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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**: Proposed rule.

**SUMMARY**: OSHA is proposing a rule to protect employees from the hazards associated with hoisting equipment when used to perform construction activities. Under this proposed rule, employers would first determine whether the ground is sufficient to support the anticipated weight of hoisting equipment and associated loads. The employer then would 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 would be 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**: Submit comments (including comments to the information-collection (paperwork) determination described under the section titled "Supplementary Information" of this notice), hearing requests, and other information by [INSERT DATE 60 DAYS AFTER PUBLICATION OF THIS NOTICE IN THE FEDERAL REGISTER]. All submissions must bear a postmark or provide other evidence of the submission date. (See the following section titled "Addresses" for methods you can use in making submissions.)

**ADDRESSES**: Comments and hearing requests may be submitted as follows:

• *Electronic*. Comments may be submitted electronically to http://www.regulations.gov, which is the Federal eRulemaking Portal. Follow the instructions online for submitting comments.

• *Facsimile*: OSHA allows facsimile transmission of comments and hearing requests that are 10 pages or fewer in length (including attachments). Send these documents to the OSHA Docket Office at (202) 693-1648; hard copies of these documents are not required. Instead of transmitting facsimile copies of attachments that supplement these documents (e.g., studies, journal articles), commenters may submit these attachments, in triplicate hard copy, to the OSHA Docket Office, Technical Data Center, Room N-2625, OSHA, U.S. Department of Labor, 200 Constitution Ave., NW., Washington, DC 20210. These attachments must clearly identify the sender's name,

date, subject, and Docket ID (i.e., OSHA-2007-0066) so that the Agency can attach them to the appropriate document.

• *Regular mail, express delivery, hand (courier) delivery, and messenger service*: Submit three copies of comments and any additional material (e.g., studies, journal articles) to the OSHA Docket Office, Docket ID OSHA-2007-0066 or RIN No. 1218-AC01, Technical Data Center, Room N-2625, OSHA, Department of Labor, 200 Constitution Ave., NW., Washington, DC 20210; telephone: (202) 693-2350. (OSHA's TTY number is (877) 889-5627.) Please contact the OSHA Docket Office for information about security procedures concerning delivery of materials by express delivery, hand delivery, and messenger service. The hours of operation for the OSHA Docket Office are 8:15 a.m. to 4:45 p.m., e.t.

• *Instructions*. All submissions must include the Agency name and the OSHA Docket ID (i.e., OSHA-2007-0066). Comments and other material, including any personal information, are placed in the public docket without revision, and will be available online at http://www.regulations.gov. Therefore, the Agency cautions commenters about submitting statements they do not want made available to the public, or submitting comments that contain personal information (either about themselves or others) such as social security numbers, birth dates, and medical data.

• *Docket*. To read or download comments or other material in the docket, go to http://www.regulations.gov or to the OSHA Docket Office at the address above. Documents in the docket are listed in the http://www.regulations.gov index; however, some information (e.g., copyrighted material) is not publicly available to read or download through this website. All submissions, including copyrighted material, are

available for inspection and copying at the OSHA Docket Office. Contact the OSHA Docket Office for assistance in locating docket submissions.

**FOR FURTHER INFORMATION CONTACT**: *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 "2008."

• *Additional information for submitting documents*. See section V.I. ("Public Participation") of this notice.

**SUPPLEMENTARY INFORMATION**:

## I. GENERAL

### A. Table of Contents

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**B. Hearing**

Requests for a hearing should be submitted to the Agency as set forth above under **DATES** and **ADDRESSES**.

## II. BACKGROUND

### A. History

The Occupational Safety and Health Act of 1970 (84 Stat. 1590, 29 U.S.C. 651-678) (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 has adopted, among others, 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 (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 applies to cranes and derricks is § 1926.550. That section relies heavily on national consensus standards that were in effect in 1971, in some cases incorporating the consensus standards by reference. For example, § 1926.550(b)(2) requires 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, § 1926.550(e) requires derricks to meet applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation prescribed in ANSI B30.6-1969, "Derricks." Since 1971, § 1926.550 has been amended substantively only twice. In 1988, a new paragraph (g) was added to establish clearly the conditions under which employees on personnel platforms may be hoisted by cranes and derricks. 53 FR 29116 (Aug. 2, 1988). In 1993, a new paragraph § 1926.550(a)(19) was added to require that all employees be kept clear of lifted and suspended loads.

There have been considerable technological changes since the 1971 OSHA standard was issued. For example, hydraulic cranes were rare at that time but are now prevalent.

Although the OSHA standard remains largely unchanged, the construction industry has updated the consensus standards on which the OSHA standard is based. For example, the industry consensus standard for derricks was most recently updated in 2003, and that for crawler, locomotive and truck cranes in 2004.

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 their numbers. They emphasized that the considerable changes in both work processes and technology have made much of Subpart N 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. (OSHA-2007-0066-0020). In December 1999, ACCSH recommended to OSHA that the agency consider using a negotiated rulemaking process as the mechanism to update Subpart N (ACCSH 1999-4, Ex. 100x, p. 112).

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

In July 2002, OSHA announced its intent 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 issued a notice of intent to use negotiated rulemaking for this project and establish the Cranes and Derricks Negotiated Rulemaking Advisory Committee ("C-DAC" or "the Committee")) (67 FR 46612, July 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 bringing different viewpoints to the table and sharing views, the members of the 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 who will

be subject to the rule and the employees who stand to 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 will have already received 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 was reached on an issue when not more than two non-federal members dissented on that issue.

In the July 2002 notice of intent to establish a negotiated rulemaking committee referred to above, the Agency listed key issues that OSHA expected the negotiations to address and the interests that OSHA had tentatively identified as being significantly affected by the rulemaking. Those 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.

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 urged interested parties to communicate with others who shared similar interests and to begin organizing coalitions to support those interests in order to identify individuals 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 might mean that not all interests could be represented on the committee itself. However, OSHA further noted that interested persons had means other than committee membership available to participate in the committee's deliberations, including attending committee meetings and addressing the committee, providing written comments to the committee, and participating in committee workgroups. 67 FR at 46615.

In response to its request for public input, the Agency received broad support for using negotiated rulemaking and 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 that proposed list. 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. 68 FR 39879 (July 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 as follows:

Table 1. The Qualifications of C-DAC Panel 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. Charman**, 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/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 programs |

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

| | |
|---|---|
| Title | National Service Manager |
| Organization/Interests represented | Tower crane distributor/manufacturer |
| 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 ten 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/users |
| Experience | Over 35 years' experience in the |

| | |
|---|---|
| | construction industry, most of them with Sundt |

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

| | |
|---|---|
| Title | Safety and Risk Manager |
| Organization/Interests Represented | Steel Erection crane user/employers |
| Experience | Over 22 years' experience in the construction/steel erection industry |

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

| | |
|---|---|
| Title | Crane and Rigging Specialist |
| Organization/Interests Represented | Employee Training/Evaluation |
| Experience | Over 31 years' experience in the construction industry |

**Emmett Russell**, International Union of Operating Engineers (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/construction industry, including ten 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 in conjunction 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/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/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/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 (respectively) |
| Organization/Interests Represented | Employers/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 | Employer/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. |

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) impartially assisting the members of the committee in conducting discussions and negotiations; and

(3) supervising the taking of minutes and keeping of records and other relevant responsibilities, including the drafting of meeting summaries after each meeting 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 nature and consequences of the Committee's decision-making. 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. Under this definition, if OSHA dissented, there would be no consensus.

This definition of consensus 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, there would be little likelihood that the Committee's work product would eventually be reflected in the final rule. These members wanted to ensure that concerns of the Agency that would prompt it to dissent were instead resolved in the negotiating process.

Under this ground rule, if C-DAC reached a final consensus agreement on some or all issues, OSHA would use the consensus-based language on those issues for which agreement was reached as 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 provide that OSHA may only depart from this aspect of the agreement by either reopening the negotiated rulemaking process or providing to the C-DAC members a detailed statement of the reasons for altering the consensus-based language sufficiently far in advance of publication that the C-DAC members could express their concerns to OSHA. The Committee members could also provide negative or positive public comment in response to those changes. (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 39879-90). 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 is the Committee's recommended regulatory text for the proposed rule, is referred to here as the C-DAC Consensus Document. (OSHA-S030-2006-0663-0639). On October 12, 2006, ACCSH adopted a resolution supporting the C-DAC Consensus Document and recommending that OSHA use it as the basis for a proposed standard. (ACCSH 2006-1, Ex. 101x, pp. 248-49).

As noted earlier, OSHA's assent was needed for C-DAC to reach consensus agreement on an issue. Thus, the fact that the Committee reached consensus agreement on all issues means that this proposal reflects OSHA's agreement with the Consensus Document. In the discussion of the various sections of the proposal below, when the Committee's views or conclusions are stated, OSHA agrees with those views or conclusions unless otherwise noted.

In reviewing the Consensus Document to draft this proposed rule, OSHA identified certain problems in the Consensus Document. These range from misnumbering and other typographical/technical errors to provisions that appear to be inconsistent with the Committee's intent or that are worded in a manner that requires clarification. This proposed rule deviates from the Consensus Document where changes were clearly needed to reflect the Committee's intent, or to correct typographical/technical errors.

With respect to substantive changes, the Agency has identified and explained them in the portions of this preamble that address the affected provisions.

There are instances where it appears to the Agency that other changes may be needed for several reasons: to conform to the Committee's intent; where the precise form of a change needed to conform to that intent is not clear; or where an aspect of a significant issue appears not to have been considered by C-DAC. In each such instance OSHA has retained the regulatory language used in the Consensus Document but asks for public comment on them.

Numerous 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 safety issues involving such equipment. In addition, other members had substantial knowledge and experience in other types of subject areas that also related to crane and derrick safety. This is reflected in the summary of their qualifications (see list above).

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 design improvements to the current Subpart N requirements that would be practical and workable. This preamble describes the proposed standard and the Committee's reasons for resolving the various issues in the manner it did.

In examining the causes of crane accidents and devising ways to reduce them, the Committee concluded that incorrect operation was a factor in many accidents. Operating a crane is a complex job requiring skill and knowledge. To operate a crane safely requires a thorough knowledge of the equipment and controls and a complete understanding of the factors that can affect the safety of its operation. The Committee believed that it was essential to address the issue of operator qualification so that accidents resulting from incorrect operation would be reduced.

C-DAC spent considerable time and effort determining how the proposed rule could best ensure that equipment operators are well qualified. C-DAC decided that it was necessary for crane operators to be certified or qualified through a formal process to ensure that they possessed the degree of knowledge necessary to operate their equipment safely. The Committee's reasoning and the details of the qualification/certification process are discussed below in connection with § 1926.1427, *Operator Qualification and certification*.

Another cause of numerous fatal and serious accidents that C-DAC addressed was equipment making electrical contact with power lines. Although Subpart N currently addresses this issue by requiring equipment to maintain a minimum distance from power lines that depends on the voltage of the line, the Committee identified reasons why the current standard was not preventing the many accidents that continue to occur. The Committee concluded that simply requiring a minimum clearance distance was not

sufficient to eliminate the human error that led to most instances of power line contact and that additional requirements that would help employers identify potential power line hazards and systematic procedures to protect against those hazards were needed to prevent power line contact. See the discussion below under §§ 1926.1407-1411, which deal with the various aspects of power line safety.

As noted above, OSHA's current standard on cranes and derricks, 29 CFR 1926.550, incorporates numerous national consensus standards by reference. The Committee reviewed the most recent versions of these consensus standards. For some issues, the Committee determined that a different approach was warranted (such as in the case of protections against power lines and operator qualification/certification). In many other instances the Committee determined that concepts in the consensus standards were appropriate but that different wording was needed to improve clarity and enforceability, or to be more readable within the structure of the proposed rule.

Where the Committee incorporated consensus standards by reference, it agreed with the concepts, found the structure and wording appropriate, and determined that the incorporation of the provisions would not detract from its goal of producing a readable document. In addition, to avoid encumbering the text with too much length and technical detail that would hinder readability, C-DAC decided to incorporate by reference certain requirements from consensus standards where those requirements addressed highly technical topics, such as welding criteria.

C-DAC also determined that some categories of equipment needed to be addressed differently than others. The proposed standard contains general requirements in §§ 1926.1402-1434 that are appropriate for most types of equipment and workplaces but which contain certain specific exclusions. Sections 1926.1435-1441 each address a specific type of equipment, such as § 1926.1435, *Tower cranes*. Those sections tailor the requirements of the proposed standard to accommodate the unique characteristics of that equipment. They state which of the general provisions in §§ 1926.1402-1434 apply to that type of equipment and which do not. They also include requirements specific to that type of equipment either (as specified) as a substitute for, or in addition to, the general provisions in §§ 1926.1402-1434. In this way, C-DAC ensured that each type of equipment would be subject to requirements appropriate for that equipment.

In drafting some of the provisions in this proposal, the Committee recognized that OSHA would be requiring cranes and derricks to be equipped with operational aids that have not been mandatory in the past. For some types of these aids, the Committee believed it would be impractical to require that cranes and derricks be retrofitted with the devices. In determining whether to propose that such requirements be prospective only, the Committee considered the degree of importance of the device to safety, whether the devices are required under industry consensus standards and, if so, the date they were first required under such standards. Recognizing that manufacturers generally follow industry consensus standards, C-DAC drafted these provisions to require equipment manufactured after the date an operational aid was required by an industry consensus standard to be equipped with the device.

In situations where no industry consensus standard required that cranes or derricks be equipped with a certain operational aid or fall protection device, the Committee decided to allow sufficient lead time for manufacturers to install the aids and devices. The Committee proposed to require some aids and devices on equipment manufactured one year after the effective date of this standard. In other cases, the Committee specified that the aids and devices would be required on equipment manufactured after January 1, 2008.

It is now evident that the standard will not be finalized by that date and that keying requirements to that date will not afford employers the lead time intended by the Committee. To conform this proposed standard to the Committee's intent, and to ensure that industry has sufficient lead time to equip cranes and derricks with the required aids and devices, OSHA is substituting "more than one year after the effective date of this standard" for "January 1, 2008" wherever that date appears in the Committee's draft.

### 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. 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) (OSHA-2007-0066-0012). The authors searched OSHA's 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 that the percentages of fatalities caused by various types of incident are in Table 2 as follows:

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. A. Suruda, M. Egger, & D. Liu, "Crane-Related Deaths in the U.S. Construction Industry, 1984-94," The Center to Protect Workers' Rights (Oct. 1997) (OSHA-2007-0066-0013). The authors examined OSHA IMIS data to identify the number of fatal accidents involving cranes and determine 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 that OSHA and the states that enforce their own state plans investigate is

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

The Suruda study determined that the number and the percentage of fatalities from various causes are in Table 3 as follows:

Table 3. The Causes of Crane Incidents

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|---|---|
| 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%) |

The proposed standard addresses the major causes of the equipment related fatalities identified in the Beavers and Suruda studies. The following is a brief synopsis of the sections in this proposed standard that address them; each proposed section is explained in detail later in this preamble.

The electrocution hazard is addressed by proposed §§ 1926.1407-1411, which deal with various aspects of power line safety. These sections contain requirements designed to prevent equipment from contacting energized power lines. The proposed rule delineates systematic, reliable procedures and methods that must be used to prevent a safe clearance distance from being breached. If maintaining the safe clearance distance is infeasible,

additional protections would be 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 and the requirement for operator qualification and certification in proposed § 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 does occur.

Fatalities that involve employees being struck or crushed during assembly/disassembly are addressed in proposed §§ 1926.1403-1406. These sections require certain specific safe practice procedures to be followed and for the employer to address a list of specific hazards. Also, assembly/disassembly must be supervised by an individual who is well qualified to see that these requirements are properly implemented.

As the 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 proposal addresses this scenario in proposed § 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 proposed standard includes requirements for: proper assembly procedures (proposed § 1926.1403); boom stops to prevent booms from being raised too far and toppling over backwards (proposed § 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 (proposed § 1926.1416, *Operational aids*). Also, the inspection requirements (proposed § 1926.1412) are designed so that a structural deficiency in a boom will be detected and addressed before an accident occurs. Cable failure will be avoided by compliance with proposed sections such as § 1926.1413, *Wire rope – inspection*, § 1926.1414, *Wire rope – selection and installation criteria*, and the provision in proposed § 1926.1416 requiring two-block protection.

Crane tip-over is caused by factors such as overloading, improper use of outriggers and insufficient ground conditions. Proposed § 1926.1417, *Operations*, includes provisions designed to prevent overloading. That 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. Proposed § 1926.1404(q) has requirements for outrigger use designed to ensure that outriggers are properly set when they are needed to provide stability when a load is lifted. Proposed § 1926.1402 has requirements designed to ensure sufficient ground conditions.

The provisions on training and operator qualification and certification will also prevent this type of accident by ensuring that the operator is sufficiently knowledgeable and

skilled to recognize situations when the crane may be overloaded and to either require that the situation be corrected or refuse to proceed in accordance with proposed § 1926.1418, *Authority to stop operation*.

Fatalities that result from workers being struck by the cab or counterweights will be avoided by compliance with proposed § 1926.1424, *Work area control*. That section would require that employees who must work near equipment with a rotating superstructure be trained in the hazards involved, that employers mark or barricade the area within the area covered by the rotating superstructure, and that the operator be alerted whenever an employee must enter that area and not rotate the superstructure until the area is clear. Protection against being struck by a counterweight during assembly/disassembly is provided by proposed § 1926.1404(h)(9), which would require the assembly/disassembly supervisor to address this hazard and take steps when necessary to protect workers against that danger.

The proposal addresses a number of types of equipment failure that can result in the load striking a worker. Such accidents are directly addressed by proposed § 1926.1425, *Keeping clear of the load*, and § 1926.1426, *Free fall/controlled load lowering*. In addition, improved requirements in proposed §§ 1926.1419-1422 for signaling will help avoid load struck-by accidents caused by miscommunication.

Improper operation, including, for example, the failure to understand and compensate for the effects of factors such as dynamic loading, can also cause employees to be struck by a

load. Such incidents will be reduced by compliance with proposed § 1926.1427, *Operator qualification and certification* and proposed § 1926.1430, *Training*. Other provisions, such as those for safety devices and operational aids (proposed § 1926.1415 and § 1926.1416), and the requirement for periodic inspections in proposed § 1926.1412, will also reduce the number of this type of accident.

Protection against falling from equipment is addressed by proposed § 1926.1423, *Fall protection*. That section would require new equipment to provide safe access to the operator work station by the use of devices such as steps, handholds, and grabrails. Certain new lattice boom equipment would have to be equipped with boom walkways. There are also fall protection provisions tailored to assembly and disassembly work and to other work. Proposed § 1926.1431, *Hoisting personnel*, addresses fall protection when employees are being hoisted.

OSHA has investigated numerous equipment accidents that have resulted in fatalities from the causes listed in the Beavers and Suruda studies. Below is a discussion of examples from OSHA's IMIS accident investigation reports from recent years that illustrate some of the types of accidents that occur when using the types of equipment covered by this proposed standard and the ways that this proposed standard would prevent such incidents. These examples illustrate the limitations of the current standard and highlight the need for a revised standard that will address the causes of the equipment accidents that continue to kill and injure construction workers.

1. February 16, 2004: 4 fatalities, 4 injuries. A launching gantry collapsed and fatally injured 4 workers and sent 4 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. (OSHA-2007-0066-0017).

OSHA believes that this type of accident would be prevented by compliance with the provisions of this proposed standard for assembling equipment. Proposed § 1403 requires that equipment be assembled in compliance with manufacturer procedures or with alternative employer procedures (see proposed § 1406) designed, among other things, to prevent the equipment from collapsing. In addition, under proposed § 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. 1 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. (OSHA-2007-0066-0017.1)

Proposed § 1926.1404(f) would prevent this type of accident by generally prohibiting 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.

3. July 23, 2001: 1 fatality. Employee failed to extend the outriggers before he extended the boom of a service truck crane to lift up some pipes. As he extended his boom, the crane tipped over on its side and an employee was struck on the head by the hook block as he stood near the rear of the truck. (OSHA-2007-0066-0017.10).

This type of accident would be prevented by compliance with proposed § 1926.1404(q), which 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.

4. March 8, 1999. 1 fatality. Some 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. (OSHA-2007-0066-0017.11).

Section 1926.1408 includes provisions that would prevent this type of accident. First, it would require the use of "encroachment prevention" measures designed to prevent the

crane from breaching a safe clearance distance from the power line. Second, if tag lines are used to guide the load, they would have to be non-conductive. Third, if maintaining the normal clearance distance were infeasible, a number of additional measures would have to be used. One of those additional measures is the use of an insulating link between the end of the load line and the load.

These measures would protect the employee guiding the load in several ways, including the following: First, they would reduce the chance that the crane would come into electrical contact with the power line. Second, if the employee were using a tag line to guide the load, it would have to be non-conductive, which would protect the employee if the load became energized.

If the crane were intentionally operated closer than the normal clearance distance, and the employer complied with the additional protective measures required in that circumstance, an insulating link would be in place. In such a case, even if there was a failure of the encroachment prevention measures and electrical contact resulted, the insulating link would prevent the load from becoming energized and prevent the employee guiding the load from being electrocuted.

5. August 21, 2003. 3 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 from the ground. When the operator stepped from the cab of the truck he created a conduction pathway to the ground through his right hand and right foot,

causing him to be electrocuted. A co-worker attempted to revive the incapacitated crane operator with cardio-pulmonary resuscitation ("CPR") while a third co-worker contacted 911 and returned to the incident location. When the third co-worker simultaneously touched the energized truck crane and the back of his co-worker performing CPR, the resulting pathway created a conduction pathway through the workers, electrocuting them all. (OSHA-2007-0066-0017.12).

This type of accident would be avoided by compliance with the proposed rule. First, as explained in the previous electrocution accident examples, proposed § 1926.1408 is designed to ensure that a minimum safe distance from the power line is maintained, which would prevent the equipment from becoming energized. Also, when working closer than the normal minimum clearance distance, the crane would have to be grounded; that would reduce the chance of an electrical pathway through the employees in this type of scenario.

In addition, proposed § 1926.1408(g) would require the operator to be trained to remain inside the cab unless there is imminent danger of fire or explosion. The operator must also be trained in the danger of simultaneously touching the equipment and the ground, as he did in this case, and in 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 would be reinforced by the electrocution warnings that must be posted in the cab and on the outside of the equipment.

6. September 28, 1999: 1 fatality. A 19-year old electrical instrument helper was at a construction site that was on a manufacturing company's property. That morning a contractor had positioned a 50-ton hydraulic crane in an open area that consisted of compacted fill material. This was the only location that the crane could be situated because the receiving area for the equipment was very close to the property border. The crane was moving large sections of piping to a new location when it overturned and struck the helper.

The crane's outriggers were set but matting was placed only under the northwest outrigger pad. At the start of the construction project, the manufacturing company cleared the site and had fill material brought in. The site was originally swamp and large amounts of fill had been brought in. (OSHA-2007-0066-0017.13).

Proposed § 1926.1402, *Ground conditions*, is designed to prevent this type of accident. Under that paragraph, care must be taken to 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. A contributing factor to this accident may have been a lack of clarity regarding responsibility for adequate ground conditions due to the fact that the employer who operated the crane did not control the ground conditions on the property.

Section 1926.1402 would impose 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 for calling any deficiency to the controlling entity's attention and having it corrected before using the crane.

7. June 17, 2006: 1 fatality. A crane was being used on a barge to install a dock in a waterway. Employees were preparing to move the barge. A spud pipe, which anchored the barge, was being raised by the barge-mounted crane when the hoisting cable broke, dropping the headache ball and rigging onto one of the employees. (OSHA-2007-0066-0017.3).

This type of accident can have various causes. An incorrectly selected wire rope (one that has insufficient capacity), use of a wire rope that is damaged or worn to the point where it needs to be replaced, or two-blocking, in which the headache ball is forced against the upper block, can each cause this type of failure. The provisions of proposed §§ 1926.1413 and 1414 on wire rope inspection, selection, and installation are designed to ensure that appropriate wire rope is installed, inspected and removed from service when its continued use would be unsafe. Section 1926.1416, *Operational aids*, contains provisions designed to protect against two-blocking.

8. July 13, 1999: 3 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. (OSHA-2007-0066-0017.4 & OSHA-2007-0066-0018).

This type of accident would be prevented by compliance with proposed § 1926.1417(n), which requires the competent person in charge of the operation to consider the effect of wind and other adverse weather conditions on the equipment's stability and rated capacity. In addition, proposed § 1926.1431, *Hoisting personnel*, requires that when wind speed (sustained or gust) exceeds 20 mph, personnel are prohibited from being hoisted by a crane unless a qualified person determines it is safe to do so.

9. November 7, 2005: 1 fatality. A construction worker was crushed between the outrigger and the rotating superstructure of a truck crane. He apparently tried to retrieve a level and a set of blueprints which were laying on the horizontal member of one of the outriggers at the same time the operator began to swing the boom. (OSHA-2007-0066-0017.5).

This type of accident would be avoided by compliance with proposed § 1926.1424, *Work area control*. That section generally requires that employers erect barriers to mark the area covered by the rotating superstructure to warn workers of that danger zone. In addition, employees who must work near equipment with a rotating superstructure must be trained in the hazards involved. If an employee must enter the marked area, the crane operator must be alerted and not rotate the superstructure until the area is clear.

10. March 19, 2005: 2 fatalities and 1 injury. During steel erection operations, a crane was lifting three steel beams to a parking garage under construction. The crane tipped over and the boom collapsed. The boom and attached beams struck concrete workers next to the structure. Two were killed and one injured. The accident apparently occurred as a result of overloading the crane. (OSHA-2007-0066-0017.6).

Overloading a crane can cause it to tip over. When it does, the load or crane structure can strike and fatally injure workers who may be some distance from the crane. Proposed § 1926.1417, *Operations*, includes provisions designed to prevent overloading. That 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.

The provisions on operator training and certification/qualification will also help prevent this type of accident by ensuring that the operator is sufficiently knowledgeable and skilled in recognizing conditions that would overload the crane.

11. December 7, 2005. 1 fatality. Two cranes were being used to lower a concrete beam across the river. During the lowering process, the west side of the beam became lower than the east side. The consequent shifting of the load's weight to the west side crane caused that crane to tip over. The west end of the beam went into the river and the east

end fell on the bank and a support mat, causing a flag person to be thrown into the beam. (OSHA-2007-0066-0017.7).

This type of accident would be prevented by compliance with proposed § 1926.1432, *Multiple crane/derrick lifts*. That section specifies that when more than one crane will be supporting a load, the operation must be performed in accordance with a plan developed by a qualified person. The plan must be designed to ensure that the requirements of this proposed standard will be met and must be reviewed with all individuals who will be involved in the process. Moreover, the lift must be supervised by an individual who qualifies as both a competent person and a qualified person as defined in this standard.

In the type of scenario involved in this accident, a plan that would comply with this requirement would, for example, include a determination of the degree of level that is needed to be maintained in order to prevent either crane from being overloaded. In addition, such a plan would include a system of communications and a means of monitoring the operation designed to ensure that the cranes' operation was properly coordinated.

12. May 7, 2004: 1 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 was extending the hydraulic boom, a two-block

condition occurred with the auxiliary line ball striking the auxiliary sheave head, knocking the sheave and ball from the boom. The employee was struck in the head and killed by the falling ball. (OSHA-2007-0066-0017.8).

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

Also, the operator-in-training in this case apparently did not understand that extending a hydraulic boom would move the sheave head toward the ball and could cause two-blocking. The proposed standard, through proposed § 1926.1427(a) and (f), would avoid having inexperienced operators make this type of mistake by prohibiting an operator-in-training from operating a crane without supervision and without first having had enough training to enable the operator to perform the assigned task safely.

13. April 26, 2006: One fatality. The deceased employee was part of a framing crew which was in the process of installing sheathing for a roof. A bundle of plywood sheathing was being hoisted by a crane to a location on the roof. As the crane was positioning the bundle of sheathing above its landing location, the load hoist on the crane free spooled, causing an uncontrolled descent of the load. The employee was under the load, preparing to position it to its landing spot, when the load fell and crushed him. (OSHA-2007-0066-0017.9).

This type of accident would be prevented by compliance with § 1926.1426, *Free fall and controlled load lowering*, which prohibits free fall of the load line hoist and requires controlled load lowering when an employee is directly under the load.

As discussed below in the *Preliminary Economic Analysis*, OSHA finds that construction workers suffer 89 fatal injuries per year from the types of equipment covered by this proposed standard. Of that number, OSHA estimates that 53 would be avoided by compliance with the proposed standard. In addition, OSHA estimates that the proposed standard would prevent 155 non-fatal injuries each year. Based on all of the available evidence and on the collective expertise of the members of C-DAC, OSHA preliminarily finds that construction workers are faced with a significant risk of death and injury resulting from equipment operations and that the risk would be substantially reduced by compliance with this proposed standard.

During the SBREFA process, several Small Entity Representatives expressed concern that the C-DAC proposal 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 without creating ambiguities. OSHA welcomes public comment on this issue.

## III. THE SBREFA PROCESS

Before proceeding with a proposed rule based on the C-DAC Consensus 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 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 might 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 (Small Entity Representatives, or "SERs") were then identified for the purpose of obtaining advice and recommendations from those individuals about the potential impacts of the proposed rule.

OSHA provided the SERs with the C-DAC consensus document and the draft regulatory flexibility analysis and afforded them the opportunity to submit written comments on those documents. The Agency also drafted questions asking them their views on the specific aspects of the C-DAC document it thought would be of most 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, 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 needed particular attention

and analysis in the proposal or for which it believed OSHA should explicitly solicit public comment.

In the discussion that follows, OSHA addresses each of the Panel's findings and recommendations in the section pertaining to the issue involved. Table 4 summarizes the Panel's recommendations and the portions of this preamble in which they are discussed.

Table 4. SBREFA Panel Recommendations and OSHA Responses

| SBREFA PANEL recommendation | OSHA response |
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| 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. | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |
| 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. | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |
| The Panel recommends that OSHA review its estimates for the direct costs of operator certification and seek comment on these cost estimates. | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |
| 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 | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |

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| 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 recommends that OSHA consider studying the impacts of the implementation of operator certification in California. | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |
| 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. | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |
| 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 current standard at 29 CFR 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 proposal would list the inspection requirements in one place rather than rely on incorporated consensus standards. OSHA does not believe |

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| | this proposed standard imposes significant new requirements for inspections. Section 1926.1413(a) explicitly says that booming down is not required for shift (and therefore monthly) inspections.<br><br>Similarly, OSHA does not believe that inspection of any of those items would require removal of non-hinged inspection plates. In the discussion of proposed § 1926.1412, OSHA requests public comment on these points. |
| 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. | Currently, Subpart N, at 29 CFR 1926.550(a)(2), requires load charts, so that is not a new cost. Subpart N does not require manuals. OSHA believes 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 believes that the cost of obtaining a copy of a manual should be modest and solicits comment on how many owners or operators do not have full manuals for their cranes or derricks. |
| 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. | See the Preliminary Economic Analysis (PEA), in section V.B. of this Federal Register notice |
| 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. | OSHA addresses this recommendation in the discussion of proposed § 1926.1400(c)(8) and solicits public comment on the issue. |

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| 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 explains 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 supervisor share responsibility for ensuring adequate ground conditions. |
| 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 addresses this recommendation in the discussion of proposed § 1926.1412(e) and solicits public comment on the issue. |
| 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 addresses this recommendation in the discussion of proposed § 1926.1412(d) and solicits 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 addresses this recommendation in the discussion of proposed § 1926.1412(a) and solicits public comment on the issues raised in the recommendation. |
| 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 explains that the shift inspection may be completed during the shift. |
| 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 | OSHA addresses this recommendation in the discussion of proposed § 1926.1412(d)(1)(xi) and requests public comment on the issues raised in the |

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| inspected for "level position." | recommendation. |
| The Panel recommends that OSHA solicit comment on whether § 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.<br>(An SER indicated that proposed paragraph (f)(2)(xiv)(D) of § 1926.1412 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 proposed 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 paragraph (f)(2)(xx) of § 1926.1412 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." | Proposed § 1926. 1412(f)(2)(xx) does not require the corrective action to which the SER refers. If an inspection under proposed § 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. | OSHA addresses this recommendation in the discussion of proposed § 1926.1412(f) and requests public comment on the issue. |
| 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. | OSHA addresses this recommendation in the discussion of proposed § 1926.1412(e) and requests public comment on the issue. |

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| 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 addresses this recommendation in the discussion of proposed § 1926.1416(d) and solicits public comment on the issue. |
| The Panel recommends that the provision on fall protection (proposed § 1926.1423) be proposed as written and that OSHA explain in the preamble how and why the Committee arrived at this provision. | In the discussion of proposed § 1926.1423, OSHA explains the Committee's rationale underlying the proposed section. |
| 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 addresses these recommendations in the discussion of proposed § 1926.1427 and requests public comment on the issues raised by the Panel. |
| 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. | The issue is discussed in the explanation of the proposed rule for § 1926.1427(h). |
| 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 ASME 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 | OSHA addresses this recommendation in the discussion of proposed § 1926.1427(b)(1)(ii)(B) and requests public comment on the issue. |

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| mounted crane (single control station); wheel mounted crane – telescoping boom (single control station)) should be used. | |
| The Panel recommends that OSHA ask for public comment on whether the rule needs to state more clearly that proposed § 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 addresses this recommendation in the discussion of proposed § 1926.1430(c) and requests public comment on the issue. |
| 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 addresses this recommendation in the discussion of proposed § 1926.1430(c) and requests public comment on the issue. |
| 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 proposed § 1926.1427(f)(2)(iii)(B). | OSHA addresses this recommendation in the discussion of proposed § 1926.1430(c) and requests public comment on the issue. |
| 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). | OSHA addresses these recommendations in the discussion of proposed § 1926.1437(n)(2) and requests public comment on the issues. |
| 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 | OSHA addresses this recommendation in the discussion of proposed paragraph |

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| appropriate to exempt from the rule small side boom cranes incapable of lifting above the height of a truck bed and with a capacity of not more than 6,000 pounds. | § 1926.1440(a) and requests public comment on the issue. |
| 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. OSHA requests comment on how and whether the proposal can be shortened or simplified—made easier to understand—and the effect of that on addressing construction hazards. |
| 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 things. OSHA notes that it cannot cite an employer for failing to have documentation not explicitly called for in 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. | OSHA addresses this recommendation in the discussion of proposed § 1926.1416(d) and requests public comment on the issue. |
| The Panel recommends that OSHA carefully discuss what is included and excluded from the | OSHA discusses in detail the types of machinery that are included under this |

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| scope of this standard. | proposed standard and those that are excluded in the explanation of § 1926.1400. |
| The Panel recommends that OSHA gather data and analyze the effects of already existing certification requirements. | OSHA has obtained and evaluated a study by the Construction Safety Association of Ontario showing that Ontario's certification requirement has led to a substantial decrease in crane-related fatalities there. |
| 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. | OSHA addresses this recommendation in the discussion of proposed § 1926.1400(c) and requests public comment on the issue. |
| 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 will consider 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 addresses this recommendation in the discussion of proposed § 1926.1427(j)(1) and requests public comment on the issue. |
| 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 addresses this recommendation in the discussion of proposed § 1926.1427(j)(1) and requests public comment on the issue. |

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| The Panel recommends that OSHA consider and solicit public comment on allowing the written and practical tests described in Option (1) of § 1926.1427(b) to be administered by an accredited educational institution. | OSHA addresses this recommendation in the discussion of § 1926.1427(b)(3) and requests public comment on the issue. |
| 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. | OSHA addresses this recommendation in the discussion of proposed § 1926.1427(h)(1) and requests public comment on the issues. |
| 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 a final rule is issued and will explain these points in the Guide. |

## IV. SUMMARY AND EXPLANATION OF THE PROPOSED STANDARD

The following discussion summarizes and explains each provision in the proposal and the substantive differences between the proposal and OSHA's current standard for cranes and derricks at 29 CFR 1926.550, which is located in Subpart N of OSHA's standards for construction work. In the discussion, OSHA explains corrections and clarifications it has

made to the language in the C-DAC Document. The Agency also identifies other areas in the C-DAC Document it believes could benefit from modifications to the C-DAC language and asks for public comment on the need for such changes and, in some instances, the appropriateness of particular clarifying language.

**Section 1400 Scope**

Paragraphs (a) through (d) of proposed § 1926.1400 set forth the scope of the proposed rule. Proposed paragraphs (a) through (c) describe, respectively, what equipment is included, the application of the standard to equipment used with attachments, and specific exclusions.

**Combining a functional description with a list of covered equipment**

Proposed paragraph (a) provides a functional definition of the covered equipment as well as a non-exclusive list of what is covered. C-DAC considered choosing between these approaches, but ultimately decided to use a combination of the two. The Committee also agreed that equipment listed in this proposed paragraph should be defined; these definitions, among others, are set forth in § 1926.1401, *Definitions*. It should be noted that the scope of 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*). OSHA believes that this format strikes

an appropriate balance between clarity and avoiding unintended limitations that might eliminate new and/or other existing technology that is similar to the listed examples.

The decision to propose a functional definition with a non-exclusive list of covered equipment followed considerable discussion. The Committee settled on a definition that focuses on the equipment's elemental functions – hoisting, lowering, and horizontally moving a suspended load. The goal of this definition is to cover both existing and new technologies that share those same functions. Committee members rejected using just a list of equipment because: (1) even the most comprehensive list might inadvertently omit existing technologies, and (2) they wanted to provide leeway in the scope for applying the new standard to future technologies.

On the other hand, C-DAC decided against a functional definition alone because that might include equipment that the standard was not designed to address (for example, equipment that poses a different set of hazards than those addressed by the standard). The list provides a context in which to apply the functional definition. The Agency believes that this hybrid approach addresses C-DAC's concerns.

**Dedicated pile drivers**

The Committee quickly agreed to include most of the items on the non-exclusive list. However, several items were included only after considerable debate. For example, C-DAC's decision to include dedicated pile drivers followed much discussion, including a

panel presentation. The panel was comprised of a manufacturer, represented by Ahti Knopp and Pentti Heinonen, President, of Junttan, as well as a user, represented by Pat Karinen and Dan Kuhs, of Pile Drivers Local Union 34 and 56. The focus of the discussion was whether to include machinery that fell outside what the industry traditionally considered to be a crane or derrick covered by existing Subpart N.

Although the manufacturer's representatives stated that they did not consider their equipment to be cranes, they ultimately supported the inclusion of dedicated pile drivers in the proposed standard for several reasons. Specifically, they emphasized certain mechanical similarities and the need for timely regulation. However, they requested that the standard be adjusted to address the equipment's unique characteristics.

The users on the panel, citing the similarities in functional capabilities and hazards between dedicated pile drivers and cranes, also supported their inclusion. They were particularly concerned about the need to establish required inspections for dedicated pile drivers in view of the stress placed on this type of equipment.

The Committee acknowledged the dilemma it faced in establishing the parameters of the proposed standard – including machines not typically described as cranes versus omitting machines similar in hazards and construction – but ultimately decided to include dedicated pile drivers. Prior to that decision, however, several members voiced concerns.

For example, some members were worried that including these machines might encourage their "use as cranes," that is, primarily for hoisting objects. The manufacturer representatives pointed out that while these machines are designed to hoist within a very limited range and capacity, it is inappropriate to use them for hoisting beyond those restricted limits. Others were concerned that some requirements in the proposed standard might be a "bad fit" for these machines. In response to such concerns, the Committee included dedicated pile drivers but tailored the requirements of the standard to take into account the specific characteristics of such equipment. As a result, proposed § 1439, *Dedicated pile drivers*, provides that most provisions of the standard apply to dedicated pile drivers but excludes some that the Committee believed were inappropriate for such equipment.

OSHA believes that this approach is appropriate to propose because it provides a workable approach that addresses the unique aspects of the equipment.

**Multi-purpose machines**

The concept of "multi-purpose machines" was discussed in depth. This term, as used in the proposed standard, refers to a relatively new type of equipment that is designed to be configured in a variety of ways to perform a variety of different types of functions. For example, during the discussion, C-DAC members noted that this type of machinery in one configuration works as an aerial forklift, and in another configuration works as a crane.

The Agency believes that the Committee developed an appropriate approach to coverage of this equipment. Specifically, the Committee defined this category of equipment in § 1926.1401, *Definitions*, to cover only machinery "designed to be configured in various ways" and has included it within the proposed scope of the standard only when configured "to hoist (by means of a winch or hook) and horizontally move a suspended load." In short, a multi-purpose machine would only be covered by the proposed standard when configured as a crane.

For example, a machine might be configured variously as a rough-terrain type forklift, work platform, or as a crane. Such a machine would only be covered by the proposed standard when configured as a crane. Conversely, a traditional rough-terrain forklift is originally designed solely as a forklift. Even if an employer suspends a load from its fork, it would still be configured (and can only be configured) as a rough terrain forklift. Such forklifts are not multi-purpose machines and would specifically be excluded from the standard's coverage by proposed § 1926.1400(c)(8).

For the same reason, aerial lifts that may have an incidental capacity to hoist (by means of suspending loads from the boom) are not multi-purpose machines. Even aerial lifts that are equipped with a low capacity hoisting device (usually located at basket level) are not "designed to be configured in various ways" and, as such, would not fall within the definition of a multi-purpose machine. Such aerial lifts are designed to be configured in only one way, that is, as an aerial lift. In fact, the provision that specifically excludes

aerial lifts, proposed § 1926.1400(c)(5), emphasizes that point in its description of aerial lifts by saying "[e]quipment originally designed as vehicle-mounted aerial devices (for lifting personnel). . . ."

The Agency agrees with the Committee that it is appropriate to propose covering multi-purpose equipment in this proposed standard (when configured as a crane) to protect employees from the types of hazards that are associated with the other equipment included in the Scope.

**Other listed equipment**

Some members were concerned that proposing to include industrial cranes on the list would result in such cranes being covered by this proposed standard even when used in a factory/general industry setting. That is not the case – this proposed standard applies only to employers engaged in construction, and therefore would apply to such equipment only when used in construction.

The Committee decided to cover side-boom cranes, which are included in the current Subpart N.[1] Committee members noted that side-boom cranes (defined in proposed § 1926.1401, *Definitions*) share characteristics with cranes. One member also stated that the American Pipeline Association supports their inclusion.

[1] 29 CFR 1926.550(a)(18) of Subpart N requires sideboom cranes mounted on wheel or crawler tractors to meet the requirements of SAE J743a – 1964.

Additional machinery that is proposed to be covered that is either not currently covered or not specifically addressed by Subpart N include cranes on a monorail, luffing tower cranes, straddle cranes, pedestal cranes and shearleg derricks (see § 1926.1436, *Derricks*). Each of these meets the functional definition in the proposed standard and presents the same types of hazards.

**Attachments**

Proposed § 1926.1400(b) would establish that equipment otherwise covered by proposed § 1926.1400(a) would remain within the scope of the proposed 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." This definition reflects an inclusive approach with respect to the use of attachments.

The Committee recognized that equipment using these attachments retain their fundamental nature as cranes, including most of the hazards typically associated with crane use. For example, hazards associated with ground conditions, assembly/disassembly and operation near power lines, as well as the importance of proper signaling, work area control, and operator knowledge and skill, remain the same while an attachment is in use. Consequently, the proposed standard as a whole is well suited to the use of this equipment with attachments.

The ACCSH December 2002 work group document provided C-DAC with an initial list of possible attachments (hooks, magnets, grapples, clamshell buckets, orange peel buckets) to be covered by the new rule. (OSHA-2007-0066-0020). Committee members suggested the remaining examples.

Whether the proposed rule should apply to a personnel platform that is pinned to the boom was the subject of considerable discussion. Such a personnel platform was the subject of a presentation to C-DAC by Dan Wolff of the National Crane Corporation. Currently, Subpart N explicitly addresses suspended personnel platforms but does not specifically mention boom-attached personnel platforms. The Committee confirmed in its discussions that installing a boom-attached personnel platform does not change the nature of the equipment to the type of aerial lift that is excluded by this proposed standard (see proposed § 1926.1400(c)(5)). The Committee was concerned that a failure to specifically address this type of platform could result in confusion as to whether its use would be governed by this standard or by the aerial lift standard. C-DAC concluded that it was appropriate to explicitly include boom-attached personnel platforms in this standard.

Committee members expressed some concern as to whether the use of such an attachment involves additional hazards not addressed in this proposed standard. The Agency is asking for public comment on whether there are additional requirements that should apply when using a personnel platform that is attached directly to the boom.

**Exclusions**

Proposed paragraph (c) lists machinery that is specifically excluded from the scope of the proposed rule. The Committee referenced a list in the ACCSH December 2002 work group document as a starting point for discussion (OSHA-2007-0066-0020). As a result of that discussion, modifications to that list were made. As discussed below, the Agency believes that the list in the proposed standard, in combination with proposed paragraphs (a) and (b), sets appropriate limits to the proposed standard's scope.

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

The view of the Committee was that, in most cases, once machinery that would otherwise be included under proposed § 1926.1400(a) is converted or adapted for non-hoisting use, the configuration and nature of operation of the machinery is generally changed to the point where many of the proposed provisions would not be directly relevant to the hazards presented. In contrast, as discussed above, C-DAC believed that equipment used with "crane-attached or suspended" attachments typically retain many of their original characteristics and the proposed provisions remain relevant.

The Agency recognizes that there may be some instances where covered equipment used with an attachment is similar in purpose to machinery converted or adapted for non-hoisting use. For example, a crane with a drilling attachment will serve the same function as a machine converted to a dedicated drilling rig. Nonetheless, the Agency believes that the approach recommended by C-DAC and reflected in the proposed rule sets an appropriate dividing line between covered and excluded machinery. The crane's hoisting mechanisms are mostly still present while the attachment is in use, and the crane's hoisting capability will likely be called upon fully once the attachment is removed. Having the machine move in and out of coverage of the rule as attachments are put on and taken off would create significant confusion. Furthermore, most of the operational characteristics and hazards of the equipment remain the same while the attachment is in use. The Agency believes that, overall, this represents a sensible approach to setting the breadth and limits of the proposed standard.

Proposed paragraph (c)(2) contains a specific list of excluded material handling machinery. This provision reflects C-DAC's decision to name specific material handling machinery that is excluded rather than simply reference "material handling machinery" as a generic basis for exclusion. The Committee indicated that a generic exclusion based upon material handling would be too broad. For example, a crane, when equipped with a clamshell bucket, is used for material handling, and C-DAC believed such equipment should be covered by the proposed standard.

C-DAC also agreed to a Committee member's suggestion of specifying that the listed machinery is excluded even when used with rigging to lift suspended loads. C-DAC acknowledged that some of the hazards of using this material handling machinery in this way are similar to the hazards associated with equipment covered by the proposed rule. However, the Committee also believed the differences between the covered equipment and the material handling machinery is such that one standard could not be readily designed to suit both. It should be noted that another construction standard, 29 CFR 1926.602 in subpart O – Motor Vehicles, Mechanized Equipment, and Marine Operations, covers material handling equipment.

Proposed paragraph (c)(3) excludes automotive wreckers and tow trucks "when used to clear wrecks and haul vehicles." A Committee member, citing C-DAC's focus on construction activities, questioned the need for this provision. In response, another member explained that some of these vehicles have substantial hoisting capacity. The implication of that observation is that these machines have the capability of hoisting construction material and so some construction employers may use them for that purpose. Consequently, C-DAC decided to cover them generally, but to exclude them when used for clearing wrecks and hauling vehicles. The exclusion is based on the Committee's view that, even if done as a construction activity (which would be very rare), clearing wrecks and hauling vehicles is a highly repetitious, predictable type of operation that is sufficiently distinct from typical construction crane and derrick use to justify an exclusion from the proposed rule. It should be noted that "cranes designed for . . . automobile wreck clearance" are excluded from the scope of ASME B30.5–2004.

Under proposed paragraph (c)(4), service trucks with mobile lifting devices for use in the power line and electric service industries, such as digger derricks, are excluded when engaged in certain listed activities for those industries. 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.

C-DAC ultimately adopted this exclusion because of the narrow, specialized range of activities and circumstances in which such trucks are used. The Agency is asking for public comment as to whether such an exclusion is appropriate and whether safety problems would be created by excluding them from coverage under the proposed standard.

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. In excluding this machinery, the Committee discussed the fact that some aerial lifts have a small capacity auxiliary winch. C-DAC decided not to include

such machinery. The use of such winches is only incidental to an aerial lift's primary function. Also, another standard, § 1926.453, addresses aerial lifts.

Proposed paragraph (c)(6) excludes telescopic/hydraulic gantry systems. This machinery is also not currently covered by Subpart N or any ANSI/ASME standards. C-DAC made the decision to exclude this machinery after extensive discussion between members and a presentation by Mr. Kevin Johnston of J&R Engineering Co., Inc.

The decision was based upon several factors. One factor was the difference in design between this machinery and other equipment covered by the proposed rule. Telescopic/hydraulic gantry systems consist (in their most basic configuration) of a header beam that is supported on each side by hydraulic jacks. The load is suspended by rigging from the header beam. The load is raised and lowered by raising and lowering the jacks.

This type of design involves hazards that are unique to this type of equipment. For example, keeping the jacks plumb and closely coordinating their movements is very important. Mr. Johnston noted that because of these differences, many of the requirements in the proposed standard would not be workable or needed. Also, hazards unique to this type of machinery would not be addressed.

C-DAC was concerned that a failure to include this machinery in the proposed rule could result in there being no applicable OSHA requirements. The Committee was particularly

concerned about this because there was no industry consensus standard for telescopic/hydraulic gantry systems. Once the Specialized Carriers & Rigging Association (SC&RA) indicated its willingness to draft and complete a voluntary consensus standard for this machinery within a short time frame, the Committee was satisfied that the best approach was to exclude telescopic/hydraulic gantry systems from the proposed rule.

The Agency notes that, in the fall of 2004, SC&RA did in fact complete a voluntary consensus standard for telescopic/hydraulic gantry systems. (OSHA-2007-0066-0027). Accordingly, the Agency agrees with C-DAC that, under these circumstances, these systems should be excluded from the proposed rule.

Under proposed paragraph (c)(7), stacker cranes are excluded. This machinery, covered by ASME B30.18, was similarly excluded in the ACCSH draft. The Agency believes that these cranes are rarely used in construction, and that their configuration is too unlike other machinery covered by this proposed standard to warrant inclusion.

Proposed paragraph (c)(8) excludes powered industrial trucks (forklifts). As noted during the C-DAC meetings, this machinery is already covered by § 1926.602 of Subpart O – Motor Vehicles, Mechanized Equipment, and Marine Operations. The Agency believes that this type of machinery is mostly used in a manner that does not involve suspended loads and would often require different responses to the hazards presented than provided

in this proposed standard. Therefore, the Agency agrees with C-DAC that this machinery should be excluded from the proposed standard.

During the SBREFA process, one Small Entity Representative stated that the C-DAC document does not contain a provision explicitly excluding coverage of machines that are originally designed to function primarily as forklifts but are modified to perform tasks similar to cranes and derricks that are covered under the standard. The Panel recommended that OSHA consider and solicit public comment on whether the scope language should be modified to explicitly state whether forklifts modified in such a manner are covered. OSHA welcomes comment on this issue.

Proposed paragraph (c)(9) excludes mechanic's trucks with hoisting devices when used in activities related to equipment maintenance and repair. The treatment of this machinery is similar to that of automotive wreckers and tow trucks. This exclusion reflects the Committee's conclusion that mechanic's trucks, when used in these support activities, have the capability of hoisting construction material and so some construction employers may use them for that purpose. Consequently, C-DAC decided to cover them generally, but to exclude them when used for equipment maintenance and repair activities. The exclusion is based on the Committee's view that, even if done as a construction activity (which would be very rare), the maintenance and repair activities are highly repetitious, predictable types of operations that are sufficiently distinct from typical construction crane and derrick use to justify an exclusion from the proposed rule.

In proposed paragraph (c)(10), machinery that hoists by using a come-a-long or chainfall is excluded. This exclusion reflects currently industry practice as exemplified by OSHA's steel erection standard. The definition of "hoisting equipment" in OSHA's steel erection standard, § 1926.751, defines "come-a-long" as "a mechanical device typically consisting of a chain or cable attached at each end that is used to facilitate movement of materials through leverage" and notes that such a device is not considered "hoisting equipment." § 1926.1401 of this proposed standard sets forth the same definition of "come-a-long" as OSHA's steel erection standard. Committee members decided that a specific exclusion was needed because these devices, that members term "tools of the trade," are not all human-powered and thus might otherwise fall within the scope of the proposed rule. C-DAC was of the view that these tools are unlike the equipment covered by the proposed rule in terms of both scale and the set of hazards associated with their use.

Proposed paragraph (c)(11) excludes dedicated drilling rigs. This exclusion was agreed upon after substantial discussion among Committee members. It should be noted that neither Subpart N nor other OSHA construction standards currently cover dedicated drilling rigs specifically.

Much of the specific information as to the nature of dedicated drilling rigs and the concerns of drill rig industry stakeholders was ascertained during a panel discussion chaired by members of the International Association of Foundation Drilling. Panel

members emphasized that, in their view, a dedicated drilling rig is not a crane, but rather is designed to function as excavating equipment.

In support of that position, the panelists noted that, unlike cranes, this machinery lacks load charts and has only limited horizontal movement, radius, and hoisting capabilities. They also stated that although many are equipped with an auxiliary service winch, the primary use of this machinery is not for hoisting. Panelists suggested that accidents associated with the use of dedicated drilling rigs tend to result from improper use (that is, attempting to use them for more extensive hoisting work, beyond the narrow limits set by manufacturer specifications). Finally, the speakers emphasized that while they did not believe this machinery should be regulated as cranes under the proposed rule, if they were to be regulated, they should be under a more closely related standard, such as the excavation standard.

Several additional concerns were examined in the course of the discussion. Some members suggested that dedicated pile drivers and dedicated drilling rigs be treated in the same manner – to either cover or exclude both. Others responded that the disparate treatment is justified by the fact that dedicated pile drivers are frequently used on barges, which involves additional hazards, and the more widespread use of that machine's hoisting function. Some members expressed concern that the inclusion of dedicated drilling rigs under the proposed rule would encourage their misuse as cranes.

The Committee decided that the arguments for excluding dedicated drilling rigs outweighed those for including them. The Agency agrees; while there are certain similarities to dedicated pile drivers in that both have an auxiliary hoisting capability, the dedicated drilling rigs are not typically used on barges and there seems to be less abuse of their very limited hoisting capabilities. Specific public comment is requested on these issues.

Proposed paragraph (c)(12) contains an exclusion for gin poles used during the erection of communication towers. It is the Agency's understanding that the erection of communication towers is a specialized subset of the construction industry, and involves issues that go beyond those C-DAC was designed to address. OSHA is therefore not proposing to include gin poles used for this purpose in the proposed rule.

Proposed paragraph (c)(13) excludes tree trimming and tree removal work from the scope of the proposed rule. In correspondence to the Committee (OSHA S030-2006-0663-0534), the Tree Care Industry Association had requested that their work be excluded from the proposed rule. The Committee noted that the vast majority of the tree care industry's work does not take place in construction and agreed that such work should be excluded. The Agency believes that, since tree trimming and tree removal work so rarely falls within construction, it is appropriate to exclude tree trimming and removal from the proposed rule.

Proposed paragraph (c)(14) excludes anchor handling with a vessel or barge using an affixed A-frame. C-DAC decided to exclude this activity after the Cranes on Barges Work Group found that there would be problems tailoring the general requirements of the C-DAC draft to address the use of these specialized devices.

Proposed paragraph (c)(15), the final item listed, excludes roustabouts. The Committee was of the view that the proposed rule is not suited to addressing these devices, which are moved about by hand.

The SBREFA Panel recommended that OSHA consider, and solicit 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 scope of the rule. OSHA requests public comment on this issue.

**Note:** OSHA replaced the word "Equipment" used in proposed §§ 1926.1400(c)(1), (c)(5) and (c)(10) of the C-DAC Consensus Document with the word "Machinery." This was done because "equipment" is a defined term in the proposed standard that refers to covered equipment and, thus, cannot be used to mean excluded machinery.

**Unspecified equipment**

Proposed paragraph (d) is included to clarify that all provisions of the proposed rule apply to covered equipment unless otherwise noted. This paragraph was 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 proposed rule. To avoid confusion, this proposed paragraph establishes that all parts of the proposed rule apply unless a provision specifically identifies other parts of the proposed rule as inapplicable, or identifies the only provisions of the standard that are applicable.

**Controlling entities**

Proposed paragraph (e) provides that the duties of controlling entities[2] are not limited to the duties specified in §§ 1926.1402(c), (e) and 1926.1424(b). This was included to clarify that the controlling entity duties specified in the proposed rule are intended to supplement, rather than displace, controlling entity duties under OSHA's multi-employer policy.

The Agency has clear authority to include in this proposed rule the provisions in proposed §§ 1926.1402(c), (e) and 1926.1424(b), which would apply specific requirements to controlling entities. First, the plain language of the OSH Act and its underlying purpose support OSHA's authority to place requirements on employers that are necessary to protect the employees of others. Second, congressional action subsequent to passage of the OSH Act recognizes this authority. Third, OSHA has consistently interpreted its statutory authority as permitting it to impose obligations on employers that extend beyond their own employees, as evidenced by the numerous

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

standards, including several construction standards, that OSHA has promulgated with multi-employer provisions. Finally, OSHA's authority to place obligations on employers that reach beyond an employer's own employees has been upheld by numerous courts of appeals and the Occupational Safety and Health Review Commission (OSHRC).

The purpose of the Act is to assure so far as possible safe and healthful working conditions for every working man and women in the nation. 29 U.S.C. 651(b). To achieve this goal, Congress authorized the Secretary to establish mandatory occupational safety and health standards. The Act broadly defines an OSHA standard as a rule that "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 employments and places of employment." 29 U.S.C. 652(8). See *Building and Constr. Trades Div., AFL-CIO v. Brock*, 838 F.2d 1258, 1278 (DC Cir. 1988). OSHA standards must prescribe measures that are appropriate to protect "places of employment;" nothing in the statutory language suggests that OSHA may do so only by regulating an employer's interaction with its own employees. On the contrary, the Act's broad language gives OSHA almost "unlimited discretion" to devise means to reach the statutory goal. See *United Steelworkers v. Marshall*, 647 F.2d 1189, 1230 (DC Cir. 1980), cert. denied, 453 U.S. 913 (1981).

Similarly, Sec. 5(a)(2) provides that each employer "shall comply with occupational safety and health standards promulgated under this Act."[3] Nothing in this language

[3] This language is in marked contrast to the language of Sec. 5(a)(1) of the Act (known as the ``general duty clause"), which requires each employer to ``furnish to each of his employees employment and a place

suggests that compliance is required only when necessary to protect the employers' own employees, or that the employer is entitled to endanger other employers' employees at the worksite. Finally, Sec. 6(b)(7) of the Act authorizes 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." 29 U.S.C. 655(b)(7) (emphasis added). Again, this authority is not limited to labels that would warn the employer's own employees of the hazard. Given the distribution of potentially hazardous products in commerce, employees are predictably exposed to hazardous conditions created by other employers. 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.

In short, the statute focuses on workplace conditions to effectuate the OSH Act's congressional mandate, and not on a particular employment relationship. The OSH Act's underlying purpose is broad--to assure safe and healthful working conditions for working men and women--and Congress made clear that it expected the Act to protect all employees. (H. Rep. No. 91-1291, 91st Cong., 2d Sess., p. 14-16 (July 9, 1970)). Numerous references in the legislative history of the Act require employers to provide a safe and healthful "place of employment" (see, e.g., S. Rep. No. 91-1282, 91st Cong., 2d Sess., p. 10 (October 6, 1970)). The OSH Act tasks OSHA with promulgating rules that will create safe places of employment, notwithstanding the many varied employment relationships that might exist at a worksite.

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of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." 29 U.S.C. 654(a)(1) (emphases added). See *Brennan v. OSHRC*, 513 F.2d 1032, 1037-38 (2nd. Cir. 1975).

Subsequent congressional action has also recognized OSHA's authority to impose responsibilities on employers to protect employees who are not their own. For example, Congress directed OSHA to develop a chemical process safety standard (the PSM standard) requiring employers to "ensure contractors and contract employees are provided appropriate information and training" and to "train and educate employees and contractors in emergency response." (29 U.S.C. note) (quoting Pub.L. 101-549, Title III, Sec. 304, November 15, 1990, 104 Stat. 2576). This is a clear ratification of the Agency's authority to require employers to protect the employees of others. Congress also approved of the Agency's authority when it relied on the provisions of OSHA's Hazard Communication standard in promulgating the Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001-11050) (EPCRA). OSHA's Hazard Communication standard, among other things, requires a manufacturer of a hazardous chemical to "inform not only its own employees of the dangers posed by the chemicals, but downstream employers and employees as well." *Martin v. American Cyanamid Co.*, 5 F.3d 140, 141 (6th Cir. 1993). Congress incorporated provisions of the Hazard Communication standard in EPCRA as a basis for triggering obligations on owners or operators of facilities producing hazardous chemicals to provide local governments with information needed for emergency response. Had Congress not approved of the multi-employer provisions in the Hazard Communication standard, it would not have approved of it as a basis for obligations in the EPCRA.

Furthermore, OSHA has consistently interpreted the OSH Act as authorizing it to impose multi-employer obligations in its standards. In addition to the Hazard Communication standard and PSM standard discussed above, OSHA included multi-employer provisions in its powered platforms standard, which requires that a building owner inform employers that the building installation has been inspected and is safe to use. 29 CFR 1910.66(c)(3). OSHA has also imposed multi-employer obligations in other construction standards.

For example, in the construction asbestos standard, OSHA requires building owners/employers to perform initial monitoring for asbestos and to communicate the presence of asbestos or presumed asbestos containing materials to prospective employers whose employees reasonably can be expected to work in exposed areas. 29 CFR 1926.1101(k)(2). In the recently promulgated steel-erection standard, OSHA imposed duties on controlling contractors to ensure that site conditions are safe for steel erection. 29 CFR 1926.752(c). OSHA just recently proposed in updates to its electric-power transmission and distribution construction standard similar multi-employer communication provisions. See 70 FR 34947-48. OSHA's inclusion of multi-employer provisions in this proposed rule is fully consistent with its past practice of ensuring the safety and health of all employees at construction worksites.

Finally, OSHA's authority to impose these provisions is confirmed by the decisions of numerous courts of appeals and the Occupational Safety and Health Review Commission holding that an employer's duties and OSHA standards may extend beyond an employer's own employees. See *Universal Constr. Co. v. OSHRC*, 182 F.3d 726, 728

(10th Cir. 1999) (following decisions from Second, Sixth, Seventh, Eighth and Ninth Circuits); *Access Equip. Sys*., 18 BNA OSHC 1718, 1722-24 (No. 95-1449, 1999). But see *Melerine v. Avondale Shipyards, Inc*., 659 F.2d 706 (5th Cir. 1981). The DC Circuit suggested in *Anthony Crane Rental, Inc. v. Reich*, 70 F.3d 1298, 1306 (DC Cir. 1995), however, that 29 CFR 1910.12(a)--a rule promulgated by OSHA to adopt Construction Safety Act (CSA) standards as OSHA standards--might limit an employer's obligations under the construction standards in part 1926 to its own employees. The court did not reach the issue, noting that the parties had not briefed it. The proposed cranes and derricks in construction standard will be included in part 1926.

Paragraph 1910.12(a) is consistent with the promulgation of requirements that place obligations on employers necessary to protect the employees of others. The provision 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.

The language of the provision supports OSHA's interpretation that an employer's responsibilities can extend beyond the employer's employees. The first sentence makes the construction standards applicable to every employment and to every "place of employment" of every construction employee. This is broad language that does not limit an employer's obligations to its own employees. The second sentence, by providing that each employer must protect the employment and the places of employment of each of his

employees, does not limit an employer's obligations to only protecting his or her employees and does not negate the broad reach of the first sentence. The two sentences, read together, require employers to comply with standards at all sites where they are working in order to protect employees who are predictably present at those sites.

The sole purpose of the provision was to "adopt and extend" existing Construction Safety Act (CSA) standards applicable under the OSH Act. 29 CFR 1910.11. Under the CSA, standards applied only to employers with Federally funded contracts, and only with respect to employees engaged on those Federal projects. See 29 CFR part 1926 subpart B; *CH2M Hill, Inc. v. Herman*, 192 F.3d 711, 718 n.1 (7th Cir. 1999). The function of 29 CFR 1910.12(a) was to adopt the CSA standards as OSHA standards and in so doing to make it clear that neither of those limitations would apply. Thus, OSHA stressed that compliance would broadly extend to each construction employer (not just those with Federal contracts) and to every construction employee (not just those working on Federal projects). In no way did OSHA intend for the language of 29 CFR 1910.12(a) to restrict its authority to promulgate construction standards that establish obligations extending beyond an employer's own employees.

Other factors confirm that OSHA had no intention in 29 CFR 1910.12(a) to bar multi-employer responsibilities under the construction standards. OSHA issued the regulation without notice and comment under Sec. 6(a) of the Act. That section provided authority only to adopt established federal standards, such as the CSA standards, without making any substantive changes. *Usery v. Kennecott Copper Corp.*, 577 F.2d 1113 (10th Cir.

1977). The CSA regulations did not limit multi-employer responsibilities; the regulations expressly provided for them. 29 CFR 1926.16. OSHA could not have intended to limit statutory obligations in an action under Sec. 6(a).

In addition, concurrently with issuance of 29 CFR 1910.12(a), OSHA issued its initial Field Operations Manual, which expressly directed issuance of citations to construction employers who created a hazard endangering their own employees or those of another employer. The Agency has also consistently promulgated rules in 29 CFR Part 1926 that expressly extend employers' obligations beyond their own employees. The requirements in proposed 29 CFR 1926.1204 reflect this consistent interpretation and will ensure that all employees on construction worksites are protected from the hazards of confined spaces.

The Occupational Safety and Health Review Commission's recent decision in *Secretary of Labor v. Summit Contractors* (OSHRC Docket No. 03-1622 (April 27, 2007), has no application to this proposed rule. In *Summit*, a divided Review Commission vacated citations issued to a controlling employer for violations of a construction standard. The two Commissioners who joined in this result issued separate opinions; each read 29 CFR 1910.12(a) as establishing a limitation on the Agency's authority to hold controlling employers accountable for violations. OSHA believes this view is mistaken, and has appealed the OSHRC decision to the U.S. Court of Appeals (8th Cir. No. 07-2191).

Moreover, *Summit* has no bearing on the duties established under the proposed rule. The *Summit* opinions interpreted OSHA's intent under then existing rules. They did not question OSHA's authority under the Act to establish multi-employer obligations through rulemaking. OSHA is exercising its authority under Sec. 6(b) to issue this proposed rule, and nothing in 29 CFR 1910.12(a) limits an employer's compliance obligations under the rule.

Proposed paragraph (f) would require that where a provision in the proposed rule directs an operator, crewmember or other employee to take a specified action, it would be 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 the employer's obligations with regard to such provisions.

**Terminology**

According to § 1926.1401, *Definitions*, two terms are defined as meaning all equipment covered by this subpart: "equipment" and "cranes/derricks." In reviewing the C-DAC document, OSHA has found that in some places it uses the word "crane" standing alone when C-DAC's intent was to refer to all covered equipment. To avoid any ambiguity, OSHA has modified the document where appropriate to replace "crane" with either "equipment" or "crane/derrick." Where "crane" is used in a way that is technically correct, as in referring to "tower cranes," OSHA has not changed it.

In instances where the C-DAC document uses the phrase "crane operator," OSHA has deleted the word "crane." By definition (in § 1926.1401) "operator" refers to the equipment operator and, in many locations, the C-DAC document already uses "operator" without a modifier to refer to the equipment operator. Therefore, use of "crane" to modify "operator" is unnecessary and potentially confusing.

**Section 1401 Definitions**

C-DAC included a number of definitions to clarify the meaning of terms used in the proposed standard. 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")(OSHA-2007-0066-0019). Some definitions were also included to ensure that certain terms used in the proposed standard have a precise, unambiguous meaning.

Where defined terms are used primarily in a single section or group of sections (such as §§ 1926.1407-1411 on power line safety), the definition will be explained in the preamble to that section or group. Definitions that are used in a number of sections will

be explained in this section. Table 5 shows the section or paragraph where each definition is discussed.

Table 5. Index of Defined Terms

| Term | Section or Paragraph where Definition is Discussed in the Preamble |
|---|---|
| A/D supervisor | § 1926.1404(a)(1) |
| Articulating crane | § 1926.1401 |
| Assembly/Disassembly | § 1926.1403 |
| Assist crane | § 1926.1404(h)(4) |
| Attachments | § 1926.1400(b)(2) |
| Audible signal | § 1926.1419(b) |
| Blocking | § 1926.1404(h)(2) |
| Boatswain's chair | § 1926.1431(o) |
| Bogie | § 1926.1435 |
| Boom (equipment other than tower crane) | § 1926.1401 |
| Boom (tower cranes) | § 1926.1435(e)(5)(ii) |
| Boom angle indicator | § 1926.1416(d)(1)(i)(A) |
| Boom hoist limiting device | § 1926.1416(d)(1) |
| Boom length indicator | § 1926.1416(e)(3) |
| Boom stop | § 1926.1416(a)(2) |
| Boom suspension systems | § 1926.1404(h)(7) |
| Builder | § 1926.1436(c)(1) |
| Calculate | § 1926.1401 |
| Center of gravity | § 1926.1404(h)(6) |
| Certified welder | § 1926.1431(e)(5) |
| Climbing | § 1926.1435(b)(7) |
| Come-a-long | § 1926.1400(c)(10) |
| Competent person | § 1926.1401 |
| Controlled load lowering | § 1926.1426(d) |
| Controlling entity | § 1926.1402(c) |
| Counterweight | § 1926.1404(h)(9) |
| Crane/derrick | § 1926.1400 |
| Crawler crane | § 1926.1401 |
| Crossover points | § 1926.1413(a)(3)(iii) |
| Dedicated channel | § 1926.1420(b) |
| Dedicated pile-driver | § 1926.1439(a) |

| | |
|---|---|
| Dedicated spotter (power lines) | § 1926.1407(b) |
| Directly under the load | § 1926.1425(e)(1) |
| Dismantling | § 1926.1405 |
| Drum rotation indicator | § 1926.1416(e)(5) |
| Electrical contact | § 1926.1407-1411 |
| Employer-made equipment | § 1926.1437(m)(4) |
| Encroachment | § 1926.1407-1411 |
| Equipment | § 1926.1400 |
| Equipment criteria | § 1926.1412(b)(1)(i) |
| Fall protection equipment | § 1926.1423(d) |
| Fall restraint system | § 1926.1423(d) |
| Fall zone | § 1926.1425(b) |
| Flange points | § 1926.1413(a)(3)(iii) |
| Floating cranes/derricks | § 1926.1437 |
| For example | § 1926.1401 |
| Free fall (of the load line) | § 1926.1426(d) |
| Free surface effect | § 1926.1437(m)(5)(ii) |
| Hoist | § 1926.1401 |
| Hoisting | § 1926.1401 |
| Include/including | § 1926.1401 |
| Insulating link/device | § 1926.1408(b)(4)(v) |
| Jib stop | § 1926.1415(a)(3) |
| Land crane/derrick | § 1926.1437(h) |
| List | § 1926.1437(e)(1) |
| Load | § 1926.1401 |
| Load moment (or rated capacity) indicator | § 1926.1416(e)(4) |
| Load moment (or rated capacity) limiter | § 1926.1416(e)(4) |
| Locomotive crane | § 1926.1401 |
| Luffing jib limiting device | § 1926.1416(d)(2) |
| Marine hoisted personnel transfer device | § 1926.1431(b)(2)(iii) |
| Marine worksite | § 1926.1431(b)(2)(iii) |
| Mobile cranes | § 1926.1401 |
| Moving point-to-point | § 1926.1423(d)(1) |
| Multi-purpose machine | § 1926.1400(a) |
| Nationally recognized accrediting agency | § 1926.1427(b)(1)(i) |
| Non-conductive | § 1926.1407(b)(2) |
| Operational aids | § 1926.1416 |
| Operational controls | § 1926.1417(b)(2) |
| Operator | § 1926.1401 |

| | |
|---|---|
| Overhead and gantry cranes | § 1926.1438 |
| Paragraph | § 1926.1401 |
| Pendants | § 1926.1404(h)(8) |
| Personal fall arrest system | § 1926.1423(f) |
| Portal cranes | § 1926.1415(a)(1) |
| Power lines | § 1926.1407-1411 |
| Procedures | § 1926.1401 |
| Proximity alarm | § 1926.1407(b)(3) |
| Qualified evaluator (not a third party) | § 1926.1428(a)(2) |
| Qualified evaluator (third party) | § 1926.1428(a)(2) |
| Qualified person | § 1926.1401 |
| Qualified rigger | § 1926.1425(c)(3) |
| Range control warning device | § 1926.1407(a)(3) |
| Rated capacity | § 1926.1401 |
| Rated capacity indicator | § 1926.1416(e)(4) |
| Rated capacity limiter | § 1926.1416(e)(4) |
| Repetitive pickup points | § 1926.1413(a)(3)(iii) |
| Running wire rope | § 1926.1413(a)(2)(ii)(A) |
| Runway | § 1926.1431(k)(12)(ii)(A) |
| Section | § 1926.1401 |
| Side-boom crane | § 1926.1440 |
| Special hazard warnings | § 1926. 1417(c)(1) |
| Stability (flotation device) | § 1926.1437(m)(5)(iii) |
| Standard Method | § 1926.1419(c) |
| Such as | § 1926.1401 |
| Superstructure | § 1926.1424(a)(1) |
| Tag line | § 1926.1407(b)(2) |
| Tender | § 1926.1437(j)(3) |
| Tilt-up or tilt down operation | § 1926.1425(e) |
| Tower crane | § 1926.1401 |
| Travel bogie (tower cranes) | § 1926.1435(d)(2)(iv) |
| Trim | § 1926.1437(e)(1) |
| Two blocking | § 1926.1416(d)(3) |
| Unavailable procedures | § 1926.1417(b) |
| Up to | § 1926.1401 |
| Upperstructure | § 1926.1424(a)(1) |
| Upperworks | § 1926.1424(a)(1) |
| Wire rope | § 1926.1413 |

Four terms that are defined in the C-DAC document – "alongside," "appointed person," "blind pick," and "power down," – were used by C-DAC in earlier drafts but are not used in the proposed standard. OSHA has therefore not included them in this section.

**"A/D supervisor"** means "an individual who meets this standard's requirements for an A/D supervisor, 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." This definition is taken from the SC&RF Handbook definition of "articulating boom crane."

**"Assist crane"** is "a crane used to assist in assembling or disassembling a crane."

**"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.'"

**"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." This definition is discussed under paragraph 1400(b) in the explanation of this proposed standard.

**"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. Typically used to support latticed boom sections during assembly/ disassembly and under outrigger floats."

**"Boatswain's chair"** is "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"** is synonymous with "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." This definition is taken from the SC&RF Handbook.

**"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"** is "a device which measures the angle of the boom relative to horizontal."

**"Boom hoist limiting device"** "includes 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. 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 systems"** are "a system of pendants, running ropes, sheaves, and other hardware which supports the boom tip and controls the boom angle."

**"Builder"** means "an employer builder/constructor of equipment." This definition is discussed under § 1926.1436(c)(1) in the explanation of this proposed standard.

**"Calculate"** "includes use of a calculator." The Committee included this definition to make clear that persons who performed calculations under this standard may use any method, including use of a calculator, that yields accurate results.

**"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"** is "a welder that meets the nationally recognized certification requirements that are applicable to the task being performed."

**"Climbing"** is "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"** is "a person 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." This definition is taken from 29 CFR 1926.32(f), which defines "competent person" under OSHA's construction standards. Those standards assign duties to "competent persons" that are similar to those assigned under this proposed standard.

**"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"** 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"** is 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." This definition is based on the definition of "crawler" in the SC&RF Handbook. Current industry terminology refers to crawler cranes and truck cranes together as "mobile cranes." See definition of "mobile crane" below.

**"Crossover points"** are "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"** 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/derrick/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)"** is defined as follows: "In order 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"** is "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"** refers to "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 point”** is “a point 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." This definition was included to demonstrate and clarify the usage of the word.

**"Free fall (of the load line)"** means "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 surface effect"** is "the uncontrolled transverse movement of liquids in compartments which reduce a vessel's transverse stability."

**"Hoist"** is "a mechanical device for lifting and lowering loads by winding rope onto or off a drum." A hoist is the primary lifting mechanism used by cranes and derricks.

**"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." This definition makes clear that "hoisting" is broad enough to encompass all movement of a load in the air by cranes/ derricks and is not limited to movement caused by wire rope/hoist drum equipment. For

example, movement resulting from booming out a hydraulic boom that is holding a load would be "hoisting."

**"Include/including"** means "including, but not limited to." This definition demonstrates and clarifies the usage of the word.

**"Insulating link/device"** is "an insulating device listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7."

**"Jib stop,"** which is 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"** is the "angle of inclination about the longitudinal axis of a barge, pontoon, vessel or other means of flotation."

**"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." This definition makes clear that in calculating the weight of the load for purposes such as making sure that the lift is within

the equipment's rated capacity, the weight of all objects used to attach the load to the equipment must be included. As drafted by C-DAC, "load" referred to the weight of the object being lifted but not the object itself. However, "load" is used throughout the proposed standard to refer to the object being hoisted in addition to the weight of the load. OSHA has modified the C-DAC definition accordingly.

**"Load moment (or rated capacity) indicator"** is "a system which aids the equipment operator by sensing 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"** is "a system which aids the equipment operator by sensing 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"** is "a crane mounted on a base or car equipped for travel on a railroad track." OSHA included this definition to remain consistent with the industry's use of the term as indicated in the SC&RF Handbook.

**"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"** is "a device, such as a 'transfer net,' used to hoist an employee to or from a marine worksite that is designed to protect the employee during a marine transfer and that allows for rapid entry/exit from the device. Such devices do not include a boatswain's chair when hoisted by equipment covered by this standard."

**"Marine worksite"** is "a construction worksite that is located in, on or above the water."

**"Mobile crane"** is "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." This definition is derived from the SC&RF Handbook. The term "mobile crane," as used in ASME B30.5–2004, "Mobile and Locomotive Cranes," encompasses crawler cranes, truck cranes, and other wheel-mounted cranes. The 1968 version of ANSI B30.5, which is incorporated by reference into Subpart N, is entitled "Crawler, Locomotive and Truck Cranes" and also covered crawler cranes, truck cranes, and other wheel-mounted cranes (in addition to locomotive cranes). C-DAC included its

definition of "mobile cranes" to reflect current industry terminology, which now refers to crawler cranes, truck cranes, and other wheel-mounted cranes collectively as "mobile cranes."

The SC&RF Handbook definition states that in Europe, "mobile crane" refers to a crane mounted on a truck carrier. The C-DAC draft of the definition of "mobile crane" included this reference to European terminology. While the European terminology describes a device that is included in this proposed rule's definition of mobile crane, OSHA has deleted the reference to the European terminology because it could be read to mean, erroneously, that only truck cranes fall within the definition of "mobile cranes." As noted above, crawler cranes and wheel-mounted cranes other than truck cranes also qualify as "mobile cranes."

**"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 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 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."

**"Non-conductive"** 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 controls"** are "levers, switches, pedals and other devices for controlling equipment operation."

**"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")."

**"Operator"** is "a person who is operating the equipment." The term is therefore not restricted to job title but includes any and all persons who actually operate the equipment. The Committee included this definition to make clear that anyone operating equipment must meet all of the requirements of this subpart that apply to "operators."

**"Overhead and gantry cranes"** is defined to include "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." For example, proposed paragraph 1423(a)(1) refers to "paragraphs (b), (c)(2), and (e)." Under this definition, it is understood that those are paragraphs in § 1423. By contrast, paragraph 1439 refers to certain paragraphs in other sections and therefore includes the section designation in the reference, for example, "paragraph 1416(d)(3)."

**"Pendants"** are defined to "include 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 cranes"** are "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"** are "electric transmission and distribution lines."

**"Procedures"** "include, but are not limited to: instructions, diagrams, recommendations, warnings, specifications, protocols and limitations." Several paragraphs of this proposed standard, such as § 1926.1417(a), require employers to follow manufacturer procedures. C-DAC developed this definition to make clear that "procedures" in a provision such as § 1926.1417(a) is to be interpreted broadly to include all recommendations by the manufacturer regardless of the format of those recommendations.

**"Proximity alarm"** is "a device that provides a warning of proximity to a power line 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)"** is an "entity that, due to its independence and expertise, has demonstrated that it is competent in accurately assessing whether individuals meet the qualifications in this Subpart for a signal person." This definition is discussed under § 1926.1428(a)(2) in the explanation of this proposed standard.

**"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." This definition corresponds to the definition of "qualified" in 29 CFR 1926.32(m). Its use here reflects the fact that the duties assigned to "qualified persons" under this proposal are similar to those assigned persons with comparable qualifications under other OSHA construction standards. By defining this term in the same way it is defined under other OSHA standards, C-DAC sought to make clear that construction industry employers could continue to rely on their understanding of the qualifications for a "qualified person" that is applied under existing standards.

**"Qualified rigger"** is "a rigger who meets the criteria for a qualified person."

**"Range control warning device"** is "a device that can be set by the equipment operator to warn that the boom or jib tip is at a plane or multiple planes."

**"Rated capacity"** is "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." The first sentence of this definition is taken from the SC&RF Handbook. The second sentence was added by C-DAC to clarify the meaning of "working conditions." Many crane/derrick accidents result when the equipment's "rated capacity" is exceeded, and the Committee sought to provide an unambiguous definition of the term to promote compliance with provisions that use the term. In reviewing the C-DAC consensus document, OSHA noted that "rated load" and "rated load capacity" were used in various places to mean the same thing as the Committee's definition of "rated capacity." For consistency and to reflect the intention of the Committee, all references to "rated load" and "rated load capacity" in the consensus document have been changed to "rated capacity."

**"Rated capacity indicator"** is an alternative term for "load moment indicator," which is defined above.

**"Rated capacity limiter"** is an alternative term for "load moment limiter," which is defined above.

**"Repetitive pickup points"** are "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”** is “a wire rope that moves over sheaves or drums.”

**“Runway”** is “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. This surface can be an existing surface or created for purposes of the work activity.”

**“Section”** means “a section of this subpart, unless otherwise specified.” This definition is included to ensure that the reader understands what “section” means in this standard.

**“Side-boom crane”** is “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”** are “warnings of site-specific hazards (for example, proximity of power lines).”

**“Stability (flotation device)”** means “the tendency of a barge pontoon, 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 Appendices for hand signals.”

**"Such as"** means "such as, but not limited to." This definition was included to demonstrate and clarify the usage of the phrase.

**"Superstructure"** is a synonym for "upperstructure" and "upperworks," which is defined below.

**"Tag line"** is 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. This definition is included to ensure that the use of this term for the application of this proposed standard is consistent with how tag lines are commonly used to control loads during hoisting operations.

**"Tender"** is "an individual responsible for monitoring and communicating with a diver."

**"Tilt-up or tilt down operation"** is the "raising/lowering of a load from the horizontal to vertical or vertical to horizontal."

**"Tower crane."** C-DAC defined a tower crane as: A type of lifting structure which utilizes a vertical mast or tower to support a working boom (jib) suspended from the working boom. While the working boom may be fixed horizontally or have luffing capability, it can always rotate about the tower center to swing loads. The tower base may be fixed in one location or ballasted and moveable between locations."

In reviewing this language, OSHA believes that several changes are needed. First, a characteristic of tower cranes that is missing from the C-DAC definition is 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. Third, 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. The definition does not make clear that both types are considered tower cranes for purposes of this proposed standard.

Therefore, the Agency has modified this language for the definition in the proposed rule as follows:

> 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.

OSHA requests public comment on these changes.

**"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"** is the "angle of inclination about the transverse axis of a barge, pontoon, vessel or other means of flotation."

**"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"** is a synonym for "superstructure" and "upperworks," which is defined below.

**"Upperworks"** means "the revolving frame of equipment on which the engine and operating machinery are mounted along with the operator's cab. The counterweight is typically supported on the rear of the upperworks and the boom or other front end attachment is mounted on the front." "Superstructure" and "upperstructure" are synonyms for "upperworks."

The second sentence of C-DAC's version of this definition stated: "The counterweight is typically supported on the rear of the upperstructure . . . ." OSHA has changed the word "upperstructure" to "upperworks" to avoid any confusion that could be caused by using one synonym in the definition of another.

**"Up to"** means "up to and including." This definition is included to make the meaning of the phrase clear.

**"Wire rope."** The C-DAC document defined this term as "rope made of wire," the definition that is used in this proposed rule. However, some wire rope has a fiber core, which proposed § 1926.1414 permits to be used for purposes other than boom hoist reeving. However, the C-DAC definition indicates that such rope would not be considered "wire rope." OSHA requests public comment on whether a more suitable definition would be the one used by SC&RF, which is the following:

> 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.

**Section 1402 Ground conditions**

The Committee believed that the failure to have adequate ground conditions is a significant crane safety problem. Adequate ground conditions are essential for safe crane operations because the crane's capacity and stability depend on such conditions being present.

In the Committee's view, there have been several key problems regarding ground conditions. First, cranes are commonly brought on site by a subcontractor, who typically neither has control over ground conditions nor knowledge of hidden hazards. For example, an HVAC subcontractor will usually not have the contractual authority to alter site conditions and will not know about hidden conditions such as sewer lines under the area where the crane will be located. Consequently, when ground conditions are inadequate, the subcontractor is typically unable to correct those conditions itself. Attempts to get other entities at the site to correct the conditions are often unsuccessful, which has led to cranes being set up on inadequate ground conditions.

Another problem is that 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 crane operations. This proposed section is designed to address these problems so that ground conditions will be made sufficient for safe crane operations.

**Paragraph 1402(a) Definitions**

Proposed paragraph (a) provides definitions of key terms used in this proposed section.

The term "ground conditions" would be defined as the ability of the ground to support the equipment (including slope, compaction and firmness). The Committee believed that

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

"Supporting materials" would be 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).

**Paragraph 1402(b)**

Under proposed paragraph (b), the equipment would be prohibited from being assembled or used unless ground conditions are firm, drained (except for marshes/wetlands), 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 Committee believed that crane tip-over incidents caused by inadequate ground conditions are a significant cause of injuries and fatalities. 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 believed that requiring adequate ground conditions will prevent many of these accidents.

This proposed provision would not require the ground conditions alone to be sufficient to support the equipment. The Committee recognized that such a requirement would be unnecessarily restrictive, since adequate support can often be achieved with the use of supporting materials. However, supporting materials cannot compensate for all ground condition problems. As a result, the Committee found that an appropriate approach would be to require that ground conditions be sufficiently firm, drained (except for marshes/wetlands) and graded to a sufficient extent so that, in conjunction (if necessary) with supporting materials, the support and degree of level would be adequate. "Adequate" in this context would mean sufficient to meet the equipment manufacturer's specifications for support and degree of level of the equipment.

In practical terms, the ultimate test of whether this criterion is met is whether the equipment can be set up so that it is within the manufacturer's specifications for the needed support for the equipment and the degree of level of the equipment and whether it can remain within those specifications while in use.

The Committee considered using more specific criteria, such as specifications for slope, compaction and firmness. That approach was rejected by the Committee for two reasons. First, in its view, such specifications would be unduly burdensome since employers would need to conduct complex tests with sophisticated instruments to ensure

compliance. Second, it believed that such tests are unnecessary because the person or persons supervising the equipment assembly and the crane operator would have sufficient expertise to assess the adequacy of ground conditions without the use of complex ground assessment tests and related instruments.

The individual (or team) supervising the equipment assembly (referred to in proposed § 1926.1404(a) as the "A/D supervisor") would, under proposed § 1926.1404(a), individually or collectively meet the definition of both a competent and qualified person. Also, under proposed § 1926.1427 (and specifically proposed § 1926.1427(j)(1)(i)(E)(1)), the crane operator would have technical knowledge applicable to the suitability of the supporting ground and surface to handle expected loads. In view of that level of knowledge, the Committee believed that both the A/D supervisor and the crane operator would be able to assess the adequacy of ground conditions without the use of complex ground assessment tests and related instruments.

OSHA notes that proposed § 1926.1402(e) refers to the "individual" supervising the equipment assembly. Since the individual or individuals supervising the equipment assembly are referred to throughout this proposed rule as the "A/D supervisor,"[4] OSHA has, for clarity, replaced the phrase "individual supervising the equipment assembly" in § 1926.1402(e) with "A/D supervisor."

Proposed paragraph 1402(b) would require the ground to be drained except for marshes/wetlands. This exception was included because the Committee was aware that,

[4] "A/D supervisor" is defined in proposed § 1926.1401, *Definitions*.

in many instances, the draining of marshes/wetlands is prohibited or restricted by environmental laws. Since there are devices available, such as marsh buggies, that are designed to provide adequate support to cranes in such areas (a marsh buggy is a device designed to support equipment such as a crane in swampy terrain; it can cross such terrain with that equipment on board), the Committee believed that such an exception would be appropriate.

**Paragraph 1402(c)**

Under proposed paragraph 1402(c), the controlling entity would have several specific duties regarding ground conditions. "Controlling entity" is defined in proposed § 1926.1401 as "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 mirrors the definition of "controlling contractor" in the steel erection standard, subpart R of 29 CFR part 1926, reflects the core principle of general supervisory control over the construction site as the central theme of the concept. The Committee believed that "controlling entity" would be a better term for this concept than "controlling contractor" because some employers may mistakenly believe that "controlling contractor" refers only to general contractors. Since in some instances an entity other than a general contractor has general supervisory control of the worksite, such an entity would meet the terms of the definition.

Proposed paragraph 1402(c)(1) would require the controlling entity to ensure that ground preparations necessary to meet the requirements in proposed paragraph (b) of this section are provided.

Currently, Subpart N does not specify who is responsible for providing for such preparations. In effect, reliance is placed on the various parties to work out who would have such responsibility through contractual arrangements. In the experience of a number of Committee members, in many instances the parties are unable to agree on who will have (or has) that contractual responsibility, with the result that inadequate ground conditions often do not get corrected. Consequently, the Committee believed that it is necessary to specify who will have ground condition responsibility.

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 considered the fact that some controlling entities claim to not know when a crane will arrive at the site, and would therefore be unable to timely arrange for the necessary ground condition preparations. However, the Committee found this unpersuasive. It believed that the controlling entity, by virtue of its control over the site and normal business responsibilities for the construction project itself, is fully able to be cognizant of construction schedules and information about crane use by its subcontractors.

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 proposed § 1926.1402(e). Under that proposed provision, if the A/D supervisor or the operator determines that ground conditions do not meet the requirements in proposed paragraph (b) of this section, that person's employer would be required to have a discussion with the controlling entity.[5] This discussion would concern the ground preparations that are needed so that, with the use of suitable supporting materials/devices (if necessary), the requirements in proposed paragraph (b) of this section can be met. This discussion would serve as a mechanism for those with expertise regarding the ground conditions needed to meet proposed paragraph (b) of this section to convey that information to the entity responsible for making the necessary preparations.

Proposed paragraph 1402(c)(2) addresses the problem of hidden hazards beneath the equipment set-up area. Open spaces underground, such as from voids, tanks, and utilities such as sewer, water supply and drain pipes, can greatly compromise the ability of the ground above them to support the equipment. At the set-up area, there are often no readily apparent visual clues above ground that such hazards exist under the area. 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.

[5] The SBREFA Panel recommended that OSHA consider whether use of the words "determine" and "demonstrate" would require employers to make and keep records to support such determinations and demonstrations. OSHA notes that records would not be required in these instances. Only where this proposal explicitly requires the employer to maintain records or documentation (see, e.g., proposed § 1926.1412(e)(3) on documentation of monthly inspections) is an employer required to create and/or maintain records.

Under proposed paragraph 1402(c)(2), the controlling entity would be 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, utilities) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity.

In 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. For example, a sewer line may be marked on a site drawing, an as-built drawing, or in a soil analysis. 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 proposed provision would not require the controlling entity to identify hazards that are not identified in such documents. In other words, it would not require the controlling entity to arrange for tests to be done at the site to determine if such hazards are present. The Committee believed that such a requirement would be unduly burdensome on the controlling entity. In its view the proposed provision would be sufficient because such hazards are typically identified in these documents in the normal course of business.

The Committee also believed that the duty to provide this information should be limited to hazards identified in documents that are available to the controlling entity. 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 believed such a duty would be unduly burdensome and unnecessary.

During the SBREFA meeting an SER commented on the difficulty and time consumed in getting approval from the controlling entity to make sure ground conditions were adequate, especially since many controlling entities were resistant to checking the site themselves for adequate ground conditions. The commenter further stated that his company relies on the steel erectors to test ground conditions for the proper support and that this system seems to work fine. OSHA notes that while the proposed rule would not preclude such arrangements, the responsibility for meeting the requirements of proposed paragraph (c) would nonetheless rest with controlling entity. Moreover, OSHA believes that this comment is illustrative of the need for the standard to require the controlling entity's involvement in this phase of the project.

Another SER expressed concern that the rule could not be properly implemented due to the number of communication channels a subcontractor would have to juggle before finally getting in contact with the controlling entity. For example, a subcontractor may have to go through several other subcontractors before it reaches the controlling entity. OSHA believes that, if controlling entities had the responsibilities set out in proposed paragraph (c), controlling entities would be more likely to facilitate such communication.

**Paragraph 1402(d)**

In the event that no controlling entity exists, proposed paragraph 1402(d) provides that the requirement in paragraph (c)(1) of this section shall 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. 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 proposed paragraph (b) would fall to that employer. However, that employer would not be required to comply with proposed paragraph (c)(2) of this section. This is because the information required to be disclosed under proposed paragraph (c)(2) is not likely to be available to that employer.

**Paragraph 1402(e)**

Proposed paragraph 1402(e) would establish a mechanism for a controlling entity to obtain information from the A/D supervisor or the equipment operator about insufficient ground conditions and the preparations needed to correct the problem. Specifically (as discussed above in the context of proposed § 1926.1402(c)(1)), if the A/D supervisor or equipment operator determines that ground conditions do not meet the criteria in proposed paragraph (b) of this section, that person's employer would be 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 proposed paragraph (b) can be met.

The Committee believed 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 supervisor or operator, who have that expertise, so that the preparations needed for safe crane operations can be made.

For example, controlling entity C, who has experience working with only relatively light, low capacity cranes, believes that the ground in set-up area Q is suitable. However, the crane that is going to be used is a high capacity crane. Because of the substantially greater weight of the high capacity crane, a greater degree of compaction of the soil in set-up area Q is needed. When the operator of the high capacity crane arrives at the site, the operator recognizes the need for more compaction. In this example, under this proposed provision, the operator's employer would then be required to have a discussion with controlling entity C regarding the need for greater compaction. As a result of the ensuing discussion, controlling entity C would have the additional information it needs so that it could then comply with proposed paragraph (c)(1) of this section by ensuring that the additional compaction needed to meet the criteria in proposed paragraph (b) of this section is performed.

Also, proposed § 1926.1402(e) would place a duty on the employer of the A/D supervisor or equipment operator irrespective of a controlling entity's lack of expertise. For example, if the controlling entity fails to ensure necessary ground condition preparations, action would be required of the A/D supervisor's or operator's employer. If either determined that ground conditions were insufficient to meet the proposed paragraph (b) criteria, that employer would be required to discuss the preparations that needed to be made with the controlling entity. The Committee believed that, in such circumstances, such a discussion would make it more likely that the requirements in proposed paragraph (b) would be met which, as discussed above, is necessary for safe crane operations.

**Sections 1403-1406 Assembly and Disassembly**

Proposed §§ 1926.1403 through 1926.1406 set out requirements designed to ensure the safety of employees while equipment is assembled and disassembled, which includes the erecting and dismantling of tower cranes. 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. Two analyses of data support their view.

A recent analysis of data published in the Journal of Construction Engineering and Management, authored by J.E. Beavers, J.R. Moore, R. Rinehart and W.R. Schriver, found that being "crushed during assembly/disassembly" was the third highest proximate

cause of crane related fatalities during 1997 to 2003.[6] (OSHA-2007-0066-0012). Contributing physical factors included improper assembly, improper disassembly (specifically, pin removal), and improper boom support. The study indicates that these assembly/disassembly fatalities occurred while using lattice boom cranes.

A 1997 study by A. Suruda, M. Egger and D. Liu analyzed crane related fatalities from 1984 to 1994.[7] This study determined that crane assembly and disassembly was the second leading cause of crane related fatalities, comprising 12% (or 58 deaths) of the total number of crane fatalities from 1984 to 1994. More specifically, a majority of these fatalities involved lattice boom cranes and a relatively small number involved tower cranes.[8] Almost 90 percent of the fatalities involving lattice boom cranes resulted when employees were removing boom pins from underneath an unsupported boom. (A. Suruda, et al., "Crane-Related Deaths in the U.S. Construction Industry, 1984-94" (1997) (OSHA-2007-0066-0013).[9]

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.

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[6] This study found that being struck by a load was the number one proximate cause of crane-related fatalities, followed by electrocution. Crushed by assembly and disassembly made up 12% of the total number of crane related fatalities in this study.
[7] This study was limited to crane related fatalities in the U.S. construction industry.
[8] Out of the 58 fatalities, 93% involved lattice boom cranes and 7% involved tower cranes.
[9] In contrast, a 34 year study (1969-2002) conducted by the Province of Ontario indicates that dismantling the boom is not a leading cause of mobile crane fatalities. This study concluded that dismantling the boom ranked sixth out of eight causes of mobile crane fatalities within the Province of Ontario during 1969 through 2002. Dismantling the boom comprised only 4% of the fatalities during this time period. (OSHA-2007-0066-0009).

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

**Section 1403 Assembly/Disassembly – selection of manufacturer or employer procedures**

In § 1926.1401, "assembly/disassembly" is 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 added this definition to avoid any implication that §§ 1926.1403-1406 on "assembly/disassembly" do not apply to tower cranes because the terms "assembly" and "disassembly" are not commonly used in the industry in referring to tower cranes. Instead, the words "erecting," "climbing," and "dismantling," are used, and the definition of "assembly/disassembly" makes it clear that §§ 1926.1403-1406 apply to tower cranes and, for that purpose, use tower crane terminology.

Proposed § 1926.1403 would require employers to choose among two options: assemble and disassemble cranes and derricks by following the manufacturer's procedures, or use

their own assembly/disassembly procedures (if they meet the proposed rule's criteria in § 1926.1406). Note, though, that the assembly/disassembly requirements in proposed §§ 1926.1404 and 1405 must be met regardless of which option the employer selects.

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, and OSHA agrees, 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, 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 Committee also agreed that, while use of methods other than those of the manufacturer should be allowed, such employer-developed procedures need to meet certain benchmarks (see the criteria in proposed § 1926.1406) to ensure that they are adequate to protect the employees during the assembly/disassembly process.

**Section 1404 Assembly/Disassembly – general requirements (applies to all assembly and disassembly operations)**

In examining the underlying causes of fatalities and injuries from assembly/disassembly accidents, the Committee determined that a systematic, proactive approach, designed to highlight the key hazards involved, was needed. C-DAC developed a list of those hazards and then considered how to deal with each one. It became apparent in that discussion that the action needed to address some of these hazards is specific and straightforward. These are addressed in paragraphs (a) through (g) and (j) through (q) of this proposed section. However, with regard to others, the wide variety of circumstances and methods that could be used to address them made specifying particular, detailed actions impractical and needlessly inflexible. For those, C-DAC decided to require that the hazard be addressed but to have an Assembly/Disassembly supervisory (A/D supervisor) determine how to deal with them; these are covered in paragraph (h). Note that the requirements in proposed § 1926.1404 would apply irrespective of whether manufacturer or employer procedures were used.

*New Issue*

The Agency has been investigating a March 15, 2008 collapse of a tower crane in New York City. One aspect of that investigation has focused on the use of synthetic slings in the process of attaching a bracing collar to the tower (the installation of such collars is part of the crane assembly process). This prompted the Agency to examine the existing OSHA standards applicable to the use of synthetic slings during crane assembly/disassembly.

In the course of that examination, OSHA has determined that neither Subpart N nor 29 CFR 1926.251, *Rigging equipment for material handling*, specifically addresses the hazard posed when a synthetic sling is used in a manner that can cause compression or distortion of the sling, or when the sling is in contact with a sharp edge. Consequently, the Agency is considering adding a provision to § 1926.1404 to address these hazards.[10]

One way of addressing these hazards would be to prohibit the use of synthetic slings in the assembly/disassembly of equipment covered by this proposed standard. Another way that the Agency is considering to address these hazards is to require padding or similar measures when needed to protect the slings from being damaged such as from being cut, compressed or distorted. OSHA requests public comment on this issue.

**Paragraph 1404(a) Supervision – competent –qualified person**

Proposed paragraph (a) would require supervision of the assembly/disassembly process by an "A/D supervisor." Section 1926.1401 defines "A/D supervisor" as "an individual who meets this proposed paragraph's criteria for being an A/D supervisor, irrespective of the person's formal job title or whether the person is non-management or management personnel." C-DAC defined the term 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 supervisor.

[10] C-DAC did not consider hazards associated with the use of synthetic slings during assembly/disassembly.

The A/D supervisor would have to meet the definition of both a "competent" and "qualified" person as OSHA defines those terms.[11] The Committee believed that having an A/D supervisor overseeing the assembly/disassembly process who had both the authority to correct a hazard or stop the process and who had the expertise of a qualified person was necessary to ensure the safety of the operation.

Many of the hazards involved in the process are not obvious to those with limited knowledge and experience in assembly/disassembly. There are numerous scenarios in which there is stored kinetic energy in the equipment's component parts. The installation or removal of components in the wrong order, or using the wrong procedure, can release that energy in ways that would be unexpected to those with little knowledge of the process.

For example, failure to place blocking in the correct position under a boom can lead to unexpected movement or collapse of the boom when a pin that is in tension is removed. Workers unfamiliar with the concept of pins in tension may not recognize the dangers of removing it in that circumstance. Having a person overseeing the process that has the expertise needed to know how the process is supposed to be done, the ability to recognize

[11] Proposed § 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 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 29 CFR 1926.32(f) and 29 CFR 1926.32(m).

dangerous situations and how to remedy them, and the authority to take corrective action, is crucial to ensuring that the assembly/disassembly process is completed safely.

The Committee agreed that the A/D supervisor did not have to be one individual since two people (one with the requisite expertise and the other with the authority to take corrective action), working as a team, would be as effective in overseeing the process as one individual.

The A/D supervisor would oversee the implementation of the proposed requirements in paragraphs (a) through (g) and (j) through (q) of this proposed section, and would also address the hazards as described in paragraph (h) of this proposed section.

**Paragraphs 1404(b) Knowledge of the procedures, and 1404(c), Review of the procedures**

Proposed paragraph (b) would require that the A/D supervisor understand the assembly/disassembly procedures. In addition, proposed paragraph (c) requires the A/D supervisor to review them prior to starting the process unless experience in having used them on the same type and configuration of equipment makes their review unnecessary. One example would be an A/D supervisor who has overseen the erection of a tower crane with the same configuration for numerous jobs in the past year. If that A/D supervisor had, through that repetitive experience, developed a knowledge and understanding of the

assembly procedures to the point where reviewing them prior to beginning assembly was no longer necessary, he/she would not be required to review them.

Without a thorough knowledge of these procedures, the A/D supervisor would be unable to ensure that the assembly/disassembly process is conducted safely.

**Paragraph 1404(d) Crew instructions**

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

The Committee was of the view that accidents during assembly/disassembly are often caused by misunderstandings of the employees working in the assembly/disassembly crew as to their tasks and how they are to be performed, as well as a failure to recognize potentially dangerous areas in and around the equipment. The details of these tasks and, in particular, the location of danger areas from which workers need to keep themselves and their extremities clear, often vary from one machine to another. Having the A/D supervisor check to make sure that the crew members know this essential information before starting the assembly/disassembly process would be, in the Committee's view, an effective and practical means of addressing this aspect of the problem.

**Paragraph 1404(e) Protecting assembly/disassembly crew members out of operator view**

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 believed 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.

This provision would therefore require that the crew member inform the operator that he/she is going to a location in, on, under, or near the equipment or load that is out of view of the operator where the movement of the equipment could injure the worker. The operator would be prohibited from moving any part of the crane/derrick or load until the operator gives a warning (the significance of which is understood by the crew member) and sufficient time for the crew member to move to a safe location, or the operator is informed through a pre-arranged means of communication that the crew member has moved to a safe location. Committee members indicated that the use of the (understood) warning coupled with sufficient time to exit, and the use of a pre-arranged means of communication, are each currently used by many employers and have proved to be effective.

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. Such a change could be made by changing the last phrase in proposed paragraph (e)(1) of this section to read, "the crew member shall inform the operator **directly or through someone instructed by the crew member** that the crew member is going to that location." OSHA is asking for public comment on this suggestion. In particular, OSHA is asking for comment on whether this approach would be as protective of the crew members as the proposal, given that it would allow indirect communication between the crew members and the operator.

**Paragraph 1404(f) Working under the boom, jib or other components**

The proposed provision would establish a general prohibition against employees being under the component when pins or similar devices are being removed (note that this provision is similar to section 5-3.1.3(l) of ASME B30.5-2004). An exception is provided for instances where the employer demonstrates that site constraints require being positioned under the component and the employer takes steps to minimize the risk of dangerous movement and duration and extent of exposure.

The Committee discussed the inherently hazardous nature of removing pins while being under the boom (and jib or similar components). If the wrong pins are removed while

employees are under the component, it can move or collapse, posing a severe hazard to the worker. Even when pins are removed in the correct order, there may be unexpected stresses in the component which, as stored kinetic energy that may not be apparent until that energy is released upon the removal of the pin – at which time unexpected movement of the component may result. While other proposed provisions in the assembly/disassembly sections address this same hazard in other ways, these provisions in combination form a layered approach to safety.

The Committee discussed whether any exceptions should be allowed to the prohibition against workers being under the component during pin removal. It determined, after considerable discussion, that the only type of situation where it may be inappropriate to apply the prohibition involves site constraints. For example, in some circumstances there is no room to assemble/disassemble the boom horizontally using ground support, and the boom has to be assembled/disassembled "in the air" (that is, at an angle well above horizontal, or over an area, such as a large excavation, where there is no ground available for support). In some of those situations, one or more employees may have to be under the boom for certain periods of time in the pin removal process.

Therefore, the proposed provision includes an exception to cover such instances. However, in those instances the hazard of being under the component is still present. Because of that, the Committee believed it important to limit the application of the exception and, where it would apply, to ensure that steps would be taken to limit the risks involved. Therefore, the exception would be applicable only where the employer

demonstrates that site constraints require being positioned under the component and the employer takes steps to minimize the risk of dangerous movement and duration and extent of exposure.

An example of a method for minimizing that risk and the exposure is provided in proposed Non-Mandatory Appendix D. The Committee considered making that method mandatory, but decided to include it only as an example because there may be other effective methods, which should not be excluded.

**Paragraph 1404(g) Capacity limits**

This proposed provision would require 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 would apply "during all phases of assembly/disassembly." One example of the risk created by not following capacity limits is the process of installing counterweights. In some cases the crane being assembled is used to install its own counterweights. Early in this process, when few counterweights are in place, the crane's capacity will be so limited that swinging beyond a certain point, or booming out beyond a certain point, may cause it to overturn.

It should be noted 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 proposed § 1926.1417(o), *Compliance with rated capacity*, with respect to the assist crane.

**Paragraph 1404(h) Addressing specific hazards**

For assembly and disassembly, this provision sets out specific hazard topics which the A/D supervisor must address. The Committee believed that requiring specific means and methods for protecting against these hazards (and, where specified goals are stated, for attaining those goals) would be too limiting. Therefore, the A/D supervisor must consider each listed hazard, determine the appropriate means of addressing it, and oversee the implementation of that method.

**Paragraph 1404(h)(1) Site and ground bearing conditions**

This proposed provision would work in conjunction with proposed § 1926.1402, which addresses ground conditions for both assembly/disassembly and use of the equipment, including ground condition criteria. Proposed § 1926.1404(h)(1) would require the A/D supervisor to assess the ground conditions for conformance with those criteria, and to assess the site for suitability for assembly and disassembly.

Before beginning assembly/disassembly, the A/D supervisor would have to make the determination that ground bearing conditions are adequate to support the equipment during assembly/disassembly (the concept of adequate ground bearing conditions is

discussed in detail above regarding proposed § 1926.1402). In addition, the A/D supervisor would have to consider the adequacy of site conditions which might affect the safety of assembly or disassembly. For example, at a construction site in an industrial facility with overhead piping carrying hazardous materials, the A/D supervisor would have to consider the potential for the equipment contacting the piping in determining where and how to conduct the assembly/disassembly operations.

**Paragraph 1404(h)(2) Blocking material and 1404(h)(3) Proper location of blocking**

These two provisions address the hazards associated with inadequate blocking. "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 the SC&RF Handbook.

Proper blocking plays an important role in assembly/disassembly safety. Blocking is used in a variety of circumstances to compensate for minor ground sloping and/or to enhance stability by spreading out the area over which forces from the load are transferred to the ground. It is used to help support assembled equipment (usually placed under outrigger pads) and during assembly/disassembly to support components. Blocking that is undersized, insufficient in type or number, in poor condition, and/or stacked in an unstable manner could lead to a failure of support and consequent unplanned movement or collapse of the equipment or component.

When used to support lattice booms or lattice components, the failure to place blocking in the correct location could have several dangerous consequences. For example, incorrect placement in some instances could cause a part of the lattice boom/component to bear too much force and damage it. That damage could compromise structural integrity and, in some cases, may not be immediately noticed. If the assembly process were to continue nonetheless, the boom/component could fail.

Improper blocking location may also result in a failure to provide adequate support of the boom/component. One example is blocking used to provide support to a boom section that will need it later in the disassembly process, such as after pins are removed. If the blocking is in the wrong place, once the pins are removed, unplanned movement or collapse could result. Note that proposed § 1926.1404(h)(3) on proper blocking location is similar to section 5-3.1.3(k) of ASME B30.5–2004 (blocking to be appropriately placed to prevent inadvertent dropping of the boom).

Proposed paragraph (h)(3) (Proper location of blocking) is unchanged from the C-DAC document and its applicability is limited to lattice booms and components. However, it is the Agency's understanding that other types of booms and components (i.e., those for hydraulic cranes) also are at times assembled and disassembled in the field and may similarly need blocking. Consequently, it appears to the Agency that it may be appropriate to broaden the provision so that it would apply to all booms and components, not just lattice boom and components. OSHA is soliciting comments from the public on

whether proposed paragraph (h)(3) of this section should be broadened to apply to all booms and components.

**Paragraph 1404(h)(4) Verifying assist crane loads**

This proposed 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 proposed § 1926.1417(o)(3) 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 proposed paragraph (o) of this section that it not be used in a manner that exceeds its rated capacity.

The Committee was concerned that, at times, resulting loads on assist cranes during the assembly/disassembly process are not properly anticipated. For example, when a boom is being disassembled in a cantilevered position, an assist crane is sometimes used to help support the boom. In some instances, the load prior to pin removal is within the assist crane's rated capacity, but exceeds its rated capacity once the pins are removed, causing a collapse.

The Committee discussed having one section on capacity limits for equipment, equipment components and accessories as well as for any assist equipment used while

assembling or disassembling. The Committee agreed that having a separate section on capacity limits for assist cranes was less confusing and would help highlight the hazard as it pertains to assembly/disassembly.

**Paragraph 1404(h)*(*5) Boom and jib pick points**

This proposed provision would require the A/D supervisor 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. Typically facilitating the safe handling of the boom/jib or boom/jib sections means using pick points that will result in the boom/section being at an intended angle (that is, 90 degrees to the load line or some other intended angle) when hoisted. For example, if the boom/section is intended to be horizontal, and only one pick point is going to be used, the pick point must coincide with the center of gravity. If the boom/section is intended to be at some other angle, a pick point would need to be identified that would generate that intended angle. Failure to use an appropriate pick point in this regard can create a situation in which there is a greater likelihood of unintended movement in connecting or disconnecting the boom/section.

**Paragraph 1404(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 supervisor would be required to identify the center of gravity of the load.

The "center of gravity" of an object is defined in § 1926.1401 as "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." This definition is similar to the one in the SC&RF Handbook.

One example of where it would be necessary to identify the center of gravity is where the assembly/disassembly crew relies on an assist crane to suspend a component in a horizontal position. In such instances the center of gravity must be identified in order to correctly install the rigging. If the center of gravity were not identified, employees might try to compensate by riding on the section/component while it is being moved into place, which is quite dangerous. Also, in such a situation, if the component gets "hung-up," it can move unexpectedly if it becomes freed.

In contrast, some methods for maintaining stability do not depend on rigging or supporting the component to attain horizontal balance. For example, if two adjoining

sections of a boom are being disconnected from each other, and both sections are supported at all four end points by blocking, identifying the center of gravity of each section would not normally be necessary.

The Committee anticipated that there may be instances where the assembly/disassembly method being used necessitates the identification of the center of gravity, but the employer is unable to get sufficient information to make that identification accurately. In those instances, measures would be required to be put in place that would prevent unintended dangerous movement resulting from an inaccurate identification of the center of gravity. An example of one such method is described in the proposed Non-Mandatory Appendix D of proposed subpart CC.

**Paragraph 1404(h)(7) Stability upon pin removal**

This proposed paragraph requires that boom sections, boom suspension systems (such as gantry A-frames and jib struts) or components must be rigged or supported to maintain stability upon the removal of the pins. "Boom suspension systems" are 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.

The Committee identified the process of pin removal as one that has proved to be particularly hazardous. Potential energy in these sections, systems and components can

be released suddenly during this process, resulting in unanticipated movement, ranging from shifting to collapse. Even small movements can result in injury, including amputations; larger movements and collapses can cause fatal injuries.

The Committee determined that the key to preventing these injuries and fatalities is through ensuring that the sections/components will remain stable upon the removal of the pins. Instability can have a variety of causes, including improper assembly/disassembly sequencing, improper rigging, incorrectly designed support, blocking failures and ground compression. Therefore, under this proposed provision, the A/D supervisor would be required to make sure that the sections/components are rigged or supported by maintaining stability once the pins are removed.

**Paragraph 1404(h)(8) Snagging**

This proposed 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). In § 1926.1401, "pendants" are defined to "include 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." This definition is similar to that in the SC&RF Handbook, but with the addition of the reference to "bar type" pendants.

Many times the pendant cables hang alongside the boom and may get caught (snagged) on the pins, bolts, or keepers as the operator raises the boom. If this were to occur the cables could be damaged or the boom may rise then drop suddenly as a snagged cable releases from the pin. This can result in shock loading and damaging cables and components. For example, under this proposed provision, once all the boom sections are installed and the pendants are pinned together, the A/D supervisor must ensure that care is taken when raising the boom so that pendant cables and hoist cables do not snag on the pins or any other component during the boom raising process.

**Paragraph 1404(h)(9) Struck by 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.

Counterweights are usually large, heavy plates made of steel and/or concrete. The A/D process typically involves the installation and removal of counterweights. This proposed provision would require that the A/D supervisor address the hazard of employees being struck by them during their installation/removal. During the installation/removal process, employees typically are in close proximity to them. An employee could be struck by a counterweight or crushed between it and the crane structure if it were to sway as it was being installed or removed. The A/D supervisor would be required to address this aspect

of the hazard, such as by taking steps to have the operator minimize the amount of sway and by positioning the employees to minimize their hazard exposure.

Additionally, after the counterweights are installed, the crane may have to swing to complete the boom assembly. The A/D supervisor would be required to address this aspect of the hazard as well, such as through the proper positioning of the employees and enhancing their awareness of the counterweight swing zone so that they will avoid being struck or crushed.

**Paragraph 1404(h)(10) Boom hoist brake failure**

This proposed 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 would be 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 would be 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 is concerned that the text of the proposed provision may not be sufficiently clear regarding the timing of this brake test. OSHA's interpretation is 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. OSHA is soliciting public comment on this issue and if it is necessary to revise the language of the provision to clarify when the test must be done.

**Paragraph 1404(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 proposed provision, before any of these occur, the A/D supervisor would be required to consider whether precautions need to be instituted to ensure that backward stability is maintained.

The illustration contained within the proposed requirements for loss of backward stability (§ 1926.1404(h)(11)) is taken from the "Mobile Crane Manual," published by the Construction Safety Association of Ontario.

**Paragraph 1404(h)(12) Wind speed and weather**

Committee members believed that wind velocity and weather must be considered so that crane stability and capacity are 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 believed 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 supervisor 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 supervisor must consider if weather conditions affect the safety of the operation.

**Paragraph 1404(i).** [***Reserved.***] OSHA is proposing to reserve this paragraph because it can be difficult for readers to distinguish **(i)** from **(j)**.

**Paragraph 1404(j) Cantilevered boom sections**

Members of the Committee believed 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 would require manufacturer's limitations on cantilevering not to be exceeded.

If the manufacturer's limitations were not available, the employer would be required to have a registered professional engineer (RPE) determine the appropriate limitations, and to abide by those limitations. The Committee believed 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.

**Paragraph 1404(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 proposed requirement would apply irrespective of whether the component is being hoisted by the crane being assembled/disassembled or by an assist crane.

**Paragraph 1404(l). [*Reserved*.]** OSHA is proposing to reserve this paragraph because it is inconvenient for readers to distinguish the letter "l" from the Arabic number "1."

**Paragraph 1404(m) Components and configuration**

This proposed 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. Proper selection of components and proper configurations are explained in the manufacturer's instructions, limitations, and specifications. Regarding component selection, the provision would address the hazards associated with use of components that the manufacturer had neither intended nor planned for incorporation into the equipment.

The Committee believes that the use of such components could adversely affect the capacity and performance of the crane/derrick, cause the manufacturer's specifications

(including the load chart) and instructions to be inapplicable, and adversely affect other components on the crane/derrick.

Similar hazards are posed by configuring the crane/derrick in a manner that does not accord with the manufacturer's instructions, limitations and specifications. An example given by the Committee was trucks carrying boom sections arriving out of sequence. To save time, some employers assemble the sections in the order in which they arrive rather than waiting for the correct section. This would result in a crane/derrick configured differently than intended by the manufacturer. Because the crane/derrick is designed and tested as a unit, the failure to configure the crane/derrick as the manufacturer had intended could present the same hazards as those described above for improper component selection.

The Committee recognized that, especially in the case of very old equipment where the manufacturer no longer exists, there are instances where the employer can no longer obtain the manufacturer's instructions, limitations and specifications regarding the selection of components and configuration of the equipment. In such instances the proposed provision would require that a registered professional engineer familiar with the type of equipment involved approve, in writing, the component selection and configuration.

Another proposed section (§ 1926.1434) would allow cranes/derricks to be modified under certain circumstances. To the extent a crane/derrick were modified in accordance

with that section, the employer would not be required to follow the manufacturer's original instructions, limitations and specifications regarding component selection and configuration regarding those modifications. Instead, under proposed paragraph (m)(1)(ii) of this section, the employer would be required to follow the component selection and configuration requirements approved in accordance with proposed § 1926.1434.

Finally, this proposed provision would require that the equipment be inspected after assembly has been completed to ensure that the component selection and configuration are correct.

**Paragraph 1404(n) Manufacturer prohibitions**

As explained above regarding proposed § 1926.1403, an employer would be able to choose to use either manufacturer assembly/disassembly procedures or its own (as long as they met the requirements in proposed § 1926.1406). However, in either case, the Committee believed that manufacturer prohibitions regarding assembly or disassembly would need to be met. In the Committee's view, a prohibition specified by the manufacturer signals that, if not heeded, a significant hazard would likely be created.

**Paragraph 1404(o) Shipping pins**

In order to properly address the hazards the Committee was concerned with, the Agency rewrote the language that C-DAC had originally agreed upon for this proposed provision. The original (C-DAC) language read as follows:

> (o) Shipping pins. Reusable shipping pins, straps, links and similar equipment must be removed and stowed in accordance with manufacturer instructions.

In studying the regulatory text as it was originally drafted it appeared the language did not accurately reflect the intentions of the Committee. The provision was intended to address two hazards. The first hazard is the failure to remove items such as shipping pins, which if left in place during operation could damage the equipment. For example, if shipping pins are not removed and the boom is raised up, the boom could be damaged. The second hazard is injury to employees where items such as shipping pins are removed but not properly stowed (i.e., placed in a special hole or bracket designed to keep the item from being dislodged) or stored on the equipment (such as in an equipment box in the cab) after assembly. Where these items are left lying on the equipment and not properly stowed or stored they present a falling object hazard to employees. To better reflect the Committee's intentions the Agency has altered the C-DAC language. The proposed provision reads:

> (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.

The Agency welcomes any comments with respect to this change.

**Paragraph 1404(p) Pile driving**

This proposed provision would prohibit equipment used in pile driving operations from having a jib attached. The constant pounding of the pile driving hammer and the sometimes rapid descent of the pile causes the boom to bounce. If a jib were installed on the tip, as the boom bounces the jib could be thrown backward against its stops, which would likely cause structural damage to the boom. The damage could cause the boom to immediately fail or could diminish its capacity.

**Paragraph 1404(q) Outriggers**

This proposed paragraph specifies requirements regarding outrigger deployment. These requirements reflect current industry best practices in the use of outriggers. Failure to use outriggers in accordance with these practices could result in the overturning of the crane.

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

The Committee believed that many of the accidents associated with cranes occur during the removal of pendant, boom and jib pins. These accidents typically occur because of a failure to recognize that, in certain situations, particular pins are "in tension." If removed

while in that state the result will be unplanned movement of a component or the collapse of the boom or jib.

Consequently, the Committee believed that the removal of pendant, boom section and jib pins warrants heightened attention. This proposed 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, proposed § 1926.1401 defines "dismantling" to include "partial dismantling (such as dismantling to shorten a boom or substitute a different component)."

In this proposed 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 failure to follow the provisions would very likely result in unintended movement and or collapse of the components. OSHA believes that these requirements will help to prevent unintended movement or collapse of booms or jibs as they are being disassembled.

While discussing the hazards associated with disassembly, the Committee reviewed particular illustrations from the "Mobile Crane Manual" by Construction Safety Association of Ontario. It was agreed that including these illustrations would be an effective way of communicating the dangers and the precautions specified in this proposed section.

**Section 1406 Assembly/Disassembly – employer procedures – general requirements**

Under proposed § 1926.1403, employers would be permitted to follow their own procedures for assembling and disassembling a crane/derrick instead of those of the manufacturer. When doing so, the employer would have to ensure that its procedures met the general requirements in proposed § 1926.1406.

The proposed general requirements would focus on a "layered" strategy for preventing injuries and fatalities during this process: maintaining stability of the equipment and its components and positioning employees so that their exposure to unintended dangerous movement is minimized. This reflects the Committee members' experience that maintaining stability and avoiding dangerous positions are the key elements to preventing these accidents.

In addition, under proposed paragraph (b) of this section, the employer would be required to have its procedures developed by a qualified person. The Committee believed that, due to the complexity of the factors involved and the resultant expertise needed to develop such procedures, it would be necessary for them to be developed by a qualified person.

Note that the Agency wording in proposed § 1926.1406(a)(1) includes a modification of the language in the C-DAC document. The C-DAC document stated:

> (1) Prevent unintended dangerous movement, and to prevent collapse, of part or all of the equipment.

Read literally, this would mean that the employer could choose to design the procedures to prevent collapse either of part or of all of the equipment. The intent of the Committee was that the procedures must not allow unintended dangerous movement of any part of the equipment. Therefore, the Agency modified this language so that the proposed provision reads as follows:

> (1) Prevent unintended dangerous movement, and to prevent collapse, of all parts of the equipment.

**Sections 1407-1411 Power lines**

**Introduction**

Proposed §§ 1926.1407 through 1926.1411 set out proposed requirements designed to help ensure the safety of employees while cranes/derricks are being assembled, disassembled, operated, or while they travel under power lines. Section 1401 defines "power lines" as "electric transmission and distribution lines." This definition makes it clear that these sections apply to all electric transmission and distribution lines. C-DAC defined "power lines" as "electrical distribution and electric transmission lines," but OSHA changed the definition to make the terminology consistent with Subpart V of 29

CFR part 1926, which applies to the construction of "electric transmission and distribution lines and equipment." 29 CFR 1926.950(a).

The Committee believed that there is a need to reduce the number of fatalities resulting from electrical contact with power lines. In its experience, the presence of power lines at construction sites poses a significant hazard to employees at the site. Power lines can be a hazard not only during the operation of cranes and derricks, such as lifting operations, but also during assembling and disassembling the equipment and traveling with such equipment under power lines. Employees are at risk of serious injury or death if the equipment they are in, on or near is at a construction site where there are power lines.

The Committee's perception of the significance of this problem is confirmed by data that indicate that electrocution is one of the leading causes of crane-related fatalities on construction sites. During the years 1992 to 2005, the Bureau of Labor Statistics (BLS) reported 1,153 crane-related fatalities. These statistics include fatalities across all industries and are not exclusive to construction crane-related fatalities. Of those total crane-related fatalities the second highest cause is attributed to cranes contacting overhead power lines (19% or 219 fatalities). Specifically for the year 2005, BLS reported 85 crane-related fatalities and 12 (or 14%) of those fatalities resulted from cranes contacting overhead power lines. (OSHA-2007-0066-0026).

In addition, a recent analysis of data published by the American Society of Civil Engineers (ASCE), authored by J.E. Beavers, J.R. Moore, R. Rinehart and W.R. Schriver,

found that electric shock caused by cranes and other lifting equipment contacting a power source was the second highest proximate cause (after being struck by a load) of crane-related fatalities in the construction industry from 1997 to 2003. These fatalities all involved the failure to maintain the minimum approach distances set out in the existing Subpart N, § 1926.550 provisions.[12] J.E. Beavers et al., "Crane-Related Fatalities in the Construction Industry," 132 Journal of Construction Engineering and Management 901, 903-04 (2006) (OSHA-2007-0066-0012).

The Construction Safety Association of Ontario conducted an extensive study which reviewed crane fatalities from 1969 through 2002 in the Province of Ontario. (OSHA-2007-0066-0009). This study showed that the number one cause of mobile crane fatalities in the Province of Ontario construction industry during these 34 years was due to power line contact, with 50 of the 115, or 43%, of the mobile crane fatalities caused by power line contact.

A 1997 study by A. Suruda, M. Egger and D. Lui, analyzed crane related fatalities in the U.S. construction industry from 1984 to 1994. This study determined that electrocution by power line contact was the leading cause of crane related fatalities in the U.S. construction industry, with 39% of the 502 fatalities caused by electrocution from power lines. In addition, the findings of this study further confirmed previous studies which indicated that power line contact contributes to a significant number of crane related

[12] The authors determined that a crane's boom was generally the component which made contact with the power line.

fatalities.[13] A. Suruda et al., "Crane-Related Deaths in the U.S. Construction Industry, 1984-94," The Center to Protect Workers' Rights (Oct. 1997) (OSHA-2007-0066-0013).

Proposed § 1926.1401 defines "electrical contact" as follows:

> 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.

The Committee decided that it was necessary to define the term "electrical contact" to clarify that the term is not limited to a person, object, or equipment making physical contact with a power line but includes situations in which the object comes close enough to a power line for current to arc between the power line and the object and thereby energize the object.

Currently Subpart N, in 29 CFR 1926.550(a)(15)(i) and (ii), addresses 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 is 10 feet; for lines over 50 kV, the minimum distance is 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 existing Subpart N provisions, which instruct employers to maintain a minimum clearance distance, do 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 is a requirement, in paragraph

[13] These studies include: D. MacCollum, "Critical Hazard Analysis and Crane Design," Professional Safety (1980); D. Dickie, "Crane Study Confirms Downward Trend, Underlines Importance of Training," The Crane Report (1993).

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.

First, in the Committee's experience, it is difficult for the operator, from his/her position in the crane's cab, to determine if the crane or load is 10 feet (or other applicable minimum distance) from a power line. According to C-DAC, generally operators know the 10 foot rule but they have problems being able to perceive or visually determine when the part of the equipment or load closest to the power line has reached the 10 foot rule's distance. The operator might think he/she is maintaining the required minimum distance when in fact the crane or load is closer than that to the line. Except for the limited requirement to use a spotter mentioned above, the existing Subpart N standard does not require any methodology or aids to be provided in each case to help the operator identify the location of this invisible boundary or otherwise avoid it.

Second, the Committee believed that operators sometimes breach the minimum clearance distance when they forget about the presence of a power line. For example, an operator might conclude at the beginning of a shift that he/she can pick and set all necessary loads while maintaining the required minimum distance but may thereafter be called upon to pick or set a load closer to the power line than normal. Having once concluded that the power line presents no problem, the operator might not recognize that the situation has changed and that there is now a danger of breaching the minimum distance.

Another scenario is when an operator concentrates so strongly on tasks related to moving the load, particularly if the load is one that requires the crane to be operated near its capacity, that he/she forgets about the power line. By not providing encroachment prevention measures, the current standard does not help the operator maintain the 10 foot rule and therefore does not address scenarios where operators forget about the presence of a power line.

Further, the current standard's provision for a spotter does not adequately address these scenarios. By requiring a spotter only "where it is difficult for the operator to maintain the desired clearance by visual means," the provision implies that typically it is not difficult for the operator to accurately judge the distance and the equipment's or load's distance from the boundary. However, a crane operator, no matter how experienced, is normally not well-positioned to judge either the boundary distance or the distance the equipment or load is from it. In most cases the power line is thin, high up, and poorly contrasted against the sky.

Adding to the operator's difficulty is a confusion of angles posed by the power lines, load line, boom, and position of the operator away from the boundary. These factors are compounded by the distorting effects of distance on depth perception. Despite these factors, the operator must be able to accurately ascertain the location of an invisible boundary and judge relatively small distances with a high degree of precision.

Even a small misjudgment can result in the minimum clearance distance being breached. In short, the current standard assumes a degree of visual acuity that experience has shown is unrealistic. The high number of fatalities that continue to result from electrocution by power lines demonstrates that the current, limited provision regarding a spotter is not effective.

Third, the Committee discussed the reality that many employers intentionally perform work closer than the 10 foot rule to energized power lines. In only two circumstances does the current standard allow the operation of cranes closer than the 10 foot rule. The first instance is where the power lines have been deenergized and visibly grounded and the second is where insulating barriers (separate from the equipment) have been erected to prevent physical contact.

Committee members noted that typically neither of these measures is implemented. Specifically, the Committee believed that most employers elect not to use the option to deenergize and ground because of the time, expense and difficulty in making those arrangements. In addition, the Committee determined 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 pierce the device. In order to address the lack of compliance and the insufficient protections provided to employees who work closer than the 10 foot rule, the Committee developed

new provisions that it believed would be both realistic and effective for safely working in such circumstances.

To summarize, the Committee found that the existing Subpart N provisions are inadequate. They fail to require employers to implement measures that would help prevent operators from inadvertently breaching the minimum clearance distance. The Committee determined that a systematic, proactive approach to preventing power line contact is needed. It recognized that while such an approach is necessarily more complex than the current 10 foot rule, it is essential to accomplishing the goal of reducing power line related fatalities and injuries.

**Brief overview of proposed requirements**

The proposed standard would require the implementation of a systematic, proactive approach to dealing with the hazard of power lines. This approach would be 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 would have 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 showed 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 would be triggered.

Specifically, unless the power lines were deenergized and grounded, encroachment/ electrocution prevention measures would have to be implemented to prevent the crane from breaching a minimum clearance distance and protect against electrocution. The employer would be 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 for the line's voltage (Table A is the "10 foot rule"; see discussion of Table A below); 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.

The proposed standard uses the word "encroachment" to describe a situation in which equipment gets closer than the minimum allowed clearance distance to a power line. Under § 1926.1401, *Definitions*, 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." Encroachment prevention measures are critical to compliance with this proposed standard's minimum distance requirements.

A similar approach to power line safety was developed for preventing electrocutions during the assembly and disassembly of equipment. This is addressed in a separate proposed section because the assembly/disassembly process involves some different circumstances than are present during operation.

**Section 1407 Power line safety (up to 350 kV) – assembly and disassembly**

The proposed requirements in § 1926.1407 address the hazards of assembling and disassembling equipment near power lines up to 350 kV. The requirements in proposed 1407 are similar in most respects to the requirements in proposed § 1926.1408, which address operations of equipment near power lines.

OSHA notes that 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 line safety, would be considered "operations" and therefore covered by proposed § 1926.1408 (or, for power lines over 350 kV, proposed § 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 would be required to comply with proposed § 1926.1408 during the assembly/disassembly process rather than with proposed § 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 proposed § 1926.1407 since it is being assembled/disassembled.

**Paragraph 1407(a)**

Under this proposed paragraph, before beginning assembly or disassembly, the employer would be required to 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. In other words, the employer would use the direction or area of assembly or disassembly in evaluating whether any such part could come closer than 20 feet. If this 20 foot "trigger" determination is positive, then the employer would be required to take additional steps. Specifically, the employer would be required to meet the proposed requirements under either, Option (1), Option (2) or Option (3) of § 1926.1407(a). If any part of the crane, load or load line could not come within more than 20 feet of a power line the employer would not be required to take any further action under this proposed section.

Upon further review of C-DAC's § 1926.1407(a), OSHA realized there was an inadvertent omission. The C-DAC regulatory text read:

> (a) Before assembling or disassembling a crane, 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**," within 20 feet of a power line during the assembly/disassembly process. (Emphasis added).

These provisions were intended to apply to both assembly and disassembly. The employer needs to evaluate power lines with respect to the direction or area of assembly when preparing to assemble the crane, and the direction or area of disassembly when preparing to disassemble the crane. A reference to "disassembly" in this regard was inadvertently omitted. Therefore, OSHA has changed the regulatory text to read:

> (a) Before assembling or disassembling a crane, 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/disassembly**," closer than 20 feet to a power line during the assembly/disassembly process.[14]

The phrase "direction or area of assembly/disassembly" is designed 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 would be required to assess the promixity that the boom will be in to the power line in its path of travel to (and on) the ground.

[14] As explained below, OSHA is changing "within 20 feet of a power line" wherever it appears in the C-DAC document to "closer than 20 feet to a power line" to avoid potential confusion over whether "within" means breaching or not breaching the 20 foot distance.

In another example, when assembling a lattice boom crane, the "area" involved will expand as boom sections are added.[15] 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.

In addition, "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 get closer to power lines than when the process began on the ground. That "direction" of assembly upwards must also be evaluated.

**Paragraph (a)(1*)* Option (1)**

An employer choosing Option 1 would protect against electrocution by having the power lines deenergized and visibly grounded. Where the employer elects this option, it would not have to implement any of the encroachment/electrocution prevention measures listed

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

in proposed § 1926.1407(b). This option helps to eliminate the electrical hazards which are present with power lines.

However, some amount of time is needed to arrange for the utility owner/operator[16] 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. The Committee recognized that, in practice, largely because of these factors, deenergizing and grounding has not been routinely done.

Therefore, the Committee believed that providing other safe and practical options would help to reduce unsafe practices in the industry. Those other options (Options 2 and 3 in proposed § 1926.1407(a)) combined with proposed § 1926.1407(b) are designed to be effective protection against the hazards of electrocution.

**Paragraph (a)(2) Option (2)**

Under Option 2 (proposed § 1926.1407(a)(2)), the employer would be required to maintain a minimum clearance distance of 20 feet. To help ensure that this distance is not breached, the employer would have to implement the encroachment prevention measures in proposed § 1926.1407(b). Under this proposed option, no part of the crane,

[16] 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. In addition, in various places in the original C-DAC document, the Committee had used the terms "power line owner," "power line owner/operator" or a variation of those terms. The Agency has changed those terms to "utility owner/operator" to be consistent throughout the proposed regulatory text.

load or load line, including rigging and lifting accessories, would be permitted closer than 20 feet to the power line.

Employers using this proposed option would, in most cases, have to stay further away from the power line than under the existing Subpart N's 10 foot rule (employers wanting to use the 10 foot rule would have to use proposed Option 3, discussed below). [17] However, an advantage of this proposed option to many employers is that they would not have to determine the exact voltage of the power line as they would if they were to apply Subpart N's 10 foot rule. They would only have to determine that the line voltage is equal to or less than 350 kV. As a practical matter, since many employers rely on the utility owner/operator to provide voltage information, this option would save them that step.

The Committee believed that, since the minimum clearance distance would be 20 feet, there would be no diminution of safety under this option since the maximum possible clearance distance under the current Subpart N's formula is 20 feet. 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 would, in most cases, result in a higher margin of safety. Employers who do not need to get closer than 20 feet in order to assemble/disassemble the crane could use this option and would be saved the step of obtaining the exact line voltage.

[17] As discussed above, the 10 foot rule is a scale of voltages and distances that begins at 10 feet.

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

**Paragraph (a)(3) Option (3)**

Under Option 3 (proposed paragraph § 1926.1407(a)(3)), the employer would be required to maintain a minimum clearance distance in accordance with Table A (of proposed § 1926.1408). Under Table A, depending on the voltage of the power line, the minimum approach distance ranges from 10 feet to 20 feet for lines up to 350 kV. Therefore, the minimum clearance distance would be essentially the same under Option 3 as under Subpart N's 10 foot rule. Under this option the employer would be 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 could usually assemble/disassemble equipment closer to the lines under this option than under Option 2.

Table A in essence is based upon the same formula as is currently used in existing Subpart N (the 10 foot rule) and is similar to Table 1 in ASME B30.5–2004. Unlike Subpart N, which requires 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. The Committee believed that a table with specified clearance distances is more readily applied than the formula set out in the existing Subpart N requirements.

The enhanced safety that would result under this option would stem from the fact that, first, there would be an affirmative obligation on the employer to determine the power line voltage so that the correct Table A minimum clearance distance could be determined. Second, in addition to maintaining the minimum clearance distance specified in the Table, employers using this option would be required to implement the encroachment prevention and other measures specified in proposed § 1926.1407(b).

In reviewing C-DAC's draft of this provision, the Agency realized that C-DAC inadvertently failed to explicitly state that the Table A minimum clearance distance must not be breached. OSHA has modified proposed paragraph § 1926.1407(a)(3)(ii) to correct this error. Therefore, the last sentence of the C-DAC language has been expanded to read as follows:

> If so, then the employer must follow the requirements in paragraph (b) **to ensure that no part of the crane, load line, or load (including rigging and lifting accessories), gets closer to the line than the minimum clearance distance.**

**Paragraph 1407(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 would be required to 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.[18]

Most of the measures in this proposed 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. Some of the measures are designed to prevent electrocution in the event of electrical contact. The committee believed these proposed requirements would add layers of protection to help keep employees safe from power lines during the assembly or disassembly of the equipment.

**Paragraph 1407(b)(1)**

Under proposed paragraph (b)(1), the employer would be required to conduct a planning meeting with the Assembly/Disassembly Supervisor (A/D Supervisor), 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.

[18] 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.

As discussed below, under this proposed paragraph, certain encroachment/electrocution prevention measures would be required (they are listed in proposed paragraph (b)(1) and (2) of this section). In addition, the employer would be required to select at least one additional measure from the list in proposed § 1926.1407(b)(3). In the planning meeting, the employer would be required to make that selection and review all the measures that will be used to comply with this section.

The purpose of this proposed 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. 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 believed that it is necessary for there to be a structured process by which the employer communicates this information.

**Paragraph 1407(b)(2)**

Proposed paragraph (b)(2) would require that where tag lines are used they must be non-conductive. This provision uses two terms that are defined in § 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 non-conductive is designed to protect against such an event. Section 1926.1401 defines "non-conductive" 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 non-conductive but also the conditions of use. For example, if an otherwise non-conductive material were to become wet and therefore able to conduct electricity, it would no longer qualify as non-conductive under this proposed paragraph.

**Paragraph 1407(b)(3)**

Under this proposed paragraph the employer would be required to choose one of five encroachment prevention measures (§ 1926.1407(b)(3)(i) through (v)) to implement. The Committee concluded that the use of any one of these measures, in combination with the required measures listed elsewhere in proposed § 1926.1407(b), would be feasible and effective in protecting against encroachment. Specifically, the employer would be

required to choose either: (i) the use of a dedicated spotter; (ii) a proximity alarm; (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 (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 would give the employer flexibility so that it could pick one that was well suited and efficient in the circumstances.

A definition of "dedicated spotter (power lines)" is included in proposed § 1926.1401, *Definitions*. That definition provides:

> In order 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 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 that detract him/her from this task. Also, the dedicated spotter must have the qualifications required of a signal person under proposed § 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 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.

The devices listed in proposed §§ 1926.1407(b)(3)(ii) and (iii) are also defined in § 1401. "Proximity alarm," is defined as "a device that provides a warning of proximity to a power line that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7." [19] A Nationally Recognized Testing Laboratory is an organization that has been recognized by OSHA pursuant to 29 CFR 1910.7 as competent to evaluate equipment for conformance to appropriate safety 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. "Range control warning device," is defined 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."

In reviewing this proposed provision, OSHA realized that some of the devices listed in proposed § 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/

[19] 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 29 CFR 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.

disassembly, one of the other options would need to be used (such as a dedicated spotter) in order to provide the needed protection.

However, the regulatory text, as currently drafted, would permit an employer to select an option irrespective of whether it would be effective under the circumstances. In order to address this concern, OSHA requests public comment on whether proposed § 1926.1407(b)(3) should be revised 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: . . . . (Emphasis added).

In situations where an employer chooses the option of using a dedicated spotter, the employer would be required to meet the proposed requirements for spotters in proposed § 1926.1407(b)(3)(i). As specified in proposed paragraph (b)(3)(i)(A) of this section, the spotter would have to 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 (as discussed above).

In the C-DAC version of this paragraph, examples of visual aids included a line painted on the ground, a clearly visible line of stanchions or a set of line-of-sight landmarks. An

example of a clearly visible set of line-of-sight landmarks would be a fence post and a building corner.

In reviewing C-DAC's draft of this provision, the Agency noted that the stanchions and landmarks would have to be "clearly visible," but that this language was not used with respect to the example of a painted line on the ground. Since all such visual aids would have to be clearly visible to be effective, and that was the evident intent of C-DAC, the Agency has modified the C-DAC language so that, in the proposed provision, all the listed examples would have to be "clearly visible." This revision was also made in proposed § 1926.1408(b)(4)(ii)(A).

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

**Paragraph 1407(c) Assembly/Disassembly below power lines prohibited**

This proposed paragraph would preclude employers from assembling or disassembling cranes/derricks beneath energized power lines. The Committee agreed 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 took 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 belief by the Committee that, in almost all cases, the employer can plan the assembly/disassembly so that there will be no need to be beneath power lines. The Committee 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.

**Paragraph 1407(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 proposed § 1926.1408) to an energized power line would be prohibited. If assembly or disassembly needed to take place closer than that distance, the employer would be required to have the line deenergized and visibly grounded. The rationale for this proposed provision is similar to that discussed above for assembly/disassembly beneath power lines. 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 proposed § 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 such movement.[20]

**Paragraph 1407(e) Voltage information**

This proposed section operates in conjunction with proposed § 1926.1407(a)(3). Under proposed § 1926.1407(a)(3), employers who elect to use Option (3) of § 1926.1407(b) must determine the line's voltage. Under proposed § 1926.1407(e), where the employer

[20] In this respect this proposed provision differs from proposed § 1926.1408. As discussed below, § 1926.1408 would allow use of minimum clearance distances closer than Table A in some circumstances for crane "operations." In contrast, proposed § 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.

asks the utility owner/operator for that voltage information, the utility owner/operator of the line would be required to provide the voltage information within two working days of the request.

This reflects a belief of the Committee that, in the absence of such a time limitation on the utility owner/operator, in many instances Option (3) (proposed § 1926.1407(b)) would not be useful because the employer would not be able to get the voltage information in sufficient time to be able to use it. Many employers would 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) (proposed § 1926.1407(b)) to be viable, the Committee believed that a reasonable time limitation for the utility owner/operator to respond is needed.[21]

The Committee believed 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.

In reviewing this provision, the Agency noted that the C-DAC provision reads:

> *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. (Emphasis added).

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

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 would apply the same definition here unless this rule were to specify a different definition. Therefore, OSHA solicits comments on whether the phrase "working days" should be defined differently for purposes of this rule than it is in 29 CFR 1903.22(c).

**Paragraph 1407(f) Power lines presumed energized**

This proposed paragraph would require 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. This fundamental precaution is essentially the same as currently in Subpart N at § 1926.550(a)(15)(vi).

**Paragraph 1407(g) Posting of electrocution warnings**

This proposed paragraph would require 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 believes 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 section 5-3.4.5.2(d) of ASME B30.5-2004.

**Section 1408 Power line safety (up to 350 kV) – operations**

As discussed above with respect to power line safety in assembly/disassembly, the proposed standard would require the implementation of a systematic approach to power line safety for crane/derrick operations. This approach would consist of two basic steps. First, the employer would need to identify the work zone, assess it for power lines, and determine how close the crane could get to them. The employer would have 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 showed 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 would be triggered.

Specifically, unless the power lines were deenergized and grounded, encroachment prevention measures would have to be implemented to prevent the crane from breaching a minimum clearance distance. The employer would be allowed to choose among three minimum clearance distance options. For example, for lines up to 350kV, the minimum clearance distance options would be 20 feet, or the distance specified in Table A (of proposed § 1926.1408) 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.[22]

**Paragraph 1408(a) Hazard assessments and precautions inside the work zone.**

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

Under the first option (proposed § 1926.1408(a)(1)(i)), the employer would be 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." See the explanation below of "range limit device" at the end of the discussion of this section.

Employers would not be permitted to use existing landmarks to demarcate boundaries unless they are marked. For example, a line of trees would be insufficient. Without

[22] An employer engaged in subpart V (of 29 CFR part 1926) work (power transmission and distribution) would also have to comply with most of these provisions. However, when certain prerequisites are met, it would be permitted to use the minimum clearance distances in Subpart V's Table V-1. In addition, where additional prerequisites are met, it would be permitted to work closer than the Table V-1 distances. These are explained in the discussion of proposed § 1926.1410.

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 would be required to consider the total area in which it will need to operate and set the boundaries accordingly.

The second option for identifying the work zone (proposed §1926.1408(a)(1)(ii)) would be 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 would be 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 1408(a)(2)**

Once the employer has identified the work zone according to proposed § 1926.1408(a)(1), it would then be 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 closer than the maximum working radius, the assessment must be made with the assumption that the crane would be operated up to that boundary).

Even if the employer has no intention of working up to the crane's maximum radius in the work zone, the assessment must still be made using this assumption. The Committee believed that this is crucial since, even if the employer's original intention was not to operate in that part of the work zone, unexpected events may occur that may lead the operator to operate the equipment there.

If this 20 foot "trigger" determination is positive, then the employer would be required to take additional steps. Specifically, the employer would be required to meet the proposed requirements under either, Option (1), Option (2), or Option (3) of proposed § 1926.1408(a)(2). [23]

[23] If any part of the crane, load or load line could not come closer than 20 feet to a power line the employer would not be required to take any further action under this proposed 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 would be required to go back to the first step under proposed § 1926.1408(a)(1), re-identify a work zone and conduct a new 20 foot "trigger" assessment.

**Paragraph 1408(a)(2)(i) Option (1)**

An employer choosing Option (1) would protect against electrocution by having the power lines deenergized and visibly grounded at the worksite. This option would prevent equipment that contacts the power line from becoming energized. The power line must be "visibly grounded at the worksite" so that the employer can verify, through observation, that the protection provided by this option remains in place for as long as the employer continues to rely on it.

Where the employer elects this option, it would not have to implement any of the encroachment/electrocution prevention measures listed in proposed § 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. The Committee recognized that, in practice, largely because of these factors, deenergizing and grounding has not been routinely done.

Therefore, the committee believed that providing other safe and practical options would help to reduce unsafe practices in the industry. Those other options (Options 2 and 3 in proposed § 1926.1408(a)(2)(ii) and (iii), discussed below) combined with proposed § 1926.1408(b) are designed to afford effective protection against the hazards of electrocution.

**Paragraph 1408(a)(2)(ii) Option (2)**

Under Option 2 (proposed § 1926.1408(a)(2)(ii)), the employer would be required to maintain a minimum clearance distance of 20 feet. To help ensure that this distance is not breached, the employer would have to implement the encroachment prevention measures in proposed § 1926.1407(b). Under this proposed option, no part of the crane, load or load line, including rigging and lifting accessories, would be permitted closer than 20 feet to the power line.

Employers using this proposed option would, in most cases, have to stay further away from the power line than under the existing Subpart N's 10 foot rule (employers wanting to use the 10 foot rule would have to use proposed Option 3 (in § 1926.1408(a)(2)(iii)). However, proper application of the 10 foot rule, as a practical matter, necessitates determining the exact voltage of the power line.[24] An advantage of this proposed option to many employers is that they would not have to determine the exact voltage of the power line (they would only have to determine that the line is equal to or less than 350 kV). As a practical matter, since many employers rely on the utility owner/operator to provide voltage information, this option would save them that step.

The Committee believed that, since the minimum clearance distance would be 20 feet, there would be no diminution of safety under this option since the maximum possible

[24] As discussed above, the 10 foot rule is a scale of voltages and distances that begins at 10 feet and increases to 20 feet (for line voltages up to 350kV).

clearance distance under the current Subpart N's formula is 20 feet. In fact, in the Committee's experience, most power lines encountered by most employers have voltages that, under the current Subpart N's formula, require a minimum clearance distance of 10 feet. Therefore, use of this option would, in most cases, result in a higher margin of safety. Employers who do not need to get closer than 20 feet in order to do their work could use this option and would be saved the step of obtaining the exact line voltage.

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

**Paragraph 1408(a)(2)(iii) Option (3)**

Under Option 3 (proposed § 1926.1408(a)(2)(iii)), the employer would be required to maintain a minimum clearance distance in accordance with Table A (of proposed § 1926.1408). Under Table A, depending on the voltage of the power line, the minimum approach distance ranges from 10 feet to 20 feet.[25] Under this option the employer would be 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 have a minimum clearance distance of 10 feet under Table A. As a result, employers could usually work closer to the lines under this option than under Option 2 (proposed § 1926.1408(a)(2)(ii)). Table A in essence is based upon

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

the same formula as is currently used in existing Subpart N. Therefore, the minimum clearance distance would be similar under Option 3 (in proposed § 1926.1408(a)(2)(iii)) as under the existing requirements.

The information in Table A (of proposed § 1926.1408) of the proposed rule is similar to information in Table 1 of ASME B30.5–2004. The Committee believed that a table with specified clearance distances is more understandable than the formula set out in the existing Subpart N requirements. Proposed Table A is intended to be a clear way of conveying the minimum clearance distances.

The enhanced safety that would result under this option would stem from the fact that, first, there would be an affirmative obligation on the employer to determine the power line voltage so that the correct Table A minimum clearance distance could be determined. Second, in addition to maintaining the minimum clearance distance specified in the Table, employers using this option would be required to implement the encroachment prevention and other measures specified in proposed § 1926.1408(b).

In reviewing C-DAC's draft of this provision, the Agency realized that C-DAC inadvertently failed to explicitly state that the Table A minimum clearance distance must not be breached. Therefore, OSHA has modified proposed §1926.1408(a)(2) to correct this error. The last sentence of the C-DAC language has been expanded to read as follows:

> If so, then the employer must follow the requirements in paragraph (b) **to ensure that no part of the crane, load line, or load (including rigging**

**and lifting accessories), gets closer to the line than the minimum clearance distance.**

**Paragraph 1408(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 proposed § 1926.1408(a)), if it chooses either Option (2) or (3) (of proposed § 1926.1408(a)(2)(ii) and (iii)), it would be required to implement encroachment prevention measures to help ensure that the applicable minimum approach distance (20 feet under Option 2 or the Table A (of proposed § 1926.1408) distance under Option 3 is not breached.[26] Most of the measures in this proposed paragraph are designed to help the employer maintain the appropriate distance and thereby prevent electrical contact while operating the equipment. Some of the measures are designed to prevent electrocution in the event of electrical contact. The committee believed these proposed requirements would add layers of protection to help keep employees safe from energized power lines.

**Paragraph 1408(b)(1)**

Under proposed 1408(b)(1) the employer would be 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.

[26] Alternatively, under Option (1) of proposed § 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.

As discussed below, under this proposed paragraph, certain encroachment/electrocution prevention measures would be required (they are listed in proposed § 1926.1408(b)(1) through (3)). In addition, the employer would be required to select at least one additional measure from the list in proposed § 1926.1408(b)(4). In the planning meeting, the employer would be required to make that selection and review all the measures that will be used to comply with this section. The purpose of this proposed 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. 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 believed that it is necessary for there to be a structured process by which the employer communicates this information.

**Paragraph 1408(b)(2)**

Proposed § 1926.1408(b)(2) would require that where tag lines are used they must be non-conductive. This provision would provide 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.

**Paragraph 1408(b)(3)**

Proposed § 1926.1408(b)(3) would require elevated: warning lines, barricades or 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 proposed § 1926.1408(a)(2)(ii)) or at the minimum approach distance under Table A (if using Option (3) (of proposed § 1926.1408(a)(2)(iii)). This provision is designed to serve as a reminder to 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 would also indicate to the operator where the minimum approach distance boundary is located. This would serve as one of two layers of protection (the second layer would consist of an additional means selected by the employer under proposed § 1926.1408(b)(4), discussed below).

C-DAC discussed and ultimately rejected the idea of permitting a visual line on the ground which would mark the minimum approach distance 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. The committee decided that these visual reminders need to be elevated, or as the proposed definition states, sufficiently elevated from the ground level to accurately enable the operator to 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, in order 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 proposed § 1926.1408(b)(4). Therefore, OSHA is planning on modifying this proposed provision by adding the following after the last sentence in proposed § 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 either the measure described in § 1926.1408(b)(4)(i), (iii), (iv) or (v).

The Agency requests public comment on this issue.

**Paragraph 1408(b)(4)**

This proposed section sets out a list of five prevention measures, from which the employer would be required to select at least one, when the employer elects to use either Option (2) or Option (3) under § 1926.1408 (a)(2). In the Committee's experience, the use of any one of these measures, in combination with the required measures listed elsewhere in proposed § 1926.1408(b), would be feasible and effective in protecting against encroachment/electrocution. 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 would be

required to choose either: (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 (v) an insulating link/device.

C-DAC believed that allowing the employer to choose from a variety of options for this second layer of protection would allow the employer to select a method that it believed would be suitable, would increase the likelihood of employer compliance and would be an effective approach to reducing power line related injuries and fatalities.

In situations where an employer chooses the option of using a dedicated spotter, the employer would be required to meet the proposed requirements for spotters in proposed § 1926.1408(b)(4)(ii). As specified in proposed § 1926.1408(b)(4)(ii)(A), the spotter would have to 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 (as discussed above).

In the C-DAC version of this paragraph, examples of visual aids included a line painted on the ground, a clearly visible line of stanchions or a set of line-of-sight landmarks. An example of a clearly visible set of line-of-sight landmarks would be a fence post positioned behind the dedicated spotter and a building corner ahead of the spotter.

In reviewing C-DAC's draft of this provision, the Agency noted that that the stanchions and landmarks would have to be "clearly visible," but that this language was not used with respect to the example of a painted line on the ground. Since all such visual aids would have to be clearly visible to be effective, and that was the evident intent of C-DAC, the Agency has modified the C-DAC language so that, in the proposed provision, all the listed examples would have to be "clearly visible." This revision was also made in proposed § 1926.1407(b)(3)(i)(A).

Under proposed § 1926.1408(b)(4)(ii)(B) – (D), the spotter would have to 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 believed that each criterion is needed for the spotter to be able to be effective.

Proposed § 1926.1408(b)(4)(iii) would give 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 proposed § 1926.1408(b)(4), 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 (which ever is closest to the 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.

Proposed § 1926.1408 (b)(4)(iv) would give 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 could 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. The Committee recognized that it may be more technically difficult to apply swing limitation devices for use in mobile cranes but believed that the technology may develop so that they could be used in such cranes.

As noted above, the insulating link option that would be available under proposed § 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 would have to 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 helps protect riggers, who often guide crane loads manually and who are therefore at high risk of being electrocuted if a load becomes energized.

As stated in proposed § 1926.1401, "Insulating link/device" would be defined as "an insulating device that has been listed, labeled, or accepted by a Nationally Recognized Testing Laboratory in accordance with 29 CFR 1910.7." This proposed definition reflects the Committee's concern that there be some assurance that the insulating link/device would work as intended. That assurance would be accomplished by requiring that such link/device be approved by a Nationally Recognized Testing Laboratory.

**Paragraph 1408(b)(5)**

Employers engaged in construction of electric transmission and distribution lines, which is regulated by 29 CFR part 1926 subpart V (§§ 1926.950 through 960), would also have to meet the requirements in proposed § 1926.1408, with several exceptions. First, in accordance with proposed § 1926.1408(b)(5), work involving cranes/derricks that is covered by Subpart V would not be required to comply with the proposed 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.

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. Non-Subpart V workers, by contrast, do not work directly with the lines, and their attention is primarily directed elsewhere. In view of these differences, the Committee believed that the protective measures listed in proposed § 1926.1408(b)(4) were not necessary for Subpart V work.

Second, as explained below in the discussion of proposed § 1926.1410, when certain prerequisites are met, the employer would be permitted to use the minimum clearance distances in Subpart V's Table V-1. Also explained in that discussion is that where additional prerequisites are met, work would be permitted closer than the Table V-1 distances.

Third, an employer engaged in Subpart V work would not be subject to the restrictions regarding operations below power lines, as explained in the discussion below of proposed § 1926.1408(d).

**Paragraph 1408(c) Voltage information**

This proposed section operates in conjunction with proposed § 1926.1408(a)(2)(iii) (Option 3 – Table A clearance). Where an employer elects to use Option (3) (of proposed § 1926.1408(a)(2)(iii)), it would be required under proposed § 1926.1408(a)(2)(iii)(A) to determine the voltage of the power lines. Under proposed §

1926.1408(c), utility owners/operators of these lines must provide the requested voltage information within two working days of the request.

The Committee believed that for Option (3) (of proposed § 1926.1408(a)(2)(iii)) to be viable, a reasonable time limit for the utility owner/operator to respond is needed. Employers must generally rely on the utility owner/operator to provide the voltage of the power line. The Committee was concerned that an extended delay in obtaining the information would lead some employers to do the work anyway without the information. The committee believed 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.[27]

As discussed above with respect to proposed § 1926.1407(e), the Agency would interpret "working days" to mean Monday through Friday, excluding federal holidays, unless this rule contains a different definition and is asking for comment on whether a different definition should be included in the rule.

**Paragraph 1408(d) Operations below power lines**

The Committee believed that there is a substantially enhanced likelihood of breaching the applicable minimum clearance distance when a crane operates below a power line. This is due to several factors, including the greater difficulty of judging the distance to the line when the line is above the equipment and the fact that in most such situations the operator

[27] As noted in the introduction, C-DAC included a member from the electric utility industry.

has to purposely look up to see the line (and therefore is more likely to forget its location or that it is there).

This proposed 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 proposed § 1926.1408(d)(2).

The first exception, § 1926.1408(d)(2)(i), is that the work the employer is doing is 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 proposed paragraph § 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 Committee believed that the other precautions required during Subpart V work would provide adequate protection when equipment operates below power lines during Subpart V work.

The second exception, § 1926.1408(d)(2)(ii), would be for equipment with non-extensible booms and the third exception, § 1926.1408(d)(2)(iii), would be for equipment with articulating or extensible booms. These exceptions would apply when the boom, either at its most vertical point (for non-extensible booms) or 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 (of proposed § 1926.1408) minimum clearance distance below the plane of the power line. 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 where the employer can demonstrate that it is infeasible to comply with proposed § 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 proposed exception, the employer must not only show that compliance with § 1926.1408(d)(1) is infeasible, it must also comply with the requirements in proposed § 1926.1410. Proposed § 1926.1410 governs equipment operations closer than the Table A (of proposed § 1926.1408) minimum approach distances. The Committee believed that in such instances those additional protective measures are needed to prevent the minimum clearance distance established under proposed § 1926.1410(c) from being breached and to protect the employees in the event of electrical contact with the power line.

**Paragraph 1408(e) Power lines presumed energized**

This proposed paragraph would require 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 currently in Subpart N at § 1926.550(a)(15)(vi).

**Paragraph 1408(f)**

Proposed paragraph (f) addresses the danger that employees could receive electrical shock from equipment that is operating near a transmission or communication tower. During such operation, the equipment could act as an antenna and become energized by the electromagnetic signal emitted by the tower. When the equipment is close enough for an electrical charge to be induced in the equipment or load, proposed § 1926.1408(f) would require the transmitter to be deenergized or the following precautions taken: the equipment must be grounded, and non-conductive rigging or an insulating link/device must be used.

Currently, Subpart N, at § 1926.550(a)(15)(vii), requires that when equipment is close enough to a transmission tower for an electrical charge to be induced, the equipment must be grounded and a ground jumper cable must connect the load to the equipment. In addition, nonconductive poles having large alligator clips or other similar protection must be used to connect the ground jumper cable to the load. By connecting the load to the grounded equipment, any electrical charge induced in the load will be dissipated. In the Committee's experience, this precaution is neither necessary nor commonly taken. The Committee believed that the proposal's requirement for nonconductive rigging or an insulating link reflects current safe industry practice.

OSHA notes that the requirement for nonconductive rigging or an insulating link in proposed § 1926.1408(f) is a fundamentally different approach than requiring a ground

jumper cable to be used as specified in current § 1926.550(a)(15)(vii). The latter connects the load to the equipment and grounds the load, while proposed paragraph (f) would insulate the load from the equipment. It appears that only an employee who is contacting the load would be affected by this provision. The Agency requests public comment on the following questions: (1) Is it necessary to take special precautions to ground the equipment to protect an employee who contacts the equipment? (2) Are employees best protected by proposed paragraph (f), by current Subpart N, or by some other means, such as requiring that they only handle the load with an insulated tag line or other means of insulation?

**Paragraph 1408(g) Training**

During C-DAC discussions, members stressed the importance of providing appropriate training to operators and their crew regarding power line safety. The Committee believed that training is a necessary component in reducing crane related fatalities.

The training topics listed are designed to ensure that both the operator and the other crew members have the information they need to protect themselves from power line hazards. The Committee believed that training for power line safety should not be limited to operators because any crew member who is near the equipment is potentially at risk of electrocution.

The Agency notes that proposed § 1926.1408(g) does not address the timing and frequency of this training. OSHA requests public comment on whether and, if so, how the standard should address training timing and frequency.

In addition, proposed § 1926.1408(g)(1)(i)(E) would requiring training in the need to avoid approaching or touching "the equipment." OSHA believes that C-DAC inadvertently failed to add the phrase "and the load" to this provision, since whenever the equipment is in electrical contact with a power line, the load may also be energized. OSHA requests public comment on whether this provision should be modified to correct this omission.

**Paragraph 1408(h)**

This proposed provision would require 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 proposed § 1926.1408, they must meet the manufacturer's procedures for use and conditions of use. The Committee believed that this provision is necessary to ensure that the devices will work as intended.

OSHA notes that § 1926.1408 uses the term "range limit device" in § 1926.1408(a)(1)(i) but that no definition of this term is provided in § 1926.1401. OSHA believes 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 requests public

comment on whether a definition of "range limit device" should be added to § 1926.1401 and, if so, whether the definition in this paragraph is appropriate.

**Section 1409 Power line safety (over 350 kV).**

Under this proposed section, the requirements in proposed §§ 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" is substituted. Therefore, the "trigger" distance that would be used when assessing the 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, employers electing to use Table A (of proposed § 1926.1408 in either assembly/disassembly (Option 3 in proposed § 1926.1407(a)(3)) or crane operations (Option 3 in proposed § 1926.1408 (a)(2)(iii) would be 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 currently drafted, 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 requests public comment on whether Option 2 is insufficiently protective for power lines rated over 1,000 kV.

**Section 1410 Power line safety (all voltages) – crane operations closer than the Table A zone.**

The existing Subpart N requirements do not permit work closer than the 10 foot rule.[28] The only exceptions to the 10 foot rule are where the lines are deenergized and visibly grounded or where insulating barriers, separate from the equipment, have been erected. However, the Committee recognized that many employers, without meeting the exceptions, nonetheless work closer than the 10 foot rule.

Specifically, the Committee believed that most employers do not use the option to deenergize and ground because of the time, expense and difficulty in making those arrangements. In addition, the Committee concluded that an "insulating barrier" of the

[28] As described earlier, the "10 foot rule" is shorthand for the formula in existing 29 CFR 1926, Subpart N for minimum clearance distances. Under the 10 foot rule, for lines rated 50 kV or less, work is 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 is required.

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 pierce the device.

In order to address the insufficient protections provided to employees who work closer than the 10 foot rule, the Committee developed a new approach, which is contained in proposed § 1926.1410. It consists of prerequisites and criteria that would apply when work must be conducted closer than the minimum clearance distance specified in Table A (of proposed § 1926.1408). The Committee believed that these provisions would be both realistic and effective for safely working in these circumstances.

This proposed section starts out by explicitly prohibiting equipment from operating closer than the distances specified in Table A (of proposed § 1926.1408) of an energized power line except where the employer demonstrates compliance with the requirements in proposed § 1926.1410.

Note that, in the discussion below of proposed § 1926.1410, references to a "registered professional engineer" are, in accordance with proposed § 1926.1410(c)(1), references to a registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.

**Paragraphs 1410(a) and (b)**

These proposed 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 proposed § 1926.1408) distance. Proposed § 1926.1410(a) would require the employer to determine that it is infeasible to do the work without breaching the minimum approach distance under Table A. If the employer determines it is infeasible to maintain the Table A distance, under proposed § 1926.1410(b) it would also have to determine, after consulting with the utility owner/operator, that deenergizing and grounding the power line, as well as relocating the line, are infeasible.

**Paragraph 1410(c) Minimum clearance distance**

After the employer makes the infeasibility determinations required by proposed § 1926.1410(a) and (b), a minimum clearance distance would have to be established. Under proposed § 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.

Under proposed § 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.

Under proposed § 1926.1410(c)(2), the proposed requirement in § 1926.1410(c)(1) described above would not apply to work covered by part 1926 subpart V. Instead, the minimum clearance distance specified in § 1926.950 Table V-1 would apply. This proposed paragraph, along with the other proposed provisions affecting work covered by Subpart V, are discussed below at the end of the portion of this preamble addressing proposed § 1926.1410.

**Paragraph 1410(d)**

Once a minimum clearance distance has been established, under proposed § 1926.1410(b) the employer would be required to have 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 proposed § 1926.1410(e), these procedures would have to be documented and immediately available on-site. In addition, in accordance with proposed

§ 1926.1410(f) and (g), these procedures would 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 (proposed § 1926.1410(e) – (g) are discussed below).

Proposed § 1926.1410(d) sets out the minimum protective measures which would have to be included in the procedures set by the employer and utility owner/operator (or registered professional engineer). The committee believed that these procedures need to include more stringent protective measures than those set out in proposed § 1926.1408, because equipment will be in closer proximity to power lines and there would otherwise be a greater risk of contacting a power line and causing electrocution. Therefore, these procedures would have to include, at the minimum, the following:

**Paragraph 1410(d)(1)**

Under proposed paragraph (d)(1), 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 would 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.

**Paragraph 1410(d)(2)**

Under proposed paragraph (d)(2), a dedicated spotter who is in continuous contact with the operator would have to 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 the spotter must give timely information to the operator so the required clearance distance can be maintained. The need for a spotter meeting this criteria is explained above in the discussion of proposed § 1926.1408(b)(4)(ii).

**Paragraph 1410(d)(3)**

Under proposed paragraph (d)(3), an elevated warning line, or barricade that is not attached to the equipment, positioned to prevent electrical contact, would have to 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 proposed § 1926.1408(b)(3).

As discussed above in relation to proposed § 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 proposed § 1926.1408 or § 1926.1409, OSHA is planning to change the regulatory text so that the employer would be required to use both a dedicated spotter and one of the other (non-spotter) measures listed in proposed § 1926.1408(b)(4).

Here, when working closer than the Table A (of proposed § 1926.1408) clearance distance, C-DAC believed 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 proposed section) to ensure that the equipment maintains the minimum clearance distance established under proposed § 1926.1410(c).

As explained in, *Subpart V-working closer than Table A*, that follows the discussion of § 1926.1410(k), this provision would not apply to subpart V work.

**Paragraph 1410(d)(4) Insulating link/device**

Under proposed paragraph (d)(4), an insulating link/device would have to be installed at a point between the end of the load line (or below) and the load. 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. In such situations it protects employees who make contact with the load or are holding a tag line.

As explained in, *Subpart V-working closer than Table A*, that follows the discussion of § 1926.1410(k), this requirement to install an insulating link/device would only apply when working closer than the § 1926.950 Table V-1 clearance distances.

**Paragraph 1410(d)(5)**

Under proposed paragraph (d)(5), if the rigging may be closer than the Table A (of proposed § 1926.1408) distance during the operation, it would be required to be non-conductive rigging. This would provide 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.

**Paragraph 1410(d)(6)**

Under proposed paragraph (d)(6), if the crane is equipped with a device that automatically limits range of movement, it would have to be used and set to prevent any part of the crane, load or load line (including rigging and lifting accessories) from breaching the minimum approach distance established under proposed paragraph (c) of § 1926.1410.

**Paragraph 1410(d)(7)**

Under proposed paragraph (d)(7), if a tag line is used it would have to be non-conductive. This requirement would provide 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 makes contact with the power line.

**Paragraph 1410(d)(8)**

Under proposed paragraph (d)(8), barricades would have to 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 would be required to be as far from the equipment as feasible. This provision, along with proposed § 1926.1410(d)(9) and (d)(10), would minimize the likelihood that any more employees than are absolutely necessary to the operation would be near the equipment in the event the equipment, load or load line makes electrical contact with the power line.

**Paragraph 1410(d)(9)**

Under proposed paragraph (d)(9), employees other than the operator would be prohibited from touching the load line above the insulating link/device and equipment. It is the Agency's understanding that the Committee's rationale for not extending 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 requests public comment on this issue.

**Paragraph 1410(d)(10)**

Under proposed paragraph (d)(10), only personnel essential to the operation would be permitted to be in the area of the equipment and the load. In conjunction with proposed § 1926.1410(d)(8) and (d)(9), this would minimize the likelihood that any more employees than are absolutely necessary to the operation would be near the equipment in the event the equipment, load or load line makes electrical contact with the power line.

**Paragraph 1410(d)(11)**

Under proposed paragraph (d)(11), the equipment would be required to be properly grounded. In the event the equipment inadvertently makes electrical contact with the power line, proper grounding would protect employees in two ways. First, if the line is equipped with a circuit interrupting device, the grounding will result in a current surge that will trip the device and deenergize the line. Second, in the event an employee on the ground is touching the equipment when it contacts the power line, proper grounding will reduce the danger to the employee by providing an alternative, low resistance path to ground for the electric current.

In reviewing this proposed paragraph, OSHA has identified what appears to be a conflict between this proposed provision and a provision in Subpart V's § 1926.952(c)(2)(iii)

regarding grounding of equipment. This issue is explained under the heading, *Subpart V work–working closer than Table V-1*, that follows the discussion of § 1926.1410(k).

**Paragraph 1410(d)(12)**

Under proposed paragraph (d)(12), insulating line hoses or cover-ups would be required to be installed by the utility owner/operator except where such devices are unavailable for the line voltages involved. The Committee noted that Subpart N, at § 1926.550(a)(15), currently allows 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 believed 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 believed 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 proposed § 1926.1410(d).

**Paragraph 1410(e)**

Under proposed paragraph (e), the procedures that are developed to comply with proposed § 1926.1410(d) would have to be documented and immediately available on-site. This would ensure that these procedures are available to be used as a reference while the work is in progress.

**Paragraph 1410(f)**

Under proposed paragraph (f), the equipment user and utility owner/operator would be required to 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 proposed § 1926.1410(d) to prevent a breach of the minimum clearance distance established under proposed § 1926.1410(c). The Committee believed that 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, who has a high level of expertise regarding the power lines.

**Paragraphs 1410(g) and (h)**

Under proposed paragraphs (g) and (h), the employer would be required to implement the procedures developed in accordance with proposed § 1926.1410(d). The utility owner/operator and all employers of the employees involved in the work would have to identify one person who will direct the implementation of the procedures. This person would have to direct the implementation of the procedures and have the authority to stop work at any time to ensure safety.

The Committee believed 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 believed that there needs to be one person who all involved in the operation recognize as having this role and authority.

**Paragraph 1410(i). [*Reserved*.]** This paragraph would be reserved because it is inconvenient for readers to determine whether "(i)" is being used as a letter or a roman numeral.

**Paragraph 1410(j)**

This proposed provision would require the employer to safely stop operations if a problem occurs with implementing the procedures in paragraph (d) or if there is an indication that those procedures are inadequate to prevent electrocution. In addition, this proposed provision would require 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.

**Paragraph 1410(k)**

This proposed provision would require 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 proposed § 1926.1410 it must meet the manufacturer's procedures for use and conditions of use. The Committee believed that this provision is necessary to ensure that the devices will work as intended.

**Subpart V work–working closer than Table A**

In considering the circumstances under which work closer than the Table A (of proposed § 1926.1408) distances would be permitted, C-DAC recognized that it was necessary to address the special circumstances of power line work covered by 29 CFR 1926 subpart V. That subpart 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.

Currently, under subparts V and N of part 1926, employers engaged in subpart V work are not required to comply with the "10 foot rule." Instead, with some exceptions, they are required to maintain the minimum clearance distances specified in subpart V's Table V-1.[29] Table V-1 has minimum clearance distances that are less than the "10 foot rule" (and, therefore, less than the proposed rule's Table A distances). As discussed below,

[29] Since C-DAC developed its consensus document, OSHA has proposed to amend part 1926 subpart V by, among other things, replacing Table V-1 with a series of tables that modify the clearance distances specified in Table V-1. 70 FR 34821 (June 15, 2005). If OSHA issues a final rule modifying Subpart V before issuing a final rule based on this proposal, OSHA will take into account any modifications to Subpart V, including Table V-1, in drafting this final rule.

under this proposed standard, employers engaged in subpart V work would continue to be permitted to use the Table V-1 minimum clearance distances. However, C-DAC believed that additional protection is needed for these workers. Therefore, this proposed rule includes new prerequisites and criteria that must be met before the Table V-1 minimum clearance distances could be used.[30]

The Committee believed that it is appropriate for employers using equipment for subpart V of part 1926 activities to work closer than the Table A (of proposed § 1926.1408) distances only where the prerequisites and criteria for doing so set out in proposed § 1926.1410, which are applicable to all employers, are met. Therefore, for subpart V work, the employer would be required to maintain the clearance distances in Table A except where the employer demonstrates infeasibility.

In addition, it would be required to implement most of the protective measures required by this proposed standard. As discussed above, Subpart V work would not be subject to the requirement for an additional protective measure from the list in proposed § 1926.1408(b)(4). The Committee believed that, with certain exceptions explained below, such additional measure would not be necessary for such work. Also, subpart V work would not be subject to the prohibition in proposed § 1926.1408(d)(1) against equipment operating under power lines (see discussion above of proposed paragraph 1408(d)(2)(i)).

[30] The only exceptions to the application of this proposed rule to subpart V of part 1926 work are those contained in §§ 1926.1407-1411; all other aspects of the proposed rule would apply. This is consistent with the current Subpart V, for § 1926.952(c) of Subpart V requires equipment operating near power lines to comply with the current cranes and derricks standard in Subpart N. Therefore, the portion of the current § 1926.952(c) that requires equipment operating near power lines to comply with the cranes and derricks standard would be retained.

However, when, as will often be the case, it is not feasible to maintain the Table A (of proposed § 1926.1408) distances for subpart V work, under proposed § 1926.1410(c)(2), the clearance distances in Table V-1 would normally apply. The Committee concluded that it was not necessary to require employers engaged in subpart V work to undertake the process in proposed § 1926.1410(c)(1) for establishing a minimum clearance distance when it is infeasible to comply with the Table A (of proposed § 1926.1408) clearances. The existing clearance distances for subpart V work found in Table V-1 recognize that such work often requires that equipment get closer to the lines than the clearance distances specified in Table A and were specifically drafted to address subpart V work. Therefore, proposed § 1926.1410 (c)(2) would exempt subpart V work from proposed § 1926.1410(c)(1) and would state instead that the minimum clearance distances specified in § 1926.950 Table V-1 would apply.

Furthermore, under proposed § 1926.1410(d)(3), an employer engaged in subpart V work closer than the Table A distance would not be required to use an elevated warning line or barricade. It is the Agency's understanding that the Committee's rationale for this exclusion was that when subpart V work takes place closer than the Table A distances, a warning line would interfere with the tools, cables, and other material used in subpart V work. However, it is unclear to the Agency why this would also be the case if a barricade were used. The Agency requests public comment on this issue.

The provisions of this proposed standard would necessitate certain conforming amendments to the subpart V provisions dealing with lifting equipment to eliminate obsolete requirements and promote clarity. Currently, § 1926.952(c)(1) reads as follows:

> (c) *Derrick trucks, cranes and other lifting equipment*. (1) All derrick trucks, cranes, and other lifting equipment shall comply with subpart N and O of this part except:
> (i) As stated in § 1926.550(a)(15)(i) and (ii) relating to clearance (for clearances in this subpart see Table V-1) and
> (ii) Derrick truck (electric line trucks) shall not be required to comply with § 1926.550(a)(7)(vi), (a)(17), (b)(2), and (e).

These subpart V provisions would need to be modified in several respects. First, 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), when used in these industries for auguring holes to set power and utility poles, or handling associated materials to be installed or removed from utility poles, are excluded from the scope of this proposed standard. They would, however, continue to be covered by subpart V when used in this manner. Specifically, subpart V's current requirement that the minimum clearance distances of Table V-1 be met when using such equipment would be retained when such equipment is used outside the coverage of the new cranes and derricks standard.

Since these trucks, when used in the manner described, would be outside the scope of the new cranes and derricks standard, subpart V's provision in § 1926.952(c)(1)(ii) stating that derrick trucks need not comply with §§ 1926.550(a)(7)(vi), (a)(17), (b)(2), and (e),

which incorporate the requirements of certain industry consensus standards, would no longer be necessary.

Second, the subpart V provisions would be changed to reflect the terminology used in the scope section of this proposed standard and its new subpart designation (Subpart CC). With respect to "cranes and other lifting equipment," § 1926.952(c)(1)(i) would be unnecessary since proposed §§ 1926.1407 through 1926.1411 of this proposed standard address the applicable minimum clearance distances, including the circumstances under which the clearance distances in Table V-1 would apply.

Accordingly, § 1926.952(c)(1) would be amended to read:

> (c) *Cranes and other lifting equipment*. (1) All equipment covered by Subpart CC that is used for work covered by this standard [Subpart V], including cranes and other lifting equipment, shall comply with subparts CC and O of this part.
>
> (2) 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), when used in these industries for auguring holes to set power and utility poles, or handling associated materials to be installed or removed from utility poles, must meet the applicable minimum clearance distance in Table V-1.

**Subpart V work – working closer than Table V-1**

Currently, § 1926.952(c)(2) recognizes that there are circumstances when the Table V-1 clearance distances cannot be maintained during Subpart V work and lists requirements that must be met when this is the case. OSHA believes that C-DAC intended to permit

Subpart V work closer than the Table V-1 clearances when the precautions in § 1926.952(c)(2), as well as additional precautions contained in proposed § 1926.1410(d), are followed.

To make this clear, OSHA is proposing to add the following language to proposed § 1926.1410(c)(2): "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)(2)(i) and (ii) are met." [Note that subsections (i) and (ii) are currently subsections (iii) and (iv) but would be renumbered under the proposed amended language of § 1926.950(c)(2) discussed below]. OSHA requests public comment on this proposed addition.

This proposed change would require conforming amendments to § 1926.952(c)(2), which currently reads as follows:

> (2) 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:
>
> (i) An insulated barrier is installed between the energized part and the mechanical equipment, or
>
> (ii) The mechanical equipment is grounded, or
>
> (iii) The mechanical equipment is insulated, or
>
> (iv) The mechanical equipment is considered as energized.

Under this proposed section, the precautions specified in paragraphs § 1926.952(c)(2)(i) and (ii) would be required under proposed § 1926.1410(d) when equipment used in Subpart V work is operated closer than the Table V-1 clearances. Since these precautions would now be required by proposed § 1926.1410(d), OSHA is proposing to delete them from Subpart V as redundant. OSHA is therefore proposing to amend § 1926.952(c)(2) to read as follows:

> (2) 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.

OSHA requests public comment on the proposed amendments to § 1926.950(c)(1) and (2) of Subpart V described above.

In addition, OSHA notes that, under the current 29 CFR Part 1926 Subpart V requirement in § 1926.952(c)(2), when doing Subpart V work closer than the Table V-1 distances, the equipment must be insulated or considered energized.[31] However, proposed § 1926.1410 does not have a similar requirement. Therefore, an employer engaged in Subpart V work that was closer than the Table V-1 distances would continue to be required (under § 1926.952(c)(2)) to insulate or consider the equipment energized,

[31] In Subpart V, when equipment is considered energized, a number of Subpart V requirements are triggered. See, for example, § 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).

but an employer engaged in non-Subpart V work at the same distance would not. The Agency requests public comment on whether such requirements should also apply to non-Subpart V work when working closer than the Table V-1 distances.

Finally, OSHA notes that in this zone, one of the options that an employer engaged in Subpart V currently has under § 1926.952(c)(2)(iii) is to insulate the equipment. Under proposed § 1926.1410(d)(11), that employer would also have to ground the equipment. The Agency's understanding of how equipment can be simultaneously insulated and grounded is illustrated by the following example: Equipment that has a boom constructed of an insulating material (such as fiberglass) is typically mounted on a carrier (the "truck" portion of the equipment), which is constructed mostly of conductive material (i.e., steel). Because the boom (and the linkages, pneumatic and hydraulic lines, and other associated parts on the boom) is insulated, the equipment is considered insulated under (§ 1926.952(c)(2)(iii)). If the employer were to ground the carrier, the parts of the equipment that could form an electrical path to ground (the carrier and the conducting parts of the equipment forming an electrical path to the carrier, such as the load line and hoist) would be grounded. Therefore, the equipment would meet both the insulating option in § 1926.952(c)(2)(iii) and the proposed grounding requirement in proposed § 1926.1410(d)(11).

**Subpart V work - summary**

The differences between how the proposed requirements for power line safety would apply generally to crane operations and how they would apply to an employer engaged in work covered by Subpart V are summarized in the following table:

| Non-Subpart V work | Subpart V work |
|---|---|
| ***When using Table A distances*** | |
| § 1926.1408: | |
| Must pick one additional prevention measure from list in § 1926.1408(b)(4) | Additional measure not required (§ 1926.1408(b)(5)) |
| § 1926.1408(d): Operations below power lines generally precluded | Operations below power lines permitted (§ 1926.1408(d)(2)(i)) |
| (All other requirements in § 1926.1408 would apply equally to both Non-Subpart V work and Subpart V) | |
| ***Working closer than Table A distances*** | |
| § 1926.1410: | |
| § 1926.1410(c)(1) (utility or registered professional engineer sets minimum clearance distance) | Instead, use Subpart V's Table V-1 minimum clearance distance (§ 1926.1410(c)(2)) |
| § 1926.1410(d)(3) (warning line or barricade) | Not required |
| § 1926.1410(d)(4) (insulating link) | Only required if working closer than Table V-1 (§ 1926.1410(d)(4)(ii)); see below |
| ***Working closer than Table V-1*** | |
| [The proposed § 1926.1410 requirements would apply to all distances closer than those specified in Table A; there are no additional proposed requirements for working closer than the Table V-1 distances for non-Subpart V work] | (Under both § 1926.1410 and current § 1926.952(c)(2)) |
| (Insulating link required under § 1926.1410(d)(4)) | Must use insulating link (§ 1926.1410(d)(4)(ii)) |
| Not required | Equipment must be insulated or considered energized (§ 1926.952(c)(2)) |
| (All other requirements in § 1926.1410 would apply equally to both Non-Subpart V work and Subpart V work) | |

**Section 1411 Power line safety –while traveling**

This proposed section is designed to protect against electrical hazards while equipment is traveling with no load under power lines on construction sites. These proposed requirements would apply only to cranes/derricks while traveling on a construction site under power lines; they would not apply to equipment while traveling on roads (or in areas) that are not part of a construction site.

The following scenario is an example of the parameters of the scope of this provision: A crane travels on a public road to the entrance of a new residential tract development. While traveling on the public road it passes under powerlines. No construction is taking place on the public road. The tract, including a road that runs through the development, is open to construction traffic but is otherwise closed to the public. In the development, homes are in various stages of construction. The crane enters the development and travels along the development road to the area where the crane is going to be operated. The crane will pass under power lines as it travels along this development road.

In this scenario, proposed § 1926.1411 would not apply with respect to the crane traveling along the public road to the entrance of the development, since that road is not part of a construction site. However, it would apply with respect to traveling under power lines on the development road since the development road is part of a construction site.

It was the intention of the Committee that the requirements of proposed § 1926.1411 apply only with respect to such equipment when traveling with no load. Power line hazards regarding equipment traveling on a construction site with a load would be governed by the proposed provisions in §§ 1926.1408, 1926.1409 and 1926.1410.

The C-DAC draft of § 1926.1411(a) stated:

> (a) This section **applies to equipment while traveling under a power line** on the construction site with no load and the boom/mast and boom/mast support system lowered sufficiently to meet the requirements of paragraph (b). (Emphasis added).

In reviewing that draft, the Agency realized that it could be misconstrued to mean that the requirements of § 1926.1411 would only apply once the crane was traveling under a power line; in other words, that no action would be required of an employer prior to the equipment being under the power line. To make it clear that there are certain proposed provisions in this section that would require the employer to make determinations and take action before the equipment is actually under the power line, the Agency has revised the Committee's original language in § 1926.1411(a) to read:

> (a) This section establishes procedures and criteria that must be met for equipment traveling under a power line on the construction site with no load.

This change clarifies that the employer would be required to make determinations and take certain actions prior to the equipment traveling under the power line. For example, under proposed § 1926.1411(b)(4), if any part of the equipment while traveling would get closer than 20 feet to the power line, the employer would be required to have a dedicated spotter who is in continuous contact with

the operator. If this requirement were to only apply at the moment the equipment was under the power line, it would not serve the purpose of providing the operator with someone to assist in gauging the clearance distance while the equipment is traveling under the power line.

In addition, the C-DAC draft of § 1926.1411(a) included a reference to the boom/mast and boom/mast support system being lowered to meet the criteria specified in proposed § 1926.1411(b). The Agency was concerned that inclusion of that reference could be misconstrued as meaning that the section is inapplicable where the boom/mast and boom/mast support system had not been sufficiently lowered. Therefore, the Agency has modified the paragraph by moving that reference to proposed 1926.1411(b) to explicitly make it part of the required criteria for traveling under powerlines without a load. The C-DAC's draft of 1926.1411(b)(1) stated:

> (b) The employer shall ensure that:
> (1) The clearances specified in paragraph (c), Table T, are maintained.

This has been changed so that the proposed § 1926.1411(b)(1) and (b)(2) now state:

> (b) The employer shall 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.

Therefore, under these proposed provisions, the employer would be required to ensure that equipment traveling with no load on a construction site under a power line has the

boom/mast and boom/mast support system lowered sufficiently so that the clearances specified in Table T are maintained.

In addition to maintaining the Table T minimum clearance distances, proposed § 1926. § 1926.1411(b)(3) would require 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. OSHA is modifying the C-DAC language as follows to clarify this requirement.

> (b)(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.

Proposed paragraph (b)(4) would require 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 would also require 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. The Committee believed that each of these measures is necessary for the spotter to be effective.

In reviewing proposed § 1926.1411(b)(4), OSHA noted that the language "crane operator" was used rather than "driver." For example, proposed § 1926.1411(b)(4) reads:

> (4) Dedicated spotter. If any part of the equipment while traveling will get within 20 feet of the power line, the employer shall ensure that a dedicated spotter who is in continuous contact with the crane operator is used . . . .

Because proposed § 1926.1411 deals with power line safety while equipment is traveling without a load, OSHA recognizes 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 is soliciting comments on whether the language "crane operator" used in proposed § 1926.1411(b)(4) should be changed to "driver" or "driver/operator."

The Committee members were also concerned about equipment traveling underneath power lines in low visibility situations, such as at night, in the rain or fog. The electrical hazards posed by power lines are exacerbated when the driver's ability to see the power line is reduced. The Committee believed that additional precautions are necessary in light of this heightened danger. Therefore, proposed § 1926.1411(b)(5) would require the employer to ensure the power lines are either illuminated or another means of identifying them are used and a safe path of travel is identified.

In reviewing the C-DAC draft of this provision, OSHA recognized that § 1926.1411(b)(5)(ii) did not clearly state the Committee's intentions. The committee intended for employers to both identify a safe path of travel and also use the identified safe path of travel. However, the C-DAC draft stated only that a safe path be

"identified," which only implicitly means that it be used. Therefore OSHA has revised the language in § 1926.1411(b)(5)(ii) from:

(ii) A safe path of travel is identified.

to read:

(ii) A safe path of travel is identified and used.

The proposed requirements of this section are similar to section 5-3.4.5.5 of ASME B30.5–2004. The values in proposed Table T of proposed § 1926.1411, which provides the minimum clearance distances while traveling with no load and a lowered boom, are substantially similar to the values used by ASME. The distinction between these proposed requirements and those requirements in ASME are that the proposed requirements govern equipment while traveling under a power line and the ASME provisions govern mobile cranes while in transit. ASME defined "transit" as the moving or transporting of a crane from one jobsite to another.

The Agency notes that ASME B30.5–2004 calls for equipment in transit to maintain a specific clearance distance to power lines in accordance with Table 1 of ASME B30.5. While proposed § 1926.1411 governs equipment traveling without a load directly under power lines, it does not otherwise address the potential hazards associated with equipment traveling without a load near power lines. Further, as stated earlier, equipment traveling with a load, whether or not under a power line, would be considered "operations" and employers would have to comply with the proposed requirements in § 1926.1408, 1926.1409, or 1926.1410 in such instances.

However, equipment traveling without a load is not covered by either proposed § 1926.1410 (operations) or §1926.1411 (traveling under power lines). Therefore, OSHA requests public comment on whether it is necessary to establish requirements for equipment traveling on a construction site without a load near power lines.

**Additional changes to the regulatory text in proposed §§ 1926.1407–1411**

In the C-DAC draft of provisions dealing with the "trigger" distance for further action, the draft referred to situations in which the crane, load or load line could get "within" the trigger distance. Because of the potential for confusion as to whether "within" means breaching or not breaching that distance, the Agency has changed "within" to "closer than." For example, the C-DAC draft of 1926.1407(a) read:

> Before assembling or disassembling a crane, the employer must determine if any part of the crane, load line or load (including rigging and lifting accessories) could get, in the direction or area of assembly, **within** 20 feet of 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, as follows: . . . .

This provision now reads:

> Before assembling or disassembling a crane, the employer must determine if any part of the crane, load line or load (including rigging and lifting accessories) could get, in the direction or area of assembly, **closer than** 20 feet ~~of~~ **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 § 1926.1407(a), as follows:

**Section 1412 Inspections**

The purpose of this proposed section is to prevent injuries and fatalities caused by equipment failures. A key method of accomplishing this goal is through the use of an inspection process that identifies and addresses safety concerns.

Currently, Subpart N requires the employer to designate a competent person to inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use. 29 CFR 1926.550(a)(5). In addition, Subpart N requires a thorough annual inspection of the hoisting machinery by a competent person or by a government or private agency recognized by the U.S. Department of Labor. 29 CFR 1926.550(a)(6).

Subpart N also contains inspection requirements for specific types of equipment that incorporate national consensus standards or manufacturer recommendations by reference. Section 1926.550(b)(2) requires crawler, locomotive, and truck cranes to meet the inspection requirements of ANSI B30.5–1968, "Crawler, Locomotive and Truck Cranes" (with a modified version of the ANSI standard's monthly inspection documentation requirement). Overhead and gantry cranes, under § 1926.550(d)(4), must be inspected pursuant to ANSI B30.2.0–1967, "Overhead and Gantry Cranes." For derricks, § 1926.550(e) requires compliance with the inspection requirements of ANSI B30.6–1969, "Derricks." Hammerhead tower cranes must be inspected (§ 1926.550(c)(5)) and floating

cranes and derricks must be tested (§ 1926.550(f)(2)(iii)) in accordance with manufacturer specifications.

The Committee believed it would avoid confusion and promote compliance to establish, as far as possible, uniform inspection schedules and requirements applicable to all types of equipment. At the same time, it recognized that the wide variety of equipment covered by this proposed standard necessitated some equipment-specific inspection provisions. Thus, proposed paragraphs (a) through (j) of this section would set inspection requirements for all covered equipment that would be supplemented by other sections of this proposed standard relative to specific equipment. The proposed section is structured so that the inspection requirements would be triggered by activity (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).

Note that for each of these inspections, as discussed in detail below, this proposed standard specifies a requisite level of qualification of the person conducting the inspection (for certain inspections, a competent person; for others a qualified person). However, like Subpart N, the proposed rule does not include a testing/evaluation requirement for such employees for assessing their ability to conduct the inspections.

Since the C-DAC document was completed, crane accidents have occurred that have raised concerns regarding the level of expertise needed by those who inspect the equipment covered by this proposed standard. In § 1926.1428, this proposed rule

specifies a protocol for ensuring that signal persons have adequate expertise to perform their duties. The Agency requests public comment on whether a similar approach is needed for those who inspect equipment as required by this proposed standard.

**Paragraph 1412(a) Modified equipment**

Proposed paragraph (a) would require an inspection (that includes functional testing) 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. In essence, the proposed provision would require assurance that such modifications or additions are performed in accordance with the approval obtained in proposed § 1926.1434, *Equipment modifications*. Proposed § 1926. 1412(a)(2) would prohibit the use of the equipment until that requirement was met. The purpose is to prevent modification-related equipment failure.

This proposed paragraph is generally similar to consensus and government standards, including ANSI B30.5–1968, ASME B30.5–2004, COE (Corps of Engineers)-EM 385-1-1 (3-Nov-03), and DOE (Department of Energy)-STD-1090-2004 in that each require an inspection and some degree of functional testing prior to using equipment that has been modified/altered. However, the inspection in the proposed paragraph differs from these in that it is limited to equipment that has modifications/additions that affect the safe operation of the equipment and is limited to confirming compliance with modifications or additions that are approved by the manufacturer or a registered professional engineer

pursuant to § 1434. Further, this proposed paragraph does not contain a documentation requirement.

The Committee was of the view that many changes made to equipment do not implicate safe operation, and application of an inspection requirement to such changes would be unnecessary and unduly burdensome. The proposed paragraph reflects this concern and is tailored to require this inspection only when the modification is of the type that could affect safety. As such, the inspection would only be required for modifications that affect "safe operation" as illustrated by a non-exclusive list of examples ("modifications or additions involving 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 mechanisms").

The first criterion to be used in conducting the inspection (proposed § 1926.1412(a)(1)(i)) is the modification approval obtained under proposed § 1926.1434. This would ensure that the modification was accomplished as intended under that approval.

The second criterion (proposed § 1926.1412(a)(1)(ii)) is functional testing. This reflects the Committee's view that functional testing is essential to ensuring that the modification was completed correctly. Such testing can reveal faults that often would not otherwise be apparent.

As drafted, § 1926.1412(a)(1)(ii) would not limit the functional testing requirement to only those components that are or may be affected by the modification or addition but would require testing of the entire equipment. OSHA requests public comment on whether the provision should be modified to limit the functional testing requirement to those components that are or may be affected by the modification or addition.

During the SBREFA process, a Small Entity Representative suggested adding an exception to proposed § 1926.1412(a) for "transportation systems," by which the SER meant any system dispersing the weight of the crane for movement on the highways. The Panel recommended that OSHA solicit public comment on whether to include such an exception and, if so, what the appropriate terminology for such an exception would be. OSHA welcomes public comment on whether an explicit exception for such transportation systems should be included in § 1926.1412(a).

**Paragraph 1412(b) Repaired/adjusted equipment**

Proposed paragraph (b) provides that equipment that has had a repair or adjustment that affects the safe operation of the equipment must be inspected (including functional testing) by a qualified person prior to initial use after the repair/adjustment. In summary, the qualified person would be required to determine if such repairs and adjustments have been performed in accordance with manufacturer equipment criteria.

As defined in § 1926.1401, "equipment criteria" include "instructions, recommendations, limitations and specifications." This definition is included to make clear that "equipment criteria" is to be broadly construed to include the full range of information regarding the equipment's functions and operation provided by the manufacturer. If those criteria were unavailable or inapplicable, the qualified person would be required to determine whether a registered professional engineer (RPE) is needed to develop criteria. If an RPE were not needed, a qualified person would be required to develop them. Use of the equipment would be prohibited until the inspection demonstrates that the repairs and adjustments met the criteria. The purpose of this provision is to avoid the failure of equipment due to improper repairs and adjustments.

The Committee was of the view that many repairs and adjustments made to equipment do not implicate safe operation, and application of an inspection requirement to all repairs and adjustments would be unnecessary and unduly burdensome. The proposed paragraph reflects this concern by limiting this proposed inspection requirement to those repairs and adjustments that are of the type that could affect safety. A non-exclusive list of examples of repairs and adjustments that would trigger the inspection is included in the provision.

The Committee believed that functional testing is essential to ensuring that a repair or adjustment has been completed correctly. Such testing can reveal faults that may not otherwise be apparent.

As discussed above in relation to proposed § 1926.1412(a)(1)(ii), the functional testing requirement is not limited to those components that are or may be affected by the repair or adjustment. OSHA requests public comment on whether the provision should be modified to add such a limitation.

The Agency believes that this inspection provision is needed to prevent injuries and fatalities from accidents caused by faulty repairs and adjustments. As evidenced by similar provisions in other standards (see COE – EM 385-1-1 (3-Nov-03), and DOE – STD-1090-2004; see also the consensus standard ASME B30.5–2004), the industry has recognized the hazards associated with improperly repaired and adjusted equipment and the importance of this type of inspection.

**Paragraph 1412(c) Post-assembly**

Proposed paragraph (c) would require a post-assembly inspection of equipment by a qualified person prior to its use. In sum, the provision would require the qualified person to assure that the equipment is configured in accordance with the manufacturer's equipment criteria. Where those criteria are unavailable, the equipment would have to meet criteria developed by either the qualified person or an RPE familiar with the equipment (if the qualified person decides that an RPE is needed). Equipment use would be prohibited until the inspection demonstrates that the criteria have been met.

ANSI B30.5–1968, and ASME B30.5–2004 do not call for this type of inspection. COE in EM 385-1-1 (3 Nov 03), Appendix H, does include a post-assembly inspection.

The Committee was of the view that a post-assembly inspection is needed because of the dangers associated with incorrectly assembled equipment. For example, the equipment's load chart may overstate the equipment's capacity if the equipment has been incorrectly assembled. Also, a component may be stressed beyond its design capacity if incorrectly assembled.

The Committee considered whether to recommend requiring that this inspection be conducted by a person who is not only qualified but is also a "competent person," i.e., a person with the authority to take corrective action. The Committee ultimately decided that this would not be necessary because proposed § 1926.1412(c)(3) would prohibit the use of equipment until the post-assembly inspection demonstrates that the equipment is configured in accordance with the applicable criteria. Therefore, if the qualified person were to find that the equipment was incorrectly assembled, it could not be used until the error was corrected.

Also discussed was whether a registered professional engineer (RPE), as opposed to a qualified person, is needed to develop the criteria for the equipment configuration where the manufacturer criteria are unavailable. The Committee agreed that an RPE would typically not be needed for, as one member stated, "a basic machine that goes together in a basic manner," but that an RPE would be needed for some of the more complex types

of equipment. As a result, the Committee found that it would be appropriate to have the qualified person determine if an RPE were needed to develop the criteria.

**Paragraph 1412(d) Each shift**

Proposed paragraph (d) would require a shift inspection, the first of three regularly scheduled equipment inspections that would be required. Specifically, 1926.1412(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 proposed paragraph lists the items that would be required to be included in this inspection and specifies the corrective action that would be required. The purpose of this provision is to identify and address safety hazards before they cause accidents.

This inspection (which would begin prior to each shift and be completed before or during that shift) is broadly similar to the current requirement in 29 CFR 1926.550(a)(5) of Subpart N to conduct an inspection "prior to each use, and during use . . . ." Similarly, several other current standards, including 29 CFR Part 1926 subpart R (Steel Erection) and COE-EM 385-1-1 (3-Nov-03) require some type of shift inspection for cranes. In contrast, ANSI B30.5–1968 as well as the more current ASME B30.5–2004, call for a "Frequent Inspection" at "daily to monthly" intervals. The "Frequent Inspection" in the ANSI/ASME standards, though, includes a reference to "observation during operation."

The “each shift” inspection in the proposed rule is designed to ensure that the equipment will be removed from service if there is a visually apparent deficiency that constitutes a safety hazard. The Committee considered adopting the “daily to monthly” inspection interval that is in the ANSI/ASME B30.5 consensus standard, but determined that that approach was too vague for use as a mandatory OSHA requirement. Instead, the Committee found that, in accordance with long-standing, common industry practice, an inspection of the items listed in the proposed paragraph each shift is an appropriate means of ensuring that the equipment’s condition will be sufficient for safe operation.

The Committee also discussed whether the shift inspection should be required to be completed before a shift’s crane operations begin. It determined that it is not necessary to complete the inspection in that short of a time frame. The Agency believes that this determination is reasonable for several reasons. First, this would be an inspection that would be done for every shift, and therefore would be done quite frequently. This would substantially diminish the likelihood that a critical problem would suddenly occur, since symptoms of such a problem developing would likely have been detected in prior shift inspections.

Second, as discussed below, one of the purposes of the annual/comprehensive inspection is to detect developing deficiencies that, while not yet safety hazards, need to be monitored. In such cases the employer under the annual/comprehensive requirements in proposed § 1926.1412(f)(4) would be required to monitor them in the monthly inspections. Finally, the competent person that conducts the shift inspection would be

required to reassess his or her determinations in light of observations made during the equipment's operation. The Committee designed these proposed requirements to work together, and in light of that combined approach, the Agency believes that it would be sufficient for the shift inspection to be completed during the shift.

The Committee also discussed the degree of scrutiny that would be required during the shift inspection. Specifically, it considered whether the shift inspection should involve any disassembly of the equipment. It determined that disassembly should not normally be needed for this type of inspection since its purpose is not to duplicate the annual/ comprehensive inspection (which is where the equipment would be subjected to a level of scrutiny that would necessarily involve disassembly). Instead, disassembly would only be required where "the results of the visual inspection or trial operation indicate that further inspection necessitating disassembly is needed."

Finally, a competent person would be required to perform the shift inspection. The Committee believed that a person that meets the definition of a competent person (see the definition discussion above) is needed to perform the shift inspection for two reasons. First, such a person would have the capability to identify apparent deficiencies, determine if any disassembly was needed, and determine if the deficiency constitutes a safety hazard. Second, a competent person would have the authority necessary to take corrective action in the event a deficiency was such a hazard.

OSHA anticipates that the equipment operator will often be used by the employer as the competent person who conducts the shift inspection. The operator will be at the site and, in most cases, by virtue of his or her qualification or certification under proposed §§ 1926.1427 and 1926.1430 and experience and familiarity with the equipment, would meet the requirements for a competent person. However, the employer would have the flexibility to use someone else to conduct the shift inspection as long as that person met the definition of competent person.

Proposed paragraphs (d)(1)(i) through (xiv) sets forth the list of items that, at a minimum, would be required to be inspected each shift. The Committee believes that this is an appropriate list for ensuring safety and builds on well established industry practice in terms of what needs to be inspected in this type of inspection. For example, the list is similar to the one for pre-shift inspections in 29 CFR Part 1926 subpart R, the list in ASME B30.5–2004 for its Frequent Inspection, and with the exception of a few additional items, to the list for Frequent Inspections in ANSI B30.5–1968.

Overall, except as noted below in the discussion of the particular items on this list, the concerns of C-DAC members relative to this list focused on whether items not listed as "daily" inspection items but included instead in the "Frequent Inspection" list in ASME B30.5a–2002 (which are identical to those in the more recent ASME B30.5–2004 standard) should be inspected each shift. A concern was raised in the Committee meetings about the nature of the visual inspection and whether including all of the listed items in ANSI/ASME would be too burdensome. To address this concern, the

Committee decided to include these items (and a few others) but to also include the language discussed above limiting the circumstances in which disassembly would be required.

The following discussion addresses only those items for which the Committee recommended inspection descriptions that vary in some significant way from past or current consensus standards (apart from their being designated for inspection each shift).

Proposed paragraph (d)(1)(ii) lists "[c]ontrol and drive mechanisms for apparent excessive wear of components and contamination by lubricants, water or other foreign matter." Though similar to the requirement in ANSI B30.5–1968 and ASME B30.5-2004 (on the "Frequent" list), and in 29 CFR Part 1926 subpart R, this provision reflects some differences. For example, unlike the ANSI/ASME standards (but similar to Subpart R), it adds "drive" mechanisms, which the Committee believed more accurately reflects the type of mechanisms that need to be inspected. In addition, "excessive" was added to account for the fact that some wear in these mechanisms is normal and not unsafe. The extent of wear needed to trigger further evaluation of the item is that which is apparently excessive.

Proposed paragraph (d)(1)(iii) addresses "[a]ir, hydraulic, and other pressurized lines for deterioration or leakage, particularly those which flex in normal operation." This paragraph is similar to an item listed in ANSI B30.5–1968 and in ASME B30.5–2004, with the difference being the reference to "air" and "other pressurized lines." These

additions reflect the Committee's belief that it is necessary to check all types of pressurized lines.

Proposed paragraph (d)(1)(v) lists "[h]ooks and latches for deformation, cracks, excessive wear, or damage such as from chemicals or heat." This substantially mirrors Subpart R, and is similar to ANSI B30.5–1968 and ASME B30.5–2004, but also differs in certain ways. First, the Committee believed that latches can be damaged by causes other than the examples listed. The proposed paragraph therefore adds the words "such as" so that the examples listed would be a non-exclusive list. Second, the Committee believed that "heat" should be added as another example of a cause of damage to highlight this as an area of concern (since, for example, welding is sometimes done near a hook or latch). Finally, the proposed provision would require the competent person to inspect for "excessive wear," as opposed to "wear." This change was made because the Committee believed that hooks and latches are designed to withstand a degree of wear, and it is only when the wear is excessive that it is of concern.

Proposed paragraph (d)(1)(vii) lists "[w]ire rope, in accordance with § 1926.1413(a)." This item references the *Shift Inspection* provision of § 1926.1413, *Wire rope – inspection*, which specifies how the wire rope would be required to be inspected in the shift inspection. As discussed below in the section of this Preamble on that proposed provision, the timing, degree of scrutiny, and level of expertise required of the person conducting the wire rope inspection essentially mirror those for proposed §

1926.1412(d)(1). This was done to ensure consistency with the wire rope inspections and the other general items inspected each shift.

Proposed paragraph (d)(1)(viii) lists "[e]lectrical apparatus for malfunctioning signs of apparent excessive deterioration, dirt or moisture accumulation." This essentially mirrors provisions in ANSI B30.5–1968 and ASME B30.5–2004 (for Frequent Inspection) and Subpart R except for the insertion of the word "apparent." That word was added to be consistent with proposed § 1926.1412(d)(1)'s reference to "apparent deficiencies."

Proposed paragraph (d)(1)(ix) lists "[t]ires (when in use) for proper inflation and condition." ASME B30.5–2004 calls for tires be checked for "inflation pressure" and Subpart R contains a similar provision, although it does not contain the "when in use" limitation. The Committee believed that it is unnecessary to check tires for proper inflation on equipment that is not in use. In addition, it decided to not include the word "pressure" because it believed that checking pressure each shift with a gauge is unnecessary and inconsistent with the visual nature of the shift inspection.

Proposed paragraph (d)(1)(x) lists "[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." This item is new, in that it is not included in 29 CFR Part 1926 subpart N or the ANSI/ASME standards. The Committee believed that ground conditions can change from shift to shift, and in light of

the critical importance of sufficient ground support, included this item in the C-DAC document.

A nearly identical provision is included in 29 CFR Part 1926 subpart R. However, the C-DAC provision differs from the Subpart R provision in that the language "and supporting foundations" was added by C-DAC to reflect that some cranes (particularly towers cranes) are set on surfaces other than "ground" (e.g., concrete) and that ground settling could occur "under and around" those foundations. As such, the Agency believes that the C-DAC language is appropriate in the proposed rule. It should also be noted that a separate provision, § 1926.1402, *Ground conditions*, is included in this proposed rule, which more specifically addresses responsibility for and adequacy of ground conditions.

Proposed paragraph (d)(1)(xi) lists "[t]he equipment for level position, both shift and after each move and setup." This item is not included in the ANSI/ASME standards; however, it mirrors the language of the similar pre-shift inspection in Subpart R. The Committee found that, as with ground conditions, maintaining the equipment's level position is essential for its safe operation. Since factors affecting the equipment's angle of inclination can change from shift to shift (such as compression of dunnage, ground settling from freeze/thaw conditions and ground compression), the Committee believed that it is necessary to include this in the shift inspection.

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." The Agency requests public comment on this issue.

Proposed paragraph (d)(1)(xii) lists "[o]perator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view."[32] The purpose of this proposed provision is to ensure adequate visibility. The Committee believed that it is important to ensure that the windows' condition does not hamper the operator's view. Since a significant crack, break or other defect hampering the operator's view may occur during a shift, it believed that this item needs to be included in the shift inspection. The inclusion of the words "significant" and "hamper the operator's view" were to clarify that minor deficiencies that do not materially impair the operator's view are not considered safety hazards.

Proposed paragraph (d)(1)(xiii) lists "[r]ails, rail stops, rail clamps and supporting surfaces when the equipment has rail traveling." This item is not specifically listed as an inspection item in the pre-shift inspections of Subpart R or in the Frequent Inspections of the 1968 or 2004 ANSI/ASME B30.5 standards. However, they are included because of the essential role they play in the holding and emergency stopping of rail mounted equipment. Their importance to safe operation is similarly recognized by their inclusion

[32] Currently, 29 CFR Part 1926 Subpart N contains a requirement specifying that the type of glazing in cabs must not cause "a visible distortion."

in proposed § 1926.1415, *Safety Devices*, as safety devices that must be working properly for crane operations to continue.

Proposed paragraph (d)(1)(xiv) lists "[s]afety devices and operational aids for proper operation." Subpart N, through its incorporation by reference of ANSI B30.5–1968, includes a daily inspection of safety devices for malfunction for the equipment it covers, while ASME B30.5–2004 requires a daily inspection of operational aids for malfunction. Finally, Subpart R includes a nonexclusive list of safety devices in its pre-shift inspection. The equipment's safety devices and operational aids would be included because of their important role in assisting the operator in the safe operation of equipment.

Concern was raised in Committee about including this item because the industry did not have clear, consistent definitions for terms "safety devices" and "operational aids." This concern was addressed by referencing the lists of devices for each of these terms in proposed § 1926.1415, *Safety devices* and § 1926.1416, *Operational aids*.

The language also reflects the Committee's view that the inspection of these devices and aids is more accurately described as an inspection for "proper operation" rather than for "malfunction." The Committee considered this a more accurate description because the person conducting the inspection does so by checking the safety device or operational aid for proper operation. If it is found to be working properly, the inspection is finished.

Another concern was including both safety devices and operational aids in this provision, since many members were of the view that these two categories of devices necessitate different levels and types of action when a deficiency is found. That concern was addressed by specifying in proposed § 1926.1412(d)(3) that if a deficiency is found, the action that would be required in response would be the actions delineated in proposed § 1926.1415, *Safety devices* and § 1926.1416, *Operational aids*, which address these two categories differently. See additional discussions of these procedures in §§ 1926.1415 and 1926.1416 of this explanation of the rule.

Proposed paragraph (d)(2) would establish the follow-up actions to the identification of apparent deficiencies during the shift inspection that would be required. Specifically, under proposed 1926.1412(d)(2), immediately following the discovery of any deficiency identified pursuant to proposed § 1926.1412(d)(1)(i) through (xiii), or pursuant to other equipment-specific inspections (e.g., see proposed § 1926.1436(p) (inspection of derricks), the competent person must determine whether the deficiency is a safety hazard. If so, equipment operations must cease until it has been corrected. The correction procedure described in proposed § 1926.1412(d)(2) is similar to that in ANSI B30.5–1968 and ASME B30.5–2004 for their Frequent Inspections.

This approach reflects the Committee's determination that not all deficiencies constitute safety hazards. The proposed language in § 1926.1412(d)(2) reflects that approach by linking the requirement for removing the equipment from service to deficiencies that constitute safety hazards. The provision is designed to ensure that this determination is

made appropriately by requiring that it be made by a competent person. The competent person would have both the capability necessary to make an accurate determination. In addition, requiring a competent person to make the determination would ensure that his or her findings were implemented; i.e., the competent person would have the authority to order the equipment out of service if the deficiency constituted a hazard. The Agency believes that this would be an appropriate means of protecting employees from equipment with deficiencies that constitute safety hazards.

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. Proposed § 1926.1413(a)(1), discussed below, explicitly states that booming down is not required as part of the shift inspection for wire rope. It is the Agency's understanding that C-DAC did not include a similar provision in the general shift inspection provision in proposed § 1926.1412(d) because booming down would not be required to observe a deficiency in any of the items requiring inspection under that paragraph. Similarly, OSHA does not believe that inspection for a deficiency in any of those items would require removal of non-hinged inspection plates. However, OSHA welcomes public comment on these points.

**Paragraph 1412(e) Monthly**

Proposed paragraph (e) would require a monthly inspection of the equipment, the second of the three regularly scheduled general inspections that would be required by this proposed standard. The monthly inspection is identical in coverage and manner to the shift inspection required by proposed § 1926.1412(d), with one addition discussed below. Thus, the monthly inspection would be a visual inspection of the items listed in the shift inspection for apparent deficiencies, conducted by a competent person. However, unlike a shift inspection, a written record of the monthly inspection is proposed to be kept and retained for at least 3 months.

In addition, under the annual/comprehensive inspection in proposed § 1926.1412(f)(4), the employer would be required to identify developing deficiencies that, while not yet safety hazards, need to be monitored. In such cases the employer under proposed § 1926.1412(f)(4) and (f)(6) would be required to monitor them in the monthly inspections.

This provision differs in some ways from the current requirement in 29 CFR part 1926 Subpart N that incorporates by reference ANSI B30.5–1968 and from ASME B30.5–2004. For example, rather than a monthly inspection, these industry standards call for a "Frequent" inspection to be done at "daily to monthly" intervals. The Committee believed that the proposed approach is an improvement over the ANSI/ASME approach by eliminating ambiguity over the frequency of inspections. Also, the consensus standards do not call for the monitoring of developing deficiencies, a change the Committee believed would lead to the elimination of hazards before they develop. However, many of the items listed in those consensus standards for frequent inspections

are similar to those listed in the shift and monthly inspections of the proposed rule (See discussion of items inspected under proposed paragraphs (d)(1)(i) through (xiv) for comparison).

Proposed paragraph (e)(3) would establish a documentation requirement for this monthly inspection. Specifically, proposed § 1926.1412(e)(3)(i) would require that the inspection "be documented by the employer that conducts the inspection" and indicate the items checked with results, the name and signature of the person of the inspector, and the date. In these respects this proposed requirement is similar to that currently in effect under § 1926.550(b)(2) of 29 CFR part 1926 Subpart N for crawler, locomotive, and truck cranes. Proposed § 1926.1412(e)(3)(ii) would establish a minimum three-month retention period for the monthly inspection documentation.

These two proposed provisions have several purposes. The Committee believed that, on a monthly basis, it is necessary to record the items checked and the results of an inspection that for the most part parallels a shift inspection. It believed that the documentation of this inspection, signed by the person who conducted the inspection and retained for three months, would have several effects. First, it would increase the likelihood that more employers would implement systems for conducting and responding to inspections. The failure to do so would be more readily apparent if a record were 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. Second, it

would create a record that the employer could use to help track developing problems so that they could be corrected in time to assure continued safe operation of the equipment.

The Agency notes that the proposed three month retention period also reflects a desire of the Committee to have a retention period that is consistent with Department of Transportation ("DOT") truck inspection documentation requirements. Also, proposed § 1926.1412(e)(3) parallels the monthly inspection for wire rope in proposed paragraph 1413(b) in terms of timing, level of scrutiny, expertise of the inspector, and documentation.

The SBREFA Panel recommended 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. (The provision for annual inspections states that the documentation must be "maintained by the employer who conducts the inspection.") OSHA requests public comment on the issue raised by the Panel's recommendation.

The SBREFA Panel also recommended that OSHA restate the corrective action provisions from the shift inspection (proposed § 1926.1412(d)(2) and (3)) in proposed § 1926.1412(e). Under proposed § 1926.1412(e)(1), the monthly inspection must be conducted in accordance with proposed § 1926.1412(d) on shift inspections, and this means that the corrective action provisions in proposed § 1926.1412(d)(2) and (3) must also be followed in the monthly inspections. OSHA requests comment on whether the

language in proposed § 1926.1412(d)(2) and (3) should be repeated under proposed § 1926.1412(e).

**Paragraph (f) Annual/comprehensive**

Proposed paragraph (f) would require an annual (i.e., once every twelve months), general inspection of the equipment, the third of the three regularly scheduled general inspections that would be required by this proposed standard. It would promote 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 proposed shift and monthly inspections.

Proposed paragraph (f)(1) would require that a qualified person inspect the equipment, at least every 12 months, in accordance with § 1926.1412(d) (shift inspections). The Committee's intent was to have the items specified in the shift inspection examined more thoroughly, by a qualified person, on an annual basis. This would ensure that deficiencies necessitating a greater degree of scrutiny than what would be required in the shift inspection (such as a deficiency that is not apparent in a visual inspection but is detectable through disassembly), and a greater degree of expertise to detect, would be discovered.

The Committee believed that, in light of this need for greater scrutiny, a higher level of expertise is needed of the person conducting the inspection than is currently required for

the annual inspection in 29 CFR part 1926 Subpart N (Subpart N, at § 1926.550(a)(6), requires that it be conducted by a competent person). The Committee's view is similar to that reflected in 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. The Agency believes that, to effectuate the purpose of the proposed annual/comprehensive inspection, a qualified person would be needed to conduct this inspection.

The Agency notes that neither this paragraph nor the subsequent paragraphs under proposed § 1926.1412(f) specify the level of scrutiny that would be required for the annual/comprehensive inspection. As it is the Agency's understanding that it was the Committee's belief that this inspection needs to be more thorough than a visual inspection for apparent deficiencies, OSHA solicits comments from the public as to whether language specifying a higher level of scrutiny (for example, "thorough, including disassembly when necessary") should be added.

In terms of timing, this proposed annual/comprehensive inspection is essentially the same as currently specified in Subpart N, which requires an "annual" inspection.

The requirement that the inspection be conducted at least every 12 months means that an inspection must be conducted on or before the anniversary date of the last annual inspection. A situation that may arise is where the equipment is not in service on the anniversary date. In that situation, since the equipment is not in service, the annual

inspection would not have to be done at that point. However, the equipment could not be put back into service until the annual inspection had been done.[33]

As discussed below, proposed § 1926.1412(f)(4) – (f)(6) contain specific proposed responsive actions in the event a deficiency is discovered in the annual/comprehensive inspection. C-DAC recommended that proposed § 1926.1412(f)(1) state that ". . .the equipment shall be inspected . . . in accordance with paragraph(d)(shift inspections)." Read literally, the C-DAC language would have required the employer to comply with the responsive actions specified for the shift inspections in proposed § 1926.1412(d). However, the specified responsive actions for the proposed shift inspection differ from those proposed for the annual/comprehensive inspection. Therefore, the Agency modified the C-DAC language for proposed § 1926.1412(f)(1) to make it clear that the responsive actions that would be required if a deficiency were found under § 1926.1412(f)(1) are those specified in proposed § 1926.1412(f)(4) – (f)(6). This has been done by adding the following language to the C-DAC (f)(1) provision:

> At least every 12 months the equipment shall be inspected by a qualified person in accordance with paragraph (d) (shift inspections) of this section, **except that the corrective action set forth in Paragraph (f) *Annual/comprehensive*, of this section shall apply.**

The difference is that while both require that the equipment be removed from service if safety hazards are identified, paragraphs (f)(4) through (f)(6) also provide that a

[33] Note that, under proposed § 1926.1412(h), discussed below, equipment that has been out of regular service for three months or more must receive a monthly inspection before being returned to service. However, if the equipment had been out of regular service for more than three months but it was due for its annual inspection, the annual inspection would have to be done and there would therefore be no need to also do the § 1926.1412(h) (out of regular service) inspection.

deficiency that might, but has not yet, reached the safety hazard stage must be monitored on a monthly basis. (Also, the determinations in § 1926.1412(f)(4) through (f)(6) are made by a qualified person, whereas the determinations in the shift inspection are made by a competent person.)

Proposed paragraphs (f)(2)(i) through (xxi) supplement the list of inspection items in proposed § 1926.1412(f)(1) that would be required to be inspected in the annual/ comprehensive 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 believed that each item plays an important role in the safe operation of equipment.

The list in proposed paragraphs (f)(2)(i) through (xxi) differs somewhat from those in consensus standards. Among other differences, the list in these proposed paragraphs is more user-friendly to the employer and qualified person because the item inspected is at the beginning of each sentence. Also, some items not in consensus standards are included because, as discussed below, in the view of the Committee, they also have a significant effect on the safe operation of equipment.

Proposed paragraph (f)(2)(i) lists "[e]quipment structure (including the boom and, if equipped, the jib)," including "(A) Structural members: deformed, cracked, or significantly corroded. (B) Bolts, rivets and other fasteners: loose, failed or significantly corroded. (C) Welds for cracks." Differences with similar items listed in ANSI B30.5-

1968, ASME B30.5–2004 and COE-EM 385-1-1 (3 Nov 03) are as follows: "Welds for cracks" was added to better ensure that the equipment is structurally sound; "Other fasteners" was added to "bolts and rivets" (referenced in the ANSI/ASME standards) because there are now other types of fasteners which also need to be inspected to ensure they are not loose, failed or significantly corroded; and "significantly" was added to describe the degree of corrosion on a structural member or fastener needed to trigger further examination because some corrosion on those items is normal and has no effect on safety.

Proposed paragraph (f)(2)(ii) through (iv) lists: "[s]heaves and drums for cracks or significant wear;" "[p]arts such as pins, bearings, shafts, gears, rollers and locking devices for distortion, cracks or significant wear;" and [b]rake and clutch system parts, linings, pawls and ratchets for excessive wear." These items are similar to the items currently listed in the Periodic Inspection (monthly to twelve month intervals) in ANSI B30.5–1968 and ASME B30.5–2004. The Committee believed that these items, as reflected in their inclusion in current consensus standards, need to be checked in an annual inspection to ensure the safe operation of the equipment.

Proposed paragraph (f)(2)(v) lists "[s]afety devices and operational aids for proper operation (including significant inaccuracies)." The Committee included the term "significant inaccuracies" in recognition of the fact that such devices normally operate within a tolerance range. Corrective action would not be required if the inaccuracy is so small as to be irrelevant with regards to 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. Consequently, the Committee believed that these devices and aids need to be inspected for both proper operation and significant inaccuracies.

This provision is broader than similar provisions in the ANSI and ANSI/ASME standards. Specifically, ANSI B30.5–1968 only addresses "safety devices for malfunction" (the Periodic inspection includes the items listed in the Frequent Inspection) while the Periodic Inspection for ASME B30.5–2004 only includes operational aids.

Another significant difference between this paragraph and the ASME standard is the follow-up action required subsequent to the discovery of a deficiency involving operational aids. Under this paragraph, the discovery of such a deficiency that is determined to be a safety hazard would require the equipment to be removed from service until the safety hazard is corrected. In contrast, under the 2004 ASME standard, alternatives to the removal of equipment from service are available.[34]

Proposed § 1926.1416 would permit equipment with operational aids that are not functioning properly to continue to be used with specified alternative measures in place.

[34] Section 5-3.2.1.2 of the ASME standard allows the employer to follow the recommendations of the manufacturer of the equipment or device for continued operation or shutdown of the equipment. The same section of the ASME standard also sets forth alternative precautions, which may be taken unless the manufacturer specifies otherwise, when specific operational aids malfunction.

Proposed § 1926.1416(d) and (e) would set time limits for such use. It is the Agency's understanding that the Committee intended that this same approach should apply with respect to the follow-up action required when an operational aid is found in the annual inspection to be not working properly. In other words, the equipment could be returned to service but the time limits in proposed § 1926.1416(d) and (e) would apply, as would the alternative measures requirements.

Proposed § 1926.1412(f) does not explicitly describe how the follow-up measures in proposed § 1926.1412(f)(4) – (f)(6) would apply to operational aids. As explained below in the discussion of proposed § 1926.1412(f)(4) – (f)(6), the Agency believes that it would be appropriate to add language to clarify that the follow-up action required when an operational aid is found in the annual inspection to be not working properly is the action specified in proposed § 1926.1416(d) and (e).

Proposed paragraph (f)(2)(vi) lists "[g]asoline, diesel, electric, or other power plants for safety-related problems (such as leaking exhaust and emergency shut-down feature), conditions and proper operation." This proposed provision was derived from ANSI B30.5–1968 and ASME B30.5–2004 and reworded to emphasize and limit its application to safety related issues, and to include examples to better communicate those concepts. Leaking exhaust was included as an example because it could asphyxiate an employee. The emergency shut-down feature was added as an example because a failure of this feature could result in an employee being struck by a suspended load.

Proposed paragraphs (f)(2)(vii), (viii) and (ix) list "[c]hains and chain drive sprockets for excessive wear of sprockets and excessive chain stretch," "[t]ravel steering, brakes, and locking devices, for proper operation," and "[t]ires for damage or excessive wear." These proposed provisions were derived from ANSI B30.5–1968 and ASME B30.5–2004. The Committee believed that these items, as their presence in these industry standards reflects, play a significant role in the safe operation of equipment.

Proposed paragraph (f)(2)(x) lists "[h]ydraulic, 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." The purpose of this proposed paragraph, as noted during C-DAC meetings, is to "call attention to specific parts of these hoses" and thus prevent the failure of mechanisms, such as the brakes, hoist mechanisms and limit switches, that are powered or affected by the movement of fluids or air through the equipment's system of hoses.

Neither the general provisions in 29 CFR 1926 Subpart N nor the provisions in ANSI B30.5–1968 that are incorporated by reference in Subpart N contain a specific requirement for an inspection of these hoses, fittings and tubing. However, several more recent consensus and government standards do contain similar items in their annual/Periodic inspections. ASME B30.5–2004, COE–EM 385-1-1 (3 Nov 03) and

DOE STD 1090-2004 all contain some form of this item in their Periodic inspection provisions.

The Committee's discussion of this item focused on whether language used in ASME B30.5–2004 should be adopted. For example, the meaning of the reference in the ASME standard to "metal and couplings" as one of the points of concern on a hose for leakage was questioned. The Committee sought to be clearer by referencing "fittings" instead in proposed § 1926.1412(f)(2)(x)(A).

Also, members questioned the appropriateness of the ASME language on inspecting for hose leakage that specifies leakage from threaded or clamped joints that is not eliminated by "recommended procedures." Since the use of such procedures to correct a leak is in the nature of a repair, the concept of limiting the inspection item in this manner was rejected.

Proposed paragraphs (f)(2)(xi) – (xiii) list a series of items that, like (f)(2)(x), focus on specific parts of hydraulic and pneumatic power systems. They would be included for the same reason – to better ensure that those parts of the equipment driven by hydraulic and pneumatic power do not fail. These provisions address: "(xi) [h]ydraulic 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) "[h]ydraulic 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)"; and (xiii) "[h]ydraulic 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."

As with proposed paragraph (f)(2)(x), these items are not explicitly mentioned in Subpart N. Neither the Subpart itself nor the incorporated "Periodic" inspection in ANSI B30.5-1968 specifically references these items. However, ASME B30.5–2004, COE-EM 385-1-1 (3 Nov 03) and DOE STD 1090-2004 each require inspection of these items by language with varying degrees of specificity.

While discussing these items, C-DAC members decided not to include the inspection of hydraulic filters that are included in ASME B30.5–2004 because, as a Committee member who works for a manufacturer noted, the condition of these filters is a maintenance rather than a safety issue. Other discussion related to several of the items in this list. In proposed § 1926.1412(f)(2)(xi)(C), "pump" was inserted to clarify which joints must be inspected for leaks. Further, "significant" was added to describe the dents subject to inspection under proposed § 1926.1412(f)(2)(xiii)(D) because some dents on cases do not affect operation.

The Committee believed that these items, as their presence in these government and consensus standards reflects, play a significant role in the safe operation of equipment.

Proposed paragraph (f)(2)(xiv) lists "[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.

This item is not included in the annual inspection of Subpart N for cranes and derricks, the periodic inspections of ANSI B30.5–1968 or ASME B30.5–2004. However, the Periodic (yearly) inspection in COE-EM 385-1-1 (3 Nov 03) may cover "outrigger pads/floats" with its general provision regarding "foundation or supports." The Committee similarly included this item because it believed that it plays a significant role in the safe operation of equipment.

Paragraph (f)(2)(xv) lists "slider pads for excessive wear or cracks." Slider pads (which are used to guide sections of equipment such as the boom extension on a hydraulic crane) are included because excessive wear may cause the equipment to fail. The Committee was aware that some disassembly may be required to inspect slider pads.

This item is not included in the annual inspection of Subpart N for cranes and derricks or the periodic inspections of ANSI B30.5–1968 or ASME B30.5–2004. However, the Committee included this item because of its role in the safe operation of the equipment.

Proposed paragraph (f)(2)(xvi) lists "[e]lectrical components and wiring for cracked or split insulation and loose or corroded terminations." Wires are not listed in the annual/Periodic inspection in Subpart N, ANSI B30.5–1968, ASME B30.5 – 2004 or COE-EM 385-1-1 (3 Nov 03). The purpose of this proposed provision is to prevent hazards related to deficiencies in electrical components and wiring. Since such deficiencies may cause a fire or the malfunction of safety related systems, the Agency believes that the inclusion of electrical components as well as wiring in the inspection list is necessary.

Proposed paragraph (f)(2)(xvii) lists "[w]arning labels and decals originally supplied with the equipment by the manufacturer or otherwise required under this standard: missing or unreadable." The annual/Periodic inspection in COE-EM 385-1-1 (3-NovJan 03) contains a similar requirement relative to "safety and function labels for legibility and replacement." However, this item is not included in the annual/Periodic inspections included in Subpart N, ANSI B30.5–1968 or ASME B30.5–2004.

The Committee believed that warning decals that would be required under this proposed standard (either by virtue of a specific provision in this proposed standard, e.g., paragraph 1407(g), or because they were originally supplied by the manufacturer with the equipment, see § 1926.1433(e)(5), Posted warnings) provide important safety reminders and information. As such, it was of the view that they need to be maintained in order for them to continue to alert users to those safety concerns. The Agency modified the C-

DAC language for proposed paragraph (f)(2)(xvii) so that it would cover warning labels and decals originally supplied by the manufacturer and thus better reflect the Committee's intent as indicated by proposed § 1926.1433(e)(5).

Proposed paragraphs (f)(2)(xviii – xxi) list: "Originally equipped operator seat: missing;" "Operator seat: unusable;" [35] "Originally equipped steps, ladders, handrails, guards: missing;" and "Steps, ladders, handrails, guards: in unusable/unsafe condition." These are not included in the annual/periodic inspections of ANSI B30.5–1968, ASME B30.5-2004, or COE –EM 385-1-1 (3 Nov 03).

The Committee believed that these are safety related items that need to be inspected. For example, if the operator seat is unusable, the likelihood of the operator manipulating a control in an inadvertent manner or being unable to reach a control is increased. The other items relate to preventing falls and contact with exposed parts that are moving or otherwise dangerous. It should be noted that, among others, proposed § 1926.1433, *Design, construction and testing*, and § 1926.1426, *Fall protection*, would include requirements related to several of these items.

Proposed paragraph (f)(3) would require functional testing as part of the annual/ comprehensive inspection. A general functional testing requirement is not included in the annual/periodic inspection in COE – EM 385-1-1 (3 Nov 03), although it does require functional testing for certain items, such as "crane function operating mechanisms," and

[35] The original C-DAC language provided: "Operator seat: missing or unusable." OSHA modified this language to avoid the implication that equipment that did not include an operator seat as original equipment would, contrary to C-DAC's intent, nevertheless need to have a seat installed.

"operator aids (safety devices) and indicating devices." Similarly, the annual/periodic inspection provisions of ANSI B30.5–1968 (incorporated by reference into Subpart N) and ASME B30.5–2004, imply a functional testing requirement with regard to several specific items (e.g., in B30.5–1968 and in B30.5–2004), "[t]ravel steering, braking, and locking devices, for malfunction").

The purpose of this testing is to ensure that the equipment as configured in the inspection is functioning properly. It was the Committee's belief that, without functional testing, the inspection may not reveal some safety problems.

The proposed provision reflects the Committee's belief that functional testing should be limited to the equipment "as configured in the inspection." In its view, functional testing in all possible configurations, with all possible attachments, is unnecessary and would be unduly burdensome. In light of the comprehensive nature of the inspection that would result from compliance with the proposed annual/comprehensive inspection provision, the Agency believes that this limitation would not adversely affect safety.

Proposed paragraphs (f)(4) through (6) delineate the follow-up procedures that would 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.

Specifically, proposed 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." Proposed paragraph (f)(5) would require that equipment with a deficiency identified as a safety hazard by the qualified person be removed from service until the deficiency is corrected. Proposed paragraph (f)(6) would require the employer to check the deficiencies in the monthly inspections that the qualified person had identified as needing monitoring.

The corrective procedures in proposed paragraphs (f)(4) through (f)(6) are similar to those in ANSI B30.5–1968 and ASME B30.5–2004 in that the ANSI/ASME provisions also call for equipment operation to cease upon discovery of a safety hazard. They differ in that the ANSI/ASME provisions have no procedures for monitoring deficiencies that are not yet safety hazards.

The Committee believed that this would be an effective means of ensuring that employers respond appropriately to deficiencies identified in the annual/comprehensive inspection. In addition, the Committee's addition of a mechanism for monthly monitoring, where needed, of deficiencies that have not yet developed into safety hazards would ensure that developing hazards are caught before they endanger employees.

Upon reviewing these proposed provisions, OSHA believes that C-DAC inadvertently omitted a reference in the proposed provisions for annual/comprehensive inspections to special corrective action procedures for operational aids. This issue is explained below.

Proposed § 1926.1416, *Operational aids*, sets out requirements that would apply where an operational aid is not working properly. Specifically, it would allow equipment with a an operational aid that is not working to continue to be operated for a limited time as long as certain temporary protective measures are used.

In a shift or monthly inspection, as reflected in proposed § 1926.1412(d)(3), if a deficiency in an operational aid is identified, the corrective action described in proposed § 1926.1416 would apply. In contrast, in the proposed paragraph on annual/comprehensive inspections (§ 1926.1412(f)), C-DAC did not include a similar reference.

If the corrective actions described in proposed § 1926.1416 did not apply and an operational aid were found to be not working properly in an annual/comprehensive inspection, the qualified person would have to determine if that constituted a safety hazard. If he or she concluded that it was a safety hazard, the equipment would have to be removed from service immediately until the aid was repaired. OSHA believes that such a result would be contrary to C-DAC's intent, since the issue of the extent to which an operational aid needed to be repaired was comprehensively dealt with in proposed § 1926.1416.

In sum, the Agency believes that proposed § 1926.1412(f) should be modified to specifically make the corrective actions in proposed § 1926.1416 applicable. OSHA requests public comment on this issue.

The Committee considered whether the monitoring aspect of this proposed requirement would unduly add to the employer's paperwork burden. The Committee determined that it would not, since all that would be involved would be a notation on the employer's monthly inspection form to pay special attention to the item and then note its condition.

Proposed paragraph (f)(7), *Documentation of annual/comprehensive inspection*, would require 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." Note that proposed § 1926.1413(c)(4), which pertains to the annual/comprehensive wire rope inspection, contains a similar documentation requirement.

This proposed documentation requirement differs in several respects from Subpart N and other current consensus standards. For example, Subpart N at 29 CFR 1926.550(a)(6), has an open-ended retention period and does not include a signature requirement or a requirement that the inspector be named. It also differs from the periodic inspection in

ASME B30.5–2004 that only calls for "dated records" for specific, critical items, does not specify that the inspector's name be listed, and does not specify a retention period.

The Committee believed that the proposed provision would promote safety by ensuring that the items checked and the inspection results are documented and maintained for at least 12 months. This would ensure that past deficiencies and potential hazards associated with the equipment can be tracked. In the Committee's view this information would help the qualified person assess the equipment in the subsequent annual/ comprehensive inspection.

The Committee believed that the documentation of this 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. 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 Committee determined that it would not be necessary for this documentation to be available on site. The information in the document is not routinely needed at the site to ensure safe operation. Rather, it would be sufficient to maintain it in a centralized location (such as a corporate office) and made available as necessary.

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 requests comment on this issue.

**Paragraph 1412(g) Severe service**

Proposed paragraph (g) would require 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 would be 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 proposed § 1926.1412(f)(4)–(f)(6).

Neither ANSI B30.5–1968 nor ASME B30.5–2004 has a specific inspection provision for severe service. Rather, those standards reference "severity of service" as a factor to be

considered when determining how frequently to conduct a Periodic Inspection. COE-EM 385-1-1 (1 Jan 03) references severe service under its periodic inspection as a basis for requiring that inspection to be performed quarterly as opposed to "Yearly."

The Committee believed that there are certain events and circumstances that, because they may cause damage (i.e., structural damage or significant wear), should trigger a close inspection to check for such damage, rather than waiting for the next annual inspection.

The Committee considered using "heavy service" as a trigger for such an inspection. In the course of that discussion, the Committee considered triggering the inspection based on specific rated load capacities (such as 85 to 100% of the rated load capacity) or on a particular number of cycles (such as in excess of 10 lift cycles per hour). These were rejected because members believed that, as long as the use is within the equipment's rated capacity, such use would not be expected to necessitate a special inspection.

Instead, the Committee agreed that a trigger based on use or conditions in which there is a reasonable probability of damage or excessive wear would be an effective means of ensuring that equipment was not operated with such damage/wear. Examples were provided in the proposed provision to add clarity to the concept.

**Paragraph 1412(h) Equipment not in regular use**

Proposed paragraph (h) would require that equipment that sits idle for three months or more be inspected by a qualified person in accordance with the monthly inspection provisions of proposed § 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 believed that this inspection would need to be done by a qualified 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. For example, equipment that is idle for a period of time is often subject to variations in weather (e.g., temperature and humidity) that cause contraction and expansion of parts and fluids, which can cause damage. In addition, idle equipment is also more likely to have corroded pins and corrosion on the boom. Such conditions need to be assessed by a qualified person to determine if there is a deficiency that constitutes a hazard.

This proposed requirement differs from the ANSI/ASME standards in several respects, most significantly in terms of the time frame that triggers the inspection and the type of inspection required. Both ANSI B30.5–1968 and ASME B30.5–2004 subject cranes that are idle for one or more months, but less than six months, to a frequent inspection, and cranes that are idle for six or more months to a periodic inspection. It should be noted that under the proposed provision and the ANSI/ASME standards, an inspection of wire rope is included. A qualified person would conduct this inspection of wire rope (as well as the rest of the items included in this inspection of equipment not in regular use).

The Committee considered the ANSI/ASME approach to inspecting idle equipment. It determined that a one month trigger was too short, because problems that may arise from the equipment sitting idle, such as drying/hardening seals, take longer than that to occur. It believed that a three month trigger was more appropriate to use for this purpose.

**Paragraph 1412(i). [*Reserved*.]** This paragraph is reserved because it is inconvenient for readers to determine whether "(i)" is being used as a letter or a roman numeral.

**Paragraph 1412(j)**

Proposed paragraph (j) would require 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 proposed section must be followed. However, the proposed paragraph notes that additional manufacturer documentation requirements need not be followed. Examples are provided in the proposed 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").

Neither the general provisions of 29 CFR 1926 Subpart N nor ANSI B30.5–1968 contains a similar provision. However, § 1926.550(c)(5) of Subpart N relative to hammerhead tower cranes and § 1926.550(f)(2)(iii) relative to floating cranes and

floating derricks require that inspections meet the manufacturer's requirements. COE–EM 385-1-1-1 (3 Nov 03) states that "[c]ranes and derricks shall be . . . inspected . . . in accordance with the manufacturer's operating manual for the crane and the applicable ANSI/ASME codes or OSHA requirements, whichever is more stringent."

The Committee believed that, to the extent a more comprehensive or frequent inspection is specified by the manufacturer, it is necessary for that to be done to ensure the safe operation of the equipment. In the Committee's view, the expertise of the manufacturer with respect to the equipment in this regard needs to be recognized and acted upon.

**Summary of significant differences from the current 29 CFR 1926 Subpart N**

This proposed section differs in several respects from Subpart N. Unlike Subpart N, the proposed standard does not include an initial inspection for new equipment or inspections for standby cranes, nor does it include a requirement for preventive maintenance.

The Committee concluded that manufacturers' quality control and inspection practices are generally effective in ensuring that new equipment does not have deficiencies that constitute safety hazards. The Committee believed that, to the extent those practices do not identify and correct all such hazards, the shift inspection would be adequate to identify and address them.

The Committee concluded that a special inspection for "standby" cranes is not needed since the proposed section includes proposed requirements for equipment "not in regular use" (see the discussion of proposed § 1926.1412(h), above).

The Committee also concluded that a general requirement for preventive maintenance is not needed because the proposed inspection requirements are designed to ensure that deficiencies constituting safety hazards will be identified quickly and equipment with such a safety hazard would be prohibited from being returned to service until the hazard is corrected.

As discussed above, the proposed section would add requirements for a post-assembly inspection and a severe service inspection, and varies from Subpart N to some extent with respect to some of the items to be inspected. In addition, the specific proposed requirements for inspecting operational aids and for a qualified person to perform the modified equipment and annual inspections would be new requirements. Finally, rather than providing for "daily to monthly" inspections, the proposed standard would require shift inspections and monthly inspections.

**Section 1413 Wire Rope – inspection**

Cranes/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 a failure of the equipment and/or a falling load, which can kill or injure workers below. 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). (OSHA-2007-0066-0011).

Subpart N, in § 1926.550(a), contains several inspection requirements applicable to wire ropes. Other requirements are found in ANSI B30.5–1968, which is incorporated by reference in Subpart N through § 1926.550(b)(2). In addition, the employer currently must look to both § 1926.550 and to the ANSI standard to learn the content of the required inspections, the qualifications of the inspector, and the requirements for addressing deficiencies found in ropes. The Committee believed that placing all of the required inspections and remedies in this subpart without reference to outside resources would make it easier for employers to find and become familiar with the steps they are required to takes and so facilitate compliance. This is particularly true for small businesses, which bear a disproportionate cost when they must access outside resources.

The proposal would require wire rope inspections at the same frequency – shift, monthly, and annually – that would apply for other crane components. Also, like inspections of other components, the shift and monthly inspections must be conducted by a "competent person," and the annual inspection by a "qualified person."

**Paragraph 1413(a) Shift inspection**

Proposed paragraph (a) would require a shift inspection, the first of the three types of wire rope inspections that would be required under this subpart. The timing, degree of scrutiny, and the level of expertise required of the person conducting this inspection and the other two inspections (monthly and annual) essentially mirror those in proposed § 1926.1412, *Inspections*, for general equipment inspections.

**Paragraph 1413(a)(1)**

Proposed paragraph (a)(1) describes who conducts the shift inspection, the timing of the inspection, and the degree of scrutiny required.

The shift inspection would be conducted by a "competent person," a defined term in this subpart.[36] C-DAC believed that a "competent person" would be the appropriate person to perform the shift inspection. OSHA standards typically assign comparable inspection duties to "competent persons." See, for example, § 1926.753(c) (competent person must conduct pre-shift visual inspection of cranes used in steel erection) and § 1926.451(d)(3)(i) (competent person must inspect suspension scaffold before use to ensure it is able to support intended load). Moreover, a "competent person" would conduct other aspects of the shift inspections under this proposed standard. Some C-DAC members questioned using a "competent person" for shift and monthly inspections on the basis that the individual most likely to perform such an inspection, the operator, may not have the authority to take corrective action, as is required of a "competent

[36] As discussed below under paragraph 1926.1413(a)(4), *Removal from service*, in certain instances tasks relative to alternative measures for certain (Category II) deficiencies would be done by a "qualified person," also a defined term.

person" by definition. In response, OSHA notes that the employer would be required to ensure that the person assigned to perform the shift inspections has the requisite authority.

This proposed paragraph also would require that this inspection be started before each shift and be completed before or during that shift. As with the general shift inspection, the Committee concluded that it was appropriate to allow the wire rope inspection to be completed during the shift instead of requiring it to be completed before the shift begins (see the discussion above of proposed § 1926.1412(d)(1), which explains the Committee's reasons for allowing the general shift inspection to be completed during the shift).

Accordingly, the competent person would be required to inspect all wire rope that is reasonably likely to be used during the shift. In cases where some of the rope that is likely to be used is not readily visible before the shift begins, as discussed above, that portion may be inspected during the shift.

Proposed § 1926.1413(a)(1) would require the competent person to conduct a "visual inspection . . . for apparent deficiencies." 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. The Committee 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" would be required during this inspection. It believed that keeping the level of inspection realistic will encourage compliance that ultimately will serve to reduce accidents.

**Paragraph 1413(a)(2) Apparent deficiencies**

Proposed § 1926.1413(a)(1) (discussed above) would require the competent person to look for "apparent deficiencies, including those listed in paragraph (a)(2)." Proposed § 1926.1413(a)(2) would establish 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. As discussed further below, the category determines the options or "next steps" available to or required of the employer under § 1926.1413(a)(4), *Removal from service*.

C-DAC's goal in this paragraph is to establish clear and appropriate requirements setting out the steps employers must take when inspections reveal deficiencies.

**Category I:** Proposed § 1926.1413(a)(2)(i) lists "Category I" apparent deficiencies. These are similar to the types of wire rope deterioration noted in the inspection provisions of section 5-2.4.1 of ANSI B30.5–1968 and section 5-2.4.2 of ASME B30.5-2004 . As further indicated below in the discussion of § 1926.1413(a)(4)(i) under *Removal from service*, these items are grouped together because they reflect damage that may or may

not be severe enough to constitute a hazard. Proposed § 1926.1413(a)(4)(i) sets forth the steps the employer would be required to take once a Category I apparent deficiency has been identified.

Proposed § 1926.1413(a)(2)(i)(A) begins the list with the "significant distortion" of wire rope, such as "kinking, crushing, unstranding, birdcaging, signs of core failure or steel core protrusion between the strands." These apparent deficiencies were selected because, as indicated by their inclusion in consensus standards, such as section 5-2.4.2 of ASME B30.5-2004, they may constitute or indicate the presence of a hazard. The Committee considered whether the reference in this paragraph to core failure should be limited to rotation resistant rope. However, the Committee decided not to limit "signs of core failure" to rotation resistant rope.

The word "significant" was included in this and other provisions in § 1926.1413(a)(2)(i) to make clear that minimal defects of these types do not rise to the level of Category I deficiencies. Only those that may pose genuine safety concerns are included.

Proposed § 1926.1413 (a)(2)(i)(B) lists "significant corrosion" as a Category I apparent deficiency. This type of damage was included because severe corrosion can weaken wire rope and cause it to break. The Committee used the descriptive term "significant" to limit further action to situations in which the degree of corrosion could realistically suggest a hazard.

Proposed paragraph (a)(2)(i)(C) lists "electric arc (from a source other than power lines) or heat damage" as a Category I apparent deficiency. These deficiencies were derived from SAE (Society of Automotive Engineers) and COE (Army Corps of Engineers) standards and are included because such damage can weaken the wire rope. In discussing these types of damage, some Committee members expressed concern that "heat damage" would include instances where the rope had been cut to size by flame cutting. However, flame cutting would occur at the end of the newly-cut rope, not at a load-bearing part of the rope. Heat damage is only a concern if it weakens a load-bearing part of the rope. Flame cutting done at the end of the rope, not in a load-bearing part, would not cause a hazard.

Proposed paragraph (a)(2)(i)(D) lists "improperly applied end connections" as another apparent deficiency. In the Committee's experience, one type of error that occurs is when somebody between shifts cuts the cable and puts the end connection back the wrong way.[37] An improper connection is weaker than a proper one and can result in the connection failing.

Proposed paragraph (a)(2)(i)(E) lists "[s]ignificantly corroded, cracked, bent, or worn end connections (such as from severe service)" as the last type of Category I apparent deficiency. Each of these may constitute a hazard.

[37] An example would be when the person installs a U-bolt clip with the "U" on the live end of the wire rope.

**Category II:** Proposed paragraph (a)(2)(ii) contains two types of Category II apparent deficiencies – visible broken wires (§ 1926.1413(a)(2)(ii)(A)) and wire rope diameter reduction (§ 1926.1413(a)(2)(ii)(B)). In the experience of the Committee, these more typically signal the presence of a safety hazard than Category I apparent deficiencies. Proposed § 1926.1413(a)(4)(ii), under *Removal from service*, sets forth the steps the employer would be required to take once a Category II apparent deficiency has been identified.

Proposed paragraph (a)(2)(ii)(A) lists separate criteria for visible broken wires for running wire ropes (six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay), rotation resistant ropes (two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in 30 rope diameters), and pendant 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).

A "running wire rope" is a wire rope that moves over sheaves or drums. This definition is included in § 1926.1401 of this proposed standard 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 section 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 section 5-2.4.2 of ANSI B30.5-1968, which is incorporated by reference in 29 CFR Part 1926 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 requests public comment on this issue.

The reference in proposed paragraph (a)(2)(ii)(B) to "a diameter reduction of more than 5% from nominal diameter" reflects a change in the manner of expressing essentially the same criteria currently set forth in fractions in Subpart N (§ 1926.550(a)(7)(iv)) and section 5-2.4.3(b)(6) of ASME B30.5-2004. OSHA notes that the "reduction in diameter" fractions set forth currently in § 1926.550(a)(7)(iv) are in each case equal to or greater than 5%, so the proposed across the board 5% criterion is equally or more protective than the current standard for each rope diameter. C-DAC used the percentage reduction criterion because it is consistent with the criterion now being set by rope manufacturers and used in the industry. The industry uses the percentage reduction criterion because it is easier to remember than the fractional reductions in Subpart N.

**Category III:** Proposed paragraph (a)(2)(iii) lists apparent Category III deficiencies. The Committee believed that these are of such significance that they require the rope's immediate removal from service. For some Category III deficiencies, the undamaged part of the rope may be returned to service if the damaged part is severed (the actions required in response to identifying these deficiencies are discussed below with respect to proposed § 1926.1413(a)(4)(iv)).

Under proposed paragraph (a)(2)(iii)(A), "core protrusion or other distortion indicating core failure" in rotation resistant rope would be a Category III apparent deficiency. As

described by a C-DAC member, this visible indicator is present when there is core protrusion between the outer strands or, in other words, "the metal core is coming out." Core protrusion is a late-stage indicator that the rope has already suffered significant damage and, in the Committee's judgment, necessitates the rope's immediate removal from service.

Under proposed paragraph (a)(2)(iii)(B), "[e]lectrical contact with a power line" would be a Category III apparent deficiency. Contact with a power line could cause the rope to carry a high electrical current that could result in internal damage that significantly reduces the rope's strength. The Committee believed that, in view of the difficulty in confirming such internal damage and the likelihood that significant damage has occurred in such instances, it is imperative that the entire rope be replaced.

The rope would have to be removed from service under this provision if the load, rigging, or the rope itself makes electrical contact with a power line. In addition, electrical contact under this provision would occur if the boom or other part of the crane contacts a power line and the wire rope is in contact with the ground through the hook or some other means.

Proposed paragraph (a)(2)(iii)(C) also lists "a broken strand" as a Category III apparent deficiency. A strand is a "group" of wires. In the Committee's view, that degree of damage clearly compromises the rope's capacity and continued use would be dangerous.

**Paragraph 1413(a)(3) Critical review items**

Under proposed paragraph (a)(3), 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).

Under proposed paragraph (a)(3)(i), rotation resistant wire rope that is in use would be a critical review item. As indicated earlier, the construction of rotation resistant rope makes it more susceptible to damage and more difficult to detect damage to the inner wires and/or strands.

Under proposed paragraph (a)(3)(ii), "wire rope being used for boom hoists and luffing hoists, particularly at reverse bends" would be included in the list because of the critical nature of these ropes and, with respect to reverse bends, because these areas are subjected to more stress and are more prone to damage.

Proposed paragraph (a)(3)(iii) lists "wire rope at flange points, crossover points and repetitive pickup points on drums" because these points of the rope are subject to additional wear. These terms are defined in § 1926.1401, *Definitions*, as follows:

> Flange point: A point of contact between rope and drum flange where the rope changes layers.
>
> Crossover points: Locations on a wire rope which is spooled on a drum where one layer of rope climbs up 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.

Repetitive pickup points: 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.

Proposed paragraph (a)(3)(iv) lists "wire rope adjacent to end connections" because such rope is prone to corrosion and/or breakage due to the localized stresses placed on these areas.

Proposed paragraph (a)(3)(v) lists "wire rope at and on equalizer sheaves" because the limited travel of such rope and added stress make it more prone to wear.

**Paragraph 1413(a)(4) Removal from service**

**Remedial steps upon identification of apparent deficiency:** Proposed paragraph (a)(4) would set out the required next steps to be taken once the competent person performing the inspection has identified an apparent deficiency. Those steps depend upon whether, under § 1926.1413(a)(2), the apparent 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. This approach was adopted by C-DAC because, in the Committee's collective experience, different types of deficiencies warrant different responses.

As described below, this approach differs somewhat from Subpart N, with its incorporation by reference of ANSI B30.5-1968, as well as ASME B30.5-2004. In addition, certain apparent deficiencies addressed in this proposed rule are not addressed by those consensus standards.

**Category I remedial steps:** Proposed paragraph (a)(4)(i) sets forth the follow-up to the discovery of a Category I apparent deficiency that would be required. Immediately upon the discovery of such a deficiency, the competent person must determine whether the deficiency is a safety hazard. If it is determined to be a hazard, operations involving the use of the wire rope would be prohibited until one of two responses is taken – the rope is replaced or the deficiency, if localized (and not due to power line contact), is removed by severing the rope in two so that the undamaged portion can be used. The provision also would prohibit joining lengths of rope by splicing.

The Committee found that the likelihood of significant damage from power line contact is so great that, after such contact, it is imperative that the rope be removed from service. Also, it determined that splicing is not a safe practice and should therefore be prohibited.

The Category I deficiencies, except for damage from significant corrosion or an electric arc, are currently addressed by Subpart N through incorporation by reference of section 5-2.4 of ASME B30.5-1968. That ANSI standard requires the deficiencies to be evaluated (by an "appointed or authorized person") and a determination made as to whether continued use of the rope would constitute a safety hazard. A similar provision

is contained in ASME B30.5–2004. These provisions imply, but do not explicitly state, that a rope constituting a safety hazard must not be used. The proposed standard would explicitly state this prohibition.

**Category II remedial steps:** Proposed paragraphs (a)(4)(ii) and (iii) establish the procedures to be followed once Category II apparent deficiencies have been identified. This category of deficiencies includes wire rope that has diameter reduction and/or visible broken wires as described in proposed § 1926.1413(a)(2)(ii). Proposed § 1926.1413(a)(4)(ii) sets forth two alternative options for the employer – Option A or B – when such a deficiency is identified.

Under Option A, an employer must consider the wire rope to be a safety hazard where the deficiency meets the wire rope manufacturer's established criterion for removal or "meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope." In such instances, operations involving the use of the wire rope in question are prohibited until it is replaced or severed as provided in § 1926.1413(a)(4)(i)(B).

Option B would allow limited continued use of the wire rope with an identified Category II apparent deficiency provided the employer ensures the procedures specified in § 1926.1413(a)(4)(iii) are met. Under 1926.1413(a)(4)(iii), a qualified person first assesses the deficiencies in light of the load and other conditions of use and determines that continued use is safe as long as the conditions established in this paragraph are met.

These conditions include (as established by the qualified person) the parameters for use of the rope, including a reduced maximum rated load, the number of broken wires and/or the diameter reduction that will require the rope to be taken out of service (or repaired in accordance with proposed 1926.1413(4)(i)(A) or (B)), and a specific time limit, not to exceed 30 days from the date the deficiency was first identified, to replace the rope or sever the damaged portion in accordance with 1926.1413(a)(4)(i)(B).

The C-DAC draft, at paragraph (a)(4)(iii)(C), would also have allowed the qualified person to specify the number of broken strands that would require the equipment to be taken out of service. However, as discussed above, under 1926.1413(a)(2)(iii)(C), a single broken strand is a Category III apparent deficiency that requires the equipment to be immediately removed from service until the rope is replaced or the deficiency severed, in which case the undamaged part of the rope may continue to be used. Because the proposed rule prohibits any use of a wire rope with a broken strand, OSHA has deleted the words "broken strands" from 1926.1413(a)(4)(iii)(C).

Once the qualified person has established the conditions for continued use of the rope, the workers who are to conduct the shift inspections must be notified of the qualified person's determinations. In addition, the qualified person's procedures and findings must be documented. The Committee included this documentation provision because the person conducting the shift inspections would need to be able to refer to the parameters set by the qualified person.

29 CFR Part 1926 subpart N, in § 1926.550(a)(7), currently requires that ropes with the same deficiencies that would fall under the proposed rule's Category II (as well as heat damage, which would be a Category I deficiency) be removed from service. Section 2.4.3(a) of ASME B30.5–2004 allows the rope to be used to the end of the work shift based on the judgment of a qualified person.

The Committee determined that the alternative measures specified in Option B are sufficiently comprehensive and specific to ensure that the rope's continued use for up to 30 days would be safe.

OSHA notes that the remedial steps for Category II apparent deficiencies do not, unlike those for Category I and III apparent deficiencies, state explicitly that splicing of wire rope is prohibited. Instead, § 1926.1413(a)(4)(ii)(A) states that, if a Category II apparent deficiency is a safety hazard, continued use of the rope is prohibited unless "the damage is removed in accordance with § 1926.1413(4)(i)(B)," which applies to Category I deficiencies. Proposed § 1926.1413(a)(4)(i)(B) includes a prohibition against splicing that C-DAC intended to apply to Category II deficiencies, but the language "damage is removed" in proposed § 1926.1413(a)(4)(ii)(A) could, in the absence of an explicit prohibition against splicing in that paragraph, arguably be read to mean that the rope could be severed and the undamaged portions spliced. To make clear C-DAC's intent that the anti-splicing provision of § 1926.1413(a)(4)(i)(B) applies to Category II, OSHA has modified the C-DAC language for proposed § 1926.1413(a)(4)(ii)(B) as follows:

(ii) If a deficiency in Category II is identified, the employer shall comply with *Option A* of this section or *Option B* of this section, as follows:

(A) *Option A*. Consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard, operations involving use of the wire rope in question shall be prohibited until the wire rope is replaced, or the damage is removed in accordance with **all of the requirements and restrictions** in paragraph (4)(i)(B) of this section.

OSHA has made similar changes to proposed § 1926.1413(a)(4)(iii)(C) & (D).

**Category III remedial steps:** Proposed paragraph (a)(4)(iv) would establish the procedure for dealing with identified apparent deficiencies that fall within Category III. These deficiencies include a broken strand, electrical contact with a power line, and core protrusion or other distortion in rotation resistant rope indicating core failure. This proposed paragraph would prohibit operations involving the use of the wire rope until either the wire rope is replaced or (except where there has been power line contact) severed in two, so that the undamaged portion can be used. Joining lengths of wire rope by splicing would be prohibited (see discussion above of proposed § 1926.1413(a)(4)(i)(B)).

Neither Subpart N nor ANSI B30.5-1968 addresses these apparent deficiencies. However, the Committee noted that section 5-2.4.2(a) of ASME B30.5-2000 lists "broken or cut strands" and "core failure in rotation resistant ropes" as deficiencies that may be an immediate hazard. (ASME B30.5–2004 contains the same characterization of these

deficiencies as the 2000 version). The Committee believed that ropes with Category III deficiencies must not be used because of the high potential for rope failure.

Proposed paragraph (a)(4)(v) would require that where a wire rope is required to be removed from service under this proposed section, the equipment (as a whole) or the hoist with that wire rope shall be tagged-out as provided in proposed § 1926.1417(f)(1) until the wire rope is replaced or repaired. Neither Subpart N, with its incorporated reference to ASME B30.5-1968, nor ASME B30.5-2004 contains a similar tag-out provision specific to wire rope. The Committee believed that this would be an efficient and effective way of preventing employees from activating equipment (or the affected hoist) that has a wire rope with an identified hazard.

**Paragraph 1413(b) Monthly inspection**

Proposed paragraph (b) would require a monthly inspection of wire rope. The monthly inspection would be, as explained below, a documented shift inspection. C-DAC decided to keep the timing of this inspection (as well as the level of scrutiny required and the expertise required of the inspector) parallel with the general inspection requirements in § 1926.1412 to provide for an efficient inspection process and thus enhance compliance. A monthly wire rope inspection is currently required by Subpart N's incorporation by reference of ASME B30.5-1968.

Proposed paragraphs (b)(1) and (b)(2) would require the monthly inspection to be conducted in the same manner as the shift inspection under § 1926.1413(a). Thus, the

monthly inspection would be a visual inspection conducted by a competent person for the same types of apparent deficiencies noted in the wire rope shift inspection.

It should be noted that the reference in proposed § 1926.1413(b)(2) of the C-DAC Consensus Document to "paragraph 1413(a)(3)" has been corrected in the proposed rule to refer to § 1926.1413(a)(4), which contains the relevant provisions governing corrective actions.

Proposed paragraph (b)(3) would require the monthly inspection to be documented in the same manner as required by paragraph § 1926.1412(e)(3) for the monthly general inspection. C-DAC wanted to keep this requirement parallel with the monthly general inspection provision in order to reduce paperwork and confusion, and facilitate compliance.

Specifically, for the general monthly inspection, § 1926.1412(e)(3) provides that the "employer that conducts the inspection" must provide documentation that reflects the items checked with results, the name and signature of the inspector, and the date. Similar requirements are set forth in ASME B30.5-1968.

Proposed paragraph 1412(e)(3) also specifies that the documentation be retained for not less than three months. The Committee believed that the proposed three month retention period would provide sufficient overlap to avoid gaps in information and thus provide a tracking mechanism for developing problem areas.

**Paragraph 1413(c) Annual/comprehensive**

Proposed paragraph 1413(c) would require 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 proposed § 1926.1413(a) and (b). 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 § 1926.1413(a)(2) and (a)(3)). In addition, under proposed § 1926.1413(c)(2), a complete and thorough inspection, covering the surface of the entire length of the wire ropes, would be required. In addition to inspecting in this manner for the types of deficiencies listed in § 1926.1413(a)(2), under proposed § 1926.1413(c)(2)(ii)(A), the qualified person would be required to give particular attention to the critical review items listed in § 1926.1413(a)(3). Note that the C-DAC document's

§ 1926.1413(c)(2)(ii)(A) referred to the "critical review items listed in paragraph (a)(2)" instead of § 1926.1413(a)(3). That reference to § 1926.1413(a)(2) was a typographical error, which has been corrected in the proposed rule.

Under proposed paragraph (c)(2)(ii)(B), particular attention must be given to those sections of wire rope that are normally hidden during shift and monthly inspections. For example, such sections would include parts of the rope that form the lower wraps on the boom hoist drum and which would not be visible unless the drum is in a very low angle position. The parts of the rope that are normally inside a cowling or covered area would be another example of such sections.

Similarly, proposed paragraphs (c)(2)(ii)(C) through (F) require particular attention to wire rope in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited, wire rope subject to reverse bends, wire rope passing over sheaves and wire rope at or near terminal ends, since these areas are more prone to wear.

Unlike the shift and monthly inspections, in which booming down would not be required, booming down would be necessary in order for the inspection to be "complete and thorough, covering the surface of the entire length of the wire rope."

OSHA notes that the items listed in § 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") are similar to the critical review items listed for

shift inspections in proposed § 1926.1413(a)(3)(iv) and (a)(3)(v)("Wire rope adjacent to end connections" and "Wire rope at and on equalizer sheaves"). Consequently, the Agency is planning 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). OSHA then could delete proposed § 1926.1413(c)(2)(ii)(C) and (c)(2)(ii)(F) because proposed § 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 proposed paragraphs § 1926.1413(c)(2)(ii)(C) and (c)(2)(ii)(F) redundant and unnecessary. The Agency asks the public for comments on this proposed action.

Proposed paragraph (c)(2)(iii) would establish 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."

This provision reflects the Committee'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. The Committee considered requiring employers anticipating such situations to provide rope that is new or "like new" when the crane is set-up at the site. Also considered was requiring that an annual inspection be required in

such instances before the start of the job. The Committee found these proposals to be impractical because it is difficult for employers to forecast completion timeframes with sufficient accuracy.

The proposed provision is intended to ensure that, under the circumstances where the exception would apply, the required inspection would occur within an appropriate period. The Committee considered a maximum of an additional 6 months appropriate for running ropes in these circumstances. A longer period, up to the time of disassembly, was considered appropriate for standing ropes because these ropes, in the Committee's experience, are less subject to deterioration and wear.

These provisions of the annual/comprehensive inspection differ in various ways from Subpart N annual inspection provisions at § 1926.550(a)(6). The current annual inspection in Subpart N is a "thorough" inspection conducted by a "competent person or by a government or private agency recognized by the U.S. Department of Labor." Under this proposal, the annual/comprehensive inspection would be conducted by a qualified person and includes a number of specific items the inspection must encompass. The Committee believed that these changes are needed to reduce the likelihood of injuries and fatalities from wire rope failure.

Proposed paragraph (c)(3) identifies the next steps that would have 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 § 1926.1413(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 discussed with respect to proposed § 1926.1413(a)(4)(i)(B), joining lengths of wire rope by splicing would be prohibited.

The proposed standard does not include a prohibition in § 1926.1413(c)(3)(i)(B) against repair of wire rope that contacted an energized power line, although such a prohibition is included in the context of a shift inspection in proposed § 1926.1413(a)(4)(i)(B). The Agency's understanding is that the Committee decided to not include that prohibition in the annual/comprehensive inspection provision because, if an energized power line contact had occurred, the rope would have been removed from service immediately in accordance with proposed § 1926.1413(a)(4)(i)(B).

If the qualified person determines that the deficiency is not currently a safety hazard but needs to be monitored, under proposed § 1926.1413(c)(3)(ii) the employer would be required to ensure that the deficiency is checked in the monthly inspections. This would ensure that, as the deficiency continues to develop, the competent person would pay particular attention to it in the monthly inspections. Once it became a safety hazard, it would be identified promptly and the appropriate corrective action would be taken.

Under proposed paragraph (c)(4), the annual/comprehensive inspection would be required to be documented according to proposed § 1926.1412(f)(7), which is the documentation provision for the annual general inspection. As with other parallel

requirements in this section, the C-DAC intended to ensure consistency with other recordkeeping requirements and thus facilitate compliance.

Proposed paragraph 1412(f)(7), which is incorporated by reference here, would require 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." This documentation requirement differs from 29 CFR Part 1926 subpart N's annual inspection in that Subpart N does not specify the period of time the documentation must be kept and has neither a signature requirement nor a requirement that the inspector be named. The Committee believed that a 12 month retention period would ensure that the employer would be able to refer to the last annual/comprehensive inspection to help track the rate of progression of a deficiency that has not yet developed into a safety hazard. The Committee also believed that it would increase the likelihood of compliance with the annual/comprehensive inspection requirements.

Finally, proposed paragraph 1413(d) would prohibit the use of the type of rope lubricants that hinder inspection. For example, rope lubricants that are opaque or so dark that they mask the wire rope inside them would be of this type. This prohibition is necessary to ensure that the rope lubricant does not hide potential deficiencies.

**Section 1414 Wire Rope – selection and installation criteria**

This proposed section sets forth requirements for selecting and installing wire rope. It addresses safety concerns related to wire rope selection and installation. In addition, it would provide greater flexibility in the selection process than current requirements under Subpart N. This flexibility reflects and takes advantage of new developments in wire rope technology.

Currently, paragraph 1926.550(a)(7)(vi) of Subpart N prescribes that wire rope safety factors accord with ANSI B30.5-1968 or SAE J959-1966. By contrast, this proposed section would not refer to external standards for wire rope safety factors or other requirements (with a single exception discussed below) and would give greater flexibility in selecting wire rope, particularly rotation resistant wire rope. Specific differences between this proposal and Subpart N are examined in the discussion of the paragraph where the difference arises.

The Agency notes that, in developing the C-DAC consensus document, the Committee appears to have made an inadvertent omission. The wire rope safety factors in section 5-1.7.1 of ANSI B30.5-1968 (which, as noted above, are incorporated by reference in Subpart N) apply irrespective of whether the rope is of the standard type (i.e., rope that is not rotation-resistant) or rotation resistant. However, the C-DAC document contains safety factor (now "design" factor) requirements only for rotation resistant rope[38]; it has no provisions on design factors for standard rope.

[38] As discussed below under proposed paragraph (c), C-DAC drew from the current 2004 ASME document in proposing design factors for rotation resistant rope.

Currently, under Subpart N's incorporation of section 5-1.7.1 of ANSI B30.5-1968, the factors for standard rope vary from a minimum of 2.5 to 3.5 depending on how the rope is used. The 2004 version of section 5-1.7.1 of ASME B30.5 contains similar provisions and the same range of design factors.[39] Given the importance of design factors in the selection of wire rope, OSHA believes that the omission of design factors for standard rope from the C-DAC document was an oversight. OSHA is unaware of any reason to omit design factors for standard rope and plans to include factors for standard rope similar to those in section 5-1.7.1 of ASME B30.5–2004. OSHA requests public comment on this issue.

**Paragraph 1414(a)**

Proposed paragraph (a) would require the selection of replacement wire rope to be in accordance with the requirements of this section and the recommendations of the wire rope manufacturer, the equipment manufacturer, or a qualified person. Currently, Subpart N (through section 5-1.7.2e of ANSI B30.5-1968) limits the employer to using replacement rope of the same size, grade and construction as the rope originally furnished by the crane manufacturer unless otherwise approved by the rope manufacturer. The

[39] The provisions for standard rope in section 5-1.7.1 of B30.5-2004 read as follows:

**5-1.7.1 Rope Design Factors**

(a) For supporting rated loads and for supporting the boom and working attachments at recommended travel or transit positions and boom lengths,
(1) the design factor for live or running ropes that wind on drums or travel over sheaves shall not be less than 3.5.
(2) the design factor for boom pendants or standing ropes shall not be less than 3.0.

(b)For supporting the boom under recommended boom erection conditions,
(1) the design factor for live or running ropes shall not be less than 3.0.
(2) the design factor for boom pendants or standing ropes shall not be less than 2.5.

2004 version of ASME B30.5, in section 5-2.4.3(d), specifies that replacement rope shall have a strength rating at least as great as the original rope unless a deviation is approved by the equipment manufacturer, the rope manufacturer, or a qualified person.

A number of concerns about the current 29 CFR Part 1926 subpart N provision were raised during the C-DAC negotiations. Some members were concerned about delays in obtaining approval from the equipment manufacturer. With respect to older equipment, the manufacturer may no longer be in business. In such cases the employer is unable to get original equipment wire rope information or obtain approval for use of a different specification of rope. Even where the original manufacturer was purchased by another company, the current company may no longer have the original equipment information. Another concern was that the wire rope manufacturer may be unduly conservative in recommending a replacement rope.

The Committee concluded that it would be appropriate to allow a qualified person to determine the replacement rope specifications. The Committee believed that the criteria for being a qualified person are sufficiently rigorous to ensure that such a person's recommendation in this regard would be authoritative with respect to safety.

OSHA notes 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. The Committee clearly intended that the remainder of § 1926.1414 apply to both original equipment rope and replacement rope. Rewording § 1926.1414(a) to read as

follows would, OSHA believes, make clear the Committee's intent: "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 requests public comment on such a revision.

**Paragraph 1414(b) Boom hoist reeving**

Proposed paragraph (b) sets forth two provisions regarding the use of wire rope for boom hoist reeving.

Proposed paragraph (b)(1) would prohibit using fiber core ropes for boom hoist reeving, except for derricks. In the Committee's view, the composition of such ropes makes them prone to degradation that is not completely detectable by normal inspection techniques. The Committee believed that fiber core ropes can be used safely for boom hoist reeving on derricks because the sheaves on derricks are smaller than on cranes, and because they are more pliable, fiber core ropes can accommodate reverse bending. In addition, but less significant, derrick booms are typically shorter in length and have less capacity.

Currently, Subpart N does not contain an express prohibition against the use of fiber core wire ropes for boom hoist reeving. ANSI B30.5-1968, incorporated by reference into Subpart N, only references the effect of temperature on fiber core wire rope.

The 2004 version of ASME B30.5, in section 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. Thus, the distinction in proposed § 1926. 1414(b) between cranes and derricks in this regard is consistent with current national consensus standards.

Proposed paragraph (b)(2) would prohibit rotation resistant rope from being used for boom hoist reeving except where the requirements of § 1926.1414(c) are met. The Committee believed that only where these provisions are met would the use of rotation resistant rope for this purpose would be safe. The particulars of paragraph (c) are discussed next.

**Paragraph 1414(c) Rotation resistant ropes**

**Paragraph (c)(1)**

Proposed paragraph (c)(1) would classify rotation resistant ropes into three "Types" ("Type I," "Type II," and "Type III").[40] Proposed § 1926.1414(c)(2) specifies use limitations and requirements for each "Type" of wire rope. This approach differs from Subpart N, ANSI B30.5-1968 and ASME B30.5-2004, which do not distinguish between types of rotation resistant rope.

[40] ASTM A 1023/A 1023M – 02 has a similar classification system, although it divides rotation resistant ropes into "categories."

Technological advances have resulted in different types of what in the past had been referred to as "rotation resistant rope." The different kinds, which are distinguished in this proposed section as Types I, II and III, have different capabilities, which are described in the definitions in proposed § 19266.1414(c)(1). This proposed section tailors the requirements and limitations to each Type. The Committee believed that this approach would enable the industry to take advantage of technological advances and improve safety.

**Paragraph (c)(2) Requirements**

Proposed paragraphs (c)(2)(i) through (iv) 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.

The specifics of each paragraph are discussed below. This approach generally differs from Subpart N. The safety factors in ANSI B30.5-1968 and SAE J959-1966 that are incorporated by reference in 29 CFR Part 1926 subpart N are applicable to wire rope generally; those industry consensus standards do not separately address rotation resistant rope with respect to design factors.

However, sections 5-5-1.7.1(c) and 5-3.2.1.1(d) of ASME B30.5-2004 generally designate a design factor of 5 for the use of rotation resistant rope, reflecting the advances in technology that led the Committee to adopt a similar approach. Further, the 2004 ASME standard allows for deviation from the design factor of 5, but in no case lower than 3.5, when certain specified procedures that are similar to procedures in proposed § 1926.1414(c)(2)(iv) and further described in § 1926.1414(c)(3) are followed.

Proposed paragraphs (c)(2)(i) – (iv) use the phrase "operating design factor." "Operating" has been included in this phrase to show that the factors specified in these proposed paragraphs are to reflect how the rope is installed on the specific piece of equipment in which it is 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 in which it will be used.

The Committee recognized that limiting the use of a particular Type of rotation resistant rope by operating design factors (and, in some instances, by activity) is a new approach. However, the technological developments that have occurred since Subpart N was promulgated have led to a need to tailor use requirements and parameters to the different Types of rotation resistant rope.

Proposed paragraph (c)(2)(i) would prohibit Types II and III rotation resistant rope with an operating design factor of less than 5 from being used for duty cycle or repetitive lifts. The Committee believed that such ropes are inappropriate for this type of use, which

subjects the rope to high levels of stress generally and/or concentrates wear in particular sections of the rope.[41]

While not addressed in the current Subpart N, a similar limitation applies to rotation resistant rope (though not limited by Type) in section 5-3.2.1.1(d)(3) of ASME B30.5-2004.

This prohibition would not apply to Type I rotation resistant rope because the Committee believed that it 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 1926.1414(c)(2)(ii).

The Committee's understanding of "duty cycle" in this context is a continuous operation in which approximately the same type and weight of load is handled. For example, dredging with a clamshell is duty cycle work. "Repetitive lifts" refers to a continuous operation with loads that may vary in size and weight. For example, steel erection work typically involves repetitive lifts of various size and configurations of structural steel members. It is the Agency's understanding that these definitions are widely understood in the industry. However, OSHA believes it is appropriate to include them in §

[41] In contrast, where the operating design factor is 5 or greater, the Committee believed that core damage (which is difficult to detect) would not occur prior to the development of outer core damage. Consequently, its use for duty cycle or repetitive lifts would be safe.

1926.1401, *Definitions*, to avoid any misunderstanding as to their meaning in this standard. OSHA requests public comment on this issue.

Proposed paragraph (c)(2)(ii) would require that all rotation resistant ropes have an operating design factor of no less than 3.5. As discussed above, some rotation resistant ropes – Types II and III – would have to have an operating design factor of no less than 5 when used for duty cycle or repetitive lifts. Apart from those uses, under proposed § 1926.1414(c)(2)(ii), the lowest operating design factor that would be allowed for both Types II and III, as well as Type I, would be 3.5.

This provision recognizes that the use of rotation resistant rope at operating design factors below 5 (but in no case below 3.5) is permissible, although proposed paragraphs (c)(2)(i) (discussed above), (iii) and (iv) would set limitations and conditions. The Committee was cognizant of the fact that section 5-3.2.1.1(d) of ASME B30.5-2004 also allows rotation resistant rope to be used at a design factor as low as 3.5 under similarly restricted circumstances.

Proposed paragraph (c)(2)(iii) would require the operating design factor for Type I rotation resistant rope to be no less than 5 except where the wire rope manufacturer and the equipment manufacturer approve a different design factor in writing. (Note that, under proposed paragraph (c)(2)(ii), the operating design factor would be prohibited from being less than 3.5). The Committee believed that, in light of the design of Type I rope,

where there is approval for the operating design factor by both the wire rope manufacturer and equipment manufacturer, the use of the rope would be safe.

The Committee considered concerns about the fact that, in the future, there may be many new Type I ropes on the market, and the manufacturer may not have tested them; this could lead to difficulty in obtaining manufacturer approval for an operating design factor less than 5. However, in the Committee's judgment, the manufacturer's expertise regarding the particular equipment is essential in this instance to ensure that use of such rope would be safe.

Under proposed paragraph (c)(2)(iv), Types II and III rotation resistant rope would be required to have an operating design factor of no less than 5 except when used for non-duty cycle and non-repetitive lifts, and where the requirements of § 1926.1414(c)(3)(i) – (iii) are met. When these exceptions apply, proposed § 1926.1414(c)(2)(ii) would prohibit the operating design factor from being less than 3.5.

This proposed paragraph reflects the Committee's belief that there is a greater likelihood of internal damage in Type II and Type III rotation resistant rope when used with an operating design factor lower than 5. However, the Committee's view is that where the additional precautions in proposed § 1926.1414(c)(3) are met, its use would be safe.

As stated above, 29 CFR Part 1926 subpart N is dissimilar from this paragraph in that it does not contain a specific operating design factor for rotation resistant rope and does not

otherwise differentiate between rotation resistant wire ropes. This provision is, however, similar to section 5-3.2.1.1(d) in ASME B30.5-2004 which, while not differentiating by "Type," does allow the use of rotation resistant rope with an operating design factor of less than 5 where conditions similar to those included in proposed § 1926.1414(c)(3) are instituted.

**Paragraph (c)(3)**

This proposed paragraph specifies additional requirements that must be met when Types II and III are used with an operating design factor of between 3.5 and 5 (for non-duty cycle, non-repetitive lifts). The Committee believed that these additional requirements are needed to ensure that use of such ropes would be safe.

Specifically, under proposed § 1926.1414(c)(3)(i), an inspection of the rope by a qualified person in accordance with § 1926.1413(a) would be required, with its use allowed only if that person determines there are no deficiencies constituting a hazard (with the presence of more than one broken wire in any one rope lay considered a hazard). Because of the lower operating design factor of these ropes, the Committee believed that the expertise of a qualified person is needed to ensure that there are no deficiencies that constitute a hazard. Similarly, even one broken wire in any one rope lay would be considered a hazard.

Under proposed paragraph (c)(3)(ii), operations would have to be conducted in a manner and at speeds that minimize dynamic effects. Dynamic effects are the additional forces exerted on the rope due to dynamics like acceleration and deceleration. Such effects need to be minimized because they increase the stress on the rope.

Under proposed paragraph (c)(3)(iii), each lift would have to be documented in the monthly and annual inspection records, with such use to be considered by the qualified person in allowing subsequent use of the rope. The Committee considered this an important step because the more times the rope is used, the greater the likelihood that degradation would have occurred. Requiring each such lift to be documented in the monthly and annual inspection records would ensure that this information is available to the qualified person when that person makes his or her inspections and assessments under proposed § 1926.1414(c)(3)(i) and (ii).

**Paragraph (c)(4) Additional requirements for rotation resistant rope for boom hoist reeving**

Proposed paragraph (c)(4)(i) would prohibit rotation resistant rope from being used for boom hoist reeving except where the requirements of proposed § 1926.1414(c)(4)(ii) are met. Currently, Subpart N, through its incorporation by reference of section 5-1.7.2 of ANSI B30.5-1968, prohibits the use of rotation resistant rope for boom hoist reeving under all circumstances. This prohibition reflects the fact that 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.

In reviewing this prohibition, the Committee noted that this problem is reduced when load hoists using rotation resistant rope are used as boom hoists for attachments such as luffing attachments or boom and mast attachment systems because the sheaves are not as close together in these applications and the twisting forces are therefore lower.

The Committee concluded that safety would not be compromised in such circumstances as long as the conditions in proposed § 1926.1414(c)(4)(ii) were met. The Committee also believed 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. Note that section 5-1.7.2 of ASME B30.5-2004 also allows rotation resistant rope to be used for boom hoist reeving when conditions similar to those in proposed § 1926.1414(c)(4)(ii) are met

Under proposed paragraph (c)(4)(ii)(A), the drum must have a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used. A first layer rope pitch diameter less than that could damage the rope.

Under proposed paragraph (c)(4)(ii)(B), the requirements of § 1926.1426(a) and (b) would have to be met.[42] Section 1926.1426(a) prohibits boom free fall for equipment manufactured prior to October 31, 1984 and restricts the circumstances under which a free falling boom may be used for equipment manufactured before that date. By saying that paragraph 1426(a) applies "irrespective of the date of manufacture," proposed § 1926.1414(c)(4)(ii)(B) makes clear that, when rotation resistant rope is used for boom hoist reeving, boom free fall is prohibited for all equipment under all circumstances. The reference to § 1926.1426(b) requires the boom hoist to have a secondary mechanism to prevent free fall in the event the primary system fails. These provisions would prevent the rope from being subjected to the shock load forces that would occur in a boom free fall when the rope arrests the fall.

The C-DAC draft of proposed paragraph (c)(4)(ii)(C) incorporated by reference the provisions in ASME B30.5-2004 at sections 5-1.3.2(a), (a)(2) through (a)(4), and (b) through (d).[43] (Note that, at the time the C-DAC document was completed, the most current version of ANSI/ASME B30.5 was the 2000 version. Since that time the 2004 version has been issued. The referenced provisions are identical in both versions).

These provisions of section 5-1.3.2 (load hoist mechanisms) of the ASME standard provide:

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[42] The C-DAC Document referred to § 1926.1426(b) and (c). C-DAC's intent clearly was to refer to § 1926.1426(a) and (b), and OSHA has corrected the text accordingly.

[43] The Committee determined that the incorporated provisions were sufficiently clear and enforceable for use as OSHA requirements.

*  *  *

(a) Load Hoist Drums. The load hoist drum assemblies shall have power and operational characteristics sufficient to perform all load lifting and lowering functions required in crane service when operated under recommended conditions.

*  *  *

(2) Load hoist drums shall have rope capacity with the recommended rope size and reeving to perform crane service within the range of boom lengths, operating radii, and vertical lifts specified by the manufacturer.

(a) No less than two full wraps of rope shall remain on the drum when the hook is in the extreme low position.

(b) The drum end of the rope shall be anchored to the drum by an arrangement specified by the crane or rope manufacturer.

(c) The drum flange shall extend a minimum of 1/2 inch (13 mm) over the top layer of rope at all times.

(3) The load hoist drums shall provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(4) A means controllable from the operator's station shall be provided to hold the drum from rotating in the lowering direction and be capable of holding the rated load without further action by the operator. Foot-operated brakes having a continuous mechanical linkage between the actuating and braking means, capable of transmitting full braking force and equipped with a positive mechanical means to hold the linkage in the applied position, meet this requirement.

*  *  *

(b) Load Hoist Brakes.

(1) When power-operated brakes having no continuous mechanical linkage between the actuating and braking means are used for controlling loads, an automatic means shall be provided to set the brake, to prevent the load from falling in the event of loss of brake control power.

(2) Foot-operated brake pedals shall be constructed so that the operator's feet, when in proper position, will not slip off, and a means shall be provided for holding the brakes in the applied position without further action by the operator.

> (c) Power Controlled Lowering. When provided, a power-controlled lowering system shall be capable of handling rated loads and speeds as specified by the manufacturer. Such a system is recommended to assist in precision lowering and to reduce demand on the load brake.
>
> (d) Cylinders with Rope Reeving. Cranes using a load hoist mechanism with hydraulic cylinder(s) and rope reeving shall have power and operational characteristics sufficient to perform all load lifting and lowering functions required in crane service when operated under recommended conditions. Sheaves used in multiple rope reeving shall have a pitch diameter not less than 16 times the nominal diameter of the rope and shall comply with para. 5-1.7.4.

Upon reviewing these provisions, OSHA believes that two changes need to be made to the incorporation recommended by C-DAC. First, the second sentence of section 5-1.3.2(c) is stated as a recommendation rather than a mandatory requirement. OSHA believes it would be confusing to incorporate a non-mandatory recommendation into this standard. Therefore, rather than incorporating that provision by reference, OSHA is adding a new paragraph (G) to § 1926.1414(c)(4)(ii) that incorporates only the mandatory first sentence of section 5-1.3.2(c) of ASME B30.5: "When provided, a power-controlled lowering system shall be capable of handling rated loads and speeds as specified by the manufacturer."

The second change pertains to the final sentence of section 5-1.3.2(d) of ASME B30.5. That sentence's requirement of a minimum pitch diameter of 16 times the nominal diameter of the rope varies from the requirement of proposed " 1926.1414(c)(4)(ii)(D), discussed next, that the minimum pitch diameter be 18 times the rope's nominal diameter. The variation is due to the fact that section 1.3.2(d) of ASME B30.5 does not apply solely to rotation resistant rope, as does this paragraph. Although it is possible to

comply with a minimum pitch diameter of both 16 and 18 times the nominal diameter of the rope by adhering to the value of 18, OSHA believes it would be confusing to include requirements giving both values. Accordingly, OSHA is modifying the incorporation by reference recommended by C-DAC so that, in this proposed rule, § 1926.1414(c)(4)(ii)(C) reads as follows:

> The requirements in ASME B30.5-2004 Section 5-1.3.2 (a), (a)(2) – (a)(4), (b), and (d), 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).

Proposed paragraph (c)(4)(ii)(D) provides that all sheaves used in the boom hoist reeving system shall have a rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

Proposed paragraph (c)(4)(ii)(E) provides that the operating design factor of the boom hoist reeving system shall be not less than five. In this paragraph and the next one as well, OSHA has changed the C-DAC term "design factor" to "operating design factor." OSHA made this change so that the terminology in these two paragraphs would be consistent with that in proposed paragraphs (c)(2) and (3) of this section. OSHA requests public comment on whether there is any reason for using different terminology in proposed § 1926.1414(c)(4)(ii)(E) and (F) than in proposed § 1926.1414(c)(2) and (3).

Proposed paragraph (c)(4)(ii)(F) provides that the operating design factor for these ropes shall 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 crane rated load. The purpose of this provision is to ensure that the methodology for computing the operating design factors is clear and the operating design factor requirements specified in the proposed standard achieve their intended effect.

**Paragraph 1414(d)**

Proposed paragraph (d) would require that wire rope clips used with wedge sockets be attached to the unloaded dead end of the rope; however, the provision also permits the use of devices specifically designed for dead-ending rope in a wedge socket. The Committee believed that this provision is necessary to ensure attachment strength, reliability and prevention of cable damage.

**Paragraph 1414(e)**

Proposed paragraph (e) states that socketing shall be done in the manner specified by the manufacturer of the wire rope or fitting. This is a clearer version of the provision in section 5-1.7.2b of ANSI B30.5-1968, which refers to the manner specified by the manufacturer of the assembly.

**Paragraph 1414(f)**

Proposed paragraph (f) specifies that prior to cutting wire rope, seizings must be placed on each side of the point to be cut, with the length and number of seizings determined in accordance with the wire rope manufacturer's instructions. Seizings are needed to hold the wire in the strands and the strands in place during handling while cutting. This keeps the rope beyond the area of the cut intact. This provision differs from both section 5.2.4.3(c) of ANSI B30.5-1968 (incorporated by reference into 29 CFR Part 1926 Subpart N) and from section 5-2.4.4(c) of ASME B30.5-2004, which set forth specific seizing requirements based upon whether the rope is preformed and the rope's diameter.

In Committee's experience, the instructions and procedures for seizing differ among various wire rope manufacturers. It concluded that the most appropriate approach would be to require that, beyond specifying that seizings be placed on each side of the point to be cut, which is always necessary, the length and number of seizings be in accordance with the manufacturer's instructions. The Committee decided to require employers to follow the manufacturer's instructions because it believed 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.

**Section 1415 Safety Devices**

This section sets forth the proposed requirements for equipping cranes and derricks with certain safety devices.

The safety devices addressed by this section are devices that C-DAC believed 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 proposed § 1926.1416. That section allows for 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 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 1415(a) Safety devices**

Proposed paragraph (a) lists the safety devices that would be required on all equipment covered by this Subpart and any specifications and conditions applicable to those devices (including the exemption of certain equipment from the requirements of the listed devices).

**Crane Level Indicator:** Proposed paragraph (a)(1) would require that a crane level indicator be on all equipment covered under this subpart. The Agency is proposing this requirement based upon the Committee's belief that level equipment is a key factor in ensuring crane and derrick 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.

C-DAC discussions also raised two significant issues in applying the (a)(1) requirement. First, as stated in § 1926.1415(a)(1)(i), the proposal specifies that a crane level indicator must either be built into the equipment or available on it. The Committee believed that either option accomplishes the purpose of enabling the employer to determine if the equipment is level. Second, as covered in § 1926.1415(a)(1)(ii), the Committee believed that tagging out or removing deficient built-in crane level indicators is necessary. This provision addresses the hazard posed by false readings.

Proposed paragraph (a)(1)(iii) would exempt portal cranes,[44] 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 upon installation and then fixed in place, precluding the need for a crane level indicator.[45]

**Boom Stops:** Proposed paragraph (a)(2) requires boom stops on all equipment except for derricks and hydraulic booms. "Boom stop" is defined in proposed § 1926.1401 as a

[44] Proposed § 1926.1401 defines "portal cranes" 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.
[45] Note that, under proposed § 1926.1437(e), a pontoon or barge/vessel list and trim device would be required for floating cranes/derricks and land cranes/derricks.

device that restricts the boom from moving above a certain maximum angle and toppling over backwards. This definition is derived from the SC&RF Handbook. The term includes all devices that meet the definition, including boom stops, (belly straps with struts/standoff), telescoping boom stops, attachment boom stops, and backstops. As the definition indicates, a boom stop is needed to prevent a boom from tipping backwards past its designed range during equipment operations. Several Committee members suggested exempting certain older equipment from being retrofitted with boom stops. However, C-DAC concluded that the significant safety issue at stake and the fact that installing boom stops is not technically difficult justify requiring them on older equipment.

As noted above, the Agency proposes to exempt derricks and hydraulic cranes from the requirements of 1926.1415(a)(2). The derrick boom overturn issue is covered in proposed 1926.1436(f)(2). Hydraulic cranes are exempted because these cranes contain the equivalent function of boom stops in that the hydraulic cylinder physically prevents the boom from moving backward past its designed range.

**Jib Stops:** "Jib stop" is defined in § 1926.1401 as the same type of device as a boom stop but used for a fixed or luffing jib. The definition notes that the device is also referred to as a "jib backstop." Proposed § 1926.1415(a)(3) would require jib stops on all equipment where a jib is attached, except for derricks. Jib stops perform the same function for jibs as boom stops perform for booms, and are similarly necessary. The

proposal exempts derricks from this requirement because jibs are not installed on derricks.

**Foot Pedal Brake Locks:** Proposed paragraph (a)(4) would require that equipment with foot pedal brakes have locks, except for portal cranes and floating cranes. Such locks are needed to 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 of time.

The rationale for exempting portal cranes and floating cranes from this requirement discussed by the Committee 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 had been activated, the operator may not be able to release the brake quickly enough in such a situation to prevent the equipment from being overloaded or to prevent unintended movement of the load.

Upon review of the exemption in the provision, the Agency has realized that C-DAC assumed that the locking device would in all cases 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, it is OSHA's understanding that there are other types of brake locking mechanisms that do not present this problem (for

example, a brake lock that is hand-actuated). It therefore appears that the exemption may not be needed.[46] The Agency requests public comment on changing proposed paragraph § 1926.1415(a)(4) by deleting the exemption and requiring a hoist brake locking mechanism for all cranes.

**Integral Holding Device/Check Valve:** Proposed paragraph (a)(5) would require 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.

**Rail Clamps and Rail Stops:** Proposed paragraph (a)(6) specifies that equipment on rails have rail clamps and rail stops, except for portal cranes. A rail clamp restricts the equipment from lifting off the rails. The rail stop prevents the equipment from moving further than a specific point on the rails. Portal cranes are exempt from the requirements of § 1926.1415(a)(6) because these cranes typically are equipped with a parking brake that provides the equivalent function of preventing the crane from unintentionally moving along the rails.

**Paragraph 1415(b) Proper operation required**

Proposed paragraph (b) would prohibit the operation of the equipment if any of the safety devices listed in this section are not in proper working order. This paragraph reflects the

[46] OSHA notes that ASME B30.8-2004, "Floating Cranes and Floating Derricks," section 8-1.6.2(l), applies to load hoists and reads as follows: "Foot-operated brake pedals . . . shall be equipped with a means for latching in the applied position."

Committee's belief, discussed above, that proper operation of these devices is critical to safe use of the equipment.

**Section 1416 Operational aids**

This section sets forth the proposed 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 § 1416 ('listed operational aids')." This definition is similar to that in section 5-0.2.2 of ASME B30.5–2004.

As discussed above in regard to proposed § 1415, the Committee believed 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 of the availability of alternatives that are sufficient on a temporary basis. The temporary alternative measures are precautions that were historically used prior to the widespread availability and use of these operational aids.

**Paragraphs 1416(a) and (b)**

Under proposed paragraphs (a) and (b), operational aids would be required on all equipment unless otherwise specified, and would have to be in proper working order

unless the employer uses specified temporary alternative protection. Section 1926.1416(b) provides that if the crane/derrick manufacturer specifies more protective alternative measures than those listed in the standard, the employer would be required to follow them.

Committee discussions of these provisions primarily focused on the use of manufacturer procedures as temporary alternative measures. The Committee considered recommending that the Agency require employers to follow any temporary alternative measures specified by the equipment manufacturer in addition to those required by this proposal. However, instead of requiring additional measures, the Committee decided that employers should be required to rely solely on measures specified by the manufacturer but only if those measures are more protective than those specified in the standard.

**Paragraph 1416(c)**

Proposed paragraph (c) states that if a listed operational aid stops working properly during operations, the operator shall safely stop operations until the temporary alternative measures are implemented or the device is again working properly. It further provides that, 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 proposed § 1926.1434, *Equipment modifications*. Section 1926.1434 applies to modifications or additions which affect the capacity or safe operation of the equipment unless certain steps are taken to have the modifications or additions approved.

The Committee believed 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.

**Paragraph 1416(d) Category I operational aids and alternative measures**

The proposal splits operational aids into two categories, with different amounts of time permitted for temporary alternative measures to be used in place of the listed operational aids. Category I operational aids, which are addressed by proposed paragraph (d), would set a 7-day time limit for repairing the deficient aid, and Category II, addressed below under proposed paragraph (e), has a 30-day time limit. The allowance of a 30-day time period for Category II operational aids reflects the Committee's belief that these aids are less critical to equipment safety than those in Category I.

Both Category I and II would have an exception to the repair time limits. For Category I, if the employer documents that it has ordered the necessary part within 7 days of the occurrence of the deficiency, the repair would have to be completed within 7 days of receipt of the part. For Category II, if the employer documents that it has ordered the necessary part 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 shall be completed within 7 days of receipt of the part. The Committee believed that these time frames set limitations that are both feasible and reflective of the amount of time that it is appropriate to rely on the alternative measures in each category.

During the SBREFA Panel process, one Small Entity Representative stated that an extended period of time might be required to determine the appropriate part number for older equipment and that it might therefore not be possible to order a replacement within 7 days. OSHA solicits public comment on the extent to which this is a problem. OSHA further seeks comment on how to accommodate a situation in which ordering a replacement part is hindered because the part number is not readily available. For example, would a parts supplier be able to furnish the correct part if the type of device (e.g., boom hoist limiting device) and the model of the crane are provided?

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 interprets 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 solicits public comment on whether a different definition of "days" should apply under this section.

Proposed paragraph (d) lists the required Category I operational aids and the acceptable temporary alternative measures for these aids.

**Boom Hoist Limiting Device:** Proposed paragraph (d)(1) would require 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. This definition is taken from the SC&RF Handbook. Section 1926.1401 also explains that the term "boom hoist limiting device" includes 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 were to be pulled 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 ANSI B30.5-1968. This was the first national consensus standard to require a boom hoist limiting device, and the Committee regarded that date as a reasonable indicator of when the industry began widely manufacturing or equipping cranes and derricks with such devices. Although the ANSI standard was only applicable to crawler, locomotive, and truck cranes, the Committee recommended extending this provision to all equipment based on prevailing industry practice.

The Agency is also proposing three temporary alternative measures [§ 1926.1416(d)(1)(A) – (C)], of which the employer must use at least one upon malfunction of the boom hoist limiting device. These are: use of a boom angle indicator; 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, 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. This paragraph further proposes requiring these measures on a permanent basis for those employers operating equipment manufactured on or before December 16, 1969 and not originally equipped with a boom hoist limiting device.

**Luffing Jib Limiting Device:** Proposed paragraph (d)(2) would require 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. C-DAC indicated that these two devices function similarly and are distinguished only as to the type of crane extension each is automatically designed to limit: the jib versus the boom. The temporary alternative measures for a luffing jib limiting device are the same as those proposed for a boom hoist limiting device in § 1926.1416(d)(1)(i)(A) – (C).

**Anti Two-Blocking Device:** Proposed paragraph (d)(3) sets forth the requirements for anti two-blocking devices. "Two blocking" is defined in § 1926.1401 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." This definition is derived from

the SC&RF Handbook. As the definition indicates, two-blocking can result in the crane dropping the load, the headache ball, or another component, creating an extreme hazard to employees below. An anti two-blocking device has been required by § 1926.550(g)(3)(ii)(C) when hoisting personnel since October 3, 1988 but is not otherwise required under 29 CFR Part 1926 subpart N. The Committee believed that expanding the use of anti two-blocking devices beyond hoisting personnel is needed to help reduce the number of crane-related injuries and fatalities.

Anti two-block devices are manufactured in two forms: as an automatic prevention device or as 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. C-DAC members agreed that the automatic prevention anti two-block device provides better protection for employees, since it automatically stops two-blocking. As discussed below, the proposed standard would ultimately require automatic prevention devices on all equipment under a phase-in schedule. In drafting the schedule, C-DAC took account of the date the national consensus standard, ANSI B30.5, began to require such devices for telescopic boom cranes and the fact that B30.5 has continued to allow lattice boom cranes to be equipped with either prevention devices or warning devices.

Effective February 28, 1992, ASME B30.5 required automatic prevention devices on telescopic boom cranes. At the same time, for lattice boom cranes, ASME B30.5 required two-block protection but allowed greater flexibility, requiring them to be

equipped with either automatic prevention devices or warning devices. The additional protection required 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 required anti two-block devices on telescopic boom cranes and the industry first began widely manufacturing or equipping such cranes with such devices, proposed § 1926.1416(d)(3)(i) would require automatic prevention devices on all telescopic boom cranes manufactured after February 28, 1992. However, because ASME B30.5 has allowed lattice boom cranes to have either a warning device or an automatic prevention device since February 28, 1992, proposed § 1926.1416(d)(3)(ii)(A) similarly would give 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.

As noted above, C-DAC believed that the automatic prevention device offers better protection than the warning device. Therefore, to ensure that future cranes are equipped with the preferable automatic prevention device, the proposal would require lattice boom cranes manufactured more than one year after the effective date of this standard to be equipped with an automatic prevention device.

Proposed paragraph (d)(3)(ii)(C) excludes lattice boom equipment used during certain activities from the anti two-block requirements of § 1926.1416(d)(3)(A) and (B). The provision would exempt lattice boom equipment when used for dragline, clamshell (grapple), magnet, drop ball, concrete bucket, and pile driving work because these operations involve heavy repetitive motion, and currently manufactured anti-two block devices used during these activities consistently malfunction (that is, the device "trips" even though a two-block has not occurred) and are frequently damaged.

Lattice boom equipment used during marine operations generally would be exempt because the constant movement of the barge tends to damage the device. Similarly, lattice boom equipment used during container handling work in construction would be exempted because this activity typically involves hoisting containers to and from ships.[47]

However, note that proposed paragraph 1437(f)(1) would require anti two-block devices on floating cranes/derricks and land cranes/derricks on barges when hoisting personnel or hoisting over an occupied coffer dam or shaft. In those situations the exemption would not apply. The Agency believes that the need for anti two-block devices in such situations to prevent employees from being dropped, and to prevent a load from striking employees in the confined work environment of a coffer dam or shaft, outweighs any propensity for damage to the device or unnecessary "tripping" during marine operations.

[47] In most situations hoisting containers would be regulated under 29 CFR Part 1918; the proposed standard would apply to hoisting containers only where that activity is considered 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 would be a construction activity and covered by this proposed standard.

For lattice boom cranes and derricks, the temporary alternative measure required when an anti two-block device malfunctions is 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 use a spotter to warn the operator to stop the hoist.

For telescopic boom cranes, the temporary alternative measure required would be 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** use a spotter when extending the boom. The Committee believed that the alternative measure for telescopic boom cranes needs to have the additional precaution of a spotter when extending the boom because in those cranes 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 would not warn the operator that two-blocking is about to occur. Therefore, when extending the boom, a spotter would also have to be used.

**Paragraph 1416(e) Category II operational aids and alternative measures**

Proposed paragraph (e) lists the required Category II operational aids and the acceptable temporary alternative measures for these aids. If these aids were to malfunction there would be a 30-day time limit for repair. If the employer documents 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 within 30 days, the repair would be required to be completed within 7 days of receipt of the part.

**Boom Angle or Radius Indicator:** Proposed paragraph (e)(1) would require a boom angle or radius indicator readable from the operator's station on all equipment. "Boom angle indicator" is defined in § 1926.1401 as "a device which measures the angle of the boom relative to the horizontal." This definition is taken from the SC&RF Handbook. Knowing the boom angle is necessary to accurately determine the crane's capacity from its load chart. The temporary alternative would be to measure the radii or boom angle with a measuring device.

**Jib Angle Indicator:** Proposed paragraph (e)(2) would require a jib angle indicator on all equipment with a luffing jib. The temporary alternative would be to measure the radii or jib angle with a measuring device.

**Boom Length Indicator:** Proposed paragraph (e)(3) would require a boom length indicator on all equipment equipped with a telescopic boom. As defined in § 1926.1401, a 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." The length of the boom must be known because it affects the crane's capacity as shown on the load chart. The temporary alternative would be one of the following: 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) would require 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 proposed § 1926.1436(f)(3), discussed below.) The framework of this proposed paragraph is similar to the approach taken in section 5-1.9.9.2 of ASME B30.5–2004 with respect to these aids. The framework permits 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.

Load moment (or rated capacity) indicator is defined in § 1401 as "a system which aids the equipment operator by sensing 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." This definition is derived from the SC&RF Handbook.

Load moment (or rated capacity) limiter is defined in § 1926.1401 as "a system which aids the equipment operator by sensing 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." The proposal permits employers flexibility in choosing which device to employ because the Committee believed that all three devices will help ensure that the equipment does not exceed its capacity and tip over.

This provision would be 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. It therefore reflects when the industry first began widely manufacturing or equipping cranes with load weighing or load moment devices.

Each of these indicators makes it easier for the operator to ensure that the equipment is operated within its capacity. The proposed provision would therefore reduce the likelihood of injuries and fatalities from tip-over and other incidents resulting from operating equipment beyond its capacity.

Proposed paragraph (e)(5) would require two future operational aids – an outrigger position sensor/monitor and a hoist drum rotation indicator – on all equipment manufactured after January 1, 2008. "Drum rotation indicator" is defined in § 1926.1401 as "a device on a crane or hoist which indicates in which direction and at what relative speed a particular hoist drum is turning." This definition is taken from the SC&RF

Handbook. C-DAC believed that these aids will help ensure the safe operation of cranes but found that additional time is needed for the industry to develop them.

The Committee also considered whether a third future operational aid – counterweight sensors – should be required on all equipment manufactured after January 1, 2008. Several Committee members representing crane manufacturers expressed concern as to the difficulty in developing a reliable counterweight sensor presently or in the near future. In light of these technological problems, the Committee did not include these.

**Section 1417 Operation**

Proposed § 1417 addresses hazards associated with general operation of equipment covered by this standard. Currently, 29 CFR Part 1926 subpart N primarily addresses safe operation by incorporating national consensus standards and manufacturer recommendations. For example, § 1926.550(b)(2) requires crawler, truck, and locomotive cranes to comply with the operation requirements of ANSI B30.5–1968. The provisions in this proposed section are designed to update such requirements, make them more comprehensive, and state them in a way that is clear and enforceable.

**Paragraph 1417(a)**

Currently, Subpart N requires employers to comply with manufacturers' operational requirements for hammerhead tower cranes (§ 1926.550(c)(5)) and for floating

cranes/derricks (§ 1926.550(f)(2)(iii)) but not for other types of equipment. Proposed § 1926.1417(a) would require employers to comply with the manufacturer procedures applicable to the operational functions of all equipment covered by this proposed standard, including the use of equipment with attachments.

The Committee believed that the manufacturer has a high degree of expertise with respect to the capabilities and limitations of the equipment it has designed and built. Accidents can therefore be prevented by ensuring that the equipment is operated in a manner that is consistent with the manufacturer's procedures. As noted in the discussion of the proposed definition of "procedures" in § 1926.1401, the phrase "manufacturer procedures" is to be interpreted broadly to include all recommendations by the manufacturer regardless of the format of those recommendations.

**Paragraph 1417(b) Unavailable operation procedures**

**Paragraphs (b)(1) through (b)(3)**. Currently, Subpart N has no provision for developing operational procedures where manufacturer procedures are not available. C-DAC believed that setting requirements to address these situations would help improve safety with respect to the operation of such equipment.

"Unavailable procedures" is defined in proposed § 1926.1401 as meaning procedures that are no longer available from the manufacturer, or have never been available from the manufacturer. C-DAC provided this definition so that employers would understand what

constitutes unavailable procedures. For instance, procedures that are in the employer's possession but are not on the job site, would not be considered unavailable under proposed §§ 1926.1417(b) and 1926.1441(c)(2), where the term is used.

Under proposed paragraph (b)(1), in the event that the manufacturer procedures for operation are not available, the employer would be required to develop procedures necessary for the safe operation of the equipment and its attachments. The employer would also be required to ensure compliance with such procedures.

For example, the manufacturers of some old equipment are no longer in business; procedures for that equipment are typically unavailable. Even where the original manufacturer became a 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 would be required to develop and follow substitute procedures.

Proposed paragraphs (b)(2) and (b)(3) would specify qualifications criteria for those who develop two aspects of the substitute procedures. Specifically, under proposed § 1926.1417(b)(2), procedures for the operational controls would have to be developed by a qualified person. As defined in § 1926.1401 of this proposed standard, "operational controls" are levers, switches, pedals and other devices for controlling equipment operation. The Committee believed that a high level of expertise is needed to develop

such procedures in light of both the complexity of the factors that must be considered in developing such procedures and the critical nature of the operational controls.

Under proposed 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 Committee believed that 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, the Committee believed that a signature by the RPE is needed to ensure that this work is done with the requisite care.

**Paragraph 1417(c) Accessibility of procedures**

**Paragraph (c)(1)**. This proposed paragraph would require 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 proposed standard, "special hazard warnings" are warnings of site-specific hazards (for example, proximity of power lines). C-DAC defines this term in proposed § 1926.1401 to differentiate these site-specific warnings from all other general hazard warnings which are common to typical construction worksites.

Currently, § 1926.550(a)(2) of Subpart N requires 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 proposed standard, it does not require the operator's manual to be accessible to the operator.

The Committee believed that the information in these materials, including the operator's manual, is essential for safe crane operation. It 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, the Committee believed 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 in order 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, which could result in injuries or fatalities.

**Paragraph (c)(2)**. Subpart N does not address the issue of load capacities that are available only in electronic form. With the advancement of technology since 29 CFR

Part 1926 subpart N was promulgated, 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, C-DAC determined that it is necessary to establish requirements to address that problem. Proposed § 1926.1417(c)(2) establishes requirements to address a situation in which electronic or other failure makes such information unavailable.

The Committee agreed that having the load capacities accessible to the operator in the cab is so important, due to this information's direct relationship to preventing overloading, that operations need to shut down without them. Therefore, where load capacities are available in the cab only in electronic form and a failure makes the load capacities inaccessible, this proposed paragraph would require that the operator immediately cease operations or follow safe shut-down procedures until the load capacities become available again (in electronic or other form).

**Paragraph 1417(d)**

This proposed paragraph would require that operators refrain from engaging in any practice that would divert his or her attention while operating the crane. This would include 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 proposed paragraph addresses the risk that an accident can occur if the operator's full attention is not directed toward that task. A

similar provision is found in section 5-3.1.2 of ANSI B30.5–1968, which is incorporated by reference in Subpart N, although it does not specifically reference the use of cell phones.

**Paragraph 1417(e) Leaving equipment unattended**

**Paragraph (e)(1)**. Currently, under 29 CFR Part 1926 subpart N, the operator of a crawler, locomotive, or truck crane is prohibited from leaving the controls while a load is suspended.[48] It is important for the operator to be at the controls for a variety of 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.

In the Committee's experience, this requirement is 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 manipulate the controls.

In this type of circumstance, the Committee believed that greater safety could be achieved by developing criteria that allow the operator to leave the controls when it is

[48] Section 5-3.2.4a. of ANSI B 30.5-1968, incorporated by reference in 29 CFR Part 1926 Subpart N at § 1926.550(b)(2), states, "The operator shall not leave his position at the controls while the load is suspended."

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 proposed § 1926.1417(e)(2)).

This proposed paragraph would require that the operator not leave the controls while the load is suspended except when four conditions, outlined in proposed § 1926.1417(e)(1)(i) through (e)(1)(iv), are met. The conditions are as follows:

**Paragraph (e)(1)(i)**. The operator would be required 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)**. The load is 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 a protracted period while the final connections are made. This period exceeds normal lifting operations. In this example, the criterion of proposed § 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 proposed § 1926.1417(e)(1)(ii) would not be met and the operator can not leave the controls.

**Paragraph (e)(1)(iii)**. The competent person would have 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 proposed provision addresses the hazard of inadvertent movement while the controls are unattended.

**Paragraph (e)(1)(iv)**. Barricades or caution lines, and notices would have to be erected to prevent all employees from entering the fall zone. Furthermore, under this proposed paragraph no employees would be permitted in the fall zone, including those listed in proposed § 1926.1425(b)(1) through (3), (d), or (e). The Committee concluded that 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.

**Paragraph (e)(2)**. As drafted, proposed § 1926.1417(e)(2) reads:

> The provisions in paragraph (e) of this section do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the load is not suspended over an entrance or exit.

The Agency notes that the reference to "§ 1926.1417(e)" is a drafting error and that the appropriate reference is to paragraph "§ 1926.1417(e)(1)." In addition, the provision currently contains two incidences of the word "not" which could lead to confusion. Therefore, the Agency is considering changing the language to read as follows and requests comment on such a change:

> The provisions in § 1926.1417(e)(1) do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the working gear is suspended over an area other than an entrance or exit.

The Committee agreed on this paragraph with the understanding that employers frequently leave lightweight items such as slings, ladders, spreader bars, and welding machines suspended in the air overnight in order to prevent theft. These are items whose weight is negligible relative to the capacity of the equipment and whose size is small (the small size means that there will not be a significant sail effect and the rigging needed to attach the item to the hook is not complex).

The Committee recognized that this practice is a safe practice as long as the working gear items are not suspended over an entrance or exit where employees could be exposed to falling object hazards. Thus, this paragraph would allow such items to be held

suspended, without the operator at the controls, and without establishing the four conditions set forth in § 1926.1417(e)(1)(i) through (iv), so long as the gear is not suspended over an entrance or exit.

**Paragraph 1417(f) Tag-out**

**Paragraph 1417(f)(1)**. ***Tagging out of service equipment/functions.*** Where the employer has taken the equipment out of service, this proposed paragraph would require that the employer place a tag in the cab stating that the equipment is out of service and not to be used. Where the equipment remains in service but the employer has taken a function out of service, this proposed paragraph would require that the employer place a tag in a conspicuous position stating that that function is out of service and not to be used. This proposed 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.

Currently, section 5-2.3.2 of ANSI B30.5-1968, which is incorporated by reference in Subpart N, requires "out of order" signs on crawler, locomotive and truck cranes undergoing maintenance. Unlike proposed 1926.1417(f)(1), 29 CFR Part 1926 subpart N does not address the situation where the equipment itself is in service but a function is out of service.

**Paragraph 1417(f)(2) Response to "do not operate"/tag-out signs.**

**Paragraph 1417(f)(2)(i)**. If there is a warning sign on the equipment or starting control, proposed paragraph (f)(2)(i) would prohibit 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 proposed § 1926.1417(f)(2)(ii), when there is a warning sign on any other switch or control, the operator would 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 paragraph § 1926.1417(f)(2)(i), described above.

These provisions would 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 addresses this issue through section 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, proposed § 1926.1417(f)(2) would permit it to be removed by an authorized person and, as an alternative, permit 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. C-DAC believed 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 would be permitted to start equipment that is tagged out or activate a tagged-out switch if the procedures specified in proposed § 1926.1417(f)(2)(i) are met. In reviewing this provision, the Agency noted that these procedures are 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).[49] The Agency requests public comment on whether procedures similar to those in paragraphs 1910.147(e)(3)(i) through (iii)[50] would be feasible and appropriate for cranes/derricks used in construction.

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[49] Section 1910.147 is not applicable to construction (see § 1910.147(a)(ii)(A)).

[50] 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).

**Paragraph 1417(g)**. Before starting the engine, this proposed paragraph would require the operator to verify that all controls are in the proper starting position and that all personnel are in the clear. The Committee agreed that requiring operators to check that all controls are in their proper starting positions would 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 designed to prevent personnel from being injured in the event that some aspect of the equipment moves upon start-up. Currently, section 5-3.1.3h of ANSI B30.5–1968, incorporated by reference in 29 CFR Part 1926 subpart N, contains a comparable requirement.

**Paragraph 1417(h).** ***Storm warning*****.** When a local storm warning has been issued, this proposed paragraph would require 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. Subpart N does not contain a corresponding requirement.

**Paragraph 1417(i).** **[*Reserved*.]** This proposed paragraph is reserved because it is inconvenient for readers to determine whether "(i)" is being used as a letter or a roman numeral.

**Paragraph 1417(j)**

This proposed paragraph would require that operators be familiar with the equipment and its proper operation. Furthermore, if adjustments/repairs are necessary, then the operator would have to promptly inform the individual designated by the employer to receive such information as well as inform the next operator in cases where there are successive shifts.

This paragraph addresses the need to identify problems that may develop with the equipment during operations. Early recognition of such problems by the operator would help prevent accidents that could result from continued operation of equipment that needs adjustment and/or repair. 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 proposed paragraph will facilitate the correction of those problems.

C-DAC did 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) would ensure that the next operator is aware of this information and will be able to take appropriate action.

This provision is comparable to section 5-3.1.3j of ANSI B30.5–1968, incorporated by reference in Subpart N, which requires operators of crawler, locomotive and truck cranes to familiarize themselves with the equipment and its proper care, to report any needed adjustments/repairs or defects to a responsible person, and to notify the next operator of any such problems when changing shifts.

**Paragraph 1417(k)**

This proposed paragraph would prohibit safety devices and operational aids from being used as a substitute for the exercise of professional judgment by the operator. The Committee agreed that 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. Subpart N contains no corresponding provision.

**Paragraph (l)**. **[*Reserved*.]** This proposed paragraph is reserved because it is inconvenient for readers to distinguish the letter "l" from the number "1."

**Paragraph 1417(m)**

If the competent person determines that there is a slack rope condition requiring re-spooling of the rope, this proposed paragraph would require that before starting the lift, it shall be verified that the rope is seated on the drum and in the sheaves as the slack is

removed. This would 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.

Section 5-3.2.3a.4 of ANSI B30.5–1968, incorporated by reference in Subpart N, has a provision stating: "If there is a slack rope condition, it should be determined that the rope is properly seated on the drum and in the sheaves." The term "should" has been interpreted by the courts of appeals as meaning that the provision is non-mandatory. The provision in paragraph (m) of this section uses language making clear that the provision is mandatory.

**Paragraph 1417(n)**

This proposed paragraph addresses the hazards posed by wind, ice and snow on equipment capacity and stability. 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). C-DAC concluded that the most effective approach would be to

require the competent person to consider their effect on equipment stability and rated capacity. 29 CFR Part 1926 subpart N currently has no similar provision.

**Paragraph 1417(o) Compliance with rated capacity**

**Paragraph 1417(o)(1)**. This proposed paragraph would require 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. A comparable requirement is contained in 29 CFR Part 1926 subpart N through incorporation by reference of section 5-3.2.1a of ANSI B30.5–1968.

**Paragraph 1417(o)(2)**. This proposed paragraph would require employers to ensure that operators are not required to operate the equipment in a manner that would exceed its rated capacity, in violation of proposed § 1926.1417(o)(1) above. This proposed provision reinforces the general prohibition of proposed § 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. 29 CFR Part 1926 subpart N currently has no provision comparable to proposed paragraph (o)(2) of this section.

In the Committee's experience, a significant problem in the construction industry is that some employers pressure operators to conduct lifts that exceed the equipment's rated

capacity. Such employers seek to avoid the time and expense associated with bringing in larger capacity equipment.[51]

The Committee believed that in many of these instances the employer knows that the load exceeds the crane's rated capacity but acts on the belief that the rated capacity is sufficiently conservative to perform the lift. In some such cases the exact weight of the load is unknown, and the employer pressures the crane operator in the belief that even if the operator is right about the weight exceeding the capacity rating, the safety factor that the employer assumes is built into the capacity rating will enable the crane to perform the lift anyway.

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, in the Committee's experience, a significant number of overturning incidents are caused by exceeding rated capacity. A study of fatal accidents

[51] 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.

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 Center to Protect Workers' Rights (Oct. 1997). (OSHA-2007-0066-0013).

The Committee believed that there are several root causes of this problem, including lack of operator qualification/certification requirements, insufficient ground conditions, reliance on unreliable information regarding load weight, and operators being pressured into exceeding rated capacity. The Committee concluded that this additional measure is needed to help counteract the persistent problem of operators being pressured into exceeding rated capacity.

**Paragraph 1417(o)(3)**. ***Load weight.*** As discussed above, another cause of injuries and fatalities from overturning equipment is the use of unreliable information on load weight. The Committee concluded that one of the ways these incidents can be reduced is to require that load weight be verified by a reliable means.

Under this proposed paragraph, the operator would be required to verify that the load is within the rated capacity of the equipment by using the procedures in either proposed § 1926.1417(o)(3)(i) or (ii). Under § 1926.1417(o)(3)(i), the weight of the load would have to be determined in one of three ways: from a reliable source, from a reliable calculation

method, or by other equally reliable means. An example of verifying the load weight from a reliable source would be where the load is mechanical equipment and the weight is obtained from its manufacturer.

An example of a reliable calculation method 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.
If the weight of the load is determined under proposed § 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.

Under proposed 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 exceed 75 percent of the maximum rated capacity, then the operator would be prohibited from proceeding with the lift until he/she verifies the weight of the load in accordance with proposed § 1926.1417(o)(3)(i).

The Committee concluded that as long as one of these devices shows that the load does not exceed 75% of the rated capacity (at the longest radius that will be used), it is not necessary to determine the actual weight of the load. Its conclusion is based on the belief that this verification procedure[52] incorporates a sufficient margin of error and would be adequate to ensure that the crane's rated capacity would not be exceeded.

In contrast, the Committee believed that if the device shows that the load exceeds 75%, there is an insufficient margin of error to proceed without a more accurate determination. In such instances a verified determination of the actual weight, in accordance with proposed § 1926.1417(o)(3)(i), is needed to ensure safety.

Currently, the only Subpart N requirement for determining or verifying the weight of the load is found in section 5-3.2.1b of ANSI B30.5–1968, which states: "When loads which are limited by structural competence rather than by stability are to be handled, the person responsible for the job shall ascertain that the weight of the load has been determined within plus or minus 10 percent before it is lifted." The Committee believed that the more detailed procedures in proposed § 1926.1417(o)(3) and the greater margin of safety provided by the 75% limit are needed to prevent the crane's capacity from being exceeded.

[52] 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 1417(p)**

This proposed paragraph would require that the boom or other parts of the equipment not contact any obstruction. The Committee agreed on this provision because of its understanding that boom contact with an obstruction can deform, misalign or otherwise damage the equipment. Such damage can cause unintended movement, prevent intended movement, or a collapse. 29 CFR Part 1926 subpart N currently has no similar provision.

**Paragraph 1417(q)**

This proposed paragraph would require that the equipment not be used to drag or pull loads sideways. The Committee intended this provision 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). Currently, section 5-3.2.3c.2 of ANSI B30.5–1968 contains a similar requirement, providing: "Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways." (As discussed below, proposed paragraph (v) addresses sideloading of freely suspended loads by restricting the speed of rotation).

**Paragraph 1417(r)**

On wheel-mounted equipment, this proposed provision would require that no loads be lifted over the front area, except as permitted by the manufacturer. The Committee agreed on this provision because wheel-mounted equipment typically is not designed to lift loads over the front area without tipping over unless it is specifically designed to do so (such as where equipped with a front outrigger for support and stabilization for this purpose). Equipment that is not so designed will likely tip over or otherwise fail when lifting loads over the front area. This proposed paragraph continues the requirement of section 5-3.2.3g of ANSI B30.5–1968, which is incorporated by reference in Subpart N.

**Paragraph 1417(s)**

In many circumstances an operator may use equipment that has not recently been used to handle a load that is 90% or more of the maximum line pull. The condition and adjustment of the brakes may be sufficient to handle lesser loads, but insufficient to handle loads closer to their design capacity. Consequently, the operator may not know that the brakes are insufficient until after the load is hoisted. In such a case the load could be dropped, posing a struck-by hazard.

This proposed paragraph would address that hazard by requiring that the operator 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 would apply

to the first but not to successive lifts, since the operator would have already determined from the initial test that the brakes are sufficient.

Currently, 29 CFR Part 1926 subpart N contains a similar requirement through section 5-3.2.3h of ANSI B30.5–1968, which states: "The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes." C-DAC believed that additional clarity than that found in the ANSI provision is needed to give employers notice of when a brake test was required and therefore proposed in §1926.1417(s) to require testing when the load is 90% or more of the maximum line pull.

**Paragraph 1417(t)**

This proposed paragraph would require 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. It continues the current Subpart N requirement found in section 5-3.2.3j of ANSI B30.5–1968.

**Paragraph 1417(u) Traveling with a load**

**Paragraph 1417(u)(1)**. This proposed paragraph would prohibit 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 proposed § 1926.1417(u)(2) are met. 29 CFR Part 1926 subpart N does not prohibit traveling with a load if the practice is prohibited by the manufacturer but, through incorporation of section 5-3.2.3n of ANSI B30.5–1968, permits traveling with a load whenever conditions similar to those in proposed § 1926.1417(u)(2)(i) are satisfied.

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 believed that the manufacturer has the expertise to ascertain its equipment's capabilities. Therefore, the Committee believed that where the manufacturer has prohibited traveling with the load, such a determination needs to be complied with to ensure safety.

**Paragraph 1417(u)(2)**. If the manufacturer does not prohibit traveling with a load, the equipment may travel with a load if the requirements of proposed § 1926.1417(u)(2) are met. This proposed paragraph sets forth three procedures that employers would have to follow when traveling with a load.

**Paragraph 1417(u)(2)(i)**. Pursuant to this proposed paragraph, a competent person would have to supervise the operation, determine if it is necessary to reduce crane ratings, and make determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety. Under

proposed § 1926.1417(u)(2)(ii), the determinations of the competent person must be implemented. These provisions are similar to section 5-3.2.3n of ANSI B30.5–1968, which is incorporated in 29 CFR Part 1926 subpart N.

As discussed above, traveling with a load imposes types and levels of forces on the equipment that are not present when the equipment is stationary, and conditions such as load position and boom location can affect the magnitude of those forces. Some of the criteria in proposed § 1926.1417(u)(2)(i) address this type of effect. Other criteria in this paragraph are intended to ensure that other hazards – those posed by the crane being in changing locations (such as ground support, travel route and overhead obstructions) – are addressed by the competent person. When traveling with a load, a crane may encounter hazards such as power lines, insufficient ground support, uneven or slippery ground conditions, and obstructions that the equipment could strike.

A competent person must address these issues before the equipment begins to travel with a load. The competent person must also supervise the operation as it proceeds so that problems that arise that were not foreseen at the outset can be properly addressed. In sum, the Committee designed these provisions to ensure that the employer plans and implements a travel operation so that the various effects and changeable conditions associated with travel are properly identified, assessed and addressed.

**Paragraph 1417(u)(2)(iii)**. For equipment with pressurized tires, this proposed paragraph would require that tire pressure specified by the manufacturer be maintained. Subpart N currently has no corresponding provision.

The Committee agreed on this provision to address the hazards posed by improper tire pressure when traveling with a load. Where pressure varies among the tires, the equipment may be out of level, reducing capacity and causing instability. Uniform but improper pressure can reduce capacity or lead to tire failure. Each of these circumstances can lead to unintended movement, loss of the load, overturning and/or collapse.

**Paragraph 1417(v)**

This proposed paragraph would require that rotational speed of the equipment be such that the load does not swing out beyond the radius at which it can be controlled. As noted above in relation to proposed § 1926.1417(q), 29 CFR Part 1926 subpart N currently permits sideloading of freely suspended loads with no restriction comparable to that in proposed § 1926.1417(v).

The Committee intended this provision 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.

**Paragraph 1417(w)**

This proposed paragraph would require that a tag or restraint line be used if necessary to prevent rotation of the load that would be hazardous. The Committee agreed on this provision in order to prevent the hazard of an unstable or uncontrolled load which could in turn destabilize other parts of the crane or the crane itself. This condition can also result in the load posing a struck-by hazard. Section 5-3.2.3p of ANSI B30.5-1968 contains a comparable requirement.

**Paragraph 1417(x)**

This proposed paragraph would require that the brakes be adjusted in accordance with manufacturer procedures to prevent unintended movement. This requirement would apply 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. 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.

Currently, 29 CFR Part 1926 subpart N does not specifically address brake adjustment. However, section 5-2.3.1a of ANSI B30.5–1968 requires a preventive maintenance

program based on the manufacturer's recommendations, and section 5-2.3.3b requires that all components and operating mechanisms be adjusted to ensure their correct functioning. In light of the critical role that brakes play in ensuring equipment safety, these provisions of ANSI B30.5–1968 can be read to include brake adjustments. The Committee concluded that the more explicit approach to this issue taken in proposed § 1926.1417(x) requirement would help enhance employee safety.

**Paragraph 1417(y)**

This proposed paragraph would require 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. Therefore, the operator must obey a stop signal given by anybody on the worksite. Section 5-3.1.3c of ANSI B30.5–1968 contains a comparable requirement.

**Paragraph 1417(z) Swinging locomotive cranes**

Pursuant to this proposed paragraph, a locomotive crane shall not be swung into a position where it is reasonably foreseeable that 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. A comparable requirement is contained in section 5-3.4.4 of ANSI B30.5–1968.

**Paragraph 1417(aa) Counterweight/ballast**

**Paragraph 1417(aa)(1)**. This proposed paragraph contains counterweight/ballast requirements that would apply to equipment other than tower cranes. Pursuant to proposed § 1926.1417(aa)(2), requirements regarding counterweight/ballast for tower cranes are found in proposed § 1926.1435(b)(7).

**Paragraph 1417(aa)(1)(i)**. This proposed paragraph would require that equipment not be operated without the counterweight or ballast in place as specified by the manufacturer. Failure to follow the manufacturer's specifications for use of counterweights and ballast could result in a tipover or collapse.

**Paragraph 1417(aa)(1)(ii)**. Under this proposed provision, the employer would be prohibited 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.

Requirements similar to those in § 1926.1417(aa)(1)(i) and (ii) are currently contained in Subpart N through incorporation by reference of section 5-3.4.2 of ANSI B30.5–1968.

The C-DAC draft of this provision stated that the maximum counterweight or ballast "approved" by the manufacturer shall not be exceeded. Upon reviewing the draft, OSHA

determined that a term that more accurately reflects the Committee's intent in this regard is "specified." Therefore, the Agency has modified the C-DAC language so that proposed § 1926.1417(aa)(1)(ii) reads:

> The maximum counterweight or ballast specified by the manufacturer for the equipment shall not be exceeded.

**Paragraph 1417(aa)(2).** This proposed paragraph complements proposed § 1926.1417(aa)(1) by noting that the counterweight and ballast requirements for tower cranes are found in proposed § 1926.1435(b)(8).

**Section 1418 Authority to stop operation**

This proposed section provides: "Whenever there is a concern as to safety, the operator shall have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured." Subpart N incorporates pre-1971 industry consensus standards that require operators to have comparable authority, and current industry consensus standards contain similar provisions. An appropriately capable equipment operator is highly knowledgeable in matters affecting equipment safety and is well qualified to determine whether an operation presents a safety concern. C-DAC believed that it continues to be necessary for the employer to provide this authority to the operator.

Current consensus standards specify that an operator with a safety concern must raise that concern with a supervisor before proceeding with a lift. For example, section 5-3.1.3(d) of ANSI B30.5-2004, "Mobile and Locomotive Cranes," provides: "Whenever there is any doubt as to safety, the operator shall consult with the supervisor before handling the loads." Similar provisions are included in section 2-3.1.7 of ASME B30.2-2001, "Overhead and Gantry Cranes," section 3-3.1.3(d) of ASME B30.3-1996, "Construction Tower Cranes," section 6-3.2.3 of ASME B30.6 - 2003, "Derricks," and other standards in the ASME B30 series.

The proposed section reflects C-DAC's belief that it is necessary to clearly delineate the circumstances under which it would be permissible to resume operations after the operator has exercised this authority. Under the proposed provision, operations would be prohibited from resuming "until a qualified person had determined that safety has been assured."

In accordance with the proposed definition of a qualified person (see the discussion above of this term in proposed § 1926.1401), that person would, "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." For example, 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 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.

An illustrative example of this is the following: A large steel cylinder, which is lying lengthwise on the ground, is to be lifted into the vertical position and then up to the top of a structure. As the crane operator prepares to lift the cylinder into the vertical position, the operator sees that the rigging is attached at a point that is more than halfway down from the top of the cylinder. This indicates to the operator that the rigging has been attached below the cylinder's center of gravity. Rigging such a load below the center of gravity could cause it to flip over when it is lifted. As a result of this concern, the operator exercises his/her authority to stop and refuse to handle the load.

After the operator explains his/her concern to the employer, the employer consults with an individual who is a qualified person with respect to the rigging of the load. The qualified person finds that the wall of the steel cylinder is much thicker near its base than at the top. After calculating the cylinder's center if gravity, the qualified person determines that it is well below the midpoint of the cylinder. The qualified person then determines that the rigging is, in fact, attached above the cylinder's center of gravity, and that safety is assured. The lifting operation is then resumed.

In this example the operator appropriately exercised his/her authority to stop and refuse to handle the load, since there were indications of an unsafe condition. A qualified person then appropriately found that safety was assured after examining those

indications, assessing the relevant factors, and determining that the load was in fact rigged in a safe manner.

**Signals**

Proposed §§ 1926.1419 through 1926.1422 address the circumstances under which a signal person must be provided, the type of signals that may be used, criteria for how signals are transmitted, and other criteria associated with the use of signals.

**Section 1419 Signals – General requirements**

This proposed section would set requirements regarding signals when using equipment covered by this proposed standard.

Currently, § 1926.550(a)(4) provides: "Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site." C-DAC believed that the current rule is insufficient in several respects. First, the current rule does not establish the circumstances in which there is a need to have a signal person. Second, the current standard refers only to hand signals. C-DAC believed that other means of signaling need to be addressed as well to provide necessary flexibility and reduce the potential for miscommunication (requirements regarding other signaling methods are addressed in proposed §§ 1926.1420 and 1926.1421).

Finally, C-DAC found that hazardous situations arise as a result of signal persons not understanding safety-related aspects of crane operations and dynamics and not knowing how to give appropriate signals. Consequently, it determined that there is a need to establish requirements regarding the qualifications of the signal person; these are addressed in proposed § 1926.1428. In short, C-DAC believed 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 1419(a)**

Proposed paragraphs (a)(1) through (a)(3) address the circumstances that would require the provision of a signal person: when the point of operation, meaning the load travel or the area near or at load placement, is not in full view of the operator (§ 1926.1419(a)(1)); when the equipment is traveling and the operator's view in the direction of travel is obstructed (§ 1926.1419(a)(2)); and 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 believed that other situations arise that, from a safety standpoint, necessitate the use of a signal person. For example, the operator

may recognize that the load at one point will move alongside and very close to a structure. Even though the load in this example will remain in view of the operator as it travels, because of the tight tolerances involved, the operator determines that a signal person is needed to help ensure that the load does not come in contact with the structure (which could cause the load to fall).

Another example is where a heavy load, such as a large HVAC unit, has to be placed very precisely on a concrete pad. In this example, as in the previous one, the load remains within the view of the operator at all times. However, the employee handling the load determines that signals need to be given to the operator so that the load handler's work and the operator's movement of the load are properly coordinated. Because of the weight of the load, the employee handling it will have to use both hands to help position it as it is placed on the pad and will not be able to give signals. In such an instance the person handling the load could determine that a signal person is necessary.

**Paragraph 1419(b) Types of signals**

Under proposed paragraph (b), signals to crane operators would have to be by hand, voice, audible, or "new" signals. As used in this proposed 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.

"Audible signal" is defined in § 1926.1401 as "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." Under some circumstances, audible signals are effective means of communicating with an operator, and C-DAC defined the term to make clear the types of sounds that would be permissible.

The criteria for the use of these signal types are set out in proposed § 1926.1419(c) – (m) (additional voice signal requirements are in proposed § 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 proposed 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 1419(c) Hand signals**

Proposed paragraph (c) 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. Subpart N currently requires that hand signals to crane and derrick operators "be those prescribed by the applicable ANSI standard for the type of crane in use" and that "an illustration of the signals shall be posted at the job site" (§ 1926.550(a)(4)).

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 are referred to as the "Standard Method," which is defined in proposed § 1926.1401 as "the protocol in Appendix A for hand signals." The "Standard Method" signals are located in Appendix A. 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.

For example, the Standard Method signal for raising the boom is: arm extended, thumb pointing upward and other fingers closed. The signal for lowering the boom is the same except the thumb points down. There are circumstances where back-lighting conditions make it difficult for the operator to see the signal person's thumb and therefore cannot discern whether it is pointing up or down. In such circumstances use of the standard signal would be infeasible.

In such instances, under this proposed paragraph, non-standard signals (examples of which are provided in Appendix B of this proposed rule) may be used. To avoid confusion when non-standard signals are used, proposed § 1926.1419(c)(2) would require that the signal person, crane operator, and lift supervisor (where there is one) meet prior to the operation to agree upon the signals that will be used.

**Paragraph 1419(d) New signals**

Proposed paragraph (d) would allow signals other than hand, voice, or audible signals to be used if certain criteria are met. As discussed above under proposed § 1926.1419(b), C-DAC include § 1926.1419(d) to allow for the development of new signals in the future. To ensure that any new signals are as effective as hand, voice, or audible signals, proposed 1926.1419(d)(1) and (d)(2) would require the employer to demonstrate either that the new signals are as effective as existing signals for communicating, or that there is a national consensus standard for the new signals.[53] C-DAC believed 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.

**Paragraph 1419(e) Suitability**

[53] 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.

Under proposed paragraph (e), the type of signal (hand, voice, audible, or new) and the transmission method used would have to 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.

**Paragraph 1419(f)**

Proposed paragraph (f) would require the ability to transmit signals between the operator and signal person to be maintained. If that ability is interrupted, the operator would be required to safely stop operations until signal transmission is reestablished and a proper signal is given and understood.

**Paragraph 1419(g)**

Proposed paragraph (g) would require the operator to stop operations if the operator becomes aware of a safety problem and needs to communicate with the signal person. Operations may only be resumed after the operator and signal person agree that the problem has been resolved.

Most signal systems permit only one-way communication, from the signal person to the operator. In addition, most two-way systems, such as a typical two-way radio system, only permit one person to speak at a time. When using such systems, circumstances may

arise in which the operator, while receiving signals, becomes aware of a safety problem that is of a nature that necessitates that the operator communicate with the signal person. For example, the signal person signals to the operator to lower the load. However, the operator sees that an employee has moved under the load in an area that is out of the view of the signal person. Under this proposed provision the operator would have to safely stop lowering the load and communicate the problem to the signal person.

Another example is where the signal person gives a hand signal but it appears to the operator that the signal person is using the wrong signal. The operator would be required to safely stop operations and communicate with the signal person to resolve the problem.

**Paragraph 1419(h) and (j)**

Proposed paragraph (h) would require that only one person at a time signal the operator. C-DAC believed this provision was needed to prevent confusion with respect to which signals the operator is supposed to follow. An exception is provided when, as provided in proposed § 1926.1419(j), somebody becomes aware of a safety problem and gives an emergency stop signal. Under proposed § 1926.1417(y), the operator would be required to obey such a signal.

**Paragraph 1419(i) [*Reserved*.]** Paragraph (i) is reserved because it is inconvenient for readers to determine whether "(i)" is being used as a letter or a roman numeral.

**Paragraph 1419(k)**

Proposed paragraph (k) would require that all directions given to the operator by the signal person be given from the operator's direction perspective. 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 would ensure that the signal that is given will be consistent with that natural tendency.

**Paragraph 1419(l) [*Reserved*.]** Paragraph (l) is reserved because it is inconvenient for readers to whether "l" is being used as a letter or a number.

**Paragraph 1419(m) Communication with multiple cranes/derricks**

Proposed paragraph (m) addresses a situation where the signal person is in communication with more than one crane or derrick. It would require the signal person to use an effective means of identifying the crane or derrick the signal is for before giving the signal. Proposed § 1926.1419(m)(i) and (ii) set out alternate means of complying with this requirement. Under proposed § 1926.1419(m)(i), for each signal, prior to giving the function/direction, the signal person must identify the crane/derrick for which the signal is intended. Alternatively, under proposed § 1926.1419(m)(ii), the employer could implement a method of identifying which crane/derrick for which the signal is intended that is as effective as the system in proposed § 1926.1419(m)(i). Because of the potential for confusion, it is essential that an alternative system under proposed § 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.

**Section 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 proposed paragraphs § 1926.1420(a) through (c). Proposed paragraph (a) would require the testing of the transmission devices prior to the start of operations to ensure that the signals are clear and that the devices are reliable. This will help ensure that the operator receives and can understand the signals that are given and will prevent accidents caused by miscommunication.

Proposed paragraph (b) would require that such 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 would ensure that the operator and signal person are not interrupted by users performing other tasks or confused by instructions not intended for them.

An exception to § 1926.1419(b) would allow 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 believed 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.

Proposed paragraph (c) would require 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 in order for the incoming signal to be received. C-DAC believed that this provision is needed because the operator must have both hands free to manipulate the equipment's controls.

**Paragraph 1421 Signals – voice signals – additional requirements**

C-DAC considered whether the proposed 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, words or phrases that the Committee might choose to propose to be required as 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 proposed § 1926.1421(a) – (c).

Under proposed paragraph (a), prior to beginning operations, the personnel involved with signals – the crane operator, signal person and lift supervisor (if there is one) – would be 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 in order to avoid miscommunication. Once the parties have met and agreed on the voice signals, another meeting is not required to discuss them unless another worker is substituted, there is some confusion about the signals, or a signal needs to be changed.

In reviewing the C-DAC draft of this provision, the Agency realized that the adjective“voice” was inadvertently left out when referring to signals. To avoid ambiguity, the Agency has added the term “voice" to clarify that this proposed provision applies to the use of voice signals.

Proposed paragraph (b) would require 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.

Proposed paragraph (c) would require the crane operator, signal person, and lift supervisor (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 caused, for example, by the crane operator moving a load in a different direction than the signal person intends.

**Section 1422 Signals – hand signal chart**

This proposed paragraph would require that hand signal charts be either posted on the equipment or be readily available at the site. The purpose of this proposed provision is to serve as a reference for operators and signal persons of the mandatory hand signals and thereby help avoid miscommunication.

**Section 1423 Fall Protection**

This proposed section contains provisions designed to protect workers on equipment covered by this Subpart from fall hazards. (See proposed § 1926.1431, *Hoisting Personnel*, for fall protection provisions that would apply when equipment is used to hoist personnel). Currently, 29 CFR Part 1926 subpart N contains certain fall protection requirements but does not address fall protection for cranes and derricks comprehensively. Where Subpart N does not specifically address a fall protection issue, the general fall protection provisions of 29 CFR Part 1926 subpart M apply. As OSHA explained when it issued subpart M, "while Subpart N contains requirements for fall protection when certain cranes are used, it does not address other equipment or working conditions otherwise covered by subpart N which may also expose employees to a fall hazard." 59 FR 40672, 40675 (Aug. 9, 1994).[54]

The fall protection requirements in Subpart M apply where an employee is on a "walking/working surface." 29 CFR 1926.501. In § 1926.500(b), the definition of walking/working surface excludes "vehicles." That definition effectively excludes many cranes (for example, mobile cranes would be considered "vehicles").

The Committee believed that safety would be enhanced by addressing the problem of fall hazards associated with cranes and derricks comprehensively. In addition, it believed that putting all such requirements under the cranes and derricks standard would make it

[54] In Subpart M, § 1926.500(a)(2) states:

> "Section 1926.501 sets forth those workplaces, conditions, operations, and circumstances for which fall protection shall be provided except as follows:
> * * *
> (ii) Requirements relating to fall protection for employees working on certain cranes and derricks are provided in Subpart N of this part."

easier for employers to readily determine the applicable fall protection requirements. Accordingly, under this proposed standard, Subpart M would not apply to equipment covered by this proposed subpart except where it incorporates requirements of Subpart M by reference. In this regard, note that the Agency is proposing to amend Subpart M at § 1926.500(a)(2)(ii) to remove the word "certain."

**Definition of fall protection equipment**

"Fall protection equipment" is defined in proposed § 1926.1401 as "guardrail systems, safety net systems, personal fall arrest systems, positioning device systems, or fall restraint systems." The first four listed systems are described, and their specifications listed, in 29 CFR Part 1926. Subpart M of this part, OSHA's general fall protection standard for construction work. See § 1926.502(b) (guardrail systems); § 1926.502(c) (safety net systems); § 1926.502(d) (personal fall arrest systems); and § 1926.502(e) (positioning device systems).

The fifth category of fall protection equipment, "fall restraint system," is defined in § 1926.1401 as "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." This definition is found in 29 CFR Part 1926. Subpart R of this part, OSHA's steel erection standard.

By defining "fall protection equipment" to include the same types of fall protection equipment required under other OSHA standards, C-DAC sought to ensure that employers would be familiar with the types of fall protection required under this standard and thereby promote compliance.

**Paragraph 1423(a) Application**

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 (OSHA-2007-0066-0023), and 394 in 2005 (OSHA-2007-0066-0024). 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) (OSHA-2007-0066-0012). 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).

Under proposed paragraph (a), certain proposed provisions in this section (proposed § 1926.1423(c)(1), (f) and (h)) would apply to all equipment, including tower cranes; certain provisions (proposed § 1926.1423(b), (c)(2), (d) and (e)) would apply to all

equipment except tower cranes; and certain provisions (proposed paragraph (g) would apply only to tower cranes).

**Paragraph 1423(b) Boom walkways**

Proposed paragraph (b) would establish when walkways must be incorporated into lattice booms and the criteria for such walkways. Boom walkways are not currently required by subpart N of this part.

Proposed paragraph (b)(1) would require that equipment manufactured more than one year after the effective date of this standard with a lattice boom be equipped with walkways on the boom if the vertical profile of the boom (from cord centerline to cord centerline) is 6 or more feet. C-DAC believed that the installation of walkways on booms would decrease the number of falls which occur during assembly/disassembly, inspection, and maintenance of booms and attached devices. Without a walkway, employees walking the boom must step from lattice to lattice. C-DAC believed it is safer to walk the boom if the boom is equipped with a walkway.

C-DAC considered the technical difficulty of equipping a boom with a vertical profile of less than 6 feet. Such booms would not accommodate the addition of a walkway into their design because the added weight of the walkway would significantly compromise their hoisting capacity. For that reason, C-DAC limited the requirement for boom walkways to equipment with lattice booms where the vertical profile of the boom is 6 feet or more.

Proposed paragraph (b)(2), *Boom walkway criteria*, would establish a minimum width for boom walkways and address safety issues associated with guardrails, railings and other attachments.[55] Proposed §1926.1423(b)(2)(i) would require that walkways on booms be at least 12 inches wide. C-DAC considered requiring boom walkways to be at least 18 inches wide to remain consistent with § 1926.451(b)(2) of the scaffold standard (Subpart L). However, C-DAC determined that there are engineering limitations applicable to booms that are not applicable to scaffolds. Specifically, the Committee found that an 18 inch requirement would present feasibility problems, especially on smaller booms. In such cases an 18 inch walkway's added weight would unduly impinge upon the equipment's capacity.

C-DAC believed that a walkway with a 12 inch width, while not as easy to use as an 18 inch walkway, would provide enough space for an employee to maintain his/her balance while walking from point to point on the boom when the boom is positioned horizontally. This would be a significant improvement over having to step across the open space between the boom's lattice-work and onto the lattice. In sum, the Committee concluded that the benefits obtained by providing a walkway on booms outweigh any drawbacks associated with a minimum width of 12 inches. Note that, in many circumstances, the safety benefits afforded by this walkway would be supplemented by fall protection equipment (see the discussion below of proposed paragraphs (d) and (e)).

[55] These criteria would apply to all boom walkways, not just those on lattice booms.

Proposed paragraph (b)(2)(ii) would address the use of guardrails, railings and other permanent fall protection attachments along walkways. The general fall protection standard for construction work at § 1926.501(b)(6) requires that walkways be equipped with guardrail systems to protect workers against falling 6 feet or more. This proposed section would retain the general requirement for fall protection at or above 6 feet for certain work (see discussion below of § 1926.1423(d)), but C-DAC believed that guardrails should not be a required form of fall protection on boom walkways because of the feasibility constraints discussed below.

Proposed paragraph (b)(2)(ii)(A) states that guardrails, railings and other permanent fall protection attachments along boom walkways would not be required. For some equipment, the added weight of fixed railings, combined with the walkway's weight, would unduly impinge upon the lift capacity of the boom. In addition, as discussed in relation to § 1926.1423(b)(2)(ii)(B) below, in some boom designs pendant ropes and bars (where present) could become snagged on such railings.

Proposed paragraph (b)(2)(ii)(B) would prohibit guardrails, railings and other permanent fall protection attachments along walkways on booms supported by pendant ropes or bars if the guardrails, railings or attachments could be snagged by the ropes or bars. Such snagging could cause instability or a collapse. Whether the potential for snagging is present on a boom supported by pendant ropes or bars would depend on the design of the equipment.

Proposed paragraph (b)(2)(ii)(C) would prohibit removable-type guardrails, railings, and other permanent fall protection along walkways. For purposes of this paragraph, "removable-type" means designed to be installed and removed each time the boom is assembled/disassembled. One of the Committee's concerns was that such devices may be left installed by mistake, which could damage the equipment and cause unexpected movement or a failure during its operation.

Under proposed paragraph (b)(2)(ii)(D), where guardrails or railings are not prohibited, they would be permitted to be of any height up to, but not more than, 45 inches. C-DAC believed that requiring all guardrails and handrails to comply with the height criteria in Subpart M of this part, which generally requires them to be 39 to 45 inches high, could deter manufacturers from equipping their products with guardrails and handrails. That is because meeting Subpart M's height criteria could make the device incompatible with the design and operation of the boom. For boom walkway applications, C-DAC concluded that using guardrails lower than 39 inches when higher guardrails are infeasible was preferable to not having any guardrails at all.

**Paragraph 1423(c) Steps, handholds, grabrails, guardrails and railings**

Proposed paragraph (c) would specify criteria for the use and maintenance of steps, handholds, grabrails, guardrails and railings.

Proposed paragraph (c)(1) would require that the employer maintain originally-equipped steps, handholds, ladders and guardrails/railings/grabrails in good condition. The failure to properly maintain such devices could pose dangers to the employees who use them. For example, a grabrail that has become weakened from rust could fail when an employee uses it, which could cause the employee to fall. Another example is a missing railing. A manufacturer that integrated a railing into its design may have provided a walking surface that would otherwise be too narrow to be safe.

Proposed paragraph (c)(2) would require that equipment manufactured more than one year after the effective date of this standard be equipped to provide safe access and egress between the ground and the operator work station(s), including the forward and rear operator positions, by the provision of devices such as steps, handholds, ladders, and guardrails/railings/grabrails. As discussed below, proposed § 1926.1423(c)(2)(i) would require these devices to meet updated design criteria.

Currently, § 1926.550(a)(13)(i) in Subpart N requires that guardrails, handholds, and steps be provided on cranes for easy access to the car and cab and specifies 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 believed 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 would be required under this proposal. Accordingly, the proposal would allow one year from the date of the published final rule for equipment to be manufactured with devices that conform to proposed 1926.1423(c)(2)(i), discussed next. This would give equipment manufacturers adequate time to incorporate the requirements of § 1926.1423(c)(2)(i) into their products.

Proposed paragraph (c)(2)(i) would require that steps, ladders and guardrails/railings/ grabrails meet the requirements of SAE J185 (May 2003) or ISO 11660-2 (1994). OSHA's construction standards contain specifications for stairways and ladders in 29 CFR Part 1926 subpart X, but C-DAC believed that the Subpart X requirements do not take into account the characteristics of the equipment covered by this proposed standard. The specifications in SAE J185 are referenced in industry consensus standards, such as ASME B30.5-2004, "Mobile and Locomotive Cranes," and crane manufacturers are familiar with those requirements. C-DAC recommended alternatively allowing compliance with ISO 11660-2 since employers also use equipment built by foreign manufacturers who have been following that standard.

Under proposed paragraph (a) of this section, the requirements in proposed paragraph § 1926.1423(c)(2) do not apply to tower cranes. It is the Agency's understanding that C-DAC excluded tower cranes from these requirements because the SAE and ISO standards

referenced in § 1926.1423(c)(2)(i) are designed for, and only address, mobile cranes. The Agency also believes that the lack of a similar provision in the C-DAC document designed for tower cranes was an oversight; tower cranes also need to be equipped with safe stairways and ladders to enable the operator to ascend to the cab and descend safely.[56] Accordingly, OSHA plans to include a requirement similar to § 1926.1423(c)(2) that would be applicable to, and designed for, tower cranes, and requests public comment on this issue.

Proposed paragraph (c)(2)(ii) would require 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). Section 1926.550(a)(13)(iii) of Subpart N of this part requires 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 would be required by this proposed section. OSHA continues to believe that compliance with this provision would 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 proposed section.

**Paragraph 1423(d) Fall protection requirements for non-assembly/disassembly work**

[56] Note that section 3-1.17.2 of both the 1996 and 2004 versions of ASME B30.3, "Construction Tower Cranes," calls for access ladders to the cab, machinery platform, and tower to conform to ANSI A14.3 or to SAE J185.

Proposed paragraph (d) 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 would be 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 subpart M, which generally requires fall protection at heights at and above 6 feet, as much as possible. (As discussed below, for A/D work, the Committee recommended fall protection beginning at 15 feet). C-DAC also believed that, in its view, operators do not need to be tied off while moving to and from their cabs, and the proposal would make this clear by requiring fall protection equipment only when employees are moving point-to-point on booms or while at a work station (with certain exceptions). The Committee believed that the steps, handholds, and railings required under proposed § 1926.1423(c) would protect operators moving to and from their workstations and eliminate the need for additional fall protection equipment.

**Paragraph 1423(d)(1) Non-assembly/disassembly: moving point to point**

Proposed paragraph (d)(1)(i) would require 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). As defined in § 1926.1401,

"moving point to point" means "the times during which an employee is in the process of going to or from a work station."

C-DAC believed 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 proposal would require fall protection above 6 feet in height.

Proposed paragraph (d)(1)(ii) would require employers to provide and ensure the use of fall protection, beginning at 6 feet, when employees must move point to point on lattice booms that are not in a horizontal position. 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 believed 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.

It is the Agency's understanding that, 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. 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. 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 believes 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 believes 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, the Agency notes 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 requests public comment on whether proposed § 1926.1423(d)(1)(ii) 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.

**Paragraph 1423(d)(2) Non-assembly/disassembly: while at a work station**

Proposed paragraph (d)(2) would require 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. An example of being at a work station is the following: An employee is assigned to replace a cotter pin for a sheave at the end of a boom. The employee's "work station" on the boom for this task will be the point where, after the employee has traversed the boom or climbed on from a ladder, the

employee performs that task. Because the employee is using one or both hands to perform the task, there is a heightened risk of falling.

Since the work is typically done while the employee is sitting or lying on or inside the boom and is stationary while doing the task, there is normally no difficulty in setting up the personal fall protection system so that it would prevent the worker from contacting the next lower level. Therefore, this proposed provision does not distinguish between work stations based on boom type or whether the boom is horizontal or elevated. For work stations on other parts of the equipment, the Committee concluded that there is normally some suitable point available to which a personal fall arrest system can be anchored.

Fall protection would not be required near draw-works when the equipment is running because of the danger that moving parts could catch a safety lanyard and pull the worker into moving machinery. This danger is present when parts in the draw works are moving. It is also present when the equipment is running and the draw works parts are not moving because of the potential that someone will activate those parts.

Fall protection would not be required when the employee is in a cab because the employee is not exposed to a fall hazard in that instance. Fall protection would also not be required for employees on decks, since the Committee believed that equipment is typically designed so that employees on the deck are not exposed to a fall hazard.

As discussed earlier, C-DAC was convinced that the steps and railings required by this proposed standard would provide adequate fall protection to operators going to and from their workstations. Therefore, fall protection (apart from those devices) would not be required for operators while moving point-to-point between the ground and the operator work station(s).

**Paragraph 1423(e) Assembly/disassembly**

Proposed paragraph (e) would require the employer to provide and ensure the use of fall protection equipment during 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.

The principal problem with the use of fall protection during assembly/disassembly below 15 feet is the difficulty in setting up a personal fall protection system that allows a significant degree of movement on a boom in this height range (which is usually of the lattice type) and also prevents the employee from contacting the next lower level. Unlike employees who work at a stationary work station, employees engaged in assembly/disassembly work typically have to move a significant amount to accomplish the work.

Consequently, the degree of movement that the protection system needs to provide to the employee is more similar to what is needed when moving point-to-point on a boom than working at a work station. As discussed above, the characteristics of lattice booms make it more difficult to set up such systems than in other situations.

The exception to the requirement for fall protection when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck is based on the same considerations discussed above with respect to proposed § 1926.1423(d)(2).

**Paragraph 1423(f) Anchorage criteria**

Proposed paragraph (f) would specify criteria for anchorage points used in personal fall protection systems. [57]

Proposed paragraph (f)(1), *Anchorages for fall arrest and positioning device systems*, contains requirements for anchorage points used in fall arrest and positioning device systems. Proposed § 1926.1423(f)(1)(i) would 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

[57] "Personal fall arrest system" is defined in § 1926.1401 of this proposed standard as "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." This definition is taken from § 1926.500(b) of Subpart M. As with other definitions applicable to this section, C-DAC used terminology that is familiar to the industry to provide clear notice of the standard's requirements and promote compliance.

not be met. 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 proposed standard are 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 believed that the proposed § 1926.1423(f)(1)(i) criteria was 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.

Proposed paragraph (f)(1)(ii) would require that attachable anchor devices (portable anchor devices that are attached to the equipment) meet the applicable anchorage criteria in § 1926.502. These criteria are the same as those discussed in the previous paragraph for fall arrest and fall positioning systems.

Proposed paragraph (f)(2), *Anchorages for restraint systems*, would require 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 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. C-DAC believed that having the anchorage support twice the maximum anticipated load will provide an adequate margin of safety when a restraint system is used.

**Paragraph 1423(g) Tower cranes**

Proposed paragraph (g) would specify fall protection requirements specific to tower cranes. Note that the terminology "erecting" and "dismantling" is used with regard to tower cranes rather than "assembly" and "disassembly;" this terminology reflects the industry's use of these terms.

**Paragraph 1423(g)(1) Non-erecting/dismantling**

Proposed paragraph (g)(1) addresses fall protection requirements for non-erecting/dismantling work. The employer would be 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.

As discussed above, for equipment other than tower cranes, there were various factors that prompted C-DAC to agree on different requirements for moving point-to-point than when working at a work station. Those factors, however, are not present in tower cranes.

For example, when moving point-to-point on the jib (or boom) or on the tower, there are no feasibility constraints to being protected. There are numerous areas on the jib to which an employee can anchor personal fall arrest equipment as the employee walks out and back on the jib (or boom) on a tower crane. Also, by standard industry practice, the counter-jib[58] is usually equipped with a walkway and railings. If the employee needs to traverse in an area that is off the walkway, other fall protection can be used, such as a personal fall arrest system. Since the jib (or boom) once erected is much higher than 6 feet from the next lower level, there is plenty of room for the arrest system to operate without allowing the employee to strike the next lower level.

Moving point-to-point on the tower is typically done either using the ladder or stair system provided within the tower, or (in some situations) moving on a tower section. When moving on a tower section, because the sections are vertical, there is always a point above the employee's feet to which the arrest system can be anchored. There is therefore no need for stanchions or other equipment to set up the system to prevent the employee from striking the next lower level.

The exception to the proposed provision for fall protection when the employee is at or near draw-works (when the equipment is running), in the cab, or on the deck is based on the same considerations discussed above with respect to proposed § 1926.1423(d)(2). The Agency notes that its understanding of the location of "the deck" on a tower crane is the walking/working area on the counter-jib.

[58] At the top of the tower, there is a long horizontal structure that supports the load (the "jib" or, if the luffing type, the "boom"), and a shorter horizontal structure that supports the counterweights, which is referred to as the "counter-jib."

**Paragraph 1423(g)(2) Erecting/dismantling**

This proposed paragraph specifies that, for erecting/dismantling work, employers must provide, and ensure 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.

On tower cranes, almost all of the erecting/dismantling work that takes place below 15 feet occurs in connection with erecting or dismantling the sections of the jib (or boom), which is usually done on the ground. In this respect the erecting/dismantling process is similar to the assembly/disassembly of other types of cranes. Therefore, the same reasons for setting a 15 foot threshold for requiring fall protection for assembling/ disassembling non-tower cranes (see discussion of proposed paragraph (e) above) are also the basis for proposing to require fall protection beginning at 15 feet for erecting and dismantling tower cranes.

The Agency notes 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. OSHA is unaware of any reason why these exceptions would not be equally applicable here, and asks for public comment on whether they should be added to proposed § 1926.1423(g)(2).

**Paragraph 1423(h) Anchoring to the load line**

Proposed paragraph (h) would permit 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. Currently, in Subpart M of this part, § 1926.502(d)(23) prohibits personal fall arrest systems to be attached to "hoists except as specified in other subparts of this part." Subpart N does 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 is currently prohibited by Subpart M.

OSHA has received a number of 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 believed that the hook or load line of a crane could be used safely as an anchor point under the conditions proposed in the rest of this paragraph.

Proposed paragraph (h)(1) would allow 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 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 had sufficient capacity to meet those criteria, there is no reason to prohibit its use for this purpose.

The criteria in § 1926.502(d)(15) were developed to ensure that fall protection anchorages provide adequate employee protection. 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 C-DAC's view, determining whether those criteria are met when anchoring to the hook or load line requires the expertise of a qualified person.

Proposed paragraph (h)(2) would require that the equipment operator be at the work site and informed that the equipment is being used to anchor a 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.

**Section 1424 Work area control**

Proposed paragraph (a) addresses the hazard of employees being struck, pinched-between or crushed when within the swing radius of the equipment's rotating superstructure. Proposed 1926.1424(a)(1) states that the precautions in § 1926.1424(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.

Currently, § 1926.550(a)(9) provides: "Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane." In proposed § 1926.1401, "superstructure" is defined as a synonym for "upperworks" and "upperstructure." Under this definition, all three terms mean the following: "the revolving frame of equipment on which the engine and operating machinery 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."

The Committee agreed that barriers around danger areas are a viable, safe option, but they also agreed that such barriers are not always feasible and that, in such cases, there needs to be alternative means of protecting the employees. In addition, C-DAC was concerned that the language "accessible areas within the swing radius . . . ." would require that all areas accessible to an employee within the swing radius would have to be protected, irrespective of whether an employee could be injured while in such an area. C-DAC viewed such a requirement as overly broad and unnecessary.

The Committee drafted the proposed requirement so that protective measures would be required for accessible areas that pose a "reasonably foreseeable risk" that an employee would be struck or pinched/crushed. The principle of reasonably foreseeable risk is one that is well established in Occupational Safety and Health Review Commission caselaw and in the courts of appeals. For example, in *Pete Miller Inc.*, 19 O.S.H.C. (BNA) 1257, 1258 (Rev. Comm'n 2000), the Review Commission stated that a violation occurs when "it is reasonably predictable either by operational necessity or otherwise (including inadvertence), that employees have been, are, or will be in the zone of danger." [59] The following are two illustrative examples of the application of this principle to the swing radius provision:

Illustrative example #1: The bottom of the rear of the rotating superstructure of crane A is 12 feet above the ground. An employee standing on the ground within that swing radius could not be struck by the rotating superstructure since the rotating superstructure would swing well above him/her. There is nothing within that area on which the employee could stand. In this example the area does not pose a reasonably foreseeable risk of the employee being struck or pinched/crushed.

Illustrative example #2: Same scenario as example #1 above, except that a truck with material that is to be unloaded from its bed is within the swing radius. If an employee were to stand on the truck bed the employee would be within the swing radius. In this

[59] See also, *Daniel Int'l Corp. v. Donovan*, 705 F.2d 382, 388 (10th Cir. 1983); *Mineral Indus. & Heavy Constr. Group v. OSHRC*, 639 F.2d 1289, 1294 (5th Cir. 1981).

example there is a reasonably foreseeable risk of an employee being struck or pinched/crushed.

Under proposed paragraph (a)(2), the employer would be required to institute two types of measures to prevent employees from entering these hazard areas. Specifically, under proposed § 1926.1424(a)(2)(i), the employer would have to train employees assigned to work on or near the equipment in how to recognize these areas. The Committee believed that employees need to understand and appreciate the risk posed by the rotating superstructure for the other precautions required by § 1926.1424(a)(2)(ii) to be effective.

Proposed paragraph (a)(2)(ii) would require 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 would be 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 would have to train employees to understand what those markings signify.

To help prevent struck-by and crushed-by injuries and fatalities, C-DAC concluded that it is necessary to address the protection of employees who must sometimes enter the hazard area to perform work. Proposed § 1926.1424(a)(3) is designed to help protect such employees by ensuring that there is adequate communication and coordination between the operator and the employee in the danger area.

Under proposed paragraph (a)(3)(i), if an employee is going to go to a location in a hazard area that is out of view of the operator, before that employee goes in that area the employee (or someone instructed by the employee) would have to ensure that the operator is informed that the employee is going to that location. Since the operator will typically be under the assumption that no one is in that area, informing the operator that an employee is going to enter the hazard area is an essential first step in preventing the operator from moving the superstructure and causing injury to that employee.

Under proposed paragraph (a)(3)(ii), once informed that an employee is going to enter a hazard area out of the operator's view, the operator would be prohibited from rotating the superstructure unless and until he/she gives a warning that the employee understands is a signal that the superstructure is about to be rotated and gives the employee time to get clear.

Alternatively, the operator may rotate the superstructure if informed in accordance with a pre-arranged system of communication that the employee 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 would need to be designed so that this all-clear

signal could not be confused with a horn signal from some other employee for another purpose.

Proposed paragraph (b) addresses 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 controlling entity would be required to coordinate the operations of these pieces of equipment. In the event that there is no controlling entity, the employer or employers operating the equipment would be required to institute a coordination system.

C-DAC's language for proposed paragraph (b) refers to "employers operating the equipment" but does not address a situation in which only one employer is operating the multiple pieces of equipment. It appears to the Agency that a coordination system is also needed in that situation. OSHA is considering revising the C-DAC language to make clear that such an employer would be required to institute a coordination system. Proposed § 1926.1424(b) could be revised in this regard as follows:

> (b) Multiple equipment coordination. Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity shall 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, shall institute such a system. (Emphasis added).

OSHA requests public comment on whether such a revision should be made.

**Section 1425 Keeping clear of the load**

Currently, 29 CFR Part 1926 subpart N at § 1926.550(a)(19) states: "All employees shall be kept clear of loads about to be lifted and of suspended loads." C-DAC believed that compliance with this provision is infeasible in certain circumstances. For example, many urban construction sites have a relatively small footprint with numerous construction employees throughout the site. These sites are typically bounded on all sides by roads and sidewalks with high concentrations of pedestrian and vehicular traffic. In such circumstances it is not always possible to route a suspended load in such a way that all employees will be clear of the load at all times. In addition, meeting that objective may sometimes conflict with meeting local requirements regarding public safety.

C-DAC also believed that employers have a greater ability to avoid having static suspended loads over employees than moving loads, since a static suspended load usually affects a much smaller area. Furthermore, in a static situation, it is possible to limit the number of employees in the fall zone to only those whose jobs involve the handling of the load and therefore require them to be in that area at that time. Accordingly, this proposed section is designed to account for these considerations and protect employees to the extent feasible.

**Paragraph 1425(a)**

Proposed paragraph (a) would require the employer to use hoisting routes that minimize employee exposure to hoisted loads to the extent consistent with public safety. This provision addresses the fact that in many situations, especially urban construction sites with high concentrations of employees throughout the site, it is not feasible to prevent all employees from being exposed to hoisted loads that are moving at all times (see discussion above).

Also, C-DAC recognized that there could be situations where minimizing employee exposure to hoisted loads would be in conflict with local requirements regarding public safety, as when an alternative route would take the load over a street with public traffic. The Committee wanted to make clear that choosing a route that would endanger the public was not required.

**Paragraph 1425(b)**

Proposed paragraph (b) addresses those situations where the equipment operator is not actually engaging the controls to move the load. In such situations, the load affects a more limited area then when it is moved up or horizontally. Consequently, C-DAC determined that, in these static situations, it is feasible to preclude most employee exposure to the load's fall zone. The only exceptions are employees engaged in the types of activities specified in proposed § 1926.1425(b)(1) through (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 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. As discussed above in relation to § 1926.1424, *Work area control*, the concept of "reasonably foreseeable" risk is well established in OSHA law.

Proposed paragraph 1425(b)(1) would permit employees engaged in hooking, unhooking or guiding a load to be within the fall zone while engaged in these activities. Hooking or unhooking a load sometimes requires an employee to be within the fall zone of a load. For example, where a lifting accessory is used, the employee will typically be under the fall zone of the lifting accessory when attaching or unhooking the load. Also, guiding a load, even with a tag line, sometimes necessitates that the employee be positioned within the fall zone, especially when the work area below is restricted in size.

Proposed paragraph (b)(2) would permit employees engaged in the initial attachment of the load to a component or structure to be within the fall zone. One example is the

following scenario: 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.

Proposed paragraph (b)(3) would allow 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.

**Paragraph 1425(c)**

Proposed paragraph (c) deals with the situations addressed in paragraphs 1425(b)(1) and (b)(2). The Committee felt that additional requirements were necessary to ensure employee safety in these situations, given the additional risks posed while loads are being connected to equipment or structures.

Proposed paragraph (c)(1) would require 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.

Proposed paragraph (c)(2) would require the use of hooks with self-closing latches or their equivalent be used, to prevent accidental failure of the hooks. However, "J" type hooks would be 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.

Proposed paragraph (c)(3) would require the use of a qualified rigger in the rigging of materials in the situations addressed by proposed § 1926.1425(c). By ensuring that the load is rigged in as safe a manner as possible, this requirement serves to reduce the risk of injury to workers who cannot perform their duties outside of the fall zone, and reduces the potential size of the fall zone.

Section 1401 of this proposed standard defines a "qualified rigger" as a rigger who meets the criteria for a qualified person. The same definition is found in subpart R of 29 CFR Part 1926, Steel Erection at § 1926.753(c)(2).

**Paragraph 1425(d) Receiving a load**

Proposed paragraph (d) would prohibit all employees except those needed to receive a load from being in the fall zone when it is being landed. An employee receiving a load will typically need to be within the fall zone when it is being landed because that is the time when the load needs to be guided to a specific landing point.

**Paragraph 1425(e)**

Proposed 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, 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. [60] Note that the requirements in this proposed paragraph would 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, proposed § 1926.1425(e)(1) provides that no employee shall 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." This provision will avoid having employees in the area that presents the greatest danger in the event of a loss of control of the load.

While C-DAC determined that tilt-up and tilt-down operations can be accomplished without anyone being directly under the load, it also found that the operation is at times infeasible unless one or more employees "essential to the operation" needs to be

[60] Proposed § 1926.1401 defines "tilt up or tilt down operation" as "raising/lowering a load from the horizontal to vertical or vertical to horizontal."

elsewhere within the fall zone. Proposed § 1926.1425(e)(2) therefore provides that employees "essential to the operation" may be in the fall zone (but not directly under the load ) during a tilt up or tilt down operation.

The C-DAC document does not contain a definition of "essential to the operation." Consequently, the proposed provision does not specify what job functions would be permitted to be performed from within the fall zone. OSHA believes that examples of an employee "essential to the operation" is an employee who must be within the fall zone because it is infeasible to conduct the following operations from outside the fall zone: (1) physically guide the load; (2) closely monitor and give instructions regarding the load's movement; and/or (3) either detach it from or initially attach it to another component or structure. OSHA requests public comment on whether there are other activities that are essential to this operation and are infeasible to be done from outside the fall zone, and whether it would be appropriate to add a definition of "essential to the operation" to the standard.

A note to paragraph (e) refers to § 1926.1426, which addresses free fall of the boom and the load. As discussed below, it specifies that employees may not be anywhere in the fall zone of a boom that is designed to free fall, and that employees are never to be directly under the load during free fall of the load line hoist.

**Section 1426 Free fall and controlled load lowering**

This proposed 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, in 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 of the load or hoisting equipment. This proposed section would prohibit use of live booms in most circumstances. An exception is provided for older equipment manufactured before the ANSI B30.5 series prohibited free fall of the boom for all hoisting operations, but only under limited conditions that do not create hazards to employees. A limited exception is also provided for floating cranes/derricks. This proposed section includes many of the modern protective methods and mechanisms included in ASME B30.5-2004.

This section also, in § 1926.1426(d), would specify the circumstances under which free fall of the load line would be prohibited.

**Paragraph 1426(a) Boom free fall prohibitions**

Under proposed paragraph (a)(1), the use of equipment in which the boom is designed to free fall would be prohibited under six specified conditions. C-DAC concluded that, in

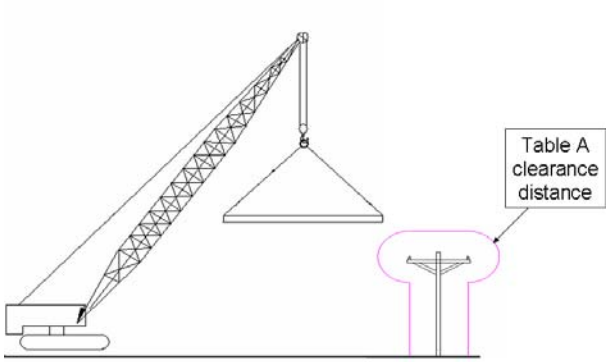
these six circumstances, free fall of the boom needs to be prohibited regardless of what type of equipment is used and when that equipment was manufactured.

Proposed paragraph (a)(1)(i) would prohibit 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 proposed § 1926.1425(b). Section 1926.1425, *Keeping clear of the load*, of this proposed standard recognizes that there are some situations in which certain employees need to be positioned in the fall zone in order to perform their assigned duties. However, the likelihood that an employee would sustain a serious injury or be killed in the event of a falling boom is very high when an employee is in the fall zone of the boom or load.

Because the likelihood of a falling boom is higher when a live boom is in use, C-DAC believed it was necessary to prohibit employees from being in the fall zone whenever a live boom is being used, without exception. Therefore, the exceptions listed in proposed § 1926.1425 that would permit employees to be in the fall zone in certain circumstances apply only where a non-live boom is being used.

Proposed paragraph (a)(1)(ii) would prohibit use of a live boom when an employee is being hoisted. This continues the current prohibition in § 1926.550(g)(3)(i)(F) of subpart N of this part, which is designed to prevent hoisted employees from being seriously injured or killed if the boom were to fall.

Proposed paragraph (a)(1)(iii) would prohibit 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 proposed §§ 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.

C-DAC recognized that a live boom that is over a power line, or that is suspending a load that is over any part of the area extending the Table A clearance distance to each side of the power line, could fall or cause the load to fall into electrical contact with a power line.

The C-DAC draft of this provision stated: "The load or boom is directly over a power line, or over the area extending the Table A clearance distance to each side of the power line." Since C-DAC's intent was to prohibit the boom or load from being over **any part**

of the area extending the Table A clearance distance to each side of the line, OSHA has changed this language to make clear that the prohibition applies with respect to the boom or load being above "any part of" that area.

In reviewing this provision, OSHA realized that there appears to be another circumstance when a fall of the boom could cause the load or boom to breach the Table A clearance distance. This would occur as follows: Neither the boom nor load is over the power line or over the Table A clearance area. However, the Table A clearance distance is within the radius of vertical travel of the boom or load. This circumstance is depicted in the following illustrations:

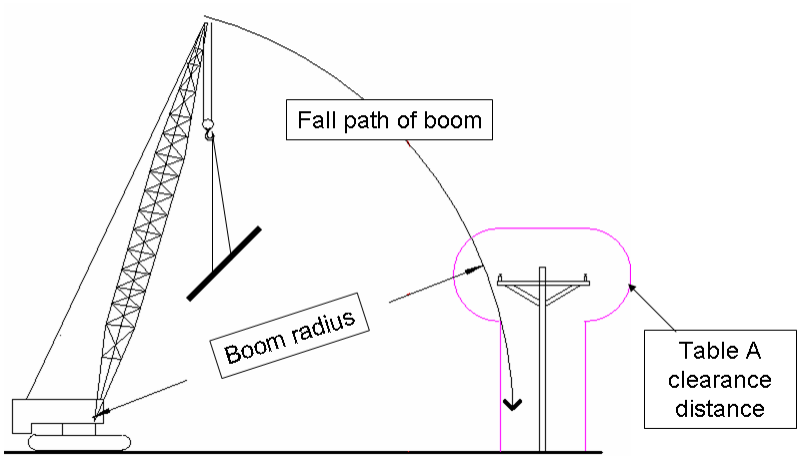
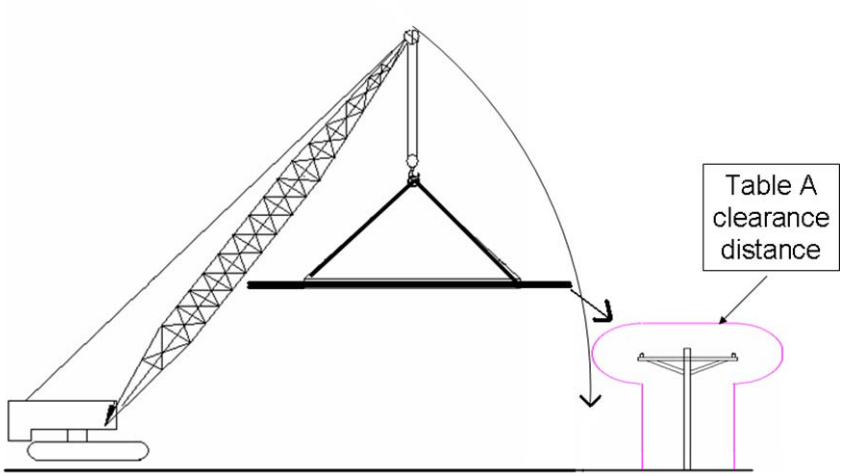



Illustration A:

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.

The Agency therefore requests public comment on whether proposed § 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 clearance distance.

Proposed paragraph (a)(1)(iv) would prohibit use of a live boom where the load is over a shaft. As discussed in relation to § 1926.1426(a)(1)(i) of this proposed section, C-DAC recognized that there are situations where employees must be in the fall zone of a suspended load. One particular scenario is when employees must receive a load that is lowered into a shaft. Such employees would be at a particularly high risk of being killed or injured by a free falling boom because the shaft severely limits or eliminates any ability to get out of the way.

Proposed paragraph (a)(1)(v) would prohibit free fall of a boom when the load is over a cofferdam, except where there are no employees[61] in the fall zone. 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, because 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 contains an exception for situations where there are no employees in the fall zone.

Proposed paragraph (a)(1)(vi) would prohibit use of a live boom for lifting operations in a refinery or tank farm. C-DAC was concerned that 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.

[61] The C-DAC draft of this provision used the term "workers;" this has been changed to "employees," which is the more appropriate term in light of the language in the Occupational Safety and Health Act.

Proposed paragraph (a)(2) is an exclusive list of conditions under which the use of cranes with live booms would be permitted. C-DAC believed that cranes with live booms could be used safely under some circumstances and did not believe that the cost of replacing or retrofitting all existing such equipment was justified as long as the use of live boom equipment was limited to those circumstances.

Proposed paragraph (a)(2)(i) would allow 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 proposed § 1926.1426(a)(1) are present. C-DAC noted that ANSI B30.5 first prohibited live booms in its 1972 version and reiterated the prohibition in the 1982 edition, which was published on October 31, 1983 and became effective on October 31, 1984.

C-DAC concluded that manufacturers would have begun to phase out live-boom equipment when ANSI first prohibited its use in 1972 and that little, 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, C-DAC concluded that most equipment manufactured after October 31, 1984 would not have live booms. Proposed § 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.

Proposed paragraph (a)(2)(ii) would allow 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 proposed § 1926.1426(a)(1) are present.[62] C-DAC noted that equipment used on the water commonly has a live boom. This is because the dynamics of load transfer while on water (from side to side), as well as unexpected wave action, which can cause rapid changes in list and trim, 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. As a result, C-DAC concluded that there is no need to alter current industry practice in this regard as long as none of the circumstances listed in § 1926.1426(a)(1) are present.

**Paragraph (b) Preventing boom free fall**

Proposed paragraph (b) sets criteria for preventing boom free fall. A boom that meets this criteria is considered to be designed to not free fall. The criteria consist of requirements for a secondary system for controlling the boom's descent in addition to the equipment's primary system. The Committee believed that the hazard posed by a failure of the primary system for holding or regulating the boom is so significant that the availability of a secondary mechanism needs to be required.

[62] OSHA has modified the language used in the C-DAC version of this provision to conform to the terminology used in proposed § 1926.1437, *Floating cranes and land cranes on barges*.

Proposed paragraph (b)(1)(i) specifies that a friction drum must have both a friction clutch and a braking device, to allow for controlled boom lowering. These provisions are similar to those in section 5-1.3.2(a)(1) and (a)(4) of ANSI B30.5-1968 and ASME B30.5-2004. Proposed § 1926.1426(b)(1)(ii) would require friction drums to also have 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). In the view of the Committee these have been well established as effective for this purpose.

Proposed paragraph (b)(2) would require hydraulic drums to have an integrally mounted holding device or internal static brake to prevent boom hoist movement in the event of hydraulic failure. The requirements of this proposed paragraph are similar to those in section 5-1.3.1(d) of ASME B30.5-2004. The hazard presented by this type of hoisting system is that once the hydraulic system fails, the boom hoist drum could free spin and allow the boom to free fall.

Proposed paragraph (b)(3) states that clutches or hydraulic motors do not qualify as brakes or locking devices for purposes of this subpart. C-DAC believed the use of clutches or hydraulic motors for such purposes would accelerate the wear of these systems and increase the risk they will fail when they are needed to control the lowering of the boom.

Proposed paragraph (b)(4) would require hydraulic boom cylinders to have an integrally mounted holding device. An integrally mounted holding device would secure the boom from pivoting down in the event that hydraulic pressure is lost. This requirement is similar to section 5-1.3.1(d) of ASME B30.5-2004.

**Paragraph 1426(c) Preventing uncontrolled retraction**

Proposed paragraph (c) would require 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. This proposed provision is similar to section 5-1.3.3(c) of ASME B30.5-2004.

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 believes that this language was unintentionally broad in that it refers to any "boom movement." The purpose of proposed § 1926.1426(b)(4) is, as discussed above, to prevent the boom from pivoting down in the event of hydraulic failure. Therefore, there is no need for proposed § 1926.1426(c) to also require a device to prevent that type of boom movement.

The Agency's understanding is that the purpose of proposed § 1926.1426(c) is, as reflected in C-DAC's heading ("Preventing uncontrolled retraction"), to prevent a telescoping hydraulic boom from retracting in the event of hydraulic failure. Therefore, OSHA has 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. OSHA requests public comment on the appropriateness of this change.

**Paragraph1426(d) Load line free fall**

Proposed paragraph (d) lists circumstances under which free fall of the load line hoist is prohibited and controlled load lowering is required. "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 with boom free fall, however, is that free fall of the load line endangers a smaller area. 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 comparatively large.

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. C-DAC therefore concluded that it would be appropriate to have a more limited prohibition compared with use of a live boom. This is reflected in the prohibition in proposed § 1926.1426(d)(1) against an employee being directly under the load. That provision is more limited than proposed § 1926.1426(a)(1)(i), which would prohibit an employee from being in the fall zone of the boom or load.

Similarly, unlike the live boom provisions, proposed § 1926.1426(d) does not include a prohibition against use of load line hoist free fall in a refinery or tank farm. Because of the more limited affected area, the operator can more readily set up the equipment so that, in the event of a load line free fall, the affected area will not include safety critical refinery or tank equipment.

However, paragraphs (d)(2), (3), and (4) are similar to the boom free fall prohibitions in that they prohibit free fall of the load line when (1) an employee is being hoisted; (2) the load 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; and (3) the load is over a shaft or cofferdam.

The C-DAC draft of proposed paragraph (d)(3) stated: "The load is directly over a power line, or over the area extending the Table A clearance distance to each side of the power line." As discussed above, C-DAC's intent was to prohibit the load from being over *any part* of the area extending the Table A clearance distance to each side of the line, and

OSHA has therefore changed this language to make clear that the prohibition applies with respect to the load being above "any part of" that area.

In reviewing proposed paragraph (d)(4), OSHA noted that it would prohibit load line free fall over a shaft or cofferdam, but contains no exception regarding cofferdams in which there is no employee in the fall zone. In this respect this provision is broader than the live boom provision in proposed § 1926.1426(a)(1)(v), which does contain such an exception. OSHA requests public comment on whether proposed § 1926.1426(d)(4) should be modified to include such an exception.

**Section 1427** Operator qualification and certification

Proposed § 1926.1427 addresses the safety concerns created by under-qualified crane operators. In the Committee's experience, human error resulting from insufficient operator knowledge and capability is a significant cause of fatal crane/derrick accidents. It concluded that a verified testing process is essential for ensuring sufficient knowledge and capability of crane/derrick operators and would be an effective and efficient way to reduce these accidents.

The Committee's view was based on the extensive collective experience of the Committee members. Members expressed the belief that crane/derrick safety depends heavily on the operator having the knowledge and ability to implement safe operation

practices. For example, an operator who does not know how to properly use load charts could miscalculate the capacity of the crane and inadvertently overload the equipment. An operator who lacks the knowledge and skill to control and manipulate a load could lose control of it, causing other employees to be struck by the load or the equipment.

In addition, knowledge and skill is needed to prevent electrical contact with power lines (see the discussion above regarding proposed §§ 1926.1407 – 1411). For example, an operator who does not understand an operational/performance characteristic such as dynamic loading may inadvertently allow the boom to get too close to a power line. This could occur where the operator failed to account for the fact that, under certain conditions, the boom would flex and so continue to move towards the line after the operator had stopped the superstructure's rotation.

Similarly, understanding and being able to minimize such effects is important in situations such as blind picks, where the operator will be relying on information relayed to him/her by a signal person.

The Committee considered whether it would be sufficient to set testing criteria without a third-party (that is, independent) verification mechanism, and determined that such an approach was not likely to be effective in ensuring sufficient operator qualifications. During the Committee's deliberations, members expressed a concern that testing conducted without a check on the quality of the test, both respect to its content and administration, has been ineffective in ensuring that crane operators are qualified to

operate the equipment safely. Members noted that operator "certification" cards are easily obtained from various Internet sites without having to pass a credible test. They also noted that the current OSHA standards, which require employers to instruct employees on the hazards involved with crane operation, and require the employer to permit only those employees qualified by training or experience to operate equipment,[63] but do not require testing verified by a third party, has been generally ineffective in ensuring an adequate degree of consistency with respect to crane operator knowledge and ability. The Committee concluded that significant advances in crane/derrick safety would not be achieved unless such testing was required.

The Committee was aware that testing of equipment operators by an impartial party 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. An example is the Department of Transportation's requirements for over-the-road commercial drivers' licenses ("CDL"). These are designed to reduce the incidence of serious accidents caused by unqualified drivers of vehicles such as trucks and buses. These requirements, codified at 40 CFR Part 383, require drivers of commercial motor vehicles to have state licenses that are issued in accordance with federal standards for qualification, training, and testing. To receive a license, the driver must pass knowledge and skills tests administered either by the state or by a third party whose examiners meet the same qualification and training standards as state examiners. 40 CFR 383.75(a).

[63] Section 1926.20(b)(4) states that "the employer shall permit only those employees qualified by training or experience to operate equipment and machinery"; § 1926.21(b)(2) states that "the employer shall instruct each employee in the recognition and avoidance of unsafe conditions . . . ."

The Committee's view of the importance of independent testing is further buttressed by a study conducted over a 34-year period (1969-2002), by the Construction Safety Association of Ontario. (OSHA-2007-0066-0009). The study 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.

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. (OSHA-2007-0066-0010).

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. (OSHA-2007-0066-0011).

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. (OSHA-2007-0066-0009).

Proposed § 1926.1427 would afford employers several options for ensuring that operators have obtained sufficient knowledge and ability. These options are designed to provide employers flexibility for meeting the proposed requirement and to accommodate the needs of the U.S. military.

**Paragraph 1427(a)**

As drafted by C-DAC, proposed paragraph (a) would have required the employer to ensure that the operator of any equipment covered under § 1926.1400 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. OSHA notes, however, that C-DAC provided for exceptions to the general rule for operator qualification/certification in

proposed §§ 1436, *Derricks*; 1926.1440, *Sideboom cranes*; and 1926.1441, *Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less*. To make proposed § 1926.1427(a) reflect the exceptions provided in these sections, OSHA has added the following language to proposed § 1926.1427(a):

> 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 rated hoisting/lifting capacity of 2,000 pounds of less (see § 1926.1441).

**Paragraph 1427(b) Option 1: Certification by an accredited crane/derrick operator testing organization**

Proposed paragraph (b) sets out Option 1, 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. Certification under this option would be "portable," which means that any employer covered by the proposed standard could meet the requirements of proposed § 1926.1427 by using an operator who had this certification. These certifications would be valid for five years.

Proposed section § 1926.1427(b) incorporates a number of safeguards to ensure that the Option 1 certification could be relied upon by any employer to meet the requirements of § 1926.1427, and adequately establishes the employee's ability to operate the types and capacities of crane for which he/she is certified. The first of these safeguards is proposed § 1926.1427(b)(1)(i), which would require that the testing organization be accredited by a nationally recognized accrediting agency.

As defined in § 1926.1401, a "nationally recognized accrediting agency" is "an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations." The Agency notes that, under this definition, new accrediting organizations would meet this definition upon establishing a national reputation based on independence, use of widely recognized criteria, and demonstrated competence in applying those criteria.

For a testing organization to be accredited, the accrediting agency would have to determine that the testing organization meets industry recognized criteria for written testing materials, practical examinations, test administration, grading, facilities/equipment and personnel.

In its deliberations, the Committee expressed concern about the need for independent evaluation of certification programs. It believed such evaluation is necessary to ensure that the certification programs are adequately and consistently applying the requisite criteria for safe crane operation when testing operators. This accreditation would ensure that the testing procedures would accurately measure whether the operator has met the knowledge and skill criteria specified in proposed § 1926.1427(j) (discussed below).

Under proposed § 1926.1427(b)(1)(v), the accreditation would be required to be reviewed every three years, to ensure continuing quality of testing materials and administration. The Committee believed that an entity that meets the proposed definition for a nationally

recognized accrediting agency ("an organization that, due to its independence and expertise, is widely recognized as competent to accredit testing organizations"), would have both the expertise and independence needed to provide reliable assurance that a testing organization meets the proposed standard's criteria.

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. (OSHA-2007-0066-0021) . Also, in 2003, the American National Standards Institute began accrediting personnel certification entities. (OSHA-2007-0066-0022).

Another safeguard is in proposed § 1926.1427(b)(1)(ii)(A), under which a testing organization would be required to administer both written and practical tests addressing the criteria set forth in proposed § 1926.1427(j). The Committee believed that operator ability cannot be assessed reliably unless both written and practical tests are used. In its view, operator ability depends both on knowledge of a variety of subjects, which the written test would address, and the ability to apply that knowledge, which would be addressed by the practical test.

Proposed paragraph 1427(b)(1)(ii)(B) would require that different levels of certification be provided, based on varying equipment capacities and types. This proposed requirement is designed to ensure that the extent of knowledge and skill required is commensurate with the type and capacity of equipment the employee operates. For 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. Similarly, 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.[64]

In its deliberations, the Committee determined that requiring the certification to be model-specific would be unnecessarily restrictive, and instead agreed on the term "type." In the SBREFA Panel Report, the Panel recommended that OSHA solicit public comment on whether the term "type" is sufficiently clear for this purpose. OSHA requests public comment on whether this term is appropriate, whether it needs to be defined (and if so, what that definition should be),[65] and suggestions as to what other terms may be better.

During the SBREFA process, several SERs described situations in which an operator is very knowledgeable and skillful with respect to one particular model of crane, but has

[64] Note that certification on a more complex and/or higher capacity piece of equipment would typically qualify an operator to operate less complex/lower capacity equipment of the same type. For example, an operator certified for a 300 ton hydraulic truck crane would not need a separate certification to operate a 22 ton hydraulic truck crane.

[65] One possible approach, referred to by the SBREFA Panel, would define "type" by using the categories of equipment represented in Figures 1 – 10 of the ASME B30.5 – 2004 standard.

very limited knowledge and ability regarding other models and types of cranes. These SERs were concerned that such operators would be unable to obtain a certification based on equipment capacity and type. They believe that, since these operators are well qualified to operate a particular crane model, there should be a mechanism for them to become certified to operate that model. The Panel recommended 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. Consistent with the Panel's recommendation, OSHA seeks public comment on this issue.

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 requests 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.

Proposed paragraph 1427(b)(1)(iii) would require 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.

Proposed paragraph 1427(b)(1)(iii) would also require that the testing organization have procedures for operators to re-apply and be re-tested in the event an operator was decertified. This would similarly help protect an employer's expenditures for training and certification testing.

Proposed paragraph 1427(b)(1)(iv) would require that the testing organization have procedures for re-certifying operators designed to ensure that the operator continues to meet the requirements of proposed § 1926.1427(j). The Committee believed that testing for recertification would not need to be as rigorous as for initial certification. This proposed provision was therefore included so that recertification procedures appropriate for those who have already been certified would be available.

Under proposed paragraph b)(2), the certification would be "portable," which means that any employer of an operator certified under Option 1 would meet the requirements of proposed § 1926.1427 with respect to that operator.[66] The Committee believed that accredited testing organizations could be relied upon to consistently adhere to the criteria in § 1926.1427, since they would be fully independent and their business interest would depend on their continued accreditation. Therefore, it would be appropriate for all employers to be able to rely on their certifications.

[66] See the explanation of the proposed definition of "portable" below in the discussion of proposed § 1926.1427(m).

Under proposed § 1926.1427(b)(3), the certification would be valid for five years. The Committee believed that this is an appropriate length of time to assume that, absent a specific indication to the contrary, an employee would retain the knowledge and proficiency demonstrated through the testing process.

In the SBREFA Panel Report, the Panel indicated that some Small Entity Representatives were concerned that there would be an insufficient number of accredited crane operator testing organizations and that many employers would not be able to set up and maintain an audited employer program under Option 2 (see discussion of Option 2 below). At present, there are two testing organizations that have been accredited by a nationally recognized accrediting organization to certify crane operators.[67]

C-DAC considered this issue and was of the view that, with a four-year phase-in period, there would be sufficient time for the market to respond to an increased demand for certification services. Some SERs expressed a similar expectation. Nonetheless, the Panel recommended that OSHA solicit public comment on whether it would be appropriate to expand Option 1 so that an accredited educational institution could be used to "administer" tests. In other words, under this concept, Option 1 would be expanded so that an accredited educational institution could administer written and practical tests that were developed or approved by an accredited crane/derrick testing organization. Many

[67] These organizations are the National Commission for the Certification of Crane Operators (NCCCO), which is accredited by the National Commission for Certifying Agencies (NCCA) (OSHA-2007-0066-0021) and by ANSI (OSHA-2007-0066-0025), and the Southern California Crane & Hoisting Certification Program (SCCHCP), which is accredited by NCCA.

educational institutions currently have an accreditation through a national or regional accrediting agency that is listed by the U.S. Secretary of Education (SOE) or have an accreditation by a State agency that has been recognized by the SOE for approval of public post-secondary vocational education. Such an expansion could broaden the availability of certification services.

C-DAC considered a related concept in which an educational institution or program accredited in this manner could both develop and administer tests. However, it rejected that concept because the SOE-related type of accreditation would be more broadly based on the institution as a whole, rather than on its operator certification program in particular.

It is the Agency's understanding that much of the Committee's concern in this regard was related to the development of the tests rather than their administration. In other words, while considerable subject-specific expertise is needed to develop accurate and reliable crane operator tests, the expertise needed to administer such tests may be similar to the expertise needed to administer tests in general. However, there is a question as to whether this is equally true for written and practical tests.

Therefore, OSHA solicits public comment on these issues. Specifically, the Agency seeks comment on whether Option 1 should be expanded so that an accredited educational institution could administer written and practical tests that were developed or approved by an accredited crane/derrick testing organization.

**Paragraph 1427(c)** Option 2: Qualification by an audited employer program

Proposed paragraph (c) sets out Option 2, in which the employer would determine, through its own audited testing program, that its employee is qualified to operate the equipment. The Committee recognized that some employers, including those that have already established in-house testing programs, may want to do their own testing to meet the proposed § 1926.1427 requirements. The Committee also recognized that, for there to be a significant improvement in the industry with respect to operator qualifications, it is essential that there be a mechanism to ensure that such testing is accurate and reliable. Therefore, under Option 2, the tests would be required to be either developed by an accredited crane operator testing organization, or approved by an auditor who is certified by an accredited crane operator testing organization. In addition, the administration of the tests would be audited.

Proposed paragraph (c)(1) sets forth the requirements that would apply to the contents and design of the tests (requirements for the administration of the tests is dealt with separately in proposed § 1926.1427(c)(2), discussed below) used in an audited employer program. To ensure that the tests meet the industry standards for written and practical examinations, they would have to be developed by an accredited testing organization (as described in proposed § 1926.1427(b)), or approved by an auditor in accordance with the requirements of proposed § 1926.1427(c)(1)(ii).

An employer choosing to use tests other than those developed by an accredited testing organization under proposed § 1926.1427(c)(1)(i) would be required to have the tests approved by an auditor in accordance with the criteria in proposed § 1926.1427(c)(1)(ii). The auditor would have to be certified as a test evaluator by an accredited testing organization. To ensure that the auditor's evaluation is independent and impartial, the auditor would be prohibited from being employed by the employer seeking evaluation of its qualification program. Also, the audit would need to determine that the program meets nationally recognized test development criteria and adequately assesses the criteria in proposed § 1926.1427(j).

The Committee believed that these requirements are necessary to ensure that the contents and design of the tests meet the criteria in proposed § 1926.1427(j) and generate valid and reliable results.

The requirements for test administration that would apply under Option 2 of this section are set forth in proposed § 1926.1427(c)(2). Proposed § 1926.1427(c)(2)(i) would require that the auditor find that the administration procedures meet nationally recognized test administration standards. The Committee believed that this proposed provision is needed to ensure that the test results would be valid and reliable.

Under proposed paragraphs (c)(2)(ii) and (c)(2)(iii), the auditor would have to be certified by an accredited certifying organization as described in § 1926.1427(b), and would be prohibited from being employed by the employer seeking the auditor's approval

for its operator qualification program. Finally, proposed paragraph § 1926.1427(c)(2)(iv) would require that the audit be conducted in accordance with nationally recognized auditing standards. The Committee believed that, to avoid a conflict of interest and assure the integrity of the audit, it is necessary to have the auditor be independent of the employer and apply well recognized procedures for conducting the audit.

The Agency notes that the proposed requirement that the audit be conducted in accordance with nationally recognized auditing standards would apply only to the audit of the administration of the tests, and not to the audit of the contents of the written and practical tests. It appears to the Agency 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 solicits public comment on whether a new § 1926.1427(c)(1)(ii)(D), reading as follows, should be added:

> (D) The audit shall be conducted in accordance with nationally recognized auditing standards.

Proposed paragraph (c)(3) addresses the need for an audit of an employer's operator qualification program shortly after its inception, as well as periodically thereafter. This would ensure regular and independent oversight of employer-run qualification programs to verify that operators are being tested according to nationally recognized standards, on at least those qualifications set forth in proposed § 1926.1427(j).

Proposed paragraph (c)(4) would require an employer's program to include re-qualification procedures, which would have to be audited as described in proposed § 1926.1427(c)(1) and (c)(2). The Committee believed that this is necessary to ensure the operators' continued proficiency with, at a minimum, the criteria set forth in proposed § 1926.1427(j).

In the event an auditor discovers a deficiency in an employer's operator qualification program, the employer would have to meet the requirements set forth in proposed § 1926.1427(c)(5). Proposed § 1926.1427(c)(5)(i) requires that no additional operators be qualified until the auditor determines that the deficiency has been corrected. Under § 1926.1427(c)(5)(ii), the program would also have to be re-audited within 180 days of the deficiency's correction to ensure that the minimum qualifications in proposed § 1926.1427(j) were being adequately and consistently tested.

Proposed paragraph (c)(5)(iii) would require the auditor to file a report of any such deficiency with the appropriate OSHA Regional Office within 15 days of discovery. In addition, records of the employer's qualification program audits would be required to be maintained by the auditor for three years and, under § 1926.1427(c)(5)(iv), would have to be made available at the request of the Secretary of Labor or a designated representative. The Committee believed that these provisions are necessary to facilitate enforcement of the Option 2 requirements.

Under proposed paragraph (c)(6)(i), a qualification by an employer's operator qualification program (Option 2) of this section would not be portable. It was the Committee's view that the degree of consistency in adhering to the proposed requirements of § 1926.1427 is likely to be highest among accredited crane operator testing organizations, since they would be fully independent and their business interest would depend on their continued accreditation. That view is reflected in full portability being restricted to certification under Option 1 of this section.

Under proposed paragraph (c)(6)(ii), a qualification by an employer's operator qualification program would be valid for five years. The Committee believed that this is an appropriate length of time to assume that, absent a specific indication to the contrary, an employee would retain the knowledge and proficiency demonstrated through the testing process.

**Paragraph 1926.1427(d)** Option 3: Qualification by the U.S. military

Proposed paragraph (d) provides that an operator would be deemed qualified if he/she had a current qualification issued by the United States military. Under proposed § 1926.1427(d)(2), such a qualification would be considered valid for the length of time stipulated by the United States military, and would not be portable.

At the C-DAC meetings a representative of the United States Navy explained that, because of a variety of potential exigencies associated with the mission of the United

States military, i.e., national defense, the military needs to be able to use its own qualification program, the criteria for which may have to vary based on the circumstances. Consequently, the criteria for qualification under Option 3 would be left to the military to determine, including the length of time for which such a qualification would be valid.

Proposed § 1926.1427(d) must be read in light of Executive Order (E.O.) 12196 (Feb. 26, 1980) and 29 CFR Part 1960, which exclude military personnel (uniformed members of the armed forces) and uniquely military equipment, systems, and operations from OSHA coverage. Consequently, uniformed military personnel would not be covered by any of this proposed standard and there would be no obligation under this standard or E.O. 12196 for uniformed military personnel operating cranes to be certified. Civilian employees of the Defense Department and Armed Forces engaged in work encompassed by "uniquely military equipment, systems and operations" similarly would not be covered by any of the provisions of this proposed standard, including the certification provisions. Therefore, even in the absence of Option 3, the Department of Defense is free to impose whatever qualifications it requires for crane operators who are military personnel or civilian employees engaged in such work.

Under E.O. 12196, OSHA standards apply with respect to a civilian employee of the Department of Defense and Armed Forces who is engaged in work that falls beyond "uniquely military equipment, systems and operations." Under that executive order, proposed § 1926.1427 would be applicable to those employees. Therefore, the U.S.

military could use Option 3 by qualifying its own civilian employee operators engaged in work that falls beyond "uniquely military equipment, systems and operations."

In reviewing this part of the C-DAC consensus document, the Agency has determined that there is an ambiguity in the text of Option 3 in that it does not clearly indicate whether it would also cover employees of private contractors of the Armed Forces or Defense Department. With respect to such private contractor employees, E.O. 12196 is inapplicable and OSHA has the authority to promulgate qualification/certification requirements regarding them.

The Agency believes that C-DAC's intent was to have Option 3 be applicable only with respect to civilian employees of the U.S. military; it was not intended to include private contractor employees. This intent is reflected in C-DAC's use of the term "Not portable" in Option 3 and that term's definition. Proposed § 1926.1427(d)(2)(i) specifies that an operator's U.S. military-issued qualification is not portable. Under the definition of that term in § 1926.1427(m)(2), such a qualification is valid "only where the operator is employed by (and operating the equipment for) the employer that issued the qualification." Since private contractor employees are not "employed by" the U.S. military, this indicates that Option 3 was not intended to apply to them. Instead, Option 3 was intended to apply only with respect to the U.S. military's own employees.

Accordingly, OSHA is planning on changing the regulatory language in proposed § 1926.1427(d) to more clearly reflect this intent. Specifically, the Agency is considering making the following changes to proposed § 1926.1427(d)(1):

> (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.

In addition, in proposed § 1926.1427(m)(Definitions), the following definition would be added:

> (3) 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.

OSHA requests public comment on this issue.

**Paragraph 1427(e)** Option 4: Licensing by a government entity

This option would allow a government licensing department/office to qualify crane operators. The Committee included this option because it believed that some States have effective, reliable licensing procedures, and that making use of them for purposes of proposed § 1926.1427 would provide additional flexibility to employers. However, in the experience of Committee members, there is significant variability in criteria and administrative practices among government licensing entities. Therefore, under this option, the license could be used to meet the requirements of proposed § 1926.1427 only if the government entity meets the licensing criteria in proposed 1926.1427(e)(2).

Proposed paragraph (e)(2)(i) would require that the criteria used by the licensing department/office address the knowledge and skill requirements listed in proposed § 1926.1427(j). Proposed § 1926.1427(e)(2)(ii) would require that the government entity follow the same test content, test administration and related criteria as required under Option 1. Proposed § 1926.1427(e)(2)(iii) would require 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 proposed § 1926.1427(e)(2)(ii) and (e)(2)(iii) have been met. Also, the government licensing office would have to have re-certification procedures in place as discussed in proposed §§ 1926.1427(b)(1)(iv) and 1926.1427(c)(4). The Committee believed that these provisions are necessary to ensure that the government licensing criteria and procedures yield valid and reliable results.

Under proposed paragraph (e)(3)(i), this qualification would be valid only within the geographic jurisdiction of the licensing entity. For reasons of federal-local government comity, the Committee decided not to include a provision requiring the government entity to be accredited by a nationally recognized accrediting agency for purposes of Option 4. In the absence of such accreditation, there is an increased potential for variability in the degree to which the criteria in proposed § 1926.1427(e)(2) will be met. Consequently, the Committee believed that, for purposes of meeting the requirements in proposed § 1926.1427, the validity of the qualification under Option 4 should not extend beyond the geographical jurisdiction of the government entity.

Proposed paragraph (e)(3)(ii) provides that the licensing entity may determine the time period for which the qualification is valid, but cannot issue a qualification intended to be valid for more than five years. The five year maximum was included in the provision because the Committee believed that this is an appropriate length of time to assume that, absent a specific indication to the contrary, an employee would retain the knowledge and proficiency demonstrated through the testing process.

**Paragraph 1427(f)** Pre-qualification/certification training period

This proposed paragraph addresses the requirements that would have to be met for a trainee to operate a crane on the job while preparing for qualification/certification assessment. Proposed § 1926.1427(f)(1) would allow for the operation of cranes by employees who are not qualified or certified, provided that they meet the requirements in proposed § 1926.1427(f)(2). Proposed § 1926.1427(f)(2) would allow those undergoing training in preparation for qualification/certification tests to operate equipment under the conditions outlined in § 1926.1427(f)(2)(i) through (f)(2)(v). The Committee believed that it is necessary for there to be a process by which operators who are not certified or qualified can get experience working with the equipment to help prepare for obtaining a certification/ qualification. This proposed paragraph would require appropriate oversight of such trainees to ensure worksite safety.

In the C-DAC consensus document, § 1926.1427(f)(2) states that,

> An employee who has passed **neither** the written **nor** practical tests required under this section is permitted to operate equipment as part of

> his/her training where the following requirements are met . . . . (Emphasis added).

It is the Agency's understanding that the intent of the Committee was to allow trainees who had not yet obtained a certification or qualification to operate equipment on the job as part of the training process as long as the criteria in § 1926.1427(f)(2) were met. However, the C-DAC language would allow such an operator to do this only if the operator had passed not yet passed **both** the written and practical tests.

The anomalous result of that language would have been that an operator who had passed one of those tests but not both would have been prohibited from operating the crane as a trainee under this provision. Since that would have been contrary to the Committee's intent, the Agency has modified that language for the proposed rule, which now reads:

> An employee who has not passed both the written and practical tests required under this section is permitted to operate equipment as part of his/her training where the following requirements are met. . . .

Proposed paragraph (f)(2)(i) would require that the trainee/apprentice be provided with sufficient training prior to operating the equipment to enable him/her to operate it safely under the limitations listed in this proposed section and any additional limitations established by the employer. This would ensure that, before beginning to operate the equipment at the site, the trainee/apprentice would have attained sufficient knowledge and skills to operate the equipment safely as a trainee/apprentice.

Proposed paragraph (f)(2)(ii) would restrict the trainee/apprentice's operation of the equipment to those tasks currently within his/her ability. The Committee believed that this is necessary to ensure that, throughout the training period, the tasks the trainee/apprentice performs are always commensurate with his/her ability. This provision would also allow the trainee/apprentice to perform progressively more complex tasks as the trainee/apprentice develops the necessary ability.

Proposed paragraph (f)(2)(iii) sets forth the requirements that an employee would have to meet to be permitted to supervise the trainee/apprentice's operation of the crane. The Committee believed that setting the criteria for such supervision is necessary to ensure that the equipment is operated safely during the training/apprenticeship period.

Under proposed paragraph (f)(2)(iii)(A), the trainee/apprentice's supervisor would have to be an employee or agent of the trainee's/apprentice's employer. The Committee believed that this is necessary to ensure that the supervisor would have the authority to direct the actions of the trainee/apprentice.

Proposed paragraph (f)(2)(iii)(B) would require that the trainee/apprentice's supervisor be either a certified operator (in accordance with proposed § 1926.1427), or have passed the written portion of a certification test under one of the Options in proposed § 1926.1427. In addition, whether the supervisor is a certified operator or has passed the written test, the supervisor would have to be familiar with the proper use of the equipment's controls.

The SBREFA panel recommended that OSHA consider whether the trainee/apprentice's supervisor should have additional training beyond the qualifications required under proposed § 1926.1427(f)(2)(iii)(B). This recommendation is addressed below in the discussion of § 1926.1430, *Training*.

The Committee believed that this provision is necessary to ensure that the supervisor has sufficient knowledge about the equipment to enable him/her to effectively oversee the safe operation of the crane. The Committee determined that a supervisor who had passed the written portion of a certification test would not need to be sufficiently proficient to pass the practical portion in order to effectively supervise a trainee/apprentice. However, both in the instance where the supervisor is certified and in the instance where he/she is not certified but has passed the written portion of the certification test, the Committee believed that it is necessary that he/she be familiar with the proper use of the equipment's controls, since such knowledge is essential to being able to effectively supervise a trainee/apprentice.

The C-DAC consensus document language refers to "certified operator" and the written portion of a "certification" test. However, under proposed § 1926.1427, an operator may be either "certified," which would be obtained under Option 1, or "qualified," which would be obtained under any one of the other options. The Agency believes that the Committee intended that as long as the supervisor meets the qualification/certification criteria under any of these options, or has passed the written portion of test used to obtain

a qualification/certification under any of these options, and all other aspects of proposed § 1926.1427(f)(2)(iii) have been met, the employer should be permitted to use that supervisor to supervise the trainee/apprentice.

In addition, the C-DAC consensus document language regarding this provision states that a supervisor who is a "certified operator" may, if the other criteria listed in the provision are met, supervise the trainee/apprentice. Alternatively, the supervisor must have "passed the written portion of a certification test. . . ." The Agency believes that it was the Committee's intent that the certification or written test that was passed be valid for the equipment that the trainee/apprentice is operating. However, the C-DAC language, read literally, would permit a supervisor with a certification or passing score on a written test that was valid only for equipment other than what the trainee/apprentice was operating to supervise that trainee/apprentice.

To conform proposed paragraph (f)(2)(iii)(B) to C-DAC's intent, OSHA is planning to modify that provision as follows and requests public comment on this change.

> (B) The operator's supervisor is either a qualified/certified operator under this section for the equipment the trainee/apprentice is operating, or has passed the written portion of a qualification/certification test for such equipment under one of the Options in paragraphs (b) through (e), and is familiar with the proper use of the equipment's controls.

Proposed paragraph (f)(2)(iii)(C) would require that the operator's supervisor perform no tasks that would detract from his/her ability to supervise the trainee/apprentice. The Committee believed that permitting the operator's supervisor to engage in tasks that

would impinge on his/her ability to supervise the trainee/apprentice would endanger the trainee/apprentice and other employees in the vicinity of the crane.

Under proposed paragraph (f)(2)(iii)(D), for equipment other than tower cranes, the operator's supervisor and the trainee/apprentice would be required to be in direct line of sight of each other, and would be required to communicate either verbally or by hand signals. The Committee believed that this would ensure that the operator's supervisor could rapidly and effectively give instructions to the trainee/supervisor, especially for purposes of correcting the trainee/apprentice.

With respect to tower cranes, it was the Committee's view that the height of the operator's station would typically make it infeasible to maintain direct line of sight between the operator's supervisor and the trainee/apprentice. For the same reason, use of hand signals is also often not feasible. Therefore, the proposed provision would instead require 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.

The Committee believed that it would be infeasible for the operator's supervisor to supervise the trainee/apprentice 100 percent of the time. Proposed § 1926.1427(f)(2)(iv) is designed to set criteria that would permit the trainee/apprentice to continue operating the crane in the absence of the operator's supervisor for short breaks under circumstances that would result in safe operation. Those criteria would be as follows:

Under proposed paragraph (f)(2)(iv)(A), the break would be restricted to no more than 15 minutes, and no more than one break per hour. The Committee believed that this restriction is needed because otherwise there would be a significant likelihood that the other criteria (discussed below) would not be followed, and that the trainee/apprentice would not receive the amount of supervision that is needed to ensure safe operation.

Under proposed paragraph (f)(2)(iv)(B), immediately prior to the break, the operator's supervisor would have to inform the trainee/apprentice of the specific tasks that the trainee/apprentice would be authorized to perform and the limitations that he/she must adhere to during the break. Under proposed § 1926.1427(f)(2)(iv)(C), the specific tasks that the trainee/apprentice would perform during the break would have to be within the trainee/apprentice's ability. The Committee believed that these provisions are necessary to prevent injuries and fatalities that could be caused by a trainee/apprentice operating a crane under circumstances that are beyond his/her ability.

The Committee believed that there are certain circumstances in which it is inappropriate for a trainee/apprentice to operate a crane because of the complexity and/or heightened risks involved. Therefore, for the circumstances listed in proposed § 1926.1427(f)(2)(v)(A) – (D), the trainee/apprentice would be prohibited from operating the equipment in all cases, even if the operator's supervisor believed the trainee/apprentice had attained the necessary knowledge and skill.

With respect to operations involving multiple-lift rigging, the Committee believed that the difficulty and/or risk involved is not at the same level as those listed in proposed § 1926.1427(f)(2)(v)(A) – (D). Consequently, as reflected in proposed § 1926.1427(f)(2)(v)(E), while there would be a general prohibition against a trainee/apprentice operating the equipment when multiple-lift rigging is involved, an exception would apply where the operator's supervisor determined that the trainee/apprentice's skills are sufficient for this high-skill work.

**Paragraph 1427(g)**

Proposed paragraph (g) would permit a testing entity 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. The Committee was aware of an impression among some people in the industry that a testing entity could not get accredited if it also provided training. However, after some research, the Committee determined that this was not a bar to accreditation if certain procedures were instituted. Specifically, an industry consensus standard, the International Organization for Standardization ("ISO") 17024, addresses entities that offer certifications to individuals. It requires that no such entity offer training unless the entity can demonstrate that the training is independent of both evaluation and certification. This is intended to preserve both confidentiality and impartiality in the testing/certification process.

Therefore, at least 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. Proposed § 1926.1427(g) reflects the Committee's intent to make clear that a testing entity is not be prohibited from providing training, as long as the applicable criteria have been met.

**Paragraph 1427(h)**

The Committee deliberated about the need for operators to be able to read to operate a crane safely and how some operators, even though they can read, nonetheless have difficulty taking written tests. The Committee believed that it is crucial for operators to be able to read the load chart and other manufacturer procedures for the equipment they operate. In its view, the failure to be able to read that information could result in injuries and fatalities through a wide variety of errors (for example, by overloading the crane as a result of exceeding the crane's working radius, failing to deploy outriggers in accordance with the manufacturer's instructions, or failing to apply a footnote in a load chart that explains that the capacity is lower when a particular configuration of the crane is used).

However, the Committee recognized that some employees, while they have sufficient literacy to be able to read this type of material, for other reasons are unable to take written tests effectively. Therefore, under proposed § 1926.1427(h), the written qualification/certification test could be administered verbally, with the answers given verbally, if two prerequisites are met.

The first is that the qualification/certification candidate pass a written demonstration of literacy relevant to the work (proposed § 1926.1427(h)(1)). The second is that the candidate demonstrate the ability to use the type of written manufacturer procedures applicable to the class/type of equipment for which the candidate is seeking qualification/certification (proposed § 1926.1427(h)(2)). These would typically include, for example, the load chart and operator's manual for the crane the candidate would be operating.

As reflected in the SBREFA Panel Report, some SERs expressed a concern that operators who are not proficient in English would not be able to meet either requirement. The Panel recommended that OSHA solicit comment on whether employers should be permitted to use manuals that have been re-written to accommodate the level of English proficiency (that is, lower level or lack of proficiency) of the operator.

C-DAC considered this same concern in designing § 1926.1427(h). Neither the demonstration in § 1926.1427(h)(1) nor (h)(2) would necessarily have to be made in English as those provisions are currently drafted. As an example, under these proposed provisions, an employer could obtain a Spanish-language version of the load charts and operator's manual from the manufacturer, and arrange to have the literacy test administered in Spanish. An operator able to meet the requirements of proposed § 1926.1427(h) using these Spanish language materials would have demonstrated adequate literacy under the proposed rule.

However, it may be necessary to modify proposed § 1926.1427(b)(1), (c) and (e) so that, in such instances, the qualification/certification is limited to the use of equipment that is equipped with such translated materials. In addition, there is an issue with respect to whether the rule needs to incorporate safeguards to ensure that a translation of manufacturer-supplied materials conveys the same information as in the original. OSHA requests comment on these issues.

Some SERs also expressed a concern that many operators are not sufficiently literate in any language to meet the proposed requirements in § 1926.1427(h)(1) and (h)(2). As discussed above, C-DAC determined that it is essential for ensuring safe crane operation that operators have sufficient literacy to read and comprehend written materials that relate to critical aspects of operation, such as load charts and manufacturer's manuals. However, the Panel recommended that OSHA solicit comment on whether employers should be permitted to use manuals that have been re-written to accommodate the literacy level of operators.

The concept underlying this recommendation is that a lower level of literacy may be sufficient as long as that level still enables the operator to read and understand the simplified language (and perhaps greater use of illustrations) in the re-written manual. If this were to be allowed, it would be necessary to modify proposed § 1926.1427(b)(1), (c) and (e) so that the certification is limited to the use of equipment that is equipped with a suitably re-written manual. Another issue that such a change would raise is whether the

rule would need to incorporate safeguards to ensure that the modified materials conveyed the same information as in the original, manufacturer-supplied materials. OSHA requests comment on the Panel's recommendation and these related issues.

**Paragraph 1427(i) [*Reserved*.]**

Proposed paragraph (i) would be reserved because it is inconvenient for readers to determine whether "i" is being used as a letter or a roman numeral.

**Paragraph 1427(j) Certification criteria**

Proposed paragraph (j) sets out the qualification and certification criteria applicable to the options described in proposed §§ 1926.1427(b)(1)(ii)(A), 1926.1427(c)(1)(ii)(C), and 1926.1427(e)(2)(iv). The Committee determined that these are the criteria needed to address the knowledge and skills that are fundamental to safe crane operation. As stated in the introductory language in proposed § 1926.1427(j), these would constitute "minimum" criteria; the accredited certifying entities, employers, or local or state licensing offices would not be precluded from adding additional requirements to their certification or qualification programs.

Proposed paragraph (j)(1) describes the criteria that would have to 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).

Proposed 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 . . ." As discussed above with respect to proposed § 1926.1427(b)(1)(ii)(B) (requirement that different levels of certification be provided, based on varying equipment capacities and types), during the SBREFA process, several SERs described situations in which an operator is very knowledgeable and skillful with respect to one particular model of crane, but has very limited knowledge and ability regarding other models and types of cranes. These SERs were concerned that such operators would be unable to obtain a certification based on equipment capacity and type. They believe that, since these operators are well qualified to operate a particular crane model, there should be a mechanism for them to become certified to operate that model. The Panel recommended 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. Consistent with the Panel's recommendation, OSHA seeks public comment on this issue.

Also, as discussed above with respect to proposed § 1926.1427(b)(1)(ii)(B), the SBREFA Panel 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 requests 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.[68]

Proposed paragraph (j)(1)(i)(A) would require 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 supported booms). Meeting these criteria would ensure that the person controlling the equipment would be able to make necessary judgments and adjustments for safe crane operation.

[68] The SBREFA Panel also recommended that OSHA ask for public comment on whether the standard should state more clearly that more limited training is required for operators of smaller capacity equipment than for more complex equipment. This recommendation is addressed below in the discussion of § 1926.1430, *Training.*

Proposed paragraph (j)(1)(i)(B) was included to ensure that operators would be able to use load capacity information on a variety of configurations of the capacity and type of equipment. Such information is typically contained in load charts and manuals. This would ensure that the operator would be able to accurately determine, independently, the capacity of the equipment in each situation that he/she might encounter. The Committee believed that this ability is critical to helping prevent injuries and fatalities caused by overloading the equipment.

The Committee considered whether it is also necessary for the operator to be able to use the load information without the aid of a calculator. It determined that calculators are now so commonly available and used that it is not necessary for the operator to be able to use the load information without one.

Proposed paragraph (j)(1)(i)(C) addresses the need for crane operators to know how to prevent power line contact. In the Committee's experience, electrocutions and electrical injuries are typically caused when the operator unintentionally brings the boom, load line or load in electrical contact with a power line. Operator knowledge of the procedures that are necessary for preventing such contact (see the discussions of proposed §§ 1926.1407 through 1926.1411 above) is essential for preventing these injuries and fatalities.

Proposed paragraph (j)(1)(i)(C) also addresses the need for crane operators to know how to respond to a power line contact if one occurs. For example, the Committee determined that some electrocutions of operators occur while an operator attempts to exit the

equipment. After realizing that the equipment is in electrical contact with a power line, the operator is electrocuted when he/she creates a grounding path by touching the equipment while stepping on the ground.[69]

Proposed paragraph (j)(1)(i)(D) addresses the need for crane operators to have technical knowledge on a range of subjects that, if not sufficiently understood, could cause injuries and fatalities. The list of subjects in proposed Non-Mandatory Appendix E of this subpart serves as an example of that set of knowledge. The Committee believed that a degree of flexibility should be accorded in terms of what specific subjects need to be included. For example, a subject relevant only to an extensible boom crane would not need to be covered for a certification for a traditional lattice boom crane. Therefore, the proposed provision states that the testing criteria must include technical knowledge "similar" to the subject matter criteria listed in Appendix E of this subpart. To accommodate those who have less of a need for such flexibility and more of a need for specificity in this regard, the proposed provision also makes clear that, when the subjects listed in Appendix E are used, the requirements of the provision would be met.

In addition to the technical knowledge that would be required under proposed § 1926.1427(j)(1)(i)(D), technical knowledge applicable to three specific subjects would also be required under proposed § 1926.1427(j)(1)(i)(E).

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[69] Note that, as provided in proposed § 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 proposed § 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.

Proposed paragraph (j)(1)(i)(E)(1) would require that an operator be able to demonstrate sufficient knowledge of how to assess ground conditions to identify potential hazards. The operator would therefore be able to assess ground conditions through inspection, and would also be aware of the potential for unseen hazards such as sewers, water mains, and other underground installations or conditions that might affect the ability of the ground to support the equipment and expected load.

Proposed paragraph (j)(1)(i)(E)(2) would require operators to demonstrate sufficient knowledge of site hazards so that the operator would be able to identify them and understand their significance to safe operation of the equipment. Examples of typical site hazards include electrical hazards posed by underground electrical or cable lines and aboveground telephone poles and power lines, and ground-support hazards posed by manholes, drains and trenches, which can lead to tip-overs.

Proposed paragraph (j)(1)(i)(E)(3) would require operators to demonstrate sufficient technical knowledge to ensure that conditions at the entrance to the site are sufficient to enable the equipment to travel safely onto 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.

Proposed paragraph (j)(1)(i)(F) would require operators to demonstrate a thorough knowledge of this subpart, including incorporated materials. The Committee believed

that operators play a key role in the application of these requirements and it is therefore essential that they understand them.

Proposed paragraph (j)(1)(ii) is intended to ensure that operators have the ability, at a minimum, to demonstrate sufficient literacy to locate and understand information both in the equipment manual as well as in other sources which address the information discussed in proposed § 1926.1427(j)(1)(i)(A) through (j)(1)(i)(F). Since the Committee determined that safe crane operation depends on applying that information, the operator needs to be able to locate and understand it.

Proposed paragraph (j)(2) would require a practical test and sets criteria for such a test. Safe crane operation depends on an operator having sufficient skill to operate the equipment safely. The Committee felt that a successful demonstration of ability to perform the operations discussed below is essential to ensuring that the operator will be able to apply the requisite knowledge in the field. The practical test under this proposed paragraph would be conducted using equipment of the capacity and type for which the candidate seeks certification.

Proposed paragraph (j)(2)(i) would require an operator to demonstrate the ability to recognize, from visual and audible observation, the items listed in proposed paragraph § 1926.1412(d)(shift inspection). Irrespective of whether the operator or someone else conducts the shift inspection, the operator needs to be able to recognize apparent deficiencies associated with these parts and mechanisms. First, the operator needs to be

able to identify indications of safety problems that may arise after the shift inspection has been completed. In addition, this ability is important since the operator needs to be able to effectively exercise his/her authority under proposed § 1926.1418, *Authority to stop operation* to stop lifting operations (see discussion of that proposed section above).

Proposed paragraph (j)(2)(ii) addresses the need for operators to have demonstrated proficiency with operational and maneuvering skills. Lack of such proficiency could result in a wide range of accidents that could cause injuries or fatalities. For example, without this level of skill, the operator could unintentionally exceed the crane's capacity (such as by booming out too far) and overturn the equipment, make electrical contact with power lines, or cause struck-by injuries and fatalities (such as by losing a load or losing control of the load).

Proposed paragraph (j)(2)(iii) requires that the operator demonstrate the ability to apply load chart information. The Committee believed that if an operator is unable to apply load chart information, there is a significantly heightened risk of the crane overturning. This is because an operator without this ability may fail to keep the crane within the required operational parameters called for by the load chart (for example, by failing to recognize that proceeding with the lift will result in exceeding the maximum allowable boom radius as specified in the load chart).

As with proposed paragraph (j)(2)(i) (ability to recognize inspection items), this ability is also important since the operator needs to be able to effectively exercise his/her authority

under proposed § 1926.1418 (Authority to stop operation) to stop lifting operations (see discussion of that proposed section above). For example, if the only way to land the load with the crane in its current position would be to exceed the allowable radius specified in the chart, the operator would need to be able to recognize that this would happen and stop the lift.

Proposed paragraph (j)(2)(iv) would require that an operator be able to shut down and secure equipment safely. This ability is necessary to ensure that the shut down procedure is done safely and the equipment is properly secured to prevent unintended movement of the equipment after shut down.

**Paragraph 1427(k) Phase-in**

Under proposed paragraph (k), the qualification/certification requirements in proposed § 1926.1427 would not become effective until four years after the effective date of the final rule. The Committee believed that this four year period would provide time for operators to get additional training (where needed) to prepare them for the testing, for additional testing organizations to become accredited for purposes of Option 1 (proposed § 1926.1427(b)), for additional organizations to become nationally recognized accrediting agencies, for employers (who so choose) to develop audited programs for use under Option 2 (proposed § 1926.1427(c)), for accredited testing organizations to develop programs to certify auditors as described under Option 2, and for state and local government entities (who so choose) to make preparations to meet the criteria under

Option 4 (proposed § 1926.1427(e)). It would also give employers time to plan which of the qualification/certification options would be most suitable for them.

Under proposed paragraph (k)(1), during this four year period, proposed paragraphs § 1926.1427(k)(1)(i) and (ii) would address operator qualifications and training. Specifically, proposed § 1926.1427(k)(1)(i) would require that operators be competent for the purposes of operating the equipment safely. This would require that the operator 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.

Proposed paragraph (k)(1)(ii) would require employers to 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 would be required to ensure that the operator is evaluated to confirm that he/she understands the information provided in the training. These interim measures are not significantly different from current requirements under Subpart N of this part, § 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 would ensure that there would not be a gap with respect to this issue between the termination of the requirements under Subpart N of this part and the effective date of proposed § 1926.1427(a) through (j) and (m). The four-year phase-in period discussed above is set out in proposed § 1926.1427(k)(2).

**Paragraph 1427(l) [*Reserved*.]**

Proposed paragraph (l) would be reserved because of the inconvenience that would result from the use of "l" both as a small Arabic numeral and as the letter "l."

**Paragraph 1427(m) Definitions**

Proposed paragraph (m) defines two terms used in the qualification/certification provisions in § 1926.1427(b) through (e) (addressed above). Proposed § 1926.1427(m)(1) explains that, if an operator has a "portable" certification, any employer may rely on that certification. The employer of an operator who carries a portable certification (which can be obtained only through the method described in proposed § 1926.1427(b)) has ensured that the operator has been qualified or certified, and has met the requirements of proposed § 1926.1427(a).

Proposed paragraph (m)(2) explains that, if an operator has a qualification that is "not portable," only the employer who issued that qualification may rely on it for purposes of meeting the requirements of proposed § 1926.1427(a). As discussed above, OSHA is considering adding a third definition for the term "employee of the U.S. military" (see the discussion above of proposed § 1926.1427(d)).

**Dissenting view of C-DAC member Brian H. Murphy**

Under the C-DAC ground rules (OSHA-S030-2006-0663, Ex. 36-1-8), the Committee reaches consensus if no more than two non-federal members dissent on a particular issue. The ground rules also provide that, upon the request of a dissenting member, OSHA will include the member's reasons for dissenting in the preamble to the proposed rule. Two members of C-DAC, Mr. Brian H. Murphy and Mr. Craig Steel, dissented from the Committee's draft of proposed § 1427. Mr. Murphy asked that his reasons for dissenting be included in the preamble, and provided them in the letter reprinted below (OSHA-2007-0066-0007). Note that, pursuant to the ground rules, OSHA has not reprinted comments in the letter regarding issues upon which the member did not dissent.

> Dear Deputy Assistant Secretary Snare:
>
> Thank you for providing an opportunity for the Associated General Contractors of America (AGC) to serve on the Occupational Safety and Health Administration's (OSHA's) Crane and Derrick Advisory Committee (C-DAC). AGC welcomed and appreciated the chance to explore OSHA's several options for a new standard on cranes and derricks with the other knowledgeable members of that committee. In addition, it was a personal privilege for me to represent AGC's 33,000 members.
>
> AGC is a nationwide trade association of general contractors, specialty contractors, material suppliers, equipment dealers and other firms that collectively form the core of the construction industry. The association was formed in 1918 at the express request of President Woodrow Wilson, and today, AGC maintains a network of 98 state and local chapters throughout the United States. Its members engage in the construction of commercial buildings, factories, warehouses, highways, bridges, airports, waterworks facilities, waste treatment facilities, dams, water conservation projects, defense facilities and multi-family housing projects, and on site preparation and utilities installation for housing development.
>
> AGC shares and strongly supports OSHA's mission. While AGC occasionally disagrees with OSHA's views on the best and most effective means and methods of improving construction safety and health, AGC is and will remain equally committed to that goal. Indeed, from its very

inception, AGC has taken a great interest in the safety and health of construction workers. Its bylaws expressly provide that "]t]he members of [AGC] shall work to develop good relations with employees . . . and shall make every effort to provide safe working conditions on construction projects and to promote safe working habits by their employees.

AGC has long taken a very proactive approach to construction safety and health. Over the last 15 years, AGC has produced over 100 videos and publications on the various practices and procedures that may be necessary, on any given jobsite, to protect construction workers from occupational injury or illness. Each year, AGC sponsors two nationwide safety award programs. Regularly, AGC also offers safety management training courses and other safety training programs. In 2003, AGC used a Susan Harwood Training Grant to train 1,800 construction workers on OSHA's new steel erection standard. In 2004, AGC will use a third grant to train another 600 construction workers on fall protection. AGC was proud to receive these grants, and today, AGC is even prouder that an overwhelming number of its trainees gave these programs excellent reviews. These efforts demonstrate AGC's commitment to partnering with OSHA to make construction work-sites safer.

AGC also supports OSHA's very specific effort to set new standards for the men and women operating cranes and derricks. AGC agrees that systematically increasing the knowledge and improving the skill of these construction workers will reduce the number of accidents involving cranes and derricks and limit the closely related risks of injury. Long before serving on C-DAC, AGC collaborated with the St. Paul Companies on an exemplary training program on the essentials of crane safety. AGC also signed a cooperative agreement with the National Commission for the Certification of Crane Operators (NCCCO), recognizing the "importance of safe crane operations on our nation's construction sites" and "the CCO written and practical examination is a method of documenting the qualifications criteria outlined in ASME B30.5-3.1-1995, "Qualifications for and Conduct of Operators and Operating Practices."

As a member of C-DAC, fully committed to its goals and objectives, AGC worked long and hard to find common ground with the other members of that group. At the end of the day, both AGC and the others did reach agreement on a vast majority of the issues that the group had to confront. The group wrote forty-two sections and two appendices into the new standard that it proposed to OSHA, developing a document that totaled one-hundred-nineteen pages in length. During its deliberations, the group reached agreement on forty-one of those sections and both appendices, which collectively accounted for one-hundred-twelve of the pages of text. On only one of the sections, and only seven pages of the text, did everyone

fail to agree. On only that one section, and those few pages of text, did AGC find it necessary to part company with the others. (Endnote 1).

AGC would not, however, suggest that the disagreement was a trivial one. Quite to the contrary, AGC believes that the disagreement was a serious one that OSHA needs to address. C-DAC accomplished most but not all of its mission. It is now incumbent upon OSHA to correct the one significant error that C-DAC made.

The disagreement between AGC and the other members of the committee was over section 1427 of the committee's proposal. That section is entitled "*Operator qualification and certification*." In paragraph (a), it requires an employer to "ensure" that its crane and derrick operators are either:

● "qualified or certified . . . in accordance with" one of four procedures, found in the following paragraphs (b), (c), (d) and (e); or
● "operating the equipment during a training period in accordance with paragraph (f)

Paragraph (b) of section 1427 provides for "[c]ertification by an accredited crane/derrick operator testing organization." Paragraph (c) provides for "[q]ualification by an audited employer program." Paragraph (d) provides for "[q]ualification by the U.S. military." And paragraph (e) provides for "[l]icensing by a government entity." (Endnote 2)

AGC opposes section 1427 primarily because its requirements for the qualification and certification of crane and derrick operators are too restrictive. For many and perhaps the vast majority of construction contractors, none of the four options for operator qualification or certification are practical to pursue. At the same time, section 1427 omits several requirements that would far more directly affect crane and derrick safety. If adopted as currently written, section 1427 would disrupt the construction industry and might actually hinder the broad effort necessary to ensure that crane and derrick operators are knowledgeable, competent and well prepared, every day, to perform their work.

Following are AGC's more specific comments on each of the four options that Section 1427 provides, on the risks that this provision would create for any employer that chose to implement an operator training program, and on several significant omissions from the proposed standard.

**Certification by an Accredited Crane/Derrick Operator Testing Organization**

While less restrictive than paragraph (d), paragraph (b) fails to provide an option for many and perhaps most of the small to medium-sized firms that dominate the construction industry. Paragraph (b) would permit employers to engage third parties to test and certify their crane and derrick operators, but in the process, paragraph (b) would severely restrict the number of organizations qualified to perform those tasks. The proposed standard would permit employers to rely on only those organizations "accredited by a nationally recognized accrediting agency."

To the best of AGC's knowledge, information and belief, only two organizations are "accrediting" agencies within the meaning and for the purposes of Section 1427, and only one of the two agencies has actually accredited any other organization to test and certify crane and derrick operators. During the lengthy deliberations among the members of C-DAC, the National Commission for Certifying Agencies (NCCA) and the American National Standards Institute (ANSI) were the only two organizations said to be such "accrediting" agencies. The NCCA was the only one of the two said to have actually accredited any other organization to test and certify operators.

To make matters worse, it was acknowledged and agreed that the NCCCO is the only testing organization that the NCCA has accredited. If other organizations are also accredited to test and certify crane and derrick operators, within the meaning and for the purposes of Section 1427, then neither the other members of C-DAC nor OSHA identified them, and AGC is unaware of them.

AGC would emphasize that it holds the NCCCO in high regard. As already mentioned, AGC has gone so far as to sign a cooperative agreement with the NCCCO. Nevertheless, AGC doubts that the NCCCO could meet the enormous demand that section 1427 would generate for crane and derrick operator testing and certification. If adopted, Section 1427 would take that demand to an entirely new level. It should be noted that NCCCO has largely succeeded in meeting the much more limited demand for voluntary certification.

In fairness, AGC believes that other members of C-DAC harbor the same doubt. Something had to motivate the authors of section 1427 to include paragraph (k), delaying the mandate for operator testing and certification for four years. It is certainly possible that the other members of C-DAC supported section 1427 in the belief that other testing organizations would use this time to seek accreditation – in the hope of profiting on a dramatic increase in the demand for operator testing and certification. The problem is that neither the other members of C-DAC nor OSHA undertook any study of the costs that such organizations would have to incur to qualify for accreditation, or to provide testing or certification services on the

massive scale that section 1427 contemplates. Nor did the other members identify the sources of capital that these other testing organizations would require, or the prices they would have to charge for their services, or how they could even begin to sustain themselves until testing and certification became mandatory. There were no business plans or business models for either the committee or OSHA to review. It might be appealing to suppose that future demand for testing and certification would call forth the necessary supply, but it would remain little more than speculation. There is no factual record to support any such conclusions.

However logical it may be, AGC maintains that OSHA cannot simply suppose that the supply of the necessary services would materialize. The stakes are much too great. If other testing organizations did not enter the market, or they subsequently failed for financial or other reasons, or they simply found it necessary to charge more than most contractors could bear, the construction industry could quickly find itself in gridlock.

AGC also doubts the wisdom of giving any private organization – whether the NCCA, ANSI, the NCCCO or any other accrediting agencies or testing organization – such a dominant role in the implementation of a federal regulation. Section 1427 would set minimal standards for accreditation, leaving most of that process in private hands. OSHA would not have any direct oversight over (or other relationship with) any testing organization. The agency would be two steps removed from that process.

**Qualification by an Audited Employer Program**

Paragraph (c) also fails to provide an option for many and perhaps most construction companies. That provision would permit an employer to test and qualify its own employees to operate cranes and derricks, but only if *inter alia* (1) the employer's written and practical tests were "developed by an accredited crane/derrick operator testing organization," (2) the employer's "program" were approved by an auditor "certified," in turn, by such an organization, and (3) the "circumstances" under which the employer administered the tests were also approved by such an auditor.

As noted, the NCCCO appears to be the only "accredited crane/derrick operator testing organization" at this time. AGC doubts that small or medium-sized construction contractors would have the resources necessary to self-administer the NCCCO's written and practical tests, particularly "under circumstances . . . meeting nationally recognized test administration standards." In addition, it appears that neither the NCCCO nor any other testing organizations would have any business incentive to develop a large pool of certified auditors. To the contrary, they would have an obvious interest in maintaining the demand for their own testing services, and their own certifications. Nothing in the proposed standard

would compel or even encourage the NCCCO or any other testing organization to help construction employers develop practical alternatives.

Further eroding paragraph (c) are provisions that would require the employer to have its "program" re-audited every three years, and suspend the employer's "program" for any "significant deficiency." Though it would expressly forbid the auditor of the employer's program to be the employer's employee – and therefore subject to the employer's control – paragraph (c) would also render the employer liable for the auditor's failure to file a "documented report" of any "significant deficiency" to OSHA within 15 days, to maintain records of his or her audits for three years, or to make such records available to the U.S. Department of Labor.

For all of these reasons, AGC believes that paragraph (c) would not be a practical and dependable option for any significant number of construction employers.

**Qualification by the U.S. Military**

As a threshold matter, paragraph (d) is limited to the men and women in uniform. By its terms, it is "[n]ot portable," meaning that it "meets the requirements of paragraph (a) only where the operator is employed by (and operating the equipment for) the employer that issued the qualification." See Section 1427(m). To any operator to which paragraph (d) might apply, the military would be "the employer that issued the qualification." It follows that any operator qualified by the military would be qualified to operate a crane or derrick only for the military. (Endnote 3).

**Licensing by a Government Entity**

Whether paragraph (e) provided any practical option for construction contractors would depend entirely on how state and local governments responded to it. This provision would permit employers to use state or local government agencies to test and license their crane and derrick operators. Employers, however, could use only the government agencies that had volunteered to perform those tasks.

In some ways, paragraph (e) is superior to paragraphs (b) and (c). The state or local agency would have to be the one that "issue[d] operator licenses for operating [relevant] equipment," and it would have to qualify for accreditation as a "government accredited crane/derrick operator testing organization." But the "government authority that overs[aw]" the agency, and not any private entity, would determine whether the agency met the substantive criteria for accreditation. Unlike paragraphs (b) and

(c), paragraph (e) makes no direct or indirect reference to a "nationally recognized accrediting agency."

Paragraph (e) does not, however, go far enough to save Section 1427. It would not – and probably could not – require any state or local agency to test or license operators. It would not – and probably could not – provide any positive incentives for any such agency to perform those tasks. It would not – and probably could not – even reimburse any government agency that volunteered to perform those tasks.

Many state and local budgets are already tight, and neither OSHA nor other members of C-DAC have given AGC any reason to expect that any significant number of state or local agencies would be likely to step forward. AGC believes that some would do so but doubts that the number would be high enough, or their distribution broad enough, to meet what would be a truly nationwide demand for the testing and certification of crane and derrick operators. A government license issued under paragraph (e) would satisfy section 1427 "only within the jurisdiction" of the agency that issued it, and at best, AGC would expect an irrational patchwork of options for crane and derrick operators and their employers across the country.

**Operator Training**

AGC also believes that Section 1427 would put employers that provided hands-on training for crane or derrick operators at great and ultimately uncontrollable risk of liability for any accidents that their trainees or apprentices might cause, and could become a legal deterrent to such training. The relevant paragraph of the proposed standard is paragraph (f), entitled "Pre-qualification/certification training period." In subparagraph (f)(2)(i), that provision states that a trainee or apprentice "shall be provided with sufficient training prior to operating the equipment to enable the trainee to operate the equipment safely. . . ." In subparagraph (f)(2)(ii), that provision adds that "[t]he tasks performed by the trainee/apprentice while operating the equipment shall be within the trainee's ability." In subparagraph (f)(2)(iv)(C), that provision further provides that "[t]he specific tasks that the trainee/apprentice will perform during [any fifteen minute] break" that his or her supervisor may take "are within the trainee/apprentice's abilities."

If these were merely statements of principle, AGC would wholeheartedly support them. AGC completely agrees that trainees and apprentices should have any prior training that they require to operate the equipment safely. AGC completely agrees that all tasks that a trainee or apprentice actually performs – at any time – should be within his or her ability.

The problem is that these would be legal requirements, and not merely goals to which contractors should aspire. As written, they would render contractors legally liable not for failing to make every reasonable effort – or even every conceivable effort – to provide such prior training, or to limit the tasks that a trainee or apprentice actually performed. In substance and effect, paragraph (f) would render contractors strictly liable for outcomes that contractors could not guarantee. If a trainee or apprentice caused an accident, it would necessarily follow that the individual did not have prior training "sufficient" to operate the equipment safely. It would also follow that the trainee or apprentice had actually performed a task not "within" his or her "ability."

Neither construction workers nor their supervisors are any less human than anyone else. No one can guarantee that others will not make mistakes, or that they will always follow instructions. Nor is an individual's prior training, or his or her current abilities, something that one can measure with great precision. Of course, all construction contractors should make a very strong effort to prevent accidents. The human toll of any accident involving a crane or derrick can easily exceed anything that anyone would ever want to bear. Holding employers strictly liable for any accident that a trainee or apprentice may cause would, however, punish the good as well as the bad actors, and in the end, AGC fears that it would discourage useful training and hinder the effort to protect construction workers. One could well expect employers to provide no more than the minimum training necessary to satisfy the proposed standard, and whenever feasible, to engage third parties to perform that function.

**Significant Omissions from the Proposed Standard**

AGC also encourages OSHA to reconsider the broader question that Section 1427 raises. At the heart of that provision lies the assumption that elaborate procedures for testing and certifying crane and derrick operators would have benefits commensurate with their cost. The proposed requirements for such testing and certification are above and beyond the broader training requirements that C-DAC embedded – with AGC's concurrence – in Section 1430. In many other instances, OSHA requires employers to train their employees, and even to ensure that the individuals employed to perform certain functions are "competent persons." In these other instances, OSHA has not, however, found it necessary to go so far as to require sophisticated testing and formal certification.

Paragraph (k) of Section 1427 contemplates a four-year "phase-in" for the testing and certification procedures, and indeed, for that substantial phase-in period, even the authors of Section 1427 considered it sufficient to require operators "to be competent," to "be provided the necessary training," and to be "evaluated to confirm that he/she understands the

information provided in the training." Under these circumstances, AGC would consider it more than fair to request that OSHA take a hard look at the actual costs and benefits of ever going beyond paragraph (k) – to the point of requiring testing and certification by third parties beyond the federal government's supervision or direct control. (Endnote 4).

AGC would simply add that the costs of the proposed testing and certification could be social as well as financial. The construction workforce is not entire English-speaking. AGC is also concerned that Section 1427 could have the unintended but clearly detrimental effect of limiting employment opportunities for competent crane operators who do not speak English. AGC is unaware of any organization that currently provides nationally recognized testing for crane or derrick operators in any language other than English.

*  *  *

**Conclusion**

In closing, AGC would like to thank you for the opportunity to serve on C-DAC. Crane and derrick safety is extremely important to AGC's members, and the association greatly appreciated the chance to participate in the committee's deliberations.

In the end, C-DAC succeeded in reaching agreement on all but one of the provisions included in the standard that the committee proposed to OSHA. AGC could not support that one provision because it is too restrictive. AGC supported the proposed requirements for the training of crane and derrick operators, and AGC could even support a carefully tailored and clear requirement that construction contractors employ "competent" operators for their cranes and derricks. AGC is far less certain that the benefits of mandating elaborate procedures for the sophisticated testing and formal certification of crane and derrick operators would ever outweigh the great cost of doing so.

*  *  *

AGC supports OSHA's effort to improve crane and derrick safety, and believes that C-DAC has greatly contributed to that effort, but maintains that Section 1427 of the proposed standard requires serious reconsideration.

Sincerely,

/S/

Brian H. Murphy, P.E., C.S.P.
AGC C-DAC Representative

Endnote 1: On that one section, the National Association of Home Builders also parted company with the other members of the committee.

Endnote 2: Presumably, the authors of this provision intended to equate "licensing" with "qualification" or "certification."

Endnote 3: AGC has received reports that some members of C-DAC were led to believe that a military certification would be valid for a construction contractor working for the military on a military installation. The wording of paragraph (d) is, however, clear and makes no reference to military projects or installations, or to the contractors construction such projects at such locations. By the express and unambiguous terms of paragraph (d), a military certification is "[n]ot portable" and in paragraph (m) by definition applies "only where the operator is employed by (and operating the equipment for) the employer that issued the certification.

Nor is it clear that OSHA could justify such awkwardly limited portability for military certifications. If OSHA rewrote paragraph (d) to provide for portability then whether a construction contractor could use a military certification to satisfy section 1427 would depend entirely on (1) whether the project owner is a branch of the military and (2) whether the project is located on a military installation. Those two factors would not, however, have any obvious bearing on the merits of the process that the military used to certify crane or derrick operators, or the knowledge or skills that such operators actually possessed. AGC cannot readily identify any rational basis for rendering a military certification portable to a contractor working for the military project on one of its installations but not portable to even the same contractor when working for a different owner, or simply across the street.

In any event, paragraph (d) could not begin to solve the larger problem. Even if it provided for portability to construction contractors working for the military on military installations, paragraph (d) would remain far too limited to provide an option for the overwhelming majority of construction contractors. The military and its installations account for only a small fraction of the contractors and projects that the new standard would cover.

Endnote 4: AGC would also encourage OSHA to compare paragraph (k) with other standards that require construction contractors to employ "competent persons" to perform certain functions. AGC believes that many if not most of those other provisions define the required competence far more precisely. AGC presumes that paragraph (k) refers to competence in dealing with the various subjects listed in paragraph (j) of

> section 1427, or perhaps paragraph (c) of Section 1430, but paragraph (k) of section 1427 does not cross-reference either of those other provisions or otherwise define the required competence. Nor does it define the "required training."
>
> [End of Murphy comments.]

OSHA notes that Mr. Murphy indicated in his letter that proposed § 1926.1427 would apply to derricks. However, under paragraph (q) of proposed §§ 1926.1436 *Derricks*, § 1926.1427 would not apply to derricks. This is explained in more detail below in the discussion on proposed § 1926.1436.

Operator qualification/certification was the only section of the C-DAC document for which there were dissenting committee members (as noted above, two members dissented: Mr. Murphy and Mr. Steele). In his letter, Mr. Murphy addressed a number of issues associated with this subject, such as questioning the need for, and practicality of, limiting an employer's operator qualification/certification options to those that require the involvement of independent third parties. There was considerable discussion by C-DAC on this subject and its many associated issues, including the degree of portability of a qualification/certification. The Agency requests public comment on these issues.

**Physical Qualifications And Substance Abuse Testing**

*Physical qualifications*

Section 5-3.1 of ANSI B30.5-1968 contains criteria for operator vision and hearing, disqualification for a "history of epilepsy" or a "disabling heart condition," and a general statement that "when he is physically or mentally unfit, an operator shall not engage in

the operation of his equipment." Subpart N at § 1926.550(b)(2) states that "all crawler, truck, or locomotive cranes in use shall meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ANSI B30.5-1968 . . . ."

In a May 8, 1981 letter of interpretation to Mr. A. Bennett Hill Jr. (OSHA-2007-0066-0016), OSHA stated that:

> It is the interpretation of OSHA that the physical qualifications requirements incorporated by reference in 29 CFR 1926.550 do not apply to operators of equipment covered by those standards.

In other words, OSHA interpreted the incorporation by reference in § 1926.550(b)(2) for "operation" as referring to how the crane was to be operated, not to who was operating it. The Agency therefore has taken the position that the incorporation by reference excludes the physical criteria listed above.

C-DAC considered whether to include in this proposed standard provisions that would require equipment operators to meet particular physical qualifications. After considering various possible approaches, including those in current 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 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. 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.

**Substance abuse testing**

The Committee also considered whether to include mandatory substance abuse testing for equipment operators and others, such as signal persons, whose jobs affect safety. OSHA informed the Committee that the case law requires that any substance abuse testing requirements included in the proposal would have to meet constitutional safeguards.[70] Because the U.S. Department of Transportation (DOT) already has substance abuse requirements and designed them to meet these safeguards, C-DAC considered whether to incorporate DOT regulations on controlled substance testing, Title 49 CFR Part 382 and Title 49 CFR Part 40, into the proposed rule.

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[70] See *Skinner v. Railway Labor Executives' Ass'n*, 109 S. Ct. 1402 (1989) and *International Brotherhood of Teamsters v. Department of Transportation*, 932 F.2d 1292 (9th Cir. 1991).

The DOT regulations govern commercial drivers and are designed to protect public highway safety. Under these requirements an employer is required to establish a program for substance abuse testing. This program must include an employer's policy statement, supervisory education and training, controlled substances and (optional) alcohol testing program, evaluation of driver, and recording keeping. Under the DOT requirements the controlled substances and alcohol testing program must include six different types of testing, which include: pre-employment, reasonable suspicion, post-accident, random, return to duty and follow up testing.

After researching the DOT regulations and several discussions with DOT representatives, OSHA presented information to C-DAC on the procedural and substantive aspects of the DOT regulations, including the administrative requirements, the types of testing by employers, and optional alcohol testing. Committee members discussed implementation and enforcement concerns such as an employer's inability to "stand down" a crane operator based on an unconfirmed test result, until a positive result is verified by a medical review officer. The parallel DOT requirement prohibits an employer from:

> temporarily removing an employee from the performance of a safety-sensitive function based only on a report from a laboratory to the MRO (medical review officer) of a confirmed positive test for a drug or drug metabolite, an adulterated test, or a substituted test, before the MRO has completed verification of the test result.

Committee members were concerned that including a substance testing provision in this standard would restrict an employer's ability to suspend an operator who tested positive pending confirmation of the result. Committee members believed that many employers

already have voluntarily instituted substance abuse testing programs. They believed that employers are able to judge whether an operator who tested positive presents a risk to workers on the site and should be able to remove an operator immediately if, in the employer's judgment, the operator presents such a risk.

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.

**Section 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 to the operator. The Committee 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 in order 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) (proposed § 1926.1428(a)(1)), the signal person would have documentation from a third party qualified evaluator 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 believed that such portability would be appropriate because of the independence and expertise of the third party evaluator.

Under Option (2) (proposed § 1926.1428(a)(2)), an employer's own qualified evaluator would have determined 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.

The term "qualified evaluator" used in proposed § 1926.1428(a)(2) is 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 is used in proposed § 1926.1428(a)(1). OSHA has therefore added the following definition for this term:

> 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.

The Agency requests public comment on whether this is an appropriate definition for this term.

Under proposed paragraph (a)(3), the documentation for whichever Option is used (that is, Option (1) or (2)) of this section, would have to be available while the signal person is employed by the employer. With respect to an employer using Option (1) of this section, the signal person's documentation from the third party qualified evaluator would have to be available. The Committee believed that this documentation is essential for this to be a viable and effective Option. Under this option the employer would be permitted to rely on someone else's assessment of the signal person rather than its own. In such a circumstance such documentation is essential for this to be a reliable means of assuring the signal person has the requisite ability.

In reviewing these provisions, the Agency noted that C-DAC used the term "available," rather than "available at the site." It is OSHA's understanding that C-DAC's intent was that the documentation be available at the site by, for example, the documentation being physically present at the site or through use of an on-site computer. For clarity, OSHA is planning on changing the term "available" to "available at the site." OSHA requests public comment on this issue.

In addition, in reviewing the C-DAC draft of Option (2) of this section, the Agency noted that it does not explicitly state that documentation of the signal person's qualification by this method is required. However, proposed § 1926.1428(a)(3) states that "the

documentation for whichever Option is used shall be available . . . ." It is not clear to the Agency if C-DAC intended to require documentation under Option (2) 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) 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 the operator until a hazardous situation has already arisen. Requiring documentation, which would have to be available at the site, would enable that determination be made before hoisting operations begin.

Requiring documentation under Option (2) of this section would address C-DAC's concern. Therefore, the Agency has expanded the first sentence of the C-DAC version of proposed § 1926.1428(a)(2) to clarify that documentation would be required under Option (2). The proposed paragraph now reads, with the added language highlighted:

> (2) *Option (2) – Employer's qualified evaluator*. The employer has its qualified evaluator assess the individual and determine that the individual meets the Qualification requirements (see § 1926.1428(c)) **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. (Emphasis added)

The Agency requests public comment on whether this revision is appropriate.

Proposed paragraph (b) 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 would be 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 proposed § 1926.1428(a).

Proposed paragraph (c) sets forth the qualification requirements for signal persons. Proposed paragraph (c)(1) would require 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 proposed § 1926.1419(c), C-DAC believed that accidents due to miscommunication could be reduced if there were more widespread use of

standardized hand signals. C-DAC concluded that this provision would promote greater use of standardized hand signals through the use of the Standard Method.[71]

Proposed paragraph (c)(2) would 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.

Proposed paragraph (c)(3) would require 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 above in the beginning of this discussion of proposed § 1926.1428, it is critical that a 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.

Proposed paragraph (c)(4) specifies that signal persons must know and understand the relevant requirements in proposed §§ 1926.1419–1926.1422, which address the types of signals that may be used and the circumstances surrounding their use, and the requirements of proposed § 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.

[71] As discussed above with respect to proposed 1926.1419(c), there are circumstances when it would be permissible to use hand signals other than the Standard Method signals. Also, under proposed § 1926.1419, signals other than hand signals could be used.

For example: A crane operation is going to use Standard Method hand signals. The signal person knows and understands all aspects of proposed § 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 proposed requirements in proposed § 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 proposed § 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 proposed § 1926.1420, *Signals – radio, telephone or other electronic transmission of signals*, or of proposed § 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) (see proposed 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.

Proposed paragraph (c)(5) would require that the signal person pass knowledge and practical tests to demonstrate that he or she meets the qualification requirements. It would allow the knowledge test to be either verbal or written. Reading or writing is not

normally necessary when working as a signal person. Therefore, C-DAC believed that administering the knowledge test verbally, without a separate demonstration of literacy, should be permitted.

**Section 1429 Qualifications of Maintenance and Repair Workers**

This proposed section addresses the qualifications that the workers who maintain and repair cranes/derricks must possess. Subpart N of this part currently contains 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 believed 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 1429(a)**

The Committee was aware that maintenance and repair workers sometimes need to operate equipment in order to perform maintenance, inspect 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 believe 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 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. Therefore, this proposed paragraph would permit maintenance and repair workers to operate equipment during their work only under specific restrictions designed to ensure safety.

Specifically, under proposed paragraph (a)(1), maintenance and repair workers would be permitted to operate the equipment only to the extent necessary to perform maintenance, inspect or verify the performance of the equipment. Under this provision, maintenance and repair workers would not be permitted to operate the equipment during regular operations.

Proposed paragraph (a)(2) would require 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, safe limitations, characteristics and hazards associated with the type of equipment involved.

**Paragraph 1429(b)**

Proposed paragraph (b) 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. Proposed § 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 work, the subject matter, or the project." In light of the safety hazards that could result from maintenance and repairs that are performed improperly, C-DAC believed that it was necessary for maintenance and repair workers to meet the "qualified person" criteria.

The Committee believed that many current maintenance and repair workers have received comprehensive, in-depth, on-the-job training from highly experienced supervisors and/or co-workers and have become highly experienced themselves. Because of such extensive training, long experience and high level of knowledge, the term "qualified persons" under this provision would include such workers under the prong for "extensive knowledge, training, and experience."

**1430 Training**

This proposed section both references training criteria that would be required by other sections of this subpart and sets forth training criteria and requirements not otherwise included in the proposed standard. Additionally, paragraph § 1926.1430(g) of this section would require employers to evaluate employees' understanding of the training. The following chart summarizes the location of the training requirements in this proposed rule:

| PARAGRAPH | TRAINING REQUIREMENT |
|---|---|
| § 1926.1408(g) | ***Power line safety*:** The operator and crew assigned to work with the equipment, including spotters, must be trained in specified topics relevant to power line safety. |
| § 1926.1424(a)(2) | ***Swing radius hazards*:** Employees assigned to work on or near the equipment must be trained to recognize struck-by and pinch/crush hazard areas of rotating superstructures. Also, where the employer protects against swing radius hazards by using warning signs and high visibility markings, the employer must train employees to understand what the markings signify. |

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| § 1926.1437(c)(2)(ii) | ***Swing radius hazards (floating cranes)*:** Where the employer protects against swing radius hazards on floating cranes by using warning signs and high visibility markings, the employer must train employees to understand what the markings signify. |
| § 1926.1430(e) | ***Crush/pinch points*:** Employees who work with equipment must be instructed to keep clear of holes, crush/pinch points, and the hazards addressed in § 1926.1424. |
| § 1926.1430(f) | ***Tag-out*:** Operators and other employees authorized to start/energize equipment or operate equipment controls (such as maintenance and repair workers), shall be trained in the tag-out procedures in § 1926.1417(f). |
| § 1926.1430(d) | ***Competent and Qualified Persons*:** Competent persons and qualified persons must be trained in the requirements of this subpart applicable to their respective roles. |
| § 1926.1430(g)(2) | ***Refresher training (general)*:** Refresher training in relevant topics shall be provided when the employee's conduct or an evaluation of the employee's knowledge indicates that retraining is necessary. |
| § 1926.1430(b) | ***Signal person training*:** Employees who will be assigned to work as signal persons who do not meet the requirements of § 1926.1428(c) shall be trained in the areas addressed in that paragraph. |
| § 1926.1428(b) | ***Signal person re-training*:** A signal person whose actions indicate that he or she does not meet the qualification requirements of § 1926.1428 must be retrained before being allowed to continue to work as a signal person. |
| § 1926.1427(f)(2)(i) | ***Operator trainee/apprentice*:** Before a trainee/apprentice is assigned to operate equipment, the employee must be provided with sufficient training for operating the equipment safely under the limitations established under § 1926.1427. |
| § 1926.1427(k) | ***Operator training during phase-in* period:** An employee assigned to operate the equipment during the phase-in period of § 1926.1427 who does not have the knowledge or ability to operate the equipment safely must be provided with necessary training prior to operating the equipment. |
| § 1926.1430(c)(1) | ***Operator training for qualification or certification*:** Operators who have not yet been qualified or certified under § 1926.1427 must be trained in the areas addressed in § 1926.1427(j). An operator who does not pass a qualification or certification test must be retrained as necessary. |
| § 1926.1430(c)(2)(i) | ***Operator training – boom hoist brake test*:** Operators must be trained to determine if the boom hoist brake needs to be adjusted or repaired by first raising the boom a short distance and testing the brake. |

| | |
|---|---|
| § 1926.1430(c)(2)(ii) | ***Operator training – emergency procedures (halting unintended movement)***: Where a manufacturer's emergency procedures for halting unintended equipment movement are available, operators must be trained in those procedures. |
| § 1926.1441(e) | ***Operator training (2,000 pound maximum rated capacity)*:** Operators of equipment with a rated hoisting-lifting capacity of 2,000 pounds or less must be trained in the safe operation of the equipment the operator is using. |

The Committee believed that both training and testing of certain employees are critical to the safety of equipment use on construction sites.[72] With respect to training, the Committee concluded that there is a need to improve upon the current general requirement for construction industry training 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," § 1926.21(a), 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," § 1926.21(b).

C-DAC found that more specific provisions were needed to ensure that employees are able to work safely with and around cranes. First, greater specificity would highlight the particular tasks (and the hazards associated with them) for which certain types of training are necessary. Second, training tailored to the specific hazards faced by particular employees would be an efficient and effective means of preventing injury.

[72] With respect to operator testing, as discussed in connection with § 1926.1427, *Operator qualification and certification*, this proposed standard places special emphasis on ensuring that equipment operators have acquired the knowledge and skills necessary to operate their equipment safely. This proposed standard also includes specific assessment requirements for signal persons (see proposed § 1926.1428(a)).

Proposed paragraph (a), *Overhead powerlines*, states that employees must be trained as outlined at proposed § 1926.1408(g) (see the explanation of hazards and training requirements in the discussion of proposed § 1926.1408(g)).

Under proposed paragraph (b), *Signal persons*, employees who will be assigned to work as signal persons who need training in order to meet the requirements of § 1926.1428(c) must be trained in the areas addressed in that paragraph. As discussed in relation to proposed § 1926.1428(c), each employee who will serve as a signal person must pass a verbal or written test and a practical test demonstrating the required knowledge and skills. Any such employee who does not pass those tests must receive additional training in the areas of deficiency.

Proposed paragraph (c), *Operators*, provides, at proposed paragraph (c)(1), that an equipment operator who is neither qualified nor certified under § 1926.1427, *Operator qualification and certification*, would be required to be trained in the areas addressed in § 1926.1427(j).

This proposed paragraph applies to operators who will need to be qualified or certified under § 1926.1427 but who are not yet qualified or certified or who have lost their qualification or certification. Operators in this category would include those who, during the four-year phase-in period of § 1926.1427, would not yet be required to be qualified or certified. Also in this category would be employees who the employer has decided will

be assigned to work as operators and will need to be qualified or certified under § 1926.1427, as well as operators who need such training in order to become re-qualified or re-certified, or who failed to pass a qualification or certification test.

Proposed paragraph (c)(2) would require operators to be trained in two practices. Paragraph (c)(2)(i) would require 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 very short distance. This provides an additional safety practice 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.

Proposed paragraph (c)(2)(ii) would require 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. The Committee recognized that manufacturer's emergency procedures for halting unintended equipment movement may not always be available and therefore this training would be required only when the procedures are available.

The C-DAC version of § 1926.1430(c)(2) began: "In addition to training in the areas addressed in § 1926.1427(j), operators shall be trained in the following practices." This wording implied that all operators must be trained in the topics listed in § 1926.1427(j). However, § 1926.1427(j) is not a training requirement but sets forth criteria that must be addressed in a qualification or certification test. Operators who are sufficiently knowledgeable in these topics through prior training and/or experience need not receive additional training under this proposed standard. To avoid any confusion in this regard, OSHA has changed C-DAC's wording to read, in proposed § 1926.1430(c)(2): "Operators shall be trained in the following practices."

The SBREFA Panel recommended that OSHA seek public comment on several issues related to operator training. Several Small Entity Representatives (SERs) believed that the training requirements in the proposed standard are too broad and should instead be keyed to the particular operations the operator performs and the particular equipment he/she operates. The SBREFA Panel also recommended that OSHA consider and ask for public comment on whether a more limited operator training program would be appropriate for operations based on the capacity and type of equipment and nature of operations.

The Panel noted that proposed § 1926.1427(j)(1)(i) requires operator training in "the information necessary for safe operation of the specific type of equipment the individual will operate" and understood this to address the SERs' concern that operators of smaller capacity equipment used in less complex operations should require less training than

those operators of higher capacity, complex equipment used in more complex situations. The Panel recommended that OSHA seek public comment on whether this point should be made more clearly, and OSHA welcomes such comment.

The Panel further recommended that OSHA consider and ask for public comment as to whether the supervisor responsible for oversight for an operator in the pre-qualification period described at § 1926.1427(f) should have additional training beyond that required at § 1926.1427(f)(2)(iii)(B). The discussion was focused on the issue of whether the supervisor should be trained to be able to take over the controls, if necessary, while supervising the operator in the pre-qualification period.

As the proposed rule is written, when the 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. In accordance with the Panel's recommendation, OSHA requests comment on whether the supervisor needs additional training in this regard than the proposal would require.

Paragraph (d), *Competent persons and qualified persons*, would require that competent persons and qualified persons be trained regarding the requirements of this Subpart applicable to their respective roles. See § 1926.1401, *Definitions*, for a description of what is necessary to be a competent person or a qualified person.

A person assigned by an employer to be a "competent person" or "qualified person" under this proposed rule must already have had a certain level of training (or, in the case of a competent person, training or experience) in order to meet the criteria applicable to such a designation. This paragraph does not address such training – it would not require the employer to provide the training needed for an employee to meet those criteria in order 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 that are applicable to the person's role and responsibility. For example, a "competent person" assigned to conduct shift inspections under § 1926.1412(d) must be trained under proposed § 1926.1430(d) in the required elements of a shift inspection. This training is necessary to ensure the competent person or qualified person is aware of his/her responsibility under this subpart for finding/correcting hazardous conditions.

Proposed paragraph (e), *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 of hazards and requirements in the discussion of proposed § 1926.1424.

Proposed paragraph (f), *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 procedures in § 1926.1417(f). See the discussion of tag-out procedures discussed in proposed § 1926.1417(f).

Proposed paragraph (g), *Training administration*, would require that employers ensure employees understand required training and provide refresher training when necessary. Specifically, proposed § 1926.1430(g)(1) would require that the employee be evaluated to verify that he/she understands the information provided in training required by this Subpart. The Committee determined that training without any follow-up measure to determine understanding or effectiveness would not achieve the goal of a safe work environment.

Proposed paragraph (g)(2) would require the employer to provide refresher training of an employee when, based on evaluation or employee conduct, it is indicated that retraining is needed.

**Section 1431 Hoisting Personnel**

Cranes and derricks are designed to move materials, not personnel. However, situations arise when a crane or derrick can be the safest means to move employees to their work area and/or to hold them in position while they do their work.

Although there are situations when using a crane or derrick to lift personnel to work areas is the safest means of accomplishing the task, there are inherent dangers in such an operation because of the heights, equipment and environment involved. A number of workers have been killed and seriously injured while being lifted by a crane or derrick

when the equipment's lifting mechanism malfunctioned and they did not have adequate fall protection. The height to which the workers are lifted means that any instability in their supporting platform creates a serious fall hazard. See 53 FR 29116, 29117-18 (Aug. 2, 1988) (discussing accidents that occurred when cranes were used to lift personnel). Because of that risk, in 1988 OSHA added regulations to subpart N of this part to both limit the use of cranes for lifting personnel and increase employee protection when it is necessary to use cranes for this purpose. See 29 CFR 1926.550(g), *Crane or derrick suspended personnel platforms*.

Because of the inherent hazards such operations present, OSHA currently permits cranes and derricks to be used to lift personnel only "when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of structural design or worksite conditions." 29 CFR 1926.550(g)(2). When a crane or derrick is used to lift personnel, a personnel platform that complies with requirements in § 1926.550(g) must be used.

The Committee concluded that the current subpart N standards governing personnel hoisting by equipment have resulted in a reduction of accidents and determined that their fundamental substance should be maintained in the proposed standard. Accordingly, the Committee proposal largely continues the current requirements of subpart N, § 1926.550(g). Some changes have been made to provide additional safety and to eliminate ambiguity. Requirements specific to certain activities, such as personnel

hoisting in pile-driving operations, drill shafts, storage tanks and marine transfer have been added. The discussion below focuses on these changes and additions.

One of the resources the Committee consulted in developing this proposed paragraph was ASME B30.23-1998, "Personnel Lifting Systems." Since the Committee finished its work, that industry consensus standard was superseded by ASME B30.23-2005. OSHA has compared the two versions and found no substantive differences in the provisions that correspond to paragraphs in this proposal. Where the ASME standard is cited in this section, the citations will refer to the 2005 version.

OSHA stresses that the proposed provisions in this section would be additional requirements that must be met when equipment is used to lift personnel. During such use, all other applicable requirements of this proposed standard would also be required to be met.

**Paragraph 1431(a)**

This proposed paragraph states that equipment may be used to hoist personnel only when all 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. The same limitation is currently found in Subpart N's § 1926.550(g)(2). 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 proposed paragraph differs from the current § 1926.550(g)(2) by substituting the word "equipment" for "crane or derrick." The terms "crane" and "derrick" do not represent the full spectrum of equipment that would be covered by this standard. See § 1926.1400, *Scope* for a description of the equipment covered by this Subpart.

Additionally, this proposed paragraph would 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 § 1926.550 without the need for a showing that other means of reaching the work area would create a greater hazard or are impossible. This provision was included in Subpart R because steel connectors must often work at high locations before there is a solid structure to stand on and where a personnel platform suspended from a crane is the safest place for them to work. 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).

**Paragraph 1431(b) Use of personnel platform**

This proposed paragraph would generally require the use of a personnel platform when hoisting employees and require that criteria specified in proposed § 1926.1431(e) be met

for such platforms. It also provides for exceptions to the use of personnel platforms that are not currently allowed by § 1926.550(g)(2).

For reasons discussed above, proposed § 1926.1431(b)(1) would generally require that a personnel platform be used when hoisting employees and that the platform meet the requirements of § 1926.1431(e) of this proposed section. As discussed below, the requirements of § 1926.1431(e) are comparable to requirements currently found in § 1926.550(g).

Proposed paragraph (b)(2), *Exceptions*, sets forth the construction activities in which hoisting personnel without using a personnel platform would be allowed because, in the Committee's view, use of a personnel platform might be infeasible or more hazardous than an alternative means of hoisting personnel. 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), and shaft operations and chimney operations. This proposed section contains specific requirements for hoisting personnel during these operations at § 1926.1431(o), (p), (r), and (s) that provide for alternatives to the use of a personnel platform. For drill shafts, pile driving operations, storage tanks, and shaft and chimney operations, which present access restrictions, the alternative to a personnel platform would be a boatswain's chair. For marine worksites, it would be a marine hoisted personnel transfer device, which is designed to facilitate exit in the event it enters the water.

For the purposes of this proposed standard, a "marine worksite" is a construction worksite that is located in, on or above the water (see proposed § 1926.1401, *Definitions*). The Committee determined it was necessary to clearly define this term since marine worksite conditions and hazards differ significantly from non-marine worksites. In particular, with respect to equipment covered by this section, the marine worksite presents unique hazards for equipment stability and environmental conditions affecting operations.

Section 1926.1401 defines a "marine hoisted personnel transfer device" as a device, such as a "transfer net" used to hoist an employee to or from a marine worksite that is designed to protect the employee during a marine transfer and that allows for rapid entry/exit from the device. Such devices do not include a boatswain's chair when hoisted by equipment covered by this standard. The Committee determined it was necessary to clearly specify the type of device that will or will not be considered a marine hoisted personnel transfer device for this standard, as marine worksites involve unique conditions and hazards with respect to hoisting employees. The Committee determined that it was necessary to require a device designed for such conditions while allowing flexibility so the employer may select the most appropriate device based on the site and working conditions.

Each of the exceptions is discussed below under the particular paragraph that addresses it. Subpart N of this part does not currently address these worksite activities (nor does ASME B30.23-2005 address these particular topics).

**Paragraph 1431(c) Equipment set-up**

This paragraph sets forth the basic criteria for equipment set-up for personnel hoisting. The requirements continue and refine those currently in Subpart N's § 1926.550(g)(3)(i)(D).

Proposed paragraph (c)(1) would require the equipment to be on level, firm and stable footing. It differs from the current standard at § 1926.550(g)(3)(i)(D) in that 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. ASME B30.23-3.2.2(a)(4)-2005 has a similar requirement, with the operator of the equipment determining equipment to be level within one percent during set up and hoisting operations. The Committee believed that the danger of equipment potentially tipping when hoisting personnel justifies the need for a qualified person to examine and approve the equipment's stability. See § 1926.1401, *Definitions* for the criteria for a qualified person.

Proposed paragraph (c)(2) specifies that each outrigger be both extended and locked. The amount of extension must be the same and also be in accordance with the manufacturer's specifications. This is similar to the current requirement of § 1926.550(g)(3)(i)(D); however, the current requirement that outriggers be "fully deployed" has been changed to require that outriggers be equally extended and in accordance with manufacturer's

procedures and load charts. Equal extension 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 in that area. The Committee determined that a requirement of full extension of all outriggers would not be appropriate for all worksite conditions. Nor is it necessary, as long as partial extension is within the manufacturer's procedures; the critical factor is to have each outrigger extended equally, whether it is a full or shorter extension.

Proper placement and deployment of outriggers is essential to prevent the hazard of equipment tipping while hoisting personnel.

**Paragraph 1431(d) Equipment criteria**

This paragraph sets forth requirements for the equipment used to hoist personnel. These requirements refine and expand the equipment requirements currently in Subpart N.

Proposed paragraph (d)(1): *Capacity: use of suspended personnel platform*, would continue the requirement at § 1926.550(g)(3)(i)(E) to limit the total load to 50 per cent of the equipment's rated capacity. It would clarify the current standard by specifying that the total load includes the hook, load line, and rigging. The 50 percent capacity limit would not apply during equipment proof testing.

The 50 percent limit reflects that using this equipment to hoist personnel requires additional 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.

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) also apply here.

The Committee considered prohibiting the use of boom attached personnel platforms for hoisting personnel. However, the Committee concluded that it was unaware of any reason to prohibit their use. As discussed above under § 1926.1400, *Scope*, Committee members were concerned that boom-attached platforms may present additional hazards not addressed in this proposed standard, and OSHA is requesting comment on whether additional requirements should apply when using them.

In reviewing the C-DAC consensus document, the Agency determined that the Committee did not address the issue of capacity when no personnel platform is used. Since there are several situations where no platform will be used at all (these are listed in proposed § 1926.1431(b)(2) of this section), the Agency believes that a capacity limit similar to those set by the Committee when using a personnel platform is needed.

Therefore, OSHA has added proposed § 1926.1431(d)(3), *Capacity: hoisting personnel without a personnel platform*, which 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. The addition of this proposed paragraph has resulted in the renumbering of the remaining paragraphs in proposed § 1926.1431(d) (as compared to the numbering in the C-DAC document).

Proposed paragraph (d)(4) would require 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.

This differs from current provision § 1926.550(g)(3)(i)(C) in Subpart N in that the proposed provision adds a requirement to use operator actuated secondary braking/locking features, when available, in addition to other braking systems. This is similar to sections 1.2.2(f) and 3.2.2(a)(19) of ASME B30.23-2005 for automatic brake systems and setting of brakes before work begins from the platform.

The subsections of proposed paragraph (d)(5), *Devices*, would require certain safety devices for equipment addressed by this proposed section.

Proposed paragraph (d)(5)(i) would address the requirements for equipment with a variable angle boom. Such equipment would be required to be equipped with both a

boom angle indicator and boom hoist limiting device (except for derricks). Use of these devices minimizes the potential for hoisting personnel at an unsafe angle, which could result in the platform or equipment tipping.

A boom angle indicator is currently required in § 1926.550(g)(3)(ii)(A). Proposed § 1926.1431(d)(4)(i) would add a requirement for a boom hoist limiting device. The Committee believed that both a boom angle indicator and a boom hoist limiting device are necessary to prevent the boom from being moved to unsafe angles. A boom hoist limiting device would be required when hoisting personnel, even though it would not otherwise be required for equipment manufactured before December 17, 1969 under proposed § 1926.1416(d)(1) (see discussion of proposed § 1926.1416(d) – *Operational aids*). This reflects the need for equipment used to hoist personnel to have additional safety features.

Proposed paragraph (d)(5)(i) would not apply to derricks. This is consistent with C-DAC's recommendation that boom hoist limiting devices and boom angle indicators not be required on derricks. See proposed § 1926.1436(f), which addresses operational aids for derricks. As discussed below, the Committee believed that these devices were not needed on derricks because the current practice in the industry of marking the boom hoist cable of derricks with visible caution and stop marks corresponding to maximum and minimum allowable boom angles is a safe work practice. Accordingly, paragraph § 1926.1436(f) permits employers to use this practice. Alternatively, it permits employers to use an electronic or other device that either signals the operator in time to prevent the

boom from moving past its minimum and maximum angles or automatically prevents such movement.

Proposed paragraph (d)(5)(ii) would address the requirements for equipment, including derricks, when a luffing jib is used for personnel hoisting. This paragraph would require all equipment to have both a jib angle indicator and jib hoist limiting device. Use of these devices minimizes the likelihood of platform tipping and equipment failure.

Neither the current Subpart N nor ASME B30.23-2005 addresses the use of luffing jibs for personnel hoisting. The Committee believed that this proposed requirement is needed to help improve the safety of crane and derrick operations.

Proposed paragraph (d)(5)(iii) would require a telescoping boom to either have a device indicating the boom's extended length or measuring marks that are clear and visible to the equipment operator. This would allow the operator to easily ascertain the extension length in order to stay within safe operating parameters. This requirement would address the hazard of equipment or platform tipping or equipment failure that can result when a telescoping boom is extended beyond appropriate operating parameters. Currently, § 1926.550(g)(3)(ii)(B) permits, as an alternative to equipping the boom with a device to indicate the boom's extended length, an "accurate determination" to be made of the load radius to be used prior to hoisting personnel. Proposed § 1926.1431(d)(5)(iii)'s provision for measuring marks on the boom would enable this determination to be made accurately if the boom is not equipped with a device indicating its extended length.

Proposed paragraph (d)(5)(iv), *Anti-two-block*, would require a device that automatically prevents contact between a component on the hoist line (load block, overhaul block, etc.) with the boom tip, which can damage or sever the load line or cause other forms of equipment failure. This contact between the hoist line component and the boom tip is referred to as two-blocking. The purpose of the anti-two-blocking device is to prevent this condition, which can result in a sudden drop of the personnel platform. See the discussion of two-blocking in proposed § 1926.1416, *Operational aids*.

Paragraph (d)(5)(iv) is similar to current § 1926.550(g)(3)(ii)(C) and adds an exception for pile driving operations. The proposed requirement would not apply when hoisting personnel in pile driving operations due to the fact the vibration of the pile driving activity makes use of an anti-two-block device ineffective.

In reviewing this portion of the C-DAC document, the Agency has noted that the use of alternative measures for preventing two-blocking during pile driving operations would be required under proposed § 1926.1431(p)(2). However, the C-DAC language for proposed provision § 1926.1431(d)(5)(iv) did not refer to the requirement for alternative measures. Therefore, OSHA has added a reference to the exception in § 1926.1431(d)(5)(iv) advising the reader that alternative measures are required under § 1926.1431(p)(2).

Proposed paragraph (d)(5)(v), *Controlled load lowering*, would require a system or device on the load line hoist drum that positively regulates the lowering speed. It would require this system to be used when hoisting personnel, in addition to a load line hoist brake. The purpose is to minimize the likelihood of free fall of the personnel that could lead to hitting the ground from a sudden fast descent. Additionally, the proposed paragraph would note that free fall of the load line hoist is prohibited and use of equipment in which the boom hoist mechanism can free fall is prohibited. Refer to proposed § 1926.1426, *Free fall/controlled load lowering*, for additional information.

Currently, 1926.550(g)(3)(ii)(D) similarly requires a system or device that positively regulates the lowering speed. Proposed § 1926.1431(d)(5)(v) would explicitly specify that the system must be used when hoisting personnel.

Proposed paragraph (d)(5)(vi), *Proper operation required*, specifies that personnel hoisting would only occur when and if all the devices required in § 1926.1431(d)(5)(i) through (v) are in proper working order. It would also mandate that if a required device stops working while personnel are being hoisted, all personnel hoisting operations must be stopped and not resumed until all devices are working properly. Alternative measures would not be allowed.

The purpose of this paragraph is to clearly establish that personnel hoisting may only be done when all necessary safety devices are working properly. The hazards addressed by this requirement include: structural failure, equipment tipping, dropping personnel, and

platform tipping. These are severe hazards, so safeguards to prevent them are clearly needed.

This paragraph does not have a specific corollary in the current Subpart N, although the Subpart N provisions that require safety devices implies that they be working properly. Sections 3.2.2(a)(23) and 1.2.2 of ASME B30.23–2005 are comparable to this requirement.

Proposed paragraph (d)(6) would prohibit the use of a personnel platform directly attached to a luffing jib. Thus, only a suspended type of personnel platform may be used on a luffing jib. The Committee determined that it would be dangerous to use a boom-attached personnel platform if attached to a luffing jib and that a complete prohibition of use of a boom-attached personnel platform to a luffing jib is appropriate.

**Paragraph 1431(e) Personnel platform criteria**

This proposed paragraph would establish the minimum criteria for a personnel platform. The criteria are similar to those currently in 29 CFR Part 1926 subpart N's § 1926.550(g)(4)(i) and (ii). However, § 1926.1431(e)(2) would add the requirement that the connection system keep the platform within 10 degrees of level and § 1926.1431(e)(10) would add a visibility requirement for the overhead protective cover to the personnel platform.

Proposed paragraph (e)(1) would require 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 would address the hazards of structural failure of the platform, failure of the attachment/suspension system, and preclude the use of designs that would be inappropriate for hoisting people. This is similar to the current 29 CFR Part 1926 subpart N's § 1926.550(g)(4)(i)(A), which states that either a "qualified engineer or a qualified person competent in structural design" shall design the platform, but clarifies that even if the platform is designed by a qualified engineer, that engineer must understand structural design. See § 1926.1401, *Definitions*, for the definition of "qualified person."

Proposed paragraph (e)(2) would require the system used to connect the personnel platform to the equipment to be within 10 degrees of level. This would address the hazard of platform tipping by maintaining the platform close to level. This requirement is not currently in subpart N.

Proposed paragraph (e)(3) would require 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. This continues the requirement of subpart N's § 1926.550(g)(4)(i)(B).

Proposed paragraph (e)(4) would require the platform to support its own weight plus a minimum of five times the maximum intended load without failure. This limit 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 would not be subject to this requirement but instead would be subject to proposed § 1926.1431(e)(6). This continues a requirement in proposed § 1926.550(g)(4)(i)(C).

Proposed paragraph (e)(5) would require 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.

"Certified welder" is defined in § 1926.1401 as "a welder that meets the nationally recognized certification requirements that are applicable to the task being performed." The requirement for a "certified" welder modifies the current requirement of Subpart N's § 1926.550(g)(4)(ii)(H), which requires a "qualified" welder. It is similar to section 1.2.1(b)(2) of ASME B30.23–2005 welding standards for personnel platforms. The Committee believed that because proper platform welding is so critical to employee safety, it is necessary for the welding to be done by a certified welder.

Proposed paragraph (e)(6) would detail 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.

Proposed paragraph (e)(6) adds to the current requirements of 29 CFR Part 1926 subpart N's § 1926.550(g)(4)(ii)(A) in specifying that "points to which personal fall arrest systems are attached must meet the anchorage requirements in 29 CFR Part 1926 subpart M." This is similar to the guardrail and anchorage specifications in sections 1.1.1(b)(2) and (3) of ASME B30.23–2005. This would update the requirements for the anchorage so that the same degree of protection currently required under Subpart M would be required under this standard.

Proposed paragraph (e)(7) would require the placement of a grab rail within the entire perimeter of the personnel platform except for access gates/doors, where a grab rail would 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. Use of the guardrail for this purpose exposes the employee's hand to being smashed by external objects. This would modify the current requirement of Subpart N's § 1926.550(g)(4)(ii)(B) by clarifying that grab rails are not required on the access gates/door. It is similar to ASME B30.23-1.1.1(b)(4)-2005.

Proposed paragraphs (e)(8)(i) and (ii), *Access gates/doors*, would specify that access gates/doors be designed to not swing outward and must also have a mechanism that will

keep the gate/door from being opened unintentionally. A door that swings outward or opens unexpectedly puts the employee at risk of fall from the platform. This modifies the current requirements of Subpart N's § 1926.550(g)(4)(ii)(C) and (D) by requiring that access doors not swing outward at any time and expands the list of types of gates/doors to include "swinging, sliding, folding, or other types." Section 1.1.1(b)(8) of ASME B30.23–2005 has similar requirements for access gates.

Proposed paragraph (e)(9) would require adequate headroom to allow employees to stand upright in the personnel platform. This would provide adequate space for the employee to work from the platform while keeping his/her entire body within the platform, and would also contribute to greater stability during platform movement. This continues the current requirement at § 1925.550(g)(4)(ii)(E).

Proposed paragraph (e)(10) would require an overhead protective cover attached to the platform when an employee is exposed to falling objects. It would mandate that the overhead cover of the platform 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 foreseeable falling objects would determine the type of material and design to provide the necessary protection for the platform occupants. Full overhead protection (i.e., no visibility through the protective cover) would be allowed when conditions are such that a full protective cover is necessary to

protect employees from falling objects. The visibility requirement is similar to section 1.1.1(b)(11) of ASME B30.23-2005. This proposed paragraph would change current § 1926.550(g)(4)(ii)(F) by clarifying the type of overhead protection that is required.

Proposed paragraph (e)(10) explicitly states that the protection provided by the cover would be supplemental to the protection provided by hard hats – the use of hard hats would not obviate the requirement for the cover. While a hard hat provides some protection to an employee's head from overhead hazards, it does not protect the rest of an employee's body from such hazards.

Proposed paragraph (e)(11) would require 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. A similar requirement is found in Subpart N's § 1926.550(g)(4)(ii)(G).

Proposed paragraph (e)(12) would require conspicuously posting a plate or other permanent written notice on the personnel platform listing the weight of the platform itself and the platform's rated load capacity. The purpose 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.

Proposed paragraph (e)(12) would modify the current requirement of Subpart N's § 1926.550(g)(4)(ii)(I) by deleting the phrase "or maximum intended load." That phrase was included in Subpart N because platforms made on the worksite did not have a manufacturer's rated capacity. However, under proposed § 1926.1431(e)(1), all personnel platforms would be required to be designed by a qualified person familiar with structural design, and such a person will be able to determine the rated capacity for the platform.

**Paragraph 1431(f) Personnel platform loading**

Proposed paragraph (f)(1) would prohibit loading the platform in excess of its rated load capacity. Proposed § 1926.1431(f)(1) differs from current § 1926.550(g)(4)(ii)(A) by deleting a provision stating that if a personnel platform does not have a rated load capacity it shall not be loaded in excess of its maximum intended load. The "maximum intended load" provision was deleted for the same reason previously discussed under § 1926.4131(e)(12).

Proposed paragraph (f)(2)(i) would require that the platform be used exclusively for personnel hoisting and not for hoisting materials. However, it would 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. This would continue the current requirement of § 1926.550(g)(4)(iii)(C).

Proposed paragraph (f)(2)(ii) would provide an exception to (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). Since the materials and tools would be secured, they would not damage the platform. Subpart N, at § 1926.550(g)(5)(i), currently allows materials/tools to be on the platform during the trial lift but does not specify that they need to be properly secured and distributed.

Proposed paragraphs (f)(3)(i) and (ii) would 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. These requirements would continue those in Subpart N's § 1926.550(g)(4)(iii)(D) & (E).

Proposed paragraph (f)(4) would limit 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. This would provide greater clarity than the current requirement of Subpart N's § 1926.550(g)(4)(iii)(B) by noting that the

number of platform occupants is limited not only by work requirements but also the platform's design.

**Paragraph 1431(g) Attachment and rigging**

Proposed paragraph (g)(1) would establish the requirements for the device used to connect the personnel platform to the hoist line. It would expand and clarify the requirements of Subpart N's § 1926.550(g)(4)(iv)(B).

The nature and type of connector used is critical to the overall safety of the suspended personnel platform. Under the proposed 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 proposed 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.

Proposed paragraph (g)(2) would require that each bridle leg in a rope bridle be connected to the master link/shackle in a manner that would allow the platform's load to be equally distributed among each bridle leg. The purpose of this type of attachment is to

avoid platform tipping. The proposed requirement differs from current Subpart N at § 1926.550(g)(4)(iv)(A) by changing the phrase "wire rope" to "rope." Currently, the only type of rope that Subpart N permits to be used for bridles is wire rope, and it is C-DAC's and OSHA's understanding that no other type of rope suitable for this purpose is currently available. However, the Committee believed that synthetic ropes now under development could someday meet the safety factor requirement in § 1926.1431(g)(3) and it did not want to preclude the potential use of sufficiently strong synthetic rope.

Proposed paragraph (g)(3) would continue the current requirement of the first sentence of § 1926.550(g)(4)(iv)(C) that all hardware used for rigging must be able to support five times the maximum intended load applied to or transmitted to that component. However, the C-DAC consensus document omitted the second sentence in current § 1926.550(g)(4)(iv)(C), which requires slings using rotation resistant rope to be able to support at least ten times the maximum intended load. In promulgating § 1926.550(g)(4)(iv)(C), OSHA arrived at the safety factor of ten for rotation resistant rope by doubling the normal design factor of five for such rope (see discussion of the design factor for rotation resistant rope above under § 1926.1414, *Wire rope – selection and installation criteria*) to add an extra margin of safety when hoisting personnel. 53 FR 29116, 29122, 29132 (Aug. 2, 1988). OSHA believes that C-DAC did not intend to lower the safety factor for rotation resistant rope used for personnel hoisting and inadvertently omitted the requirement that slings using rotation resistant rope to have a safety factor of ten. OSHA has therefore restored that requirement to proposed 1926.1431(g)(3). As modified, 1926.1431(g)(3) reads:

> (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 shall be capable of supporting without failure at least ten times the maximum intended load.

Proposed paragraph (g)(4) would require the eyes in wire rope slings to be fabricated with thimbles, continuing the current Subpart N's § 1926.550(g)(4)(iv)(D) requirement. The purpose of this requirement is to prevent excessive wear to the eyes and possible failure of the platform's rigging.

Proposed paragraph (g)(5) would require that bridles and rigging used to suspend the personnel platform be used exclusively for hoisting personnel operations, continuing the current requirement of § 1926.550(g)(4)(iv)(E). Rigging components must be dedicated for the sole use of personnel hoisting to provide maximum safety. 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 structural failure.

**Paragraph 1431(h) Trial lift and inspection**

The proposed requirements of paragraphs (h)(1) through (5) generally continue the current requirements of Subpart N's § 1926.550(g)(5)(i) through (v). The proposed requirements have been reorganized and reworded for clarity. Requirements for removal

of the test weight, checking for wire rope deficiencies, and use of a competent person for trial lifts are not currently in 29 CFR Part 1926 subpart N.

Proposed paragraph (h)(1) continues the requirement of § 1926.550(g)(5)(i) for a trial lift without occupants 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 accessibility of the work location; no work locations 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 would be required to 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 would be required to 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. Second, 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.

Upon reviewing § 1926.1431(h)(1) in the C-DAC document, OSHA believes that the phrase "a single trial lift for all locations," which was taken from current 1926.550(g)(5)(i), may not be sufficiently clear to describe the intended meaning. In addition, OSHA is 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 lift. OSHA believes that the following language would more clearly reflect the intent of the provision and requests public comment on whether the language should be clarified in this manner:

> (h) *Trial lift and inspection*.
>
> (1) A trial lift with the unoccupied personnel platform loaded at least to the anticipated liftweight shall 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 ~~for all locations~~, **in which the platform is moved sequentially to each location**, shall be performed; **the method selected must be the same as the method that will be used to hoist the personnel.**

Proposed paragraph (h)(2) would require that the trial lift 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. Additionally, a trial lift must be done when the lift route is changed, unless a competent person determines the new lift route does not present new factors affecting safety. Similar requirements are found in Subpart N's § 926.550(g)(5)(i) and (ii).

Proposed paragraph (h)(3) would require a competent person to ensure that all required safety devices and operational aids required by this proposed 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 would ensure that necessary safety measures are in place and validated by a competent person for the trial lift. The proposed paragraph differs from the current requirements at § 1926.550(g)(5)(i) as it would require a competent person to make the determination rather than the operator. Under sections 3.2.2(a)(9) and (a)(10) of ASME B30.23–2005, the operator is also required to determine that the trial lift has been conducted properly. 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.

Proposed paragraph (h)(4) would establish the duties of the competent person immediately after the trial lift. It would require 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 proposed § 1926.1431(h)(6), any condition found during the trial lift that fails to meet a requirement of this proposed standard or otherwise constitutes a safety hazard must be corrected before hoisting personnel). Proposed paragraph (h)(4) would continue the current requirements of 1926.550(g)(5)(iv) while adding the requirement that the competent person ensure that the test weight is removed. This has been added because the Committee was aware of incidents in which overloading of the personnel platform occurred due to use of the platform to hoist personnel with the test weights still on board.

Under proposed 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.

It is the understanding of the Agency that 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.

However, while the text of this proposed provision implies that the check is to be done with the personnel and materials/tools on board, it does not specifically so state. The Agency plans to add language to that effect so that proposed § 1926.1431(h)(5)(i) would read as follows:

> (i) The platform shall 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.

The Agency requests public comment on such a change.

Proposed paragraph (h)(5)(ii) would require 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. Proposed paragraphs (i) and (ii) continue the current requirements of § 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 required by existing § 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.

Proposed paragraph (h)(6) would establish that any condition that fails to meet any requirements of this standard or otherwise creates a safety hazard must be corrected before personnel are hoisted. This includes such conditions found during the trial lift or

in any inspection or subsequent review of the equipment, platform or rigging. This is similar to the requirement of Subpart N's § 1926.550(g)(5)(v).

**Paragraph 1431(i) [*Reserved.*]**

This proposed paragraph is reserved because it is inconvenient for readers to determine whether "(i)" is being used as a letter or a roman numeral.

**Paragraph 1431(j) Proof Testing**

This proposed paragraph would delineate the requirement of and method for proof testing the personnel platform and rigging. It would require 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 would 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 proposed 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 of the platform or rigging. Proposed paragraph § 1926.1431(j) contains requirements similar to those in Subpart N's § 1926.550(g)(5)(vi). It adds the requirement in proposed § 1926.1431(j)(2) that the platform be lowered by controlled load lowering and braked before being held in position for five minutes. This provision was added to ensure that the load lowering and braking mechanisms are functioning properly before personnel are lifted. In addition, proposed § 1926.1431(j)(3) clarifies that only deficiencies that present a safety hazard need be corrected to avoid any implication that minor deficiencies bearing no relation to safety need to be corrected.

The Committee discussed requiring the employer to document the proof test but determined that documentation of the proof test would not add to employee safety.

**Paragraph 1431(k) Work practices**

Proposed paragraph (k)(1) would require hoisting of the personnel platform in a slow, controlled, cautious manner, with no sudden movements of the equipment or platform. This precaution would minimize the likelihood of platform tipping, loss of footing, and loss of control of the platform by the operator during hoisting. A comparable requirement is now contained in Subpart N at § 1926.550(g)(3)(i)(A).

Proposed paragraph (k)(2)(i) would require 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 would not apply when a platform occupant must position the platform. Additionally, this does not apply while performing the duties of a signal person. The purpose of this requirement is to prevent an employee from having a body part struck or caught in between the personnel platform and another object. This differs from the current requirement of Subpart N at § 1926.550(g)(6)(i) by providing an exception for a platform occupant positioning the platform. The Committee believed that such positioning can be important to safety, and therefore an exception in this regard would be appropriate.

Proposed paragraph (k)(2)(ii) would add a new provision by prohibiting 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 would prohibit 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 receive the protections of the guardrail system and do not destabilize the platform.

Proposed paragraph (k)(2)(iii) would add a new provision by prohibiting 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.

Proposed paragraph (k)(3) would require a personnel platform that is not landed to be secured to the structure before employees enter or exit the platform. It would allow an

exception when a greater hazard would be created by securing the platform to the structure. The purpose is to provide a stable surface to prevent loss of footing when entering or exiting the platform. This provision is similar to Subpart N's § 1926.550(g)(6)(ii) but replaces the words "unsafe condition" with "greater hazard" to clarify that the exception only comes into play when the hazard that would be created by securing the platform to the structure is greater than would exist if it were not secured.

Proposed paragraph (k)(4) would add a new requirement that the operator receive confirmation that the platform is no longer tied to the structure and is freely suspended before the operator moves the platform. This requirement would prevent structural damage to the platform and/or rigging and prevent the fall hazard that could result from pulling the platform out of plumb if there is an attempt to move it while it is still attached.

Proposed paragraph (k)(5) would require 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. This would modify the current requirement of Subpart N's § 1926.550(g)(6)(iii), which requires the use of tag lines unless their use would create an unsafe condition. The Committee believed it is not always necessary to use tag lines even when their use would not create an unsafe condition and was of the view that this change would not decrease safety.

Under proposed paragraph (k)(6), where the platform is not equipped with controls, the equipment operator would be required to remain at the equipment controls at all times while the personnel platform is occupied. Since 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. Subpart N at § 1926.550(g)(6)(iv) currently contains a similar requirement but requires the operator to remain at the controls "when the crane engine is running and the platform is occupied." Proposed § 1926.1431(k)(6) specifies that the operator must stay at the controls at all times the platform is occupied, whether or not the crane engine is running.

Proposed paragraph (k)(7), *Platforms with controls*, and its subsections apply when a personnel platform has controls. At present, platforms being manufactured with controls are boom-tip mounted platforms. Controls on certain personnel platforms enable a platform occupant to articulate 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. Currently, Subpart N of this part does not distinguish between platforms with controls and platforms without controls, so the requirement of § 1926.550(g)(6)(iv) that the operator remain at the equipment controls when the engine is running and the platform is occupied applies to both types of platform.

Proposed paragraph (k)(7)(i) would require 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) would require the equipment operator to be either at the equipment controls, in the personnel platform, or onsite in view of the equipment. It is OSHA's understanding that the purpose of this proposed provision is to require the equipment operator to be available to take action if necessary, such as where there is unexpected or inadvertent platform or equipment movement, a sudden change in wind conditions, or an injury to a platform occupant.

It is also OSHA's understanding that C-DAC intended this provision to give employers the flexibility to position the operator where he or she is needed in certain common situations. For example, if the controls on the platform are designed to control both the platform and the boom, the operator could be the qualified person on the platform who operates the controls. If the controls allow only limited control of the platform itself, the operator will be needed at the equipment controls, as under proposed § 1926.1431(k)(6). The Agency also believes that C-DAC intended the option of having the operator onsite and in view of the equipment to accommodate radio-controlled operations, in which the operator controls the equipment from a position off the equipment but within its line of sight.

Upon reviewing proposed paragraph (k)(7)(ii), OSHA is concerned that the proposed provision would not operate in this manner. Specifically, it would not limit the

employer's choices to situations where they are suitable. For example, under the provision as written, the operator could be on the platform even if the controls on the platform allow only limited control of the platform, and the operator would therefore not be available at the equipment controls to move the boom when it is necessary to do so. OSHA requests public comment on whether it is necessary to reword proposed § 1926.1431(k)(7)(ii) to clarify the circumstances under which employers can use the three options for positioning the equipment operator and, if so, how the provision should be worded to achieve that goal.

Proposed paragraph (k)(7)(iii) would require the platform 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.

Proposed paragraph (k)(8)(i), *Environmental conditions -- Wind*, would require a qualified person to determine if it is unsafe to hoist personnel when the wind speed (gust or sustained) exceeds 20 mph. High winds increase the likelihood of platform tipping, sudden unexpected movement of the platform, or structural failure of the equipment. If the qualified person determines that hoisting personnel is unsafe, hoisting operations must not begin or, if already in progress, must be terminated.

Subpart N at § 1926.550(g)(6)(v) currently requires personnel hoisting operations to stop when there is indication of any dangerous weather conditions or other impending danger.

The Committee believed that it was necessary to establish a clearer guideline with respect to hoisting personnel under windy conditions. C-DAC discussed setting a particular wind speed at which hoisting personnel would be prohibited (it considered, for example, that section 3.2.1(e) of ASME B30.23-2005 prohibits personnel hoisting operations when wind speed exceeds 20 mph). It determined that the number of variables involved at each site precludes establishing a single wind speed threshold at which, in each instance, it could be said that hoisting personnel is not safe. It did, however, determine that 20 mph is an appropriate point at which a determination, in all cases, needs to be made. Therefore, it found that it was appropriate to have the qualified person evaluate all relevant factors in order to determine if conditions are such that hoisting personnel with wind speed over 20 mph is unsafe.

Proposed paragraph (k)(8)(ii), *Environmental conditions -- Other weather and environmental conditions*, would require 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.

The purpose of this paragraph is to require evaluation of all environmental conditions, including weather, by a qualified person, to determine if the conditions make it unsafe to hoist personnel. Dangerous conditions, such as those presented by severe weather, may contribute to the hazards of platform tipping, unexpected platform movement, dropping

the platform, or structural failure of the platform or equipment. Examples of non-weather environmental dangers would be a neighboring fire that threatens the area of the crane operations or a chemical release from a neighboring manufacturing facility that threatens to drift into the area. Section 3.2.1(c) of ASME B30.23-2005 lists electric storms, snow, ice, sleet, or other adverse weather conditions that could affect the safety of personnel as reasons for suspending operations. Rather than listing specific dangers or events, C-DAC believed that the determination of whether conditions were dangerous was best left to the assessment of the qualified person.

As noted above, § 1926.550(g)(6)(v) requires personnel hoisting operations to stop when there is indication of any dangerous weather conditions or other impending danger. The proposed paragraph continues that requirement; however, it adds the requirement that a qualified person must make the determination.

Proposed paragraph (k)(9) would require 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 that 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 to the employees being hoisted. This provision would ensure that such information can be communicated quickly between the hoisted employees and operator.

Currently, Subpart N's § 1926.550(g)(6)(vi) requires hoisted employees to remain in continuous sight of and in direct communication with the operator or signal person. Reliance on direct communication alone (such as by radio) is only permitted when visual contact with the operator is not possible and the use of a signal person (to relay information by hand signals) would create a greater hazard. The Committee believed that direct communication, either with a signal person (when used) or with the operator, is an effective way for the hoisted employees to communicate with the operator and that § 1926.550(g)(6)(vi)'s preference for visual contact does not add to safety. Accordingly, proposed § 1926.1431(k)(9) would allow direct communication with a signal person or the operator in all instances.

Proposed paragraphs (k)(10)(i) and (ii), *Fall protection*, would 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 that resulted in the employees being in the water, being tied-off would exacerbate the drowning hazard. However, the requirements of § 1926.106, *Working over or near water*, would apply.

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. This is similar to

the requirements of Subpart N's § 1926.550(g)(6)(vii). However, it replaces use of a "body belt/harness system with lanyard" with "personal fall arrest system" to reflect current technology, terminology and practice for personal fall protection and to be consistent with 29 CFR Part 1926 subpart M's personal fall arrest system requirements. Additionally, the Committee determined that the requirement in the current standard to attach a personal fall arrest system to the "lower load block or overhaul ball" was no longer considered good industry practice and, instead, an employee needs to be tied off to "a structural member within the personnel platform." Tying off to the lower load block or overhaul ball places the employee at risk of being pulled through the top of the personnel platform and into the rigging attached to the personnel platform.

Proposed paragraph (k)(11)(i), *Other load lines*, would mandate that while hoisting personnel no other lifts may be made with any of the equipment's other load lines. This proposed provision has several purposes. First, it would prevent platform tipping due to entanglement with other load lines or loads. Second, it would reduce the chance that the equipment would be overloaded. Third, when hoisting personnel, it is essential that the operator's full attention be devoted to the personnel; use of another load line would necessarily divert his/her attention. This is comparable to the requirement of Subpart N's § 1926.550(g)(6)(viii), with the addition of an exception for pile driving equipment. In pile driving operations, personnel have to be hoisted at times as part of the pile driving operation while the pile driving apparatus is being suspended on another load line.

In reviewing this aspect of the C-DAC document, the Agency noted that under the C-DAC language, the provision would have applied only when personnel were "suspended on a platform." Since there are specified exceptions to the proposed requirement to use a personnel platform, there will be specific instances where personnel will be hoisted without a platform. The Agency believes that it is equally important to safety that the prohibition against using any other load lines apply in these instances (with the exception of pile driving operations, in which it is not feasible to use only one load line), and that this was a textual oversight by the Committee. Therefore, OSHA has modified the C-DAC language of this provision so that the prohibition would apply "while personnel are *being hoisted* . . . ." OSHA requests comment on this change.

Proposed paragraph (k)(11)(ii), *Other load lines*, would allow 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. The Committee believed that, when all of these factors are present, there is little chance that the use of the winch line would compromise safety.

Proposed paragraph (k)(12)(i), *Traveling – equipment other than derricks*, would prohibit 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 proposed § 1926.1431(k)(13), discussed below.

Traveling while hoisting personnel is generally prohibited due to several additional risks that it presents. The platform will tend to swing when the equipment is traveling, which presents an increased likelihood of employee injury from platform tipping or loss of footing. If the swing is pronounced, the equipment could become unbalanced and its capacity exceeded. Also, the chance of an unplanned circumstance or event increases when the equipment travels, which heightens the risk to the employees being hoisted. Therefore, the exception to this prohibition is narrowly drawn.

Traveling would be permitted with equipment that travels on fixed rails, as travel on fixed rails is relatively stable and predictable, which reduces the chance of significant uncontrolled movement. Traveling may be done with equipment that is not on fixed rails and not rubber-tired, but only where the employer can demonstrate that there is no less hazardous way to perform the work.

However, traveling would be prohibited with rubber-tired equipment. The Committee was of the view that traveling with such equipment while hoisting personnel is inherently dangerous due to the bouncing and swaying of the equipment that is inherent in this type of equipment because of the tires and suspension.

The current requirements of Subpart N at § 1926.550(g)(7)(i), prohibit hoisting employees while a crane is traveling "except for portal, tower or locomotive cranes, or where the employer demonstrates that there is no less hazardous way to perform the work." The proposed paragraph would have a clearer restriction on equipment traveling by establishing a complete prohibition on traveling while hoisting employees for any rubber-tired equipment. Instead of referring to particular types of cranes, the proposed paragraph allows for hoisting personnel by equipment that travels on fixed rails, which more directly relates to what makes the use of such equipment acceptable for this purpose. The proposed paragraph still allows for hoisting personnel if there is no less hazardous means to do the work, but this exception does not apply to rubber-tired equipment.

Proposed paragraph (k)(12)(ii), *Traveling – equipment other than derricks*, would establish certain criteria that would have to be met when traveling with employees is allowed. The purpose of this proposed paragraph is to establish the conditions necessary to minimize the effect of traveling on the stability of the equipment and personnel. In order to hoist employees while traveling, the following would be required: travel restricted to a fixed track or runway; distance of travel limited to the length of the boom, including any attached jib; the boom parallel to the direction of travel (unless it is safer otherwise); and a complete trial run performed to test the travel route before employees occupy the platform

In proposed § 1926.1401, a "runway" is defined as 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, including an existing

surface. For the purposes of this proposed paragraph, OSHA believes it is necessary to clearly define what constitutes a runway since its purpose differs, for example, from a runway on a gantry crane. The function of the runway required by this proposed paragraph would be to provide a stable surface for equipment during travel to minimize unexpected movement. This definition is included to remain consistent with the term, without change, as it is used in Subpart N of 29 CFR Part 1926. The required trial run may be done at the same time as the trial lift testing the lift route (see proposed paragraph (h)).

This continues the requirements of Subpart N's § 1926.550(g)(7)(ii) with three exceptions. Currently, "the boom must be parallel to the direction of travel"; the proposed paragraph allows an exception when it is safer to travel with the boom not parallel to the direction of travel. For example, if the work was being done to the side of the crane, and booming to parallel would take the personnel platform closer to a power line, and the manufacturer permits the crane to travel with the boom to the side, it would be safer to travel with the boom to the side in this instance. Next, the Committee determined that the current travel limit of "the load radius of the boom" was confusing terminology and found that a clearer and equally safe restriction would be to limit the distance of travel to the "boom length." Finally, as discussed above, the proposed paragraph would prohibit all traveling while hoisting personnel with rubber-tired equipment. The current standard (§ 1926.550(g)(7)(ii)(E)) in effect allows use of rubber-tired equipment in limited conditions.

Proposed paragraph (k)(13), *Traveling – derricks*, would prohibit a derrick from traveling while it is hoisting personnel. The current requirements of Subpart N that address traveling refer only to cranes. C-DAC believed that the intent of Subpart N was to prohibit derricks from traveling with hoisted employees and decided it was necessary to note this exclusion to eliminate any ambiguity. Hoisting employees on a traveling derrick is dangerous because derricks are not sufficiently stable when traveling. This proposed paragraph reflects the current industry practice as reflected in section 3.3.4(a)(14) of ASME B30.6–2003, "Derricks."

**Paragraph 1431(l) [*Reserved*.]**

This proposed paragraph is reserved because it is inconvenient for readers to distinguish the letter "l" from the number "1."

**Paragraph 1431(m) Pre-lift meeting**

This proposed paragraph would require 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 would require 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 would provide 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 would address hazards which could result from misunderstanding of the requirements, particular lift conditions or procedures.

The provisions of proposed paragraph (m) are comparable to the requirements of § 1926.550(g)(8).

**Paragraph 1431(n) Hoisting personnel near power lines**

This proposed paragraph would prohibit 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 would result if the personnel, a personnel platform, or equipment made electrical contact with a power line. The clearance distances are similar to those in proposed §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. Here, the Committee believed that the extra risk that arises when personnel are hoisted near a power line justifies the requirement to maintain the minimum distances of 20 feet for lines 350 kV or less and 50 feet for lines over 350kV regardless of whether operations at closer distances without hoisting personnel would be permitted.

Currently, Subpart N at § 1926.550 has no specific requirement for hoisting personnel near power lines, and the normal minimum distances established by that standard apply.

**Paragraph 1431(o) Hoisting personnel in drill shafts**

This proposed paragraph would provide requirements when hoisting personnel in drill shafts that are 8 feet and smaller in diameter. C-DAC noted that drill shafts of this size may be either too small to use a personnel platform, or that use of a personnel platform might not allow the room needed to perform the necessary work. As a result, the Committee determined that, 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.

"Boatswain's chair" is defined in § 1926.1401 as "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." Except for the parenthetical, this definition is identical to that in OSHA's construction scaffolding standard, § 1926.450(b).

The parenthetical has been added to clarify that a boatswain's chair in which the seat or sling is incorporated into a full body harness complies with the standard.

Proposed § 1926.1431(o)(1) would allow the employer to use either a personnel platform or a boatswain's chair; the employer would have the option of choosing which one to use.[73] When the employer elects to use a boatswain's chair in lieu of a personnel platform, particular supplementary requirements in proposed paragraph (o)(3) would have to be met. These particular requirements address the heightened danger that the employee may fall from the chair or contact the wall of the drill shaft. Subpart N does not have requirements that specifically address hoisting personnel in drill shafts.

Proposed § 1926.1431(o)(1) would require that the employer use either a personnel platform or boatswain's chair

Proposed § 1926.1431(o)(2) would require the employer to follow requirements (a) through (n) of § 1926.1431 when using a personnel platform to hoist employees. This would make clear that the provisions in proposed paragraph (o) are supplementary requirements.

[73] Note that, under proposed § 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. C-DAC provided, in paragraphs (o)(2) and (o)(3)(i), that paragraph (a) applies to the use of either a personnel platform or a boatswain's chair. Therefore, before using either means to hoist personnel in drill shafts, the employer would need to determine that hoisting personnel in lieu 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.

Proposed § 1926.1431(o)(3) would establish the requirements when the employer elects to use a boatswain's chair in lieu of a personnel platform for hoisting personnel.

Proposed § 1926.1431(o)(3)(i) would establish which of the previous proposed paragraphs in § 1926.1431 would continue to apply when using a boatswain's chair. For these applicable paragraphs, the reader would substitute the phrase "boatswain's chair" for either "personnel platform" or "platform," and the employer must comply with these requirements.

The proposed paragraphs omitted from proposed § 1926.1431 (o)(3)(i) would not apply when a boatswain's chair is used. This is because the requirement is either specifically applicable to personnel platform design and use, or generally not applicable when hoisting personnel in a drill shaft.

Proposed § 1926.1431(o)(3)(ii) would require a signal person to be stationed at the opening of the shaft during personnel hoisting. The purpose is to have the signal person at the best position to watch the employee being hoisted and signal the equipment operator, since the employee would be out of visual range of the operator.

Proposed § 1926.1431(o)(3)(iii) would require 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 fall from the chair or impact with the walls of the drill shaft.

Proposed § 1926.1431(o)(3)(iv) would require 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.

Proposed § 1926.1431(o)(3)(v) would require fall protection equipment to comply with § 1926.502, *Fall protection systems criteria and practices*.

Proposed § 1926.1431(o)(3)(vi) would require 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 proposed § 1926.1431(e)(4). The strength requirement that would be applicable to personal fall arrest anchorages is in § 1926.502(d)(15).

Proposed § 1926.1431(o)(3)(vii) would mandate that only one person be hoisted at a time when using a boatswain's chair. The Committee believed that hoisting more than one person using a boatswain's chair in a drill shaft would present unacceptable additional hazards for the employees being hoisted.

**Paragraph 1431(p) Hoisting personnel for pile driving operations**

This proposed paragraph would provide requirements for hoisting personnel in pile driving operations. Subpart N does not have provisions that specifically address hoisting personnel in pile driving operations.

Proposed § 1926.1431(p)(1) would require that the employer use either a personnel platform or boatswain's chair when hoisting personnel in pile driving operations. As with drill shafts, C-DAC believed that use of a personnel platform would often be infeasible in this type of operation, and § 1926.1431(p)(1) therefore gives the employer the option of choosing which one to use.

Proposed § 1926.1431(p)(2) would require the cable being used to hoist personnel to be clearly marked at the point on the cable that would allow the equipment operator the opportunity to stop the hoist to prevent two-blocking. In the C-DAC document an alternative to marking the cable would have been permitted: use of a spotter to observe the lift and alert the equipment operator in time to prevent two-blocking. An anti-two-blocking device would not be required for equipment during pile driving operations since the vibration of the pile driver would destroy this device. (See § 1926.1431(d)(4)(iv), *Anti-two-block*).

In reviewing this portion of the C-DAC document, the Agency has noted that the means of preventing two-blocking in the C-DAC language, that is, to mark the cable **or** use a spotter, is consistent with the temporary alternative measure for an anti two-block device

specified in proposed § 1926.1416(d)(3)(ii)(D) for lattice boom cranes. However, as indicated in proposed § 1926.1416(d)(3)(i), marking the cable is not sufficient for telescopic boom cranes when extending the boom. As discussed above in the context of that proposed provision, when extending a telescopic boom, a spotter is needed to warn against two-blocking.

The Agency believes that the Committee developed its language for preventing two-blocking when pile driving with only lattice boom cranes in mind, since that is the type of equipment that is commonly used for this work. However, as technology and construction practices evolve, telescopic boom cranes may be used for this work as well. Therefore, the Agency has modified the C-DAC language so that proposed § 1926.1431 (p)(2) would require that, when using a telescopic boom crane for pile driving operations, a spotter must be used in addition to marking the cable. The Agency requests public comment on this issue.

Proposed § 1926.1431 (p)(3) would require the employer to follow requirements (b) through (n) of § 1926.1431 when using a personnel platform to hoist employees. Section 1926.1431(a) would not apply because the Committee determined that the employer should not be required to demonstrate that the other means of access listed in § 1926.1431(a) are infeasible before being able to use a personnel platform to hoist personnel during pile driving operations. C-DAC believed that demonstrating infeasibility prior to using a personnel platform should not be required because, in most instances, it is not feasible to use other means of access.

Proposed § 1926.1431(p)(4) would establish the requirements when the employer elects to use a boatswain's chair in lieu of a personnel platform for hoisting personnel.

Proposed § 1926.1431(p)(4)(i) would establish which of the previous paragraphs in § 1926.1431 continue to apply when using a boatswain's chair in a pile driving operation. For these applicable paragraphs, the reader would substitute the phrase "boatswain's chair" for either "personnel platform" or "platform" and the employer must comply with these requirements.

The proposed paragraphs omitted from proposed § 1926.1431(p)(3)(i) do not apply when a boatswain's chair is used because the requirement is either specifically applicable to personnel platform design and use or generally not applicable for pile driving operations.

Proposed § 1926.1431(p)(4)(ii) would require 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.

Proposed § 1926.1431(p)(4)(iii) would require 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 would both protect the employee from a sudden drop or fall due to failure of that equipment and protect the employee when accessing and egressing the boatswain's chair.

Proposed § 1926.1431(p)(4)(iv) would require fall protection equipment to comply with § 1926.502, *Fall protection systems criteria and practices*. This would ensure that the fall equipment is sufficient to safely arrest the employee's fall.

In reviewing this portion of the C-DAC document, the Agency has noted that the Committee did not include a provision similar to proposed § 1926.1431(o)(3)(vi)(drill shafts) and § 1926.1431(s)(3)(v)(storage tanks) to require a minimum strength for the boatswain's chair. In addition, it did not include a provision similar to proposed § 1926.1431(o)(3)(vii)(drill shafts) and § 1926.1431(s)(3)(vi)(storage tanks) to restrict hoisting to one person at a time. Accordingly, the Agency is planning to add the following provisions to proposed § 1926.1431(p)(4) and requests public comment on these additions.

> (v) The boatswain's chair itself (excluding the personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.
>
> (vi) No more than one person shall be hoisted at a time.

**Paragraph 1431(q) [*Reserved.*]**

This paragraph is reserved because it is inconvenient for the reader to distinguish the letter q, when in parentheses, from the letter o.

**Paragraph 1431(r) Hoisting personnel for marine transfer**

This proposed paragraph would address the particular hazards related to hoisting personnel for transfer to or from a marine construction worksite. Currently, Subpart N does not address the particular hazards and requirements of marine personnel transfer. This proposed paragraph would apply only when hoisting employees solely for such transfer.

Proposed § 1926.1431(r)(1) would require the employer to use either a traditional personnel platform or a marine hoisted personnel transfer device. This proposed paragraph would allow 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 possibility is that the employees may need to jump off into the water to avoid a collision with the ship or an object on the construction site. A third possibility is that the operator will be 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 either enter or 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. For example, there is usually a gate that latches shut. Also, the gate may prevent more than one employee from entering or exiting at a time. In contrast, a marine hoisted personnel transfer device is designed specifically to facilitate the employees' rapid entry and exit. The Committee believed that the employer should have the option of using such a device so that it may be used where, in the judgment of the employer, the conditions are such that the risk of being prevented from entering or exiting quickly is greater than the risk of unintentionally falling off.

OSHA notes that proposed § 1926.1431(r)(1) would give employers an unrestricted choice of whether to use a personnel platform or a marine hoisted personnel transfer device despite the fact that the personnel platform would often be a less safe choice. OSHA requests public comment on whether the employer should be required to select the device used for marine transfer on the basis of which is safer under the circumstances or should otherwise restrict the use of personnel platforms for marine transfer.

Proposed § 1926.1431(r)(2) would require the employer to follow requirements (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 moving the employees and that the personnel platform's design and use are adequate from a safety standpoint.

Proposed § 1926.1431(r)(3) would establish the requirements when the employer elects to use a marine hoisted personnel transfer device in lieu of a personnel platform for hoisting personnel.

Proposed § 1926.1431(r)(3)(i) would establish which of the previous paragraphs in § 1926.1431 continue to apply when using a marine hoisted personnel transfer device. For these applicable paragraphs, the reader would substitute the phrase "marine hoisted personnel transfer device" for either "personnel platform" or "platform" and the employer must comply with these requirements.

The paragraphs omitted from proposed § 1926.1431(r)(3)(i) do not apply when a marine hoisted personnel transfer device is used. This is because the requirement is either specifically applicable to personnel platform design and use or generally not applicable when hoisting personnel at a marine worksite.

Proposed § 1926.1431(r)(3)(ii) would require the marine hoisted personnel transfer device to be used exclusively for transferring employees. One purpose of this proposed provision is to not allow the device to be 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 falling while an employee uses

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.

Proposed § 1926.1431(r)(3)(iii) would limit the number of employees on the marine hoisted personnel transfer device to the maximum number the device was designed to hold. This would prevent overloading, which could result in structural failure of the device. It would also prevent overcrowding, which could cause an unintended fall or preclude a worker from entering or exiting as rapidly as when used properly.

Proposed § 1926.1431(o)(3)(iv) would require 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.

**Paragraph 1431(s) Hoisting personnel for storage tank (steel or concrete), shaft and chimney operations**

This proposed paragraph would establish requirements when hoisting personnel in storage tank (steel or concrete), shaft operations and chimney operations. C-DAC determined that 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, the Committee determined that boatswain's chairs should be allowed instead of a personnel platform in such instances, but only when the employer can demonstrate that use of a personnel platform is infeasible. [74] For these reasons, proposed § 1926.1431(s)(1) would allow the employer to use a boatswain's chair only when the employer has determined that use of a personnel platform is infeasible.

Proposed § 1926.1431(s)(2) would require the employer to follow requirements (a) through (n) of § 1926.1431 when using a personnel platform to hoist employees. Under proposed § 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 a personnel platform to hoist personnel in storage tank (steel or concrete), shaft operations and chimney operations, the employer would need to determine that hoisting personnel in lieu 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.

Proposed § 1926.1431(s)(3) would establish the requirements when the employer uses a boatswain's chair in lieu of a personnel platform for hoisting personnel.

Proposed § 1926.1431(s)(3)(i) would establish which of the previous paragraphs in § 1926.1431 continue to apply when using a boatswain's chair. For these applicable paragraphs, the reader would substitute the phrase "boatswain's chair" for either

[74] There is no current requirement in Subpart N that specifically addresses hoisting personnel in storage tanks (steel or concrete), shaft operations, or chimney operations.

"personnel platform" or "platform" and the employer must comply with these requirements.

The paragraphs omitted from proposed § 1926.1431(s)(3)(i) do not apply when a boatswain's chair is used. This is because the requirement is either specifically applicable to personnel platform use and design or generally not applicable when hoisting personnel in storage tanks (steel or concrete), shaft operations and chimney operations.

Proposed § 1926.1431(s)(3)(ii) would require 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 fall from the chair or impact with the walls or other areas or structures involved in these operations.

Proposed § 1926.1431(s)(3)(iii) would require 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 problem associated with the operation of the crane/derrick and to protect the employee from falls when accessing and egressing the boatswain's chair.

Proposed § 1926.1431(s)(3)(iv) would require fall protection equipment to comply with § 1926.502, *Fall protection systems criteria and practices*. This would ensure that the fall equipment is sufficient to safely arrest the employee's fall.

Proposed § 1926.1431(s)(3)(v) would require 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).

Proposed § 1926.1431(s)(3)(vi) would mandate that only one person be hoisted at a time when using a boatswain's chair. The Committee believed that hoisting more than one person using a boatswain's chair in these operations would present unacceptable additional hazards for the employees being hoisted.

**Section 1432 Multiple crane/derrick lifts**

This proposed section lists additional requirements for operations involving multiple cranes and derricks. It addresses hazards arising from operations that use more than one crane/derrick to lift a single load. This section evolved from the Committee's concern that such operations involve an additional level of risk due to their higher degree of complexity. Specifically, the number and type of factors that must be accounted for, the difficulties associated with closely coordinating the movement of the multiple cranes/derricks, and the likelihood that such lifts are typically outside the normal routine for most employers, combine to create this higher level of risk. Consequently, the Committee agreed that such lifts need an additional level of planning and expertise over that required in routine operations. This section would require development and

implementation of a plan by qualified persons, which would result in proactive decision-making and greater awareness and caution during multiple-crane/derrick operations.

Currently, Subpart N, through incorporation of section 5-3.2.3l of ANSI B30.5–1968, addresses multiple lifts as follows: "When two or more cranes are used to lift one load, one designated person shall be responsible for the operation. He shall analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made." As discussed below, this proposed rule also requires supervision of the operation and instruction of personnel but, in addition, specifies qualifications that the person who supervises the lift must have and contains additional provisions to ensure safety.

**Paragraph 1432(a) Plan development**

The purpose of the proposed requirement for a plan is to help ensure that the hazards involved with a multiple lift are identified and eliminated. These hazards include, but are not limited to, load slipping and unintended load shifting. Such hazards can be minimized by a plan that addresses elements such as the capacity of the cranes/derricks relative to load distribution (throughout the lift), load rigging, load travel (from start to finish), and communication. The Committee discussed several specific methods of addressing these hazards, but in view of the wide variety and circumstances of such lifts, determined that a plan-based requirement would be most appropriate and would be effective in reducing the risks associated with these operations.

Proposed § 1926.1432(a)(1) would require that a qualified person develop the plan. Because of the inherent complexity of these operations, Committee members believed that it is necessary for a person with a high degree of knowledge and experience to develop the plan; otherwise, there is a significant likelihood that the plan would be ineffective in addressing the hazards. Therefore, the Committee determined that the plan developer would need to be a qualified person.

Proposed § 1926.1432(a)(2) would require that the plan be designed to ensure that the requirements of this Subpart are met. This provision emphasizes that all applicable requirements in the proposed standard must be met when performing multiple crane/derrick lifts, in addition to the specific requirements set forth in this section. The Committee believed that it was important to emphasize this in the plan to help ensure safe multiple-crane/derrick lift operations.

**Paragraph 1432(a)(3)**

Proposed § 1926.1432(a)(3) would require engineering expertise to be provided by the employer whenever the qualified person determines that it is necessary. 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. The Committee believed that it is not practical to set criteria in this proposed rule for identifying which lifts need such expertise.

**Paragraph 1432(b) Plan implementation**

Under this proposed paragraph, the employer would be required to take specific steps designed to ensure that the decisions and precautions built into the plan are effectively implemented.

Proposed § 1926.1432(b)(1) would require supervision of plan implementation by competent and qualified persons, or by one person who meets the definitions of both. The Committee believed that, especially in light of the inherent complexity of these operations, it is essential that a person (or team) with sufficient expertise and authority oversee the implementation of the plan. Supervision by a person or team with the attributes of both a competent and qualified person would ensure not only that potential problems are identified, but also that the person in charge of oversight will have the authority to correct anything that is amiss. For a detailed explanation of competent and qualified persons, refer to the preamble discussion of proposed § 1926.1404(a), *Supervision – competent-qualified person*.

Proposed § 1926.1432(b)(2) would mandate that the supervisor review the plan with all employees who will be involved with the operation before lift operations begin. This would typically involve the signal person, rigging crew, crane operator, and sometimes laborers, who would all meet to make certain that everyone understands the plan and how the operation will be conducted. The Committee believed 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.

**Section 1433 Design, construction and testing**

Currently, Subpart N includes 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 29 CFR 1926.550(b)(2)); overhead and gantry cranes (ANSI B30.2.0–1967, incorporated by 1926.550(d)(4)); and derricks (ANSI B30.6–1969, incorporated by § 1926.550(e)). The latter includes hammerhead tower cranes (§ 1926.550(c)(5)) and floating cranes and derricks (§ 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 proposed standard that is dedicated to that type of equipment. This proposed section contains certain requirements applicable only to crawler, locomotive, and truck cranes and, in addition, contains requirements that apply to all of the equipment subject to this standard.

The C-DAC draft provides that the requirements of this section "apply to equipment that has a manufacturer-rated hoisting/lifting capacity of 2,000 pounds or more." However, proposed § 1926.1441 sets forth requirements for equipment with a rated capacity of

2,000 pounds or less and excludes § 1926.1433 from the requirements for such equipment. The two sections conflict with respect to equipment rated at 2,000 pounds, which is a common rating. It is OSHA's understanding that C-DAC included the 2,000-pound cutoff to parallel ANSI B30.5 in this regard. The 1968 and 2004 versions of ANSI B30.5, as well as intermediate versions, exclude equipment with a capacity of one ton or less. To conform to that intent in the proposed rule, OSHA has changed the introductory sentence so that it reads: "The following requirements apply to equipment that has a manufacturer-rated hoisting/lifting capacity of more than 2,000 pounds."

**Paragraph 1433(a)**

Proposed paragraph (a) would require 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 Standard No. 2," 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 proposed provision would allow employers to continue to use equipment that complies with § 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. The Committee concluded that the equipment manufactured during this period that was built to conform to the applicable DIN standards has not shown signs of being less safe from the

standpoint of its design and construction than equipment built during this period to meet the applicable ANSI or PCSA standards.

The C-DAC draft of this paragraph, and of § 1926.1433(c)(see discussion below), referred to "the effective date of 1926.1400" instead of the "effective date of the standard." For consistency throughout this proposal, OSHA has changed the references to "the effective date of 1926.1400" to "the effective date of the standard."

**Paragraph 1433(b)**

Proposed (b) uses the phrase "mobile and locomotive cranes" to reflect the current terminology used in ASME B30.5–2004. As drafted by C-DAC, it would require 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 this proposal, OSHA has updated the provision to refer to the 2004 version of ASME B30.5. OSHA has compared the 2004 and earlier version and, as discussed below, requests public comment on whether certain changes in the 2004 version should be adopted. The provisions of ASME B30.5–2004 incorporated in the C-DAC document are as follows:

(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), (a)(2) – (a)(4) (including subparagraphs), (b) – (d) (including subparagraphs);

(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"); and

(16) In section 5-1.9.12 ("Miscellaneous equipment"), paragraphs (a), (c), (e), and (f).

C-DAC's intent in this paragraph was to incorporate design and construction provisions of ASME B30.5-2004 that would only be applicable to mobile and locomotive cranes. Some other provisions of ASME B30.5–2004 are not incorporated here because they deal with issues addressed elsewhere in this proposal. For example, two-block protection, which is required by section 5-1.9.9.1 of the ASME standard, is addressed in § 1926.1416

of this proposed standard. In addition, the issues addressed in proposed 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 proposed § 1926.1433(b)(1) and (b)(13) contain substantive differences between the 2004 and earlier versions. For § 1926.1433(b)(1), Table 1 of section 5-1.1.1 includes new requirements for equipment with outriggers partially extended that are not found in the earlier version. For paragraph § 1926.1433(b)(13), the 2004 version of section 5-1.9.3 contains a new paragraph (d) dealing with deploying partially extended outriggers. Inasmuch as § 1926.1404(q)(1) of this proposal permits partial deployment of outriggers when manufacturer procedures permit, OSHA believes it would serve C-DAC's intent to incorporate the provisions on partially deployed outriggers in the 2004 version of ASME B30.5. OSHA requests public comment on this issue.

Upon reviewing the C-DAC draft of § 1926.1433(b)(5), OSHA notes that two corrections are necessary. First, there is an internal inconsistency between the incorporation of paragraph (a) of the ASME section and the more limited incorporation of paragraphs (a)(2) through (a)(4). To correct this inconsistency, OSHA is deleting the reference to paragraph (a). Second, as noted earlier in the discussion of § 1926.1414, the second sentence of section 5-1.3.2(c) of ASME B30.5–2004 is stated as a recommendation rather than a mandatory requirement. OSHA believes it would be confusing to incorporate a

non-mandatory recommendation into this standard. Therefore, rather than incorporating all of section 5-1.3.2(c) by reference, OSHA is proposing to incorporate only the first sentence, which reads: "When provided, a power-controlled lowering system shall be capable of handling rated loads and speeds as specified by the manufacturer." With these changes, proposed § 1926.1433(b)(5) reads as follows:

> (5) In section 5-1.3.2 ("Load Hoist Mechanism"), paragraphs (a)(2) – (a)(4) (including subparagraphs), (b) (including subparagraphs), (c) (first sentence only), and (d).

Finally, due to renumbering, section 5-1.9.12 of the older ASME standard is section 5-1.9.11 in the 2004 version. The proposed rule reflects this change.

**Paragraph 1433(c)**

Proposed (c), *Prototype testing*, would require that prototype 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 proposed section. As discussed in greater detail below, Test Option A continues the prototype testing methodology that has been required under Subpart N for crawler, locomotive, and truck cranes through the incorporation of ANSI B30.5–1968. Test Option B would permit, as an alternative, the use of computer modeling technology for prototype evaluation.

**Test Option A—Physical Testing**

Proposed paragraph (c)(1)(i), *Test Option A*, would state that the following applies to equipment with cantilevered booms (such as hydraulic boom cranes): all the tests listed in SAE J1063, Table 1, shall be performed to load all critical structural elements to their respective limits; and all the strength margins listed in SAE J1063, Table 2 shall be met. As mentioned in previous paragraphs of this proposed standard, C-DAC recognized the abundance of hydraulic cranes now in production and believed OSHA needs to ensure that prototypes are tested to the most applicable standards. C-DAC identified current SAE standards as being most protective and applicable to the majority of cantilevered-boom cranes that are manufactured in the United States. In addition, they believed that most US manufacturers already adhere to the SAE standards.

Proposed § 1926.1433(c)(1)(ii) states that the following applies to equipment with pendant supported lattice booms: all the tests listed in SAE J987, Table 1, shall be performed to load all critical structural elements to their respective limits; and all the strength margins listed in SAE J987 Table 2 shall be met. C-DAC recommended that OSHA include the minimum testing criteria specified in the referenced SAE standard to ensure that prototype cranes with pendant supported booms were safe to operate on construction sites.

The testing involved in the SAE tables under Option A uses empirical measurements of the prototype; in other words, "physical testing," using equipment such as strain gauges, is done to determine if the prototype is within the requisite limits.

**Test Option B— Computer Modeling With Methodology Verification.**

In contrast to the physical testing required under Test Option A, under proposed § 1926.1433(c)(2), *Test Option B*, the testing and verification requirements of CEN's EN 13000 (2004), which permits tests to be conducted using computer modeling, would apply. In using the CEN (Comité Européen de Normalisation, or European Committee for Standardization) standard, the additional requirements specified in proposed § 1926.1433(c)(2)(i) through (iii), which impose conditions that must be met if computer modeling is used, would also have to be met.

During the C-DAC meetings, there was considerable discussion about whether computer modeling is a sufficient substitute for physical testing. A German crane manufacturer gave a presentation to C-DAC in which they described successful experience with the use of computer modeling, which convinced some members of C-DAC that computer modeling should be allowed to be used to comply with this proposed section. Other C-DAC members were not convinced that computer modeling was sufficient to ensure that prototype cranes were safe for operation because the tested areas of those cranes were not strain gauged. Others believed that data was available which indicated that, when CEN testing standards were met, imported cranes were as safe as those tested using the strain gauging methods specified in § 1926.1433(c)(1). Ultimately, C-DAC agreed to allow testing under the CEN standard but to mandate that the requirements of proposed §

1926.1433(c)(2), discussed below, are met to ensure the reliability of the computer modeling.

Proposed § 1926.1433(c)(2)(i) would require that the analysis methodology (computer modeling) demonstrate that all load cases listed in SAE J1063 meet the strength margins listed in SAE J1063 Table 2 for equipment with cantilevered booms (such as hydraulic boom cranes). C-DAC determined that it is necessary that the computer modeling demonstrate that the prototype meets the same minimum strength criteria used in Test Option A (see proposed § 1926.1433(c)(1)(i), *Test Option A*, above).

Proposed § 1926.1433(c)(2)(ii) would require that the analysis methodology (computer modeling) demonstrate that all load cases listed in SAE J987 meet the strength margins listed in SAE J987 Table 2 for equipment with pendant supported lattice booms. This proposed provision was included for the same reason as explained in the discussion of proposed § 1926.1433(c)(2)(i) above.

Proposed § 1926.1433(c)(2)(iii), *Analysis verification*, is designed to ensure that computer modeling would not be used as a substitute for physical testing unless its accuracy and reliability is verified. Some C-DAC members raised objections to reliance on computer modeling because it may not accurately account for some aspects of a design, or may not be reliable for other reasons. Their concern was that if the analysis methodology did not accurately or reliably account for some aspect of the design, such error might not be known until there had been a failure of the crane when in use.

To address this concern, under this proposed provision, computer modeling may only be used as a substitute for strain gauge testing if the reliability of the computer modeling is verified by a history of strain gauge testing, or strain gauge testing combined with other physical testing. This does not mean that each computer modeling assessment of a particular prototype must be verified with strain gauge testing of that prototype. Rather, it means that strain gauge testing, or strain gauge testing combined with other physical testing, has been used to confirm the results of the computer modeling in enough relevant instances, which are documented, to demonstrate that the modeling is accurate and reliable.

Some members of C-DAC were concerned that small employers would not have the resources to determine if the computer modeling used to test its crane met the specified SAE standards. This concern is addressed by proposed paragraph (e), which allows employers to rely on manufacturer documentation to show that the testing requirements of this proposed standard have been met.

The C-DAC draft included a § 1926.1433(c) that would have required that prototype testing of crawler, locomotive, and truck cranes meet the applicable requirements for prototype testing prescribed in ANSI B30.5–1968. Upon reviewing that provision, OSHA notes that it is included in the requirement of proposed § 1926.1433(a) that such cranes meet the applicable testing requirements of ANSI B30.5–1968. To avoid any confusion that such duplication may cause, OSHA is deleting C-DAC's proposed §

1926.1433(c) and has redesignated the paragraphs that followed it. However, to make clear that this deletion does not alter the substantive requirement for prototype testing in the C-DAC document, OSHA is adding a note at the end of paragraph (c) that states that prototype testing of crawler, locomotive and truck cranes manufactured prior to the effective date of the standard must conform to paragraph (a).

OSHA notes that neither proposed § 1926.1433(c) nor any other proposed provisions would apply prototype testing requirements to tower cranes. It appears to the Agency that this was an oversight on the part of C-DAC. OSHA requests public comment on whether there should be prototype testing requirements for tower cranes, and, if so, what requirements should apply.

**Paragraph 1433(d)**

Proposed paragraph (d) would mandate that all equipment covered by this Subpart meet the requirements listed in § 1926.1433(d)(1) through (d)(13) of this proposed section. As noted above, the issues addressed by paragraph (d) are addressed by ASME B30.5–2004. However, instead of making those requirements apply solely to mobile and locomotive cranes, C-DAC believed that all equipment covered by this proposal presents similar issues and drafted this paragraph to apply to all covered equipment.

Proposed § 1926.1433(d)(1), *Load capacity/ratings and related information*, would require 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). This proposed paragraph essentially tracks section 5-1.1.3 of ASME B30.5–2004 but uses wording that makes the provisions of the ASME standard applicable to all equipment subject to this standard. Some of this information is already required for mobile and locomotive cranes by Subpart N's incorporation of ANSI B30.5–1968. C-DAC believed that 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.

Proposed § 1926.1433(d)(2), (3), and (4) are comparable to requirements in section 5-1.7.6 of ASME B30.5–2004. Proposed § 1926.1433(d)(2) would require 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. C-DAC explained that due to the various lengths of booms possible and the weight of varying lengths of cable along the entire lengths of those booms, selection of sufficiently weighted ball assemblies and load blocks is crucial to safe hoisting operations. C-DAC believed that this proposed requirement is necessary to prevent any incidents that would 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.

Proposed § 1926.1433(d)(3) would require that hook and ball assemblies and load blocks be marked with their rated capacity and weight. C-DAC believed that marking this

equipment with their rated capacities is needed to help ensure that they are not overloaded, which could lead to loss of the load. Marking them with their weight is necessary to help enable employers to comply with proposed § 1926.1433(d)(2) (discussed above).

Proposed § 1926.1433(d)(4), *Latching hooks*, would require that hooks meet the requirements in § 1926.1433(d)(4)(i) – (iii) of this proposed section. C-DAC believed that these proposed requirements would help employers reduce or eliminate the number of incidents related to the unintentional disengaging of loads from their load line hooks.

Proposed § 1926.1433(d)(4)(i) would require that hooks be equipped with latches, except where the requirements of § 1926.1433(d)(4)(ii) are met. C-DAC believed 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. 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 hazard.

To accommodate such greater hazard scenarios, proposed § 1926.1433(d)(4)(ii) would require that hooks without latches, or with latches removed or disabled, not be used unless two criteria are met. First, 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.

Proposed § 1926.1433(d)(4)(iii) would require that the latch close the throat opening and be designed to retain slings or other lifting devices/accessories in the hook when the rigging apparatus is slack. This requirement was included to ensure that the rigging will not be unintentionally dislodged from the hook when the rigging apparatus is slack. C-DAC members described scenarios where loads had become caught on structures or objects and created a slack condition. This caused the rigging to become dislodged and resulted in the load falling.

Proposed § 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 shall be maintained in legible condition. Compliance with this proposed requirement would increase the likelihood that employees will recognize the hazard identified on the posted warning and avoid or protect themselves from that hazard.

Proposed § 1926.1433(d)(6) would require that an accessible fire extinguisher be on the equipment. This requirement, which is similar to one currently at § 1926.550(a)(14)(i), would enable a small fire to be extinguished before it can spread.

Proposed § 1926.1433(d)(7), *Cabs*, states that equipment with cabs shall meet the requirements listed in § 1926.1433 (d)(7)(i) through (v) of this proposed section. The

majority of § 1926.1433(d)(7) is currently required for crawler, locomotive, and truck cranes by Subpart N, which incorporates the construction requirements of ANSI B30.5-1968. These proposed provisions would 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.

Proposed § 1926.1433(d)(7)(i) would require that cabs 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 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 would ensure adequate air circulation both for the operator's health and for good visibility.

Under proposed § 1926.1433(d)(7)(ii), cab doors (whether swinging or sliding) would have to 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. This proposed provision is currently required for crawler, locomotive, and truck cranes by section 5-1.8.1c of ANSI B30.5–1968, which is incorporated by reference in Subpart N. Standardization of the direction for opening doors helps ensure that an operator will be able to exit the cab quickly in an emergency.

Proposed § 1926.1433(d)(7)(iii), *Windows*, would require that cabs meet the requirements listed in § 1926.1433(d)(7)(iii)(A) through (C).

Proposed § 1926.1433(d)(7)(iii)(A) would require that the cab have windows in front and on both sides of the operator. Forward vertical visibility would have to be sufficient to give the operator a view of the boom point at all times. This proposed provision is currently required for crawler, locomotive, and truck cranes by section 5-1.8.1b of ANSI B30.5–1968, which is incorporated by reference in Subpart N.

Proposed § 1926.1433(d)(7)(iii)(B) would allow windows to have sections designed to be opened or readily removed. Windows with sections designed to be opened would have to be designed so that they can be secured to prevent inadvertent closure. This proposed provision is currently required for crawler, locomotive, and truck cranes by section 5-1.8.1b of ANSI B30.5–1968, which is incorporated by reference in Subpart N. Compliance with this provision would ensure that the operator can adequately ventilate the cab should conditions within the cab affect the safe operation of the crane. Under such conditions, inadvertent closure of the windows during the operation of the crane could distract an operator or facilitate reoccurrence of conditions within the cab which adversely affect the safe operation of the crane.

Proposed § 1926.1433(d)(7)(iii)(C) would specify that windows 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 crane. This provision maintains the protections currently required by § 1926.550(a)(12).

Proposed § 1926.1433(d)(7)(iv) would require that a clear passageway be provided from the operator's station to an exit door on the operator's side. This proposed provision is currently required for crawler, locomotive, and truck cranes by section 5-1.8.1d of ANSI B30.5–1968, which is incorporated by reference in Subpart N. 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.

Proposed § 1926.1433(d)(7)(v) would state that areas of the cab roof that serve as a workstation for rigging, maintenance or other crane-related tasks shall be capable of supporting 250 pounds without permanent distortion. This proposed provision maintains the protection provided by Subpart N for crawler, locomotive, and truck cranes through its incorporation by reference of ANSI B30.5–1968 (section 5-1.8.4), except that the cab roof strength requirement was increased to 250 pounds from 200 pounds. This increase was recommended by C-DAC to increase the safety factor of the roof in light of heavier employees and equipment that must be supported by the cab roof.

Proposed § 1926.1433(d)(8) would require 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. This proposed provision

continues the basic requirement of § 1926.550(a)(8) of Subpart N but revises the Subpart N provision to include an exception for maintenance and repair employees. The exception would permit maintenance and repair workers to remove the guards when their work requires access to the parts being guarded. C-DAC believed this exception was necessary because these employees often cannot perform their work with the guards installed.

Proposed § 1926.1433(d)(9) would require 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 proposed § 1926.1433(d)(8), an exception is provided when maintenance and repair workers need to remove the guards to perform their work. This proposed provision was included to retain the employee protection against burn injuries currently provided by § 1926.550(a)(10), which requires guarding or insulation of exhaust pipes, and to extend it to other components that can get hot enough to cause burns if contacted.

Proposed § 1926.1433(d)(10) would require that hydraulic and pneumatic lines be protected from damage to the extent feasible. 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. A similar provision is in section 5-1.9.8 of ASME B30.5–2004. C-DAC believed that most manufacturers in the industry are already providing protection for these lines but believed

it was advisable to include this proposed provision in light of the increasing numbers of pneumatically and hydraulically controlled cranes now being operated in the industry.

Proposed § 1926.1433(d)(11) would require 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 proposed provision was included to retain the employee protection provided for crawler, locomotive, and truck cranes by section 5-1.9.2 of ANSI B30.5–1968, incorporated by reference in Subpart N, and to extend it to other types of equipment. This proposed requirement ensures that exhaust gases which are likely to adversely affect or incapacitate the operator will not accumulate in the cab because of the design of the equipment.

Proposed § 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 shall 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. Comparable requirements now apply to crawler, locomotive, and truck cranes through incorporation by reference in Subpart N of ANSI B30.5–1968 (sections 5-1.3.2a.1 and 5-1.3.3). C-DAC believed that a similar requirement should apply to all equipment using friction mechanisms to control the boom hoist or load line. The Committee believed that this engineering technology is typical in most modern friction mechanisms.

Proposed § 1926.1433(d)(13), *Hydraulic load hoists*, would specify that hydraulic drums have an integrally mounted holding device or internal static brake to prevent load hoist movement in the event of hydraulic failure. A comparable requirement is in section 5-1.3.1(d) of ASME B30.5–2004. This requirement will protect employees against serious injuries and deaths that could result from an unintended movement of the load hoist caused by a hydraulic failure.

**Paragraph 1433(e)**

As noted above, proposed paragraph (e) would permit 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 changed since it was manufactured, except in accordance with § 1926.1434, *Equipment modifications*. Section 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.

A failure to have such documentation would not, in itself, constitute a violation of these provisions. Rather, proposed § 1926.1433(e) is intended to make it easier for employers to determine if their equipment meets these criteria.

**Section 1434 Equipment modifications**

This proposed section addresses the procedures an employer must follow if it wants to modify equipment in a way that would affect 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.

Currently, § 1926.550(a)(16) provides:

> No modifications or additions which affect the capacity or safe operation of the equipment shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

By requiring the manufacturer's written approval, § 1926.550(a)(16) seeks to ensure that the proposed modifications or additions will be consistent with the design and structural integrity of the equipment and will not reduce the original safety factor of the equipment. The Committee believed that manufacturer approval was an important safeguard and should be retained but was concerned that it does not address situations in which the manufacturer does not respond to a request to approve a modification or when the manufacturer is no longer available to evaluate a proposed modification. Therefore, the Committee recommended a new provision that addresses these types of scenarios with procedures that it believed would allow for modifications to be made safely.

**Paragraph 1434(a)**

Proposed paragraph (a) would prohibit modifications or additions which affect the capacity or safe operation of the equipment except where any of three approval options set out in proposed § 1926.1434(a)(1), (2), and (3) are met. In the first option, proposed § 1926.1434(a)(1)(i), *Manufacturer review and approval*, the employer would be required to obtain written manufacturer approval for the modifications/additions.

OSHA has corrected an inadvertent omission from proposed § 1926.1434(a)(1) by adding proposed § 1926.1434(a)(1)(ii), which requires the employer to modify the load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition. Currently, § 1926.550(a)(16) contains such a requirement and proposed § 1926.1434(a)(2), which requires the modifications or additions to be approved by a registered professional engineer if the manufacturer declines to review the proposal, does as well (see below). It was clearly C-DAC's intent to retain the existing protection in § 1926.550(a)(16) and require the employer to modify the load charts, procedures, instruction manuals and instruction plates/tags/decals regardless of who approved the modification/addition. The crane operator and other employees who work with the crane need accurate information about the topics addressed in those materials, and having them available, as proposed § 1926.1434(a)(1)(ii) requires, will help ensure that the equipment is operated safely.

The second option, proposed § 1926.1434(a)(2), *Manufacturer refusal to review request*, would establish a procedure where the manufacturer either declines to review a request for a modification approval or fails to respond to the request. Under this procedure, the

employer would be required to 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 would be permitted to proceed with the modification if the requirements specified in proposed § 1926.1434(a)(2)(i) and (ii) are met.

Proposed § 1926.1434(a)(2)(i) would require that a registered professional engineer who is a qualified person with respect to the equipment involved take two actions. First, under proposed § 1926.1434(a)(2)(i)(A), the engineer would have to approve the modification/addition and specify the equipment configurations to which that approval applies. The second action that the approving engineer would have to take, which is described under proposed § 1926.1434(a)(2)(i)(B), would be to modify load charts, procedures, instruction manuals and instruction plates/tags/decals as necessary to accord with the modification/addition.

This is essential for safe equipment operation because these are the charts, signs and materials that inform the user and operator of the capacities, procedures and limitations that apply to the equipment. Proposed § 1926.1434(a)(2)(ii) would specify that the modification/addition not reduce the original safety factor of the equipment, retaining the comparable requirement now found in § 1926.550(a)(16).

The Committee recommended § 1926.1434(a)(2) because it believed that the refusal of a manufacturer to review a request, or a manufacturer's failure to act on the request within a reasonable time, should 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.

C-DAC believed that the actions specified in proposed § 1926.1434(a)(2)(i) would need to be done by a registered professional engineer who is a qualified person with respect to the equipment involved. The term "qualified person" is defined in proposed § 1926.1401 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 related to the subject matter, the work, or the project." The Committee thought it important to make clear that this individual needs to be a qualified person "with respect to the equipment involved," since specialized engineering knowledge is needed to make the required assessments regarding the particular equipment that is being modified.

The approval of the modification/addition under proposed § 1926.1434(a)(2)(i) would have to specify the equipment configurations to which that approval applies. Cranes typically can be configured in a variety of ways. Modifications may have different

effects depending on the configuration. It is therefore essential for purposes of ensuring safe operation that the approval specify the configurations to which the approval applies. An example of an approval that met this aspect of the proposed provision 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."

This proposed section uses the term "modification/addition" to refer to "modification or addition." The Committee wanted to make clear 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.

Proposed § 1926.1434(a)(3), *Unavailable manufacturer*, would address a scenario where an employer wishes to make an equipment modification and the manufacturer of the equipment is unavailable to review the proposed modifications because, for example, it has gone out of business (and has not been taken over by a successor company). Under these circumstances, if the employer wishes to modify its equipment in such a way that affects its capacity and safe operation, it must meet the requirements of proposed § 1926.1434(a)(2)(i) and (a)(2)(ii) above.

**Paragraph 1434(b)**

Proposed paragraph (b) would prohibit 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. This requirement is the same as in § 1926.550(a)(16), except C-DAC believed 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 would both demonstrate that the manufacturer reviewed the technical safety merits of the request and give the employer the opportunity to modify the proposal to address the manufacturer's objections.

The C-DAC version of proposed § 1926.1434(b) did not explicitly state the effect of a manufacturer rejecting the proposal but failing to provide written reasons for the rejection. OSHA believes that C-DAC intended that such a situation be treated as a manufacturer refusal to review the request under § 1926.1434(a)(2). To effectuate this intent, OSHA has added the following sentence to proposed § 1926.1434(b):

> 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.

**Paragraph 1434(c)**

Proposed paragraph (c) would state that the provisions in § 1926.1434(a) and (b) of this proposed section do not apply to modifications made or approved by the U.S. military. A

representative of the U.S. Navy indicated to C-DAC that such an exception is needed in the event of military exigencies.

**Section 1435 Tower Cranes**

"Tower crane" is defined in § 1926.1401 as "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." This definition is based in part on the SC&RF Handbook's definition.[75]

Subpart N, at § 1926.550(c), addresses only one type of tower crane: those in which the working boom is fixed horizontally (hammerhead cranes). Furthermore, § 1926.550(c) addresses such tower cranes only to a limited extent. Specifically, it addresses adequate clearance for employee passage near moving and rotating parts, fall protection, trolley buffers, and limit switches for cranes that travel on rails. In addition, § 1926.550(c)(5) requires that hammerhead tower cranes meet the applicable requirements for design, construction, installation, testing, maintenance, inspection, and operation as prescribed by the manufacturer.

[75] This definition is explained in the discussion above of proposed § 1926.1401 (Definitions).

The Committee believed that most of the provisions in the other sections of this proposed standard are necessary and appropriate for tower cranes but that, in addition, certain unique characteristics of tower cranes necessitate certain additional requirements.

**Paragraph 1435(a)**

Proposed paragraph (a) states that unless provided otherwise in this section, all other sections of this proposed standard apply to tower cranes. As discussed below, sections § 1926.1415 (safety devices) and § 1926.1416 (operational aids) would not apply to tower cranes. Instead, this proposed section lists the safety devices and operational aids that would be required for tower cranes. In addition, this proposed section contains additional requirements for erecting, climbing, dismantling, and inspections.

**Paragraph 1435(b) Erecting, climbing and dismantling**

Proposed paragraph 1435(b) addresses erecting, climbing, and dismantling tower cranes. Under proposed paragraph 1435(b)(1), the employer would be required to comply with the assembly and disassembly requirements set out in proposed §§ 1926.1403, 1926.1404 and 1926.1405 except as otherwise specified in this section. Because the industry generally refers to the assembly and disassembly of tower cranes as erecting, climbing and dismantling, the term "assembly," as used in §§ 1926.1403 through 1926.1405, is replaced with "erecting and climbing," and the term "disassembly" is replaced with "dismantling."

OSHA notes that proposed § 1926.1403(b) specifies that employer procedures for assembly and disassembly may be used only where the employer can demonstrate that the procedures used meet the requirements in § 1926.1406. The C-DAC draft of §1926.1435(b) inadvertently omitted a reference to § 1926.1406. OSHA has corrected that omission; proposed paragraph (b)(1) now reads as follows:

> (1) Sections 1926.1403 (Assembly/disassembly – selection of manufacturer or employer procedures), 1926.1404 (Assembly/disassembly – general requirements), 1926.1405 (Disassembly – additional requirements for disassembly of booms and jibs), 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."

Proposed paragraph 1435(b)(2), *Dangerous areas (self-erecting tower cranes)*, addresses the hazards associated with crew members located in certain areas. Employees would be prohibited from being 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 would be 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.

Under proposed paragraph (b)(3), *Foundations and structural supports*, tower crane foundations and structural supports would be required to be designed by the manufacturer or a registered professional engineer. The Committee noted that structural supports can include portions of a structure, such as the floors or columns of a building, when the tower crane is mounted to them and they are used to help support the crane.

When a tower crane is mounted to portions of a structure, it is vital for safe operation that the structure be able to withstand 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.

Moreover, that entity must ensure both that the structure is strong enough to support the crane under all anticipated conditions of use and that the means of attaching the crane to the structure are strong enough to maintain the crane's support throughout the job. Therefore, OSHA interprets "structural supports" in this provision to include both the portions of the structure used for support and the means of attachment. OSHA requests

public comment on whether proposed § 1926.1435(b)(3) states this intent with sufficient clarity.

As drafted by C-DAC, this provision was listed as one of the hazards the A/D supervisor must address. However, the provision imposes a specific duty on the employer to have the foundations and structural supports designed by the manufacturer or a registered professional engineer, and this will be more clearly stated if the provision is contained in a stand-alone requirement rather than as one of several requirements that the A/D supervisor must address. Accordingly, OSHA has moved the provision into a separate § 1926.1435(b)(3).[76] In addition, as discussed below, the original § 1926.1435(b)(3)(i) (now § 1926.1435(b)(4)(i)) has been modified to state that the A/D supervisor must verify that the foundation and structural supports have been installed in accordance with their design in order to ensure that the design of the manufacturer or registered professional engineer has actually been implemented.

Proposed paragraph 1435(b)(4), *Addressing specific hazards*, would require the employer to comply with proposed § 1926.1404(h)(1) through (9). During erecting, climbing and dismantling, proposed § 1926.1404(h) would require that the A/D supervisor address certain hazards (these are discussed above in the discussion of proposed § 1926.1404). Proposed 1926.1435(b)(4) lists additional hazards, specific to tower cranes, that the A/D supervisor would also have to address. These additional hazards are those associated

[76] The list of hazards the A/D supervisor must address was in § 1926.1435(b)(3) of the C-DAC draft; that list (as modified in accordance with the discussion above) is now located in proposed § 1926.1435(b)(4).

with (i) the foundations and structural supports for tower cranes, (ii) the loss of backward stability, and (iii) wind speed.

Proposed paragraph 1435(b)(4)(i) would require the A/D supervisor 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.

Proposed (b)(4)(ii) would require that the A/D supervisor address the backward stability of the crane before self erecting tower cranes or cranes on traveling or stationary undercarriages are swung. This provision is similar to the assembly/disassembly requirement in § 1926.1404(h)(11)(discussed above) 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.

Tower cranes have a relatively small footprint relative to their height. The horizontal force caused by wind during erecting and dismantling can therefore have a substantial effect on the stability of a tower crane. Proposed § 1926.1435(b)(4)(iii) would require that erecting, climbing, and dismantling not take place when the wind speed recommended by the manufacturer is exceeded. Where the manufacturer does not

specify the proper wind speed, a qualified person would be required to determine the wind speed not to be exceeded.

Proposed paragraph (b)(4), *Plumb tolerance*, addresses the extent to which tower cranes need to be plumb. This proposed provision would require that the crane's tower be plumb to the manufacturer's tolerance and verified by a qualified person. The Committee noted that if a vertical tower is out of plumb the stability of the crane is greatly reduced. In addition, an out of plumb condition can reduce the crane's capacity and could cause a collapse.

Where the manufacturer does not specify the plumb tolerance, this provision would require that the tower be plumbed to a tolerance of at least 1:500. 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.

Proposed paragraph (b)(6), *Multiple tower crane jobsites*, would require construction jobsites with more than one fixed jib (hammerhead) tower crane installed to be located so that no crane could contact the structure of another crane. However, the jibs of multiple hammerhead tower cranes would be permitted to pass over/under one another.

This would help to ensure that multiple tower cranes on a construction site do not collide with each other. Such a collision could cause employee injuries or fatalities in various

ways. For example, employees could be struck by a load that was caused to swing by the collision; a tower crane operator could be struck; employees could be struck by a falling load, or there could be a collapse of one or more cranes.

Proposed paragraph (b)(7), *Climbing procedures*, contains special requirements that would have to be followed during the climbing process. "Climbing" is defined in § 1926.1401, *Definitions*, as: "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)."

Currently, the process of climbing is unique to tower cranes. The Committee indicated that, if done improperly, a collapse can occur during the climbing process. This proposed paragraph would require 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, a qualified person must determine the appropriate wind speed.

Proposed (b)(7)(ii) would require 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.

Proposed (b)(7)(iii) would require 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. This provision is included because, during the climbing process, a tower crane is not yet fully stabilized and excessively high winds can lead to a collapse.

The Agency notes that proposed § 1926.1435(b)(4)(iii) would require wind speed to be addressed during erecting, climbing and dismantling in the same manner as § 1926.1435(b)(7)(iii). OSHA requests public comment on whether § 1926.1435(b)(7)(iii) should be omitted as redundant.

Proposed paragraph (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. Proposed § 1926.1435(b)(8)(i) and (ii) would 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 and that the maximum amount of counterweight or ballast not be exceeded. The registered professional engineer must be one who is familiar with the equipment.

OSHA has made several wording changes to proposed § 1926.1435(b)(8)(i) and (ii) as compared with the C-DAC draft of these provisions. First, the C-DAC draft of proposed § 1926.1435(b)(8) used the term "professional engineer," rather than, as used in proposed § 1926.1435(b)(7)(i) and other provisions in this proposed standard, "registered professional engineer." OSHA believes that this was an inadvertent omission and has added the word "registered" in proposed § 1926.1435(b)(8)(i) and (ii).

Second, the C-DAC draft of proposed § 1926.1435(b)(8)(ii) used the word "approved" in the phrase "approved by the manufacturer or professional engineer." In contrast, in the draft of proposed § 1926.1435(b)(8)(i), C-DAC used the phrase "as specified by" rather than "approved." To ensure consistency and avoid confusion, the Agency has substituted the phrase "as specified by" for the word "approved" in proposed § 1926.1435(b)(8)(ii).

Third, the C-DAC draft of proposed § 1926.1435(b)(8)(i) referred to the amount and position of the "counterweight or ballast." However, some tower cranes, such as traveling tower cranes, have both counterweight **and** ballast. Therefore, the Agency has changed the language so that proposed § 1926.1435(b)(8)(i) refers to "counterweight **and/or** ballast."

**Paragraph 1435(c) Signs**

This proposed requirement addresses the hazards that can result from adding signs to tower cranes. Many employers will attach/hang/install signs (or advertisements) to the

jib, boom or tower, such as signs with the company name. 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. Proposed 1926.1435(c) would require employers to comply with the manufacturer's specifications [77] regarding the size and location of signs. Where the manufacturer does not specify this information or where such information is unavailable, this provision would require 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.

Note that the C-DAC draft included this provision as § 1926.1435(b)(4). However, upon review, OSHA became aware that signs are sometimes placed on tower cranes after the erecting/climbing process has been completed. Therefore, to make clear that the provision would apply irrespective of whether the sign was installed during or after erecting/climbing, the Agency has changed this provision's designation so that it is no longer under the paragraph on erecting, climbing and dismantling.

**Paragraphs 1435(d), Safety devices, and 1435(e), Operational aids**

These proposed paragraphs set out the safety devices and operational aids that would be required on tower cranes. Proposed §§ 1926.1415 and 1926.1416, which would require safety devices and operational aids on other types of cranes, would not be applicable to tower cranes. Instead, proposed § 1926.1435(d) and (e) would apply. Although some of

[77] OSHA has changed the C-DAC word "procedures" to "specifications" for greater accuracy and clarity.

the safety devices and operational aids for tower cranes are the same as §§ 1926.1415 and 1926.1416 require for other equipment, others are unique to tower cranes. C-DAC believed it would promote clarity to list all the devices and aids for tower cranes in this section.

Safety devices would be required to be in proper working order. Where a safety device is not in proper working order, the crane would have to be taken out of service until it is again functioning properly. The Committee believed 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 proposed section, the employer would be required to follow those more protective alternative measures.

**Safety Devices**: Proposed paragraph (d)(2) would require the safety devices on tower cranes discussed below.

Boom stops on luffing boom type tower cranes (proposed § 1926.1435(d)(2)(i)) and jib stops on luffing boom type tower cranes if equipped with a jib attachment (proposed § 1926.1435(d)(2)(ii)) would be required. These are comparable to the boom and jib stops required for other cranes under proposed § 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.

Proposed paragraph (d)(2)(iii) would require travel end rail stops at both ends of the travel rail. These are comparable to the rail stops required for equipment on rails under proposed § 1926.1415 and are designed to keep the crane from overshooting the boundaries on the rail within which it is supposed to operate. Overshooting the boundaries could result in a collapse. Subpart N currently contains a similar requirement at § 1926.550(c)(4).

Proposed paragraph (d)(2)(iv) would require travel rail clamps on all travel bogies. A "travel bogie (tower cranes)" is defined at § 1401 as "an assembly of two or more axles arranged to permit vertical wheel displacement and equalize the loading on the wheels." This definition is comparable to the definition of "bogie" in the SC&RF Handbook. When tower cranes travel on rails, they are mounted on travel bogies. The rail clamps that would be required by this proposed paragraph enable the bogies to be clamped to the rail to prevent the crane from lifting off the rail. They secure the crane in place when out of operation to prevent the crane from drifting unintentionally, which could cause struck-by accidents.

Proposed paragraph (d)(2)(v) would require 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.

Proposed paragraph (d)(2)(vi) would require 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.

Proposed paragraph (d)(2)(vii) would require 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 proposed 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.

Proposed paragraph (d)(2)(viii) would require 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.

Proposed paragraph (d)(2)(ix) would require 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.

Proposed paragraph (d)(3) would require that 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 would be prohibited from resuming until the device is once again in proper working order.

**Operational aids**: Like proposed § 1926.1416 for other equipment, proposed paragraph § 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 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.

Proposed paragraph 1435(e)(4) specifies that operational aids must work properly during operations and, if an aid stops working, the operator would be required to safely stop operations until the aid is working properly again or until the temporary alternative measures 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 proposed § 1926.1434, i.e., it would not need to be approved by the manufacturer or a registered professional engineer. See the discussion above regarding proposed § 1926.1416 for an explanation of the committee's rationale for this approach to operational aids.

Three of the operational aids discussed below would be required on tower cranes manufactured more than one year after the effective date of the standard. The remainder would be required on all cranes. It was C-DAC's understanding that the three aids that would not be required on existing cranes represent technology that has not been commonly available until recently, while the aids that would be required on all cranes have routinely been used in the industry for some time.

Proposed paragraph (e)(5) would require the Category I operational aids discussed below and specifies the alternative measures that would have to be followed if they are not working properly.

Proposed paragraph (e)(5)(i) would require trolley travel limiting devices. These devices would be 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 when operations are conducted within 10 feet of a trolley end stop. The Committee believed that both options would constitute safe alternatives until the trolley travel limit device is back in working order within the required time frame.

In order for the proposed option for a spotter in proposed § 1926.1435(e)(5)(i)(B) to work effectively and as the Committee intended, the spotter would need to communicate with the operator. Although such a communication requirement is implicit, the Agency believes that, to avoid ambiguity, the provision needs to explicitly require that the spotter be in communication with the operator. Therefore, OSHA believes that the C-DAC language in proposed § 1926.1435(e)(5)(i)(B), as well as the additional provisions in proposed § 1926.1435 which reference spotters, should be changed to include such a requirement. The provision, if changed in this manner, would read:

> (B) Option B. A spotter **who is in direct communication with the operator** shall be used when operations are conducted within 10 feet of the outer or inner trolley end stops.

OSHA requests public comment on the advisability of such a change.

In Subpart N, § 1926.550(c)(3) currently requires trolley end stops (it refers to them as "buffers"). In reviewing the C-DAC draft of the trolley travel limiting devices provision discussed above, OSHA realized that the C-DAC draft did not carry forward the requirement in § 1926.550(c)(3) for trolley end stops. The Agency believes that this was an inadvertent omission, since the C-DAC draft included a requirement for trolley travel limiting devices, and those devices would not work without trolley end stops. Therefore, OSHA has added proposed § 1926.1435(d)(2)(x), which would require trolley end stops as safety devices.

Proposed paragraph (e)(5)(ii) would require a boom hoist limiting device. As defined in proposed § 1926.1401, the word "boom" used in reference to tower cranes refers to a luffing boom. Therefore, under this proposed 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 proposed § 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 proposed § 1926.1416(d)(1): the employer would have 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.

Proposed paragraph (e)(5)(iii) would require 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 would be 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 would have 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. (See the discussion of the need for this type of device and rationale for including it as an operational aid above with respect to proposed § 1926.1416 (d)(3)).

Proposed paragraph (e)(5)(iv) would require a hoist drum lower limiting device. This proposed paragraph would require 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 would prevent 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.

OSHA notes that the C-DAC draft of this provision was mistakenly entitled, "Hoist drum lowering device." Since this device is a limiting device, the title has been changed in the proposed rule to, "Hoist drum lower limiting device."

Proposed paragraph (e)(5)(v) would require a load moment limiting device. "Load moment (or rated capacity) limiter" is defined in § 1926.1401 as "a system which aids the equipment operator by sensing 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."
As the definition indicates, 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 would be 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 would be required to be used. If the crane is not so equipped, the radius would be 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 would be required to be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or

by other equally reliable means. This information would be required to be provided to the operator prior to the lift.

The C-DAC document refers to this device as a "load moment limit device." OSHA has corrected this to "load moment limiting device."

Proposed paragraph (e)(5)(vi) would require 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. Such a drop could cause a worker to be struck by the load.

The temporary alternative measure for this operational aid would be that the operator would 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.

Proposed paragraph (e)(5)(vii) would require 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 believed that rail stops should not be the exclusive means of ensuring that the crane stays within its intended limits because the crane 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 would be to use a spotter when the crane is operated within 10 feet of a rail stop.

Proposed paragraph (e)(5)(viii) would require the boom hoist drum to be equipped with a positive locking device. One example of such a device is a ratchet and pawl mechanism. The purpose of the device is to prevent the boom (and therefore the load as well) from inadvertently lowering.

C-DAC intended that the device be able to be set from the operator's station because it provided that the temporary alternative to a device that can be set from the operator's station is to set the device manually when its use is required. However, neither the requirement for a device that can be set from the operator's station nor the alternative of setting the device manually will help the operator lock the boom hoist drum if the device itself malfunctions. Accordingly, the Agency requests 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.

Proposed paragraph (e)(6) would require the category II operational aids discussed below and specifies the alternative measures that would have to be followed if they are not working properly.

Proposed paragraph (e)(6)(i) would require a boom angle or hook radius indicator as specified in proposed § 1926.1435(e)(6)(i)(A) and (B). Under these provisions, luffing boom tower cranes would be 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 would be 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 would be to measure the boom angle or hook radius with a measuring device (proposed § 1926.1435(e)(6)(i)(C)).

Proposed paragraphs (e)(6)(ii) through (iv) would require a trolley travel deceleration device, boom hoist deceleration device, and load hoist deceleration device. These devices reduce the speed of the trolley, boom and load as they approach certain limits. They prevent crane components from being subjected to the excessive stress that would result if the trolley, boom, or load were to run into a limiting device without slowing down. Such high stresses could cause a crane component to fail, which could cause unintended movement of the load, loss of the load, or damage/collapse of a component (and therefore struck-by injuries or fatalities).

Proposed (e)(6)(ii) would require tower cranes to have a trolley travel deceleration device which would automatically reduce the trolley speed before the trolley reached the end limit in both directions. Proposed § 1926.1435(e)(6)(iii) would require 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. Proposed § 1926.1435(e)(6)(iv) would require tower cranes to have a load hoist deceleration device, which would automatically limit the load speed before the load hoist reaches the upper limit. The temporary alternative measure for each of these operational aids would be 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 Agency requests public comment on whether there are any such alternative measures that could be used in these instances.

Proposed (e)(6)(v) would require tower cranes to have a device that displays the wind speed, mounted above the upper rotating structure. On self erecting 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.

As discussed under proposed § 1926.1417 (Operation), paragraph § 1926.1417(n) would require a competent person to consider the effect of wind (and other weather conditions) on equipment stability and rated capacity. Tower cranes are particularly susceptible to the effects of high wind, and knowledge of wind speed is needed so that the competent person can consider its effect on equipment stability and rated capacity. The temporary alternative measure would be 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.

Proposed paragraph 1435(e)(6)(vi) would require 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 that is 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 the load that is on the hook. By informing the operator of the weight of the load, this device will help the operator ensure that the crane is operated within its rated capacity. The temporary alternative would be for the weight of the load to be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information would be required to be provided to the operator prior to the lift.

**Paragraph 1435(f) Inspections**

Under proposed paragraph (f)(1), § 1926.1412 (Inspections) would apply to tower cranes except that the term "assembly" would be replaced by "erection" (the appropriate term for tower cranes).

Proposed paragraph (f)(2) would supplement the requirement in proposed § 1926.1412(c). It would require that a load test be conducted as part of the post-erection inspection required by proposed § 1926.1412(c). The load test would have to be conducted using certified weights or weights that have been weighed on a calibrated scale (with a current certificate of calibration) (proposed § 1926.1412(f)(2)(i)). The test would have to be conducted in accordance with the manufacturer's instructions or, if those are unavailable, in accordance with written procedures developed by a registered professional engineer familiar with the type of equipment involved (proposed § 1926.1412(f)(2)(ii)). This would help ensure that any significant problems or errors made during the erection process would be revealed prior to placing the crane in operation.

Proposed paragraph (f)(3) would require 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-mast brace support (proposed § 1926.1435(f)(3(i)). The monthly inspection would also include the upper-most tie-in, braces, floor supports, and floor wedges where the tower crane is supported by the structure (proposed § 1926.1435(f)(3(i)), for loose or dislodged components. These items are critical to the stability of the crane, and C-DAC believed that a monthly inspection would uncover any deficiencies that would endanger the crane's stability.

**Section 1436 Derricks**

This proposed section contains requirements for derricks that would supplement the other requirements of this standard. Currently, 29 CFR Part 1926 subpart N, at § 1926.550(e), requires derricks to meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation as prescribed in ANSI B30.6–1969, safety code for "Derricks," as well as the general requirements of Subpart N applicable to all equipment.

C-DAC's 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 insofar as the provisions discussed below are concerned, so the requirements of this section differ substantively from those of Subpart N in only limited respects. Where substantive differences exist, they are discussed in the context of that requirement.

**Paragraph 1436(a)**

Proposed paragraph (a) explains that this section contains supplemental requirements for derricks, whether temporarily or permanently mounted; all sections of this Subpart would apply to derricks unless specified otherwise. Proposed § 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.

Proposed paragraph (a)'s exclusion of gin poles used for erection of communication towers mirrors the exclusion of such equipment from the scope of the standard under proposed § 1926.1400(c)(12). As explained above in the discussion of proposed § 1926.1400(c)(12), gin poles used for erecting communication towers are excluded because the erection of communication towers is a highly specialized subset of the construction industry and involves interests and issues that go beyond the interests and issues C-DAC was designed to address.

**Paragraph 1436(b) Operation – procedures**

Proposed paragraph (b)(1) states that § 1926.1417 (Operation) of this proposed standard applies except for proposed § 1926.1417(c) (Accessibility of procedures). C-DAC believed 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, proposed § 1926.1417(c) would require the operating procedures, including load charts, to be located in "the cab" of the equipment and derricks often do not have a cab. Therefore, that proposed requirement would not apply to derricks. Proposed § 1926.1436(b)(3), discussed below, sets forth requirements for accessibility of the load chart for derricks.

Proposed paragraph (b)(2), *Load chart contents*, would list what information must be included on load charts. Subpart N incorporated similar load chart requirements of section 6-1.1.2 in ANSI B30.6-1969, which remains the same in the ASME B30.6-2003 version of the consensus standard.

Proposed paragraph (b)(2)(i) would require the load chart to 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 needed because the derrick's load capacity varies with different component lengths.

Proposed paragraph (b)(2)(iii) would require the load chart to list parts for hoist reeving. By listing the reeving parts considered during the tabulation of available load charts, the employer can determine if available load charts are applicable to the configuration of the derrick at its work site. As with proposed § 1926.1436(b)(2)(i) and (ii), meeting this requirement would help prevent accidents that could occur result from errors in determining the equipment's rated capacity.

Proposed paragraph (b)(2)(iv) would require the size and construction of rope to be included on the load chart or in the operating manual. This proposed requirement would prevent hoisting accidents that might occur if a rope fails because it was the wrong size or construction for the load being lifted.

Proposed paragraph (b)(3), *Load chart location*, states where the required load charts must be kept. Proposed § 1926.1436(b)(3)(i), *Permanent installations*, would require 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. Proposed § 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 would ensure that the critical information contained on these charts is available on the worksite to enable the employer to calculate the parameters of a safe lift.

**Paragraph 1436(c) Construction**

Proposed paragraph (c) contains supplemental engineering and fabrication requirements that address hazards specific to derricks. Proposed paragraph (c)(1), *General requirements*, would list general construction requirements that apply to the use of all types of derricks. The requirements that follow are similar to section 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.

Proposed paragraph (c)(1)(i) states that derricks shall 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 "an employer builder/constructor of equipment." This definition distinguishes a "builder" of equipment (an employer at the worksite where the derrick is erected) 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. This requirement is similar to section 6-1.2.1(a) of ANSI B30.6-1969 and ASME B30.6-2003.

Proposed paragraph (c)(1)(ii) specifies that the welding of load sustaining members shall conform to recommended practices in ANSI/AWS D14.3–94 or D1.1–02. This latter provision is similar to section 6-1.2.1(b) of ASME B30.6–2003 and relies on newer

welding standards than the corresponding requirement of ANSI B30.6–1969, which requires welding of critically stressed members to conform to AWS D2.0-66. [78] These provisions would prevent structural failures when using the derrick within its rated capacity.

Proposed paragraph (c)(2), *Guy derricks*, lists additional requirements applicable to the construction of guy derricks. In addition, proposed § 1926.1436(d), *Anchoring and guying*, contains requirements for anchoring and guying guy derricks. Both of these sections contain provisions that address the specifications for guys, and OSHA is concerned about whether placing related requirements in two different paragraphs could lead to confusion and impede compliance.[79] Moreover, OSHA is concerned about whether proposed § 1926.1436(c)(2) is worded in a way that clearly states its intent. OSHA requests public comment on whether these provisions need to be modified to provide clearer guidance and, if so, how they should be modified. A discussion of the issues these proposed paragraphs present follows.

A guy derrick consists of a vertical, rotating mast anchored at its base and a boom connected to the bottom of the mast in such a way that the boom can pivot in a vertical plane, i.e., the angle between the boom and the mast can vary. The mast is supported at its top by guys that run from the mast to the surface on which the derrick is mounted. Factors such as the number, spacing, and angle of the guys, the material of which they are

[78] The text of section 6-1.2.1(b) of ASME B30.6 – 2003 does not state the dates of the welding standards it incorporates. However, those dates are specified in section 6-0.3 of the ASME standard, and OSHA has added them to the text of § 1926.1436(c)(1)(ii).
[79] A similar problem with the provisions on stiffleg derricks is discussed below.

made, and the tension in the guys, affect whether the derrick is able to handle loads within its rated capacity.

The following proposed provisions apply to guy derricks.

(c) Construction

* * *

(2) Guy derricks.

(i) The minimum number of guys shall 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 shall not be used unless the employer has the following guy information:

(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 (ii), the employer shall have the following guy information:

(A) The amount of initial sag or tension.

(B) The amount of tension in guy line rope at anchor.

(d) Anchoring and guying.

(1) Load anchoring data developed by the manufacturer or a qualified person shall be used.

(2) Guy derricks.

(i) The mast base shall be anchored.

(ii) The guys shall be secured to the ground or other firm anchorage.

(iii) The anchorage and guying shall 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.

Proposed paragraph (c)(2)(i) specifies that the minimum number of guys shall 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. This requirement is comparable to section 6-1.2.2 of ANSI B30.6–1969 and ASME B30.6-2003.

Proposed paragraph (c)(2)(ii) states that guy derricks shall not be used unless the employer has the following guy information: (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.

Proposed paragraph (c)(2)(iii) requires that for guy derricks manufactured after December 18, 1970, in addition to the information required in § 1926.1436(c)(2)(ii), the employer shall have the following guy information: (A) The amount of initial sag or tension; and (B) The amount of tension in guy line rope at anchor.

OSHA notes that proposed § 1926.1436(c)(2)(ii) does not establish specifications an employer must follow when installing a guy derrick. They require only that the employer have the specified information on the guying used to install the derrick.

The requirement of proposed § 1926.1436(c)(2) that the derrick user possess certain guy information differs substantially from that found in the ANSI/ASME standards on which proposed § 1926.1436(c) is based. The corresponding ANSI/ASME provisions are section 6-1.2.2 of ANSI B 30.6–1969 and ASME B30.6–2003, which require the derrick manufacturer to furnish complete information recommending the guy specifications listed in § 1926.1436(c)(2)(ii).[80] Thus, the ANSI/ASME provisions impose a duty on derrick manufacturers to provide certain information and recommendations to their customers. The C-DAC provisions, by contrast, impose an obligation on derrick users to possess the information provided by the manufacturer. However, as drafted, proposed § 1926.1436(c)(2) does not require derrick users to follow the manufacturer's recommendations on the listed guy specifications, only to have that information.

In sum, proposed § 1926.1436(c) tells guy derrick users (1) that they must install a minimum of six guys with equal spacing, unless the derrick manufacturer or a qualified person approves variations from these requirements and revises the rated capacity accordingly, and (2) that they must have information on the number of guys and spacing, as well as the type of guy material used and, for newer derricks, the tension in the guys.

The subject of guy installation is also addressed by proposed § 1926.1436(d). Proposed § 1926.1436(d)(1) requires the derrick user to use load anchoring data developed by the manufacturer (or a qualified person) to anchor the mast and install the guys. Under

[80] The 1969 version of the ANSI standard does not include the items in proposed § 1926.1436(c)(2)(iii), but later versions of the B30.6 standard, including the 2003 version, list those items.

proposed § 1926.1436(d)(2), the employer must use this data to (i) anchor the mast base; (ii) secure the guys to the ground or other firm anchorage; and (iii) install guying that will withstand the maximum horizontal and vertical forces encountered when operating within rated capacity with the particular guy slope and spacing specified for the application. Although this provision requires the employer to install guying that will enable the derrick to handle loads within its rated capacity and to use manufacturer's (or a qualified person's) data for this purpose, it does not explicitly require the employer to follow manufacturer recommendations on guying. Nor does it explicitly say that an employer who follows the manufacturer's guying recommendations is in compliance.

OSHA believes that, in many if not most cases in which guy derricks are used, the employer who uses the derrick will want to be able to rely on the manufacturer's recommendations for number, spacing, angle, material, and tension of guys and that permitting employers to do so will promote safe use of such derricks. OSHA is concerned about whether the proposed C-DAC provisions clearly permit an employer to rely on such manufacturer recommendations.[81]

OSHA requests public comment on whether and, if so how, any of these proposed provisions should be modified to make clear what information the derrick user must use when installing guys. For example, should the derrick user be required to use specifications provided by the manufacturer of the derrick (assuming such specifications

[81] The provisions do not explicitly permit the employer to rely on manufacturer recommendations and could be read not to permit reliance on such recommendations because the provisions on guy information, which would typically be provided by the manufacturer (proposed § 1926.1436(c)(2)(ii) and (iii)), and those on installing anchoring and guying (proposed § 1926.1436(d)(1) and (2)), are found in different paragraphs and may therefore be read to be mutually exclusive.

are available from the manufacturer) on all of the topics listed in proposed § 1926.1436(c)(2)(ii) and (iii)?

OSHA further notes that the need for the "grandfathering" provision in proposed § 1926.1436(c)(2)(iii) is problematic. Although the 1969 ANSI B30.6 standard did not require manufacturers to provide information on sag and tension of guy line rope, proposed § 1926.1436(d)(1) contemplates that such information could be developed by a qualified person. OSHA therefore additionally requests public comment on whether the standard should require guy tension (as well as other guy specifications) to be developed by a qualified person if not available from the manufacturer.

Proposed paragraph (c)(2)(iv) states that the mast base shall permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack. Proposed § 1926.1436(c)(2)(v) requires that the mast cap shall: (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 attaching guy ropes. These requirements track similar ones in sections 6-1.2.2(c) and (d) of ANSI B30.6-1969 and ASME B30.6-2003.

Proposed paragraph (c)(3), *Stiffleg derricks*, provides additional requirements specific to stiffleg derricks to help ensure their safe use. These requirements are comparable to those in section 6-1.2.3 of ANSI B30.6-1969 and ASME B30.6-2003.

As with guy derricks, specifications for stiffleg derricks are found in both proposed § 1926.1436(c) and (d). Both paragraphs contain provisions dealing with the ability of stifflegs to withstand loads, and OSHA is concerned about the possibility for confusion if two different provisions address the same issue. The two provisions are:

> Proposed § 1926.1436(c)(3)(ii): The stifflegs shall be capable of withstanding the loads imposed at any point of operation within the load chart range.
>
> Proposed § 1926.1436(d)(3)(ii): The mast base and stifflegs shall 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.

Even though these two provisions appear to be consistent with each other, there is always the possibility for confusion if two differently worded provisions address the same topic, and OSHA requests public comment on whether either or both of these provisions should be changed or deleted to avoid any such potential confusion.

Proposed paragraph (c)(3)(i) would require that the mast be supported in the vertical position by at least two stifflegs; one end of each would have to be connected to the top of the mast and the other end securely anchored.

Proposed paragraph (c)(3)(ii) states that the stifflegs shall be capable of withstanding the loads imposed at any point of operation within the rated load chart range.

Proposed paragraph (c)(3)(iii) specifies that the mast base shall: (A) Permit the mast to rotate freely (when necessary); and (B) Permit deflection of the mast without binding.

Proposed paragraph (c)(3)(iv) states that the mast shall be prevented from lifting out of its socket when the mast is in tension.

Proposed 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.

Paragraph (c)(4), *Gin pole derricks*, contains additional requirements specific to gin pole derricks to help ensure their safe use. Similar requirements are found in section 6-1.2.4 of ASME B30.6-2003. ANSI B 30.6-1969, which is incorporated by reference in Subpart N, does not contain provisions specific to gin pole derricks.

Proposed paragraph (c)(4)(i) provides that guy lines 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 shall ensure that the derrick is not used in an unstable position.

Proposed paragraph (c)(4)(ii) requires that the base of the gin pole permit movement of the pole (when necessary).

Proposed paragraph (c)(4)(iii) would require the gin pole to be anchored at the base against horizontal forces (when such forces are present).

Proposed paragraph (c)(5), *Chicago boom derricks*, states that the fittings for stepping the boom and for attaching the topping lift shall 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 section 6-1.2.5 of ASME B30.6-2003. ANSI B 30.6–1969, which is incorporated by reference in Subpart N, does not contain specific requirements for Chicago boom derricks.

**Paragraph 1436(d) Anchoring and guying**

Proposed paragraph (d) lists requirements for anchoring and guying derricks to the surfaces that support them.

Proposed paragraph (d)(1) would require use of load anchoring data developed by the manufacturer or a qualified person. Currently, Subpart N, through incorporation of section 6-1.4.3 of ANSI B30.6–1969, requires load anchoring data for non-permanent installations, which would 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 believed that, to better ensure safety, a qualified person (as defined in proposed § 1926.1401) is needed to develop such data. The proposal 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.

For permanent fixed installations, the 1969 ANSI standard requires load anchoring data to be provided by the derrick manufacturer, while the 2003 version requires it to be provided by the owner. 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.

Proposed paragraph (d)(2), *Guy derricks*, lists additional requirements, for anchoring and guying, that are specific to the use of guy derricks. These provisions are similar to section 6-1.4.1of ANSI B30.6–1969 and ASME B30.6–2003. These provisions are discussed above in connection with proposed § 1926.1436(c)(2).

Proposed paragraph (d)(3), *Stiffleg derricks*, lists anchoring and guying requirements that are specific to the use of stiffleg derricks. The provisions in this paragraph are similar to section 6-1.4.2 in ANSI B30.6–1969 and ASME B30.6-2003.

Proposed paragraph (d)(3)(i) would require the mast base and stifflegs to be anchored.

Proposed paragraph (d)(3)(ii) would require the mast base and stifflegs to 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. This provision is discussed above in connection with proposed § 1926.1436(c)(3).

**Paragraph 1436(e) Swingers and hoists**

Proposed paragraph (e) lists requirements for swinger mechanisms and hoists that are used as part of a derrick.

Proposed paragraph (e)(1) would require 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 section 6-1.5.1 of ANSI B30.6–1969 and section 6-1.5 of ASME B30.6-2003.

Proposed paragraph (e)(2), *Base-mounted drum hoists*, would specify minimum requirements for hoists used for derricks. Currently, Subpart N has requirements for base-mounted drum hoists in 29 CFR 1926.553. These requirements apply to all base-mounted drum hoists used in construction, including those used for derricks.

It should be noted that this rulemaking is limited to setting requirements for cranes and derricks, and therefore does not address the requirements in § 1926.553 for base-mounted

drum hoists to the extent they apply beyond their use for derricks. Consequently, proposed § 1926.1436(e)(2) would set requirements for base-mounted drum hoists only to the extent such hoists are used for derricks. Also note that the requirements in § 1926.553 for base-mounted drum hoists would no longer apply to such hoists used for derricks. To make this clear, this proposed rule would amend § 1926.553 by adding the following § 1926.1436(c) to that section and requests public comment on this proposed change:

> (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).

Section 1926.553 requires base-mounted drum hoists to meet the applicable requirements for design, construction, installation, testing, inspection, maintenance, and operations prescribed by the manufacturer. In addition, it imposes requirements to guard exposed moving parts, locate controls within easy reach of the operator's station, and equip electric motor operated hoists with certain safety features.

For such hoists used for derricks, instead of relying on a manufacturer's recommendation for most requirements, proposed § 1926.1436(e)(2) incorporates by reference certain sections of ASME B30.7-2001, "Base Mounted Drum Hoists," and sets forth specific requirements for load tests.

Proposed paragraphs (e)(2)(i)(A) through (D) would require that base mounted drum hoists meet the requirements in the following sections of ASME B30.7-2001:

(A) Sections 7-1.1 (Load ratings and markings).

(B) Section 7-1.2 (Construction), except: 7-1.2.13 (Operator's cab); 7-2.15 (Fire extinguishers) (Note: The requirements excluded by this proposed paragraph would be covered by the general fire extinguisher and operator's cab requirements in § 1926.1433(e)(6) and (7) of this proposed standard. Therefore, the incorporation by reference of those requirements from ASME B30.7-2001 would be redundant.)

(C) Section 7-1.3 (Installation).

(D) Applicable terms in Section 7-0.2 (Definitions).

The requirements incorporated from section 7-1.2 include those for guarding exposed moving parts, locating controls within easy reach of the operator's station, and equipping electric motor operated hoists with certain safety features. Comparable requirements are now found in § 1926.553. Section 7-1.2 also contains a number of additional requirements from ASME B30.7, including requirements for hoist and swinger mechanisms, brakes, clutches, adjustments for brakes and clutches, ropes, prime mover controls, electric resistors and switches, and lubrication.

Proposed paragraph (e)(2)(ii), *Load tests for new hoists*, would require that the employer 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 section 7-2.2.2(a), requires similar load 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 this proposal permits the test to be conducted by any party as long as it is performed correctly.

Proposed paragraph (e)(2)(iii), *Repaired or modified hoists*, would require that hoists which have had repairs, modifications or additions affecting their capacity or safe operation be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing shall be conducted in accordance with § 1926.1436(e)(2)(ii) and (iv). This requirement parallels section 7-2.2.2(b)(1) of ASME B30.7-2001.

Proposed paragraph (e)(2)(iv), *Load test procedure*, would state that load tests required by § 1926.1436(e)(2)(ii) or (e)(2)(iii) shall be conducted in accordance with the requirements listed in § 1926.1436(e)(2)(iv)(A) to (C). Proposed § 1926.1436(e)(2)(iv)(A) would require that the test load be hoisted a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s). Proposed § 1926.1436(e)(2)(iv)(B) provides that the test load shall be lowered, stopped and held with the brake(s). These specifications are comparable to those in section 7-2.2.2(b)(2) of ASME B30.7-2001.

Proposed paragraph (e)(2)(iv)(C) states that the hoist shall not be used unless a competent person determines that the test has been passed. [82] The requirement that a competent person determine whether a base-mounted drum hoist has passed a load test is consistent with the requirement, discussed below under proposed § 1926.1436(g), that a competent person determine whether a derrick has passed a load test. C-DAC believed that, to ensure that the load test is properly assessed, this determination needs to be made by a competent person.

[82] ASME B30.7-2001 does not specify who must determine if a hoist passes its load test.

**Paragraph 1436(f) Operational aids**

Proposed paragraph (f) would specify the types of operational aids that must be used on derricks during construction activities.

Proposed paragraph (f)(1) states that proposed § 1926.1416 (Operational aids) applies, except for § 1926.1416(d)(1) (Boom hoist limiting device), (e)(1) (Boom angle or radius indicator) and (e)(4) (Load weighing and similar devices). Under proposed § 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) – would be required on a derrick manufactured more than one year after the effective date of this subpart. Neither is currently required under 29 CFR Part 1026 subpart N.[83] The safety functions served by these operational aids are described above in the discussion of proposed § 1926.1416.

Proposed paragraph (f)(2), *Boom angle aid*, would require the employer 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.

[83] Other operational aids listed in § 1926.1416 – a luffing jib limiting device, a jib angle indicator, a boom length indicator on equipment with a telescoping boom, and an outrigger position sensor/monitor on equipment with outriggers – are required on equipment with components not possessed by derricks.

C-DAC discussed whether to require derricks to be equipped with boom angle indicators. Section 6-1.6.4 of ASME B30.6-2003 advises that derricks have such devices, stating that "Boom angle indicators should be provided and be readable by the operator or the signal person, unless the derrick has one rating for all boom angles." C-DAC believed that, instead of requiring such a device, marking the boom hoist cables to indicate maximum and minimum boom positions is a safe work practice that is routinely implemented by many derrick operators in the industry.

The Committee also believed that the most recent accident data it reviewed did not indicate that this work practice was ineffective and concluded that requiring boom angle indicators would be an added cost to the industry with no significant impact on safety. The proposed standard therefore would require the employer either to mark the boom hoist lines or to use an electronic signaling device in lieu of using a boom angle indicator.

OSHA notes that, as drafted by C-DAC, proposed § 1926.1436(f)(2) would require derrick users to take one of the two specified precautions even if the derrick is equipped with a boom angle indicator as suggested by ASME B30.6. It is the Agency's understanding that C-DAC intended those precautions to be taken in lieu of requiring boom angle indicators and that they are not needed if the derrick has such a device. OSHA therefore requests public comment on whether it should modify § 1926.1436(f)(2) by adding the words "If the derrick is not equipped with a functioning boom angle indicator" so that it would read as follows:

(2) *Boom angle aid*. If the derrick is not equipped with a functioning boom angle indicator, the employer shall ensure that either:

(i) The boom hoist cable shall be marked with caution and stop marks. The stop marks shall correspond to maximum and minimum allowable boom angles. The caution and stop marks shall 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.

Proposed paragraph (f)(3), *Load weight/capacity devices*, would require that derricks manufactured more than one year after the effective date of this Subpart 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 would adopt for derricks a comparable requirement to that for cranes required by proposed § 1926.1416(e)(4). However, the requirement for cranes applies to cranes manufactured after March 29, 2003. That date was chosen for cranes because it was when ANSI B30.5 first required load weighing devices on all mobile cranes with a rated capacity over 6,000 pounds. There is no comparable requirement for derricks in the ASME B30.6 standard. Since this proposed paragraph, if adopted, would impose a requirement not previously applied to derricks by an industry standard, C-DAC believed it is appropriate to allow one year after this standard becomes effective for new derricks to be equipped with such devices.

Proposed paragraph (f)(3) sets temporary alternative measures that must be used when the load weight/capacity device is not working properly. These temporary alternatives are the same as those required by proposed § 1926.1416(e)(5) for equipment generally and under proposed § 1926.1435(e)(6)(vi) for tower cranes specifically. Under § 1926.1416(e) and § 1926.1435(e)(6), such a device is a category II operational aid and, as such, it must be repaired within 30 days if it is not working properly. OSHA requests comment on whether to apply that same 30-day requirement, along with the exception if a part is ordered within 7 days of the malfunction and not received in time to complete the repair within 30 days, to proposed § 1926.1436(f)(3).

**Paragraph 1436(g) Post-assembly approval and testing – new or reinstalled derricks**

Proposed paragraph (g) would list 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 believed that by meeting these minimum requirements, the employer would provide its workers with a safe derrick that will not endanger its workers during hoisting operations.

Proposed paragraph (g)(1), *Anchorages*, would list minimum requirements for an anchor used to support a derrick. Proposed § 1926.1436(g)(1)(i), would require that the anchorages, including the structure to which the derrick is attached (if applicable), be approved by a qualified person.

Proposed paragraph (g)(1)(ii) would require the qualified person to determine if any special testing of the anchorage is needed when rock or hairpin anchorage are used. If so, it shall be tested accordingly. The provisions in proposed § 1926.1436(g)(1) are similar to what is required by Subpart N through its incorporation of section 6-2.2.1b in ANSI B30.6-1969 and also what is currently in section 6-2.2.1(b) in its newest revision, ASME B30.6-2003.[84] These requirements would help the employer ensure that the derrick would not collapse due to insufficient anchoring and injure or kill workers who must use or be in the vicinity of the derrick.

Proposed paragraph (g)(2), *Functional test*, would require that, prior to initial use, new or reinstalled derricks shall be tested by a competent person with no hook load to verify proper operation. Section 2.2.1a of ANSI B30.6-1969, incorporated in Subpart N, requires the employer to test the derrick to ensure that it can safely hoist and lower the load, boom up and down, swing left and right, and brake/control the speed of its hoist lines. The five provisions of this proposed paragraph are similar to section 6-2.2.1 of ASME B30.6-2003 and would require, respectively, the following tests: (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).

[84] This proposed paragraph differs from section 6-2.2.1(b) of 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.

Proposed paragraph (g)(3), *Load test*, would require that, prior to initial use, new or reinstalled derricks shall be load tested by a competent person. Subpart N requires operational tests prior to initial use of all new and altered derricks through the incorporation of section 6-2.2.1 of ANSI B30.6-1969, but a load test is not explicitly required. C-DAC recommended that OSHA adopt the revised guidance provided in section 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 believes that compliance with the load test requirements listed below would help the employer identify defects in the derrick prior to its actual use.

Proposed paragraph (g)(3)(i) would require that test loads shall 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 shall the test load be less than the maximum anticipated load.

Proposed paragraph (g)(3)(ii) would list minimum procedures that must be accomplished during the load testing. These are: (A) the test load be hoisted a few inches and held to verify that the load is supported by the derrick and held by the hoist brake(s); (B) the derrick must be swung, if applicable, the full range of its swing, at the maximum allowable working radius for the test load; (C) the derrick must be boomed up and down within the allowable working radius for the test load; and (D) the load must be lowered, stopped and held with the brake(s).

Proposed paragraph (g)(3)(iii) would require that the derrick not be used unless the competent person determines that the test has been passed.

Proposed paragraph (g)(4), *Documentation*, would require that tests conducted under this paragraph be documented. The document must contain the date, test results, and the name of the tester. The document shall be retained until the derrick is re-tested or dismantled, whichever occurs first. Because a load test meeting the criteria listed in the proposed standard is so important to the safe use of the derrick, C-DAC believed 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.

**Paragraph 1436(h) Load testing repaired or modified derricks**

Proposed paragraph (h) would require 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 it is, load testing shall be conducted and documented in accordance with § 1926.1436(g). Subpart N, through incorporation by reference of section 6-2.3.3 of ANSI B30.6-1969, *Adjustments and Repairs*, requires all replaced and repaired parts to have at least the original safety factor. However, there is no explicit requirement to load test the derricks after parts are repaired or replaced. ASME B30.6-2003 does address load testing of repaired, altered or modified derricks in its section 6-2.2.2(b), specifying that the need for such a test be determined by a qualified

person. C-DAC recommended that load testing should be mandatory after a derrick has been repaired or modified. Such testing will help the employer identify safety defects in a repaired or modified derrick prior to its actual use.

**Paragraph 1436(i) [*Reserved*.]** This proposed paragraph is reserved because it is inconvenient for readers to determine whether "(i)" is being used as a letter or a roman numeral.

**Paragraph 1436(j) Power failure procedures**

Proposed paragraph (j) would require the derrick operator to safely stop operation if the power fails during operations and would list additional steps that must be taken. Proposed § 1926.1436(j)(1) would require setting all brakes or locking devices. Proposed § 1926.1436(j)(2) would require moving all clutch and other power controls to the off position. These steps would prevent inadvertent movement of the load during the power outage or upon restoration of power. These precautions are found in section 6-3.2.3(h) of ANSI B30.6-1969, which is incorporated by reference in Subpart N of this part, and are reiterated in ASME B30.6-2003.

**Paragraph 1436(k) Use of winch heads**

Proposed paragraph (k) would specify minimum requirements for the safe use of a winch during hoisting operations. Proposed paragraph (k)(1) would require that ropes not be handled on a winch head without the knowledge of the operator. Proposed § 1926.1436(k)(2) would require the operator to be within reach of the power unit control while a winch head is being used. These proposed requirements are in section 6-3.3.5 of ANSI B30.6-1969, which is incorporated by reference in Subpart N, and are continued in section 6-3.3.6 of ASME B30.6-2003.

**Paragraph 1436(l): [*Reserved*.]** This proposed paragraph is reserved because it is inconvenient for readers to distinguish the letter "l" from the number "1."

**Paragraph 1436(m) Securing the boom**

Proposed paragraph (m) would list minimum requirements for ensuring the stability of a derrick's boom at rest to prevent injuries and deaths that could occur if it inadvertently shifted or fell. Subpart N incorporates section 6-3.3.6 of ANSI B30.6-1969, which contains similar requirements. ASME B30.6-2003 revised those provisions in its section 6-3.3.7, and C-DAC recommended that OSHA list elements of the updated consensus standard's provisions in proposed § 1926.1436(m)(1) and (2) below.

Proposed paragraph (m)(1) would require that when the boom is being held in a fixed position, dogs, pawls, or other positive holding mechanisms on the boom hoist be engaged. Proposed § 1926.1436(m)(2) would require 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 (section 6-3.3.7) would require the boom to be secured when the derrick is "not in use." C-DAC believed the intent of the ANSI provision was to require the boom to be secured when the derrick was not in service but thought 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 was taken out of service for 30 days or more.

**Paragraph 1436(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. Proposed § 1926.1436(n) would require that the process of jumping the derrick be supervised by the A/D (assembly/disassembly) supervisor. As provided in § 1926.1401, the A/D supervisor 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, proposed § 1926.1436(g) would require 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. Some members stated that load testing a derrick after it has been jumped would be unduly burdensome since it is often already difficult to locate loads heavy enough to meet the 100-110% of rated capacity requirement of the initial load test. C-DAC agreed that a jumped derrick need not be load tested and believed that the A/D supervisor could be relied upon to see that the jumped derrick is properly erected and anchored and complies with the applicable requirements of this proposed standard. OSHA is satisfied with C-DAC's rationale and believes that giving the A/D supervisor the responsibility for supervising the jumping of a derrick will ensure that the jumped derrick is safe to use.

**Paragraph 1436(o)**

Proposed paragraph (o) would require that derrick operations be supervised by a competent person. Subpart N incorporates by reference section 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 believes its 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 safety of derrick operations.

**Paragraph 1436(p) Inspections**

Under proposed paragraph (p), the inspection requirements of proposed § 1926.1412 apply to derricks. In addition to the items that must be inspected under § 1926.1412, proposed § 1926.1436(p) 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.

Proposed paragraph (p)(1), *Daily*, would require the inspection of guys for proper tension. Guy wires are critical elements of the support system for derricks, and ANSI B30.6-1969 and ASME B30.6-2003 both require their daily inspection in section 6-2.1.2.

Proposed paragraph (p)(2), *Annual*, contains two requirements.

Proposed paragraph (p)(2)(i) would require the inspection of the gudgeon pin for cracks, wear, and distortion. This requirement is found in section 6-2.1.3 of ANSI B30.6-1969 and ASME B30.6-2003, which establish requirements for periodic inspections.

Proposed paragraph (p)(2)(ii) would require 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 believed it was necessary to require the foundation to be inspected annually in addition to the items specified in § 1926.1412 of this proposed standard. This requirement is similar to section 6-2.1.3(b) of ANSI B30.6-1969 and ASME B30.6-2003.

**Paragraph 1436(q)**

Proposed paragraph (q) would state that § 1926.1427 (Operator qualification and certification) does not apply. As discussed in regard to § 1926.1427 above, C-DAC paid considerable attention to the need for equipment operators to be well qualified to operate the equipment to which they are assigned, and the Committee concluded that crane operators need to be certified through an accredited testing process to ensure that they are sufficiently qualified. After discussing whether there should be a similar certification requirement for derrick operators, the Committee decided against recommending such a requirement.

The Committee noted that there are no accredited testing criteria to use for testing of 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 operator certification in light of the

relatively small number of derrick operators in the construction industry. C-DAC also believed it would be difficult 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.

**Training**

In reviewing the C-DAC language of proposed § 1926.1430, *Training* and § 1926.1436, *Derricks*, the Agency realized that C-DAC did not specify any training requirements for derrick operators, which OSHA believes was an inadvertent omission. The Agency is planning to add such a requirement, such as a provision that would require that derrick operators be trained "on the safe operation of the equipment the operator will be using." OSHA requests public comment on this issue.

**Section 1437 Floating cranes/derricks and land cranes/derricks on barges**

Currently, § 1926.550(f) of Subpart N includes limited requirements specific to floating cranes/derricks and land cranes attached to a vessel. The current requirements are broadly written and incorporate manufacturer's guidelines for design, construction, installation, testing, maintenance, and operation (proposed § 1926.550(f)(2)(iii)). The

Committee believed that greater clarity and specificity, along with some additional safety requirements, would improve safety by more effectively addressing the unique hazards in the marine construction environment. Of special concern to the Committee were drowning incidents from cranes overturning from or sliding off vessels and the hazardous effects of wind, water and the marine environment on equipment and operations.

Section 1926.1437 covers two types of equipment in a marine environment: those manufactured as a combination crane/derrick and vessel, and equipment designed to operate on land but used on a means of flotation, such as a vessel. The first type is referred to as "floating cranes/derricks," which are 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." "Land cranes/derricks" are 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.

Most provisions of this section apply to both floating cranes/derricks and land cranes/derricks used on barges, pontoons, vessels or other means of flotation. Proposed § 1926.1437(m) applies only to floating cranes/derricks, and proposed § 1926.1437(n) only to land cranes/derricks used on barges, pontoons, vessels or other means of flotation.

**Paragraph 1437(a)**

Proposed paragraph (a) specifies that the requirements of § 1926.1437 are supplemental requirements and, therefore, all other requirements of this proposed subpart would continue to apply unless specifically noted otherwise. Proposed § 1926.1437(a) would specifically exempt equipment operating on jacked barges in certain circumstances from the requirements of § 1926.1437. The barges would be exempted when the jacks are deployed to the river/lake/sea bed and the barge is fully supported by the jacks.

The Committee explained that 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 results in work conditions similar to a crane working on land and unlike the work conditions pertinent to equipment covered by this section. Therefore, equipment used on a jacked barge deployed in this manner would be subject to all other applicable requirements of this proposed Subpart and not the requirements of this section.

The C-DAC consensus document, at § 1926.1437(a), states that, "The requirements of this section do not apply **to** jacked barges . . . ." [Emphasis added]. To clarify that this sentence pertains to situations when equipment is used on a jacked barge, the Agency has modified the language for the proposed rule to now read: "The requirements of this section do not apply **when using** jacked barges when the jacks are deployed to the river/lake/sea bed and the barge is fully supported by the jacks." [Emphasis added].

Proposed § 1926.1437(a) of the C-DAC draft states that, "This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation; all 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." At various points in proposed § 1926.1437, the phrase "vessels/flotation devices" is used synonymously with "barges, pontoons, vessels or other means of flotation." To make it clear that these two phrases mean the same thing, the Agency has modified the first sentence of proposed § 1926.1437(a) to read as follows: **"**This section contains supplemental requirements for floating cranes/derricks and land cranes/derricks on barges, pontoons, vessels or other means of flotation (**vessels/flotation devices**)**;** all 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." [Emphasis added.]

Some paragraphs of proposed § 1926.1437 in the C-DAC draft employ other phrases to mean the same thing as "barges, pontoons, vessels or other means of flotation (vessels/flotation devices)." For example, proposed § 1926.1437(h)(2) uses the phrase "vessel/means of flotation." The Agency has identified a number of such paragraphs and, to avoid ambiguity, has modified the language of proposed § 1926.1437 to use either the phrase "barges, pontoons, vessels or other means of flotation" or "vessel/flotation device" in the following proposed paragraphs: §§ 1926.1437 (e)(1),

1926.1437(h)(2), 1926.1437(j)(4), 1926.1437(n)(3)(i), 1926.1437(n)(5)(i), 1926.1437(n)(5)(iv)(B), and 1926.1437(n)(5)(iv)(C).

**Paragraph 1437(b) General requirements**

Proposed paragraph (b) specifies that proposed § 1926.1437(c) – (k) apply to both floating cranes/derricks and land cranes/derricks mounted on barges, pontoons, vessels, or other means of flotation. As noted above and discussed below, proposed § 1926.1437(m) would apply only to floating cranes/derricks, and proposed § 1926.1437(n) only to land cranes/derricks mounted on vessels/flotation devices.

**Paragraph 1437(c) Work area control**

Proposed paragraph (c) provides that the requirements of § 1926.1424, *Work area control*, applies to equipment covered by this section, except for the requirements of § 1926.1424(a)(2)(ii). Section 1926.1437(c)(2) of this section closely parallels § 1926.1424(a)(2)(ii) but dispenses with the requirement that the employer demonstrate infeasibility in order to use 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 operates within limited physical work space, the Committee believed that employers need increased flexibility in determining which work area control method is most appropriate in light of special site-specific circumstances. To ensure that employees are adequately

protected if the employer uses high visibility markings to supplement warning signs, this paragraph would require that the employer train employees to understand the meaning of the markings.

**Paragraph 1437(d) Keeping clear of the load**

Proposed paragraph (d) states that the requirements of proposed § 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 Committee determined that the requirements of § 1926.1425 are infeasible in these worksite environments.

**Paragraph 1437(e) Additional safety devices**

Proposed paragraph (e) lists additional safety devices required for equipment covered by this section. Equipment covered by § 1926.1437 would also be required to have the safety devices listed in proposed § 1926. 1415, *Safety Devices*, unless otherwise noted in § 1926.1415. The additional safety devices required by proposed § 1926.1437(e) reflect 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 would exempt 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 of § 1926.1415(a)(1)(iii) and (a)(4).

Proposed paragraph (e)(1) would require that equipment covered by this section have a barge, pontoon, vessel or other means of flotation, list and trim device. The Committee believed that it is necessary to have this device since it allows an operator to have a reading of the current list and trim of the vessel. 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 operation, the Committee believed it necessary to define these two terms for clarity. Proposed § 1926.1401 defines "list" as "the angle of inclination about the longitudinal axis of a barge, pontoon, vessel, or other means of flotation." "Trim" is defined in proposed § 1926.1401 as "the angle of inclination about the transverse axis of a barge, pontoon, vessel, or other means of flotation." (Note that proposed § 1926.1437 includes requirements related to the maximum degrees of list and trim that can exist when equipment is used on marine worksites). The list and trim device required by this proposed paragraph is needed to inform the operator during an operation whether environmental conditions have changed to affect list or trim and how the movement of the load is affecting or may affect the stability of the vessel. Based on this information, the equipment operator can make any necessary adjustments to keep the equipment within required parameters.

Proposed paragraph (e)(2) would require that equipment covered in this section have a horn. The sounding of a crane's horn is commonly understood in the marine segment of the industry as a warning to employees.

Proposed paragraph (e)(3) would require that all equipment with a rotating superstructure have a positive crane house lock. The Committee indicated that 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 unintended 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, proposed § 1926.1437(e)(4) would require that equipment covered by this section 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.

**Paragraph 1437(f) Operational aids**

Proposed paragraph (f) modifies the application of some of the proposed requirements in proposed § 1926.1416, *Operational Aids*, for equipment covered by this section. Apart from these specific differences, in all other respects proposed § 1926.1416 would apply to equipment covered by this section.

Paragraph (f)(1) would require that equipment covered by this section be equipped with an anti two-block device only when hoisting personnel or when hoisting over an occupied cofferdam or shaft. As discussed above with respect to proposed § 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, the Committee determined that 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, C-DAC proposed to only require the use of the anti two-block devices when hoisting personnel or hoisting over an occupied cofferdam or shaft due to the additional risk to employees during these operations.

Proposed 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, would be exempt from the requirements of proposed § 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.

**Paragraph 1437(g) Accessibility of procedures applicable to equipment operation**

Proposed paragraph (g) sets forth a set of requirements regarding accessibility of equipment operation procedures. The provision is split into different requirements based on whether the equipment has a cab. If the equipment covered by this section has a cab, the requirements of proposed § 1926.1417(c), *Operation – accessibility of procedures*, would apply. If the equipment covered by this section does not have a cab, proposed § 1926.1437(g)(1) and (g)(2) of this section would apply.

During the C-DAC negotiations, individuals from the marine construction industry addressed the Committee and emphasized the importance of load charts being located where the operator is stationed. Under proposed § 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 proposed § 1926.1437(g)(2), the remaining procedures (other than load charts) would be required to be readily available on board. 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, if necessary, during operations.

**Paragraph 1437(h) Inspections**

Proposed paragraph (h) sets forth additional inspection requirements applicable to equipment covered by this section. It states that § 1926.1412, *Inspections*, applies to

the inspection of the crane/derrick. The additional inspection requirements in this paragraph apply to the vessel/flotation device that supports the crane/derrick.

The Agency notes that there is a discrepancy between two proposed paragraphs of § 1926.1437. Paragraph (b) of the C-DAC Consensus Document specifies that the requirements of proposed § 1926.1437(c) – (k), which include proposed § 1926.1437(h), apply to both floating cranes/derricks and land cranes/derricks mounted on barges, pontoons, vessels, or other means of flotation. Proposed § 1926.1437(h), as drafted by C-DAC, contains provisions for inspecting vessel-related items only for land cranes/derricks mounted on barges, pontoons, vessels, or other means of flotation, but not for floating cranes/derricks.

OSHA believes that C-DAC intended the vessel-related inspections to apply to all the equipment covered by this section and is changing the introductory sentence of this paragraph to read: "In addition to meeting the requirements of § 1926.1412 for inspecting the crane/derrick, the employer shall ensure that the vessel/means of flotation used to support a floating crane/derrick or land crane/derrick is inspected as follows." The Agency requests public comment on this change.

The Committee's discussions regarding § 1926.1437(h) were extensive and focused on three aspects of inspection of vessels/means of flotation: (1) who would conduct the inspection of the equipment; (2) what would the equipment be inspected for; and (3) how often.

The Committee believed that inspections need to be required at four distinct times: each shift, each month, annually, and quadrennially. The Committee determined that a competent person (see proposed § 1926.1401, *Definitions)* needs to conduct the shift and monthly inspections. If the competent person identifies one or more deficiencies, an immediate determination by a qualified person (see proposed § 1926.1401, *Definitions)* would be required to determine if the deficiency constitutes a hazard. If the deficiency constitutes a hazard, the vessel would have to be removed from service until the deficiency is corrected.

The Agency notes that the C-DAC draft of § 1926.1437(h)(3) refers to "The **daily** and monthly inspections . . ." [Emphasis added]. To be consistent with the usage throughout this proposed rule, the reference to "daily" inspections has been changed to "shift" inspections. Therefore, the proposed rule reads: "The **shift** and monthly inspections . . ." [Emphasis added].

The Committee indicated that the conditions listed under the requirements of shift and monthly inspections are easily identifiable to a competent person with respect to a vessel or other means of flotation and did not necessitate a more extensive professional knowledge of vessel deficiencies. Therefore, a competent person would be required to conduct shift and monthly inspections.

Under this proposed paragraph, a qualified person would have to determine if the identified deficiency constitutes a hazard. This differs from the shift and monthly general inspection provisions of proposed § 1926.1412, in which the competent person who identified a deficiency would then determine whether the deficiency was a safety hazard requiring immediate correction. The reason for this difference is that that this is a highly specialized area and the judgments involved require a very high level of knowledge and ability.

With respect to the annual inspections, proposed § 1926.1437(h)(4) would require the equipment and vessel/flotation device to be inspected by a qualified person with expertise with respect to vessels/flotation devices. The Committee believed it is important to explicitly state that the qualified person conducting these inspections must have the necessary expertise with respect to barges, pontoons, vessels or other means of flotation for the items listed for the annual inspection.

The qualified person required in the shift and monthly inspections must have expertise with respect to the nature of the work conditions, the crane/derrick and the vessel/flotation device. (See § 1926.1401, *Definitions – Qualified person*.) However, the annual inspection is more extensive than the shift or monthly inspections. As a result, the Committee chose to clearly specify that the qualified person for the annual inspection must have a greater level of expertise than that of 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 the level of expertise for all the areas covered by the annual inspection in addition to general expertise regarding the equipment and vessel/flotation device.

Proposed paragraph (h)(5) would require quadrennial inspections 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. As with the qualified person performing an annual inspection, C-DAC chose to emphasize the higher level of expertise necessary for performing the quadrennial inspection. By listing "other qualified person" together with "marine engineer," "marine architect," and "licensed surveyor," C-DAC intended to make clear that the expertise of the "other qualified person" would need to be equivalent to that of a marine engineer, marine architect, or licensed surveyor.

Proposed § 1926.1437(h) specifies the items that would have to be inspected under the shift, monthly, and annual inspections. C-DAC used ASME B30.8–1999, "Floating Cranes and Floating Derricks," specifically section 2.1 of B30.8, as a basis for developing the inspection list.[85] However, the Committee did not set forth a specified list of inspection items to be checked in the quadrennial survey of the internal portion of the vessel/flotation device, instead deferring to the expert knowledge of the marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices. The Committee chose a once-every-four-year time period for surveying the internal portion of a vessel/flotation device

[85] The 1999 version of ASME B30.8 has since been superseded by a 2004 version. The list of items to be inspected in section 2.1 is the same in both versions.

based on the comments of individuals from the marine construction industry that this frequency reflects the prevailing industry practice and provides adequate safety.

Proposed paragraph (h)(6) sets forth the documentation requirements for the monthly, annual, and quadrennial inspections, which follow those in proposed § 1926.1412, *Inspections*, at § 1926.1412(e)(3) and (f)(7). However, with respect to the quadrennial inspections the written documentation of the inspection would have to be maintained for four years. This would enable the employer to track changes in the condition of the vessel from the previous inspection.

**Paragraph 1437(i) [*Reserved*.]**

Paragraph (i) is reserved because it is inconvenient for readers to determine whether "i" is being used as a letter or a roman numeral.

**Paragraph 1437(j) Working with a diver**

Proposed paragraph (j) sets forth supplemental requirements designed to ensure that a diver is hoisted safely from the vessel and back when equipment covered by this section is used to move a diver to and from the water. Extra precautions and measures are needed when engaged in this activity due to the drowning, struck-by, crushed-by, and other hazards involved in this activity.

Marine environments and the condition of a diver can change quickly and unexpectedly; the 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 would be prohibited from using the equipment for any other purpose until all divers have returned back on board. This would ensure that the operator's attention is not diverted from the welfare of the divers. Proposed § 1926.1437(j)(2) would require the equipment operator to remain at the equipment controls the entire time. This would ensure that the operator can respond as necessary.

Proposed paragraph (j)(3) would require that, in addition to the signal requirements in proposed §§ 1926.1419-1422, the diver tender must be in direct communication with the equipment operator. This communication may be done either through maintaining a clear line of sight between the operator and tender or by electronic transmission between the operator and tender. As defined in proposed § 1926.1401, a "tender" is the individual responsible for monitoring and communicating with the diver. The Committee determined it was necessary to define tender since that person is critical to effective communication with the equipment operator during an operation with a 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 crane is needed.

Proposed 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. The Committee determined that even a small shift of a crane/derrick on a barge can result in unintended movement that can injure the diver.

OSHA notes that proposed § 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 proposed § 1926.1431. However, proposed § 1926.1431(b)(2) contains exceptions to the need to use a personnel platform and one such exception, in § 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 proposed § 1926.1401, "marine worksite" includes a worksite in the water, so the exception to the requirement to use a personnel platform in proposed § 1926.1431(b)(2)(iii) would apply when a diver is hoisted into or out of the water in a marine hoisted personnel transfer device.

**Paragraph 1437(k)**

Proposed paragraph (k) would require 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. The Committee believed that the manufacturer is in the best position to determine the maximum external loads the vessel/flotation device can withstand while maintaining the necessary stability and buoyancy and that the necessary protection would be provided by requiring employers to adhere to the manufacturer's specifications and limitations.

The text developed by C-DAC reads:

> (k) The barge, pontoons, vessel or other means of flotation shall be capable of withstanding imposed environmental, operational and in-transit loads under conditions specified by its manufacturer.

Upon reviewing this language, OSHA believes it does not clearly convey C-DAC's intent to place a duty on the employer who uses the equipment to comply with the manufacturer's recommendations. The Agency has therefore modified this proposed paragraph to read:

> (k) The employer shall 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.

OSHA requests public comment on this change.

**Paragraph 1437(l) [*Reserved*.]**

Paragraph (l) is reserved because it is inconvenient for readers to distinguish the letter "l" from the number "1."

**Paragraph 1437(m) Floating cranes/derricks**

Proposed paragraph (m) 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 set forth in § 1926.1437(m)(1) through (5) address the various hazards which can contribute to instability of the vessel/flotation device and the effect of marine conditions that can lead to boom/equipment failure.

As defined in proposed § 1926.1401, a floating crane/derrick may be built either by a manufacturer or by the employer who uses the equipment. Both types would have to meet the criteria in proposed § 1926.1437(m)(1) through (3). These provisions are designed to prevent the crane/derrick portion of the equipment from failures due to overloading and to prevent capsizing.

Proposed paragraph (m)(1) would require that load charts applicable to operations on water not be exceeded. The employer would be required to comply with all the

parameters and limitations that apply to proper application of the load charts. Additionally, § 1926.1437(m)(1)(ii) would require the load charts to account for a minimum wind speed of 40 mph.[86]

Proposed paragraph (m)(2) sets forth criteria (in Table M1 proposed § 1926.1437) for maximum allowed list and trim relative to rated capacity of the equipment.[87] Section 1926.1437(m)(3) sets forth two charts that would set stability criteria regarding certain specified conditions. The first chart (Table M2 of proposed § 1926.1437) contains the minimum requirements relative to stability with respect to wind speed and freeboard distance of the vessel/flotation device. The second chart (Table M3 of proposed § 1926.1437) addresses the backward stability of the boom.[88] In reviewing Table M2, the Agency realized that the term "freeboard," which is used in the table, was not defined in the C-DAC document. OSHA requests public comment on an appropriate definition for this term.

Employer-made equipment is defined in proposed § 1926.1401 as "equipment designed and built by an employer for its own use." In some cases, for example, an employer designs and custom-builds the equipment for a particular operation or worksite. The Committee therefore determined it was necessary to include criteria for employer-made equipment.

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[86]This is the same wind speed that section 8-1.2.2(c) of AMSE B30.8 – 2004, "Floating Cranes and Floating Derricks," requires to be considered in establishing operating criteria for floating cranes.
[87] These criteria are the same as those in section 8-1.2.2(a) of ASME B30.8 – 2004.
[88] The criteria in Tables M2 and M3 are the same as those in section 8-1.2.2(b) of ASME B30.8 – 2004.

Under proposed paragraph (m)(4), employer-made equipment would have to meet the same criteria as those in proposed § 1926.1437(m)(1) – (3) for manufacturer-made equipment. In addition, an employer using equipment it builds would be required to have documents demonstrating that those criteria have been met. Such documents would have to be signed by a registered professional engineer who is a qualified person with respect to a design of the type involved.

C-DAC concluded that manufacturers have sufficient expertise with respect to the development of load charts, rated capacities and related operational limitations that there is no need for a documentation requirement for manufacturer-built floating cranes/derricks. However, the expertise in this regard of non-manufacturers can vary greatly. Because of the specialized knowledge and skill needed for this work, and the potentially catastrophic consequences if this work was not done correctly, C-DAC believed that this documentation requirement is needed to provide the same level of safety for employer-made equipment as manufactured equipment.

Proposed 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 unintended movement while operating equipment and minimizing the likelihood of capsizing.

Proposed paragraph (m)(5)(i) would require that the vessel 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 anticipated deck loads and ballasted compartments. This is necessary to minimize the likelihood of the vessel's structure failing, which could result in unintended movement during equipment operations or drowning.

Proposed paragraph (m)(5)(ii) would require a subdivided hull with at least one longitudinal watertight bulkhead to reduce the free surface effect on the vessel. "Free surface effect" is defined in § 1926.1401 as the "uncontrolled transverse movement of liquids in compartments which reduce a vessel's transverse stability." By reducing the free surface effect, subdividing the hull limits the influence of liquid movement on vessel stability and reduces the risk of the vessel capsizing.

Proposed paragraph (m)(5)(iii) would require void compartments to be accessible for inspection and pumping. This is needed to evaluate the amount of water in them so that the employer can determine the potential free surface effect on vessel stability and initiate pumping when necessary. As defined in § 1926.1401 of this proposed standard, "stability (flotation device)" means the tendency of a barge pontoon, vessel or other means of flotation to return to an upright position after having been inclined by an external force. Since the stability of the vessel is critical to the safe operation of equipment at a marine worksite, the Committee determined it necessary to clarify this term. The Agency determined it was appropriate to add the parenthetical "(flotation device)" to the term as the word stability in its more common usage occurs frequently throughout this proposed standard.

**Paragraph 1437(n) Land cranes/derricks**

Proposed paragraph (n) 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 addressed by this paragraph when they are mounted on a vessel/flotation device and used on water. The Committee determined that special requirements were needed to address the distinctive safety issues presented by the use of such equipment.

The stability of the vessel/flotation device is affected by the use of a land crane/derrick on board. The Committee determined that one of the primary causes of accidents for a land crane/derrick on a vessel is related to the crane/derrick not being properly secured to the vessel. This can result in the equipment sliding off the vessel or the vessel capsizing. 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. Consequently, the rated capacity must be adjusted for use 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.

Proposed 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 reflect the use of the equipment on a flotation device or the environmental conditions of a marine worksite. Therefore, under proposed § 1926.1437(n)(1)(i), the rated capacity (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 must also be considered. Since some locations on the vessel/flotation device will have less ability to support the crane/derrick than others, under proposed § 1926.1437(n)(1)(ii), the rated capacity would have to be applicable to a specified location (or specific locations) on the particular vessel/flotation device. This assessment would have to be made considering the expected environmental conditions.

Furthermore, the rated capacity would have to be designed to ensure that the maximum allowable list and trim for the vessel/flotation device, as required in proposed § 1926.1437(n)(3), would not be exceeded. Also, the rated capacity would have to be designed so that the conditions listed in proposed § 1926.1437(n)(4) would be maintained. If the rated capacity was not so designed, the operator could inadvertently cause these criteria to be violated.

Proposed paragraph (n)(2) would require that the modification to rated capacity required by proposed § 1926.1437(n)(1) of this section be prepared either by the manufacturer of the equipment or by a qualified person with expertise in both land crane/derrick capacity and stability of vessels/flotation devices. The Committee determined this was necessary to achieve equivalent operational safety conditions as for floating cranes/derricks.

In the SBREFA Panel Report, the Panel recommended that OSHA solicit comment on whether there are qualified persons in the field with expertise in both land crane/derrick capacity and stability of vessels/flotation devices with respect to this equipment performing duty cycle work. Additionally, the Panel recommended that OSHA solicit comment on the following: when cranes are solely used for duty cycle work: 1) whether the requirements of proposed § 1926.1437(n)(2) are necessary for safety for equipment performing duty cycle work, 2) the safety justification for the requirement for equipment performing duty cycle work, and 3) a definition of "duty cycle work." As recommended by the Panel, OSHA solicits public comment on these issues.

Proposed paragraph (n)(3) would set parameters for the maximum allowable list and trim for the vessel/flotation device and the land crane/derrick to help ensure the necessary vessel and crane/derrick stability and to help prevent the crane/derrick from exceeding its rated capacity.

The maximum list and trim for the vessel/flotation device may not exceed the least of the following: 5 degrees, the amount specified by the crane/derrick manufacturer, or the amount specified by a qualified person in the event an amount is not specified by the manufacturer.[89]

Under proposed paragraph (n)(4), when a land crane/derrick is used on a flotation device, all deck surfaces would have to be above water and the entire bottom area must be submerged. This 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 proposed § 1926.1437(n)(5)) to fail, and to protect against overloading the vessel/flotation device land/crane derrick.

Proposed paragraph (n)(5) sets forth four options for securing[90] the land crane/derrick on the vessel/flotation device. The Committee determined that providing several options would address the variety of work scenarios that are found in the industry. It also determined that each option would be effective in preventing the land crane/derrick from rolling, sliding or otherwise shifting away from its proper location. It is these horizontal movements that can cause the vessel/flotation device to be destabilized or cause the land crane/derrick to slide or fall into the water. Additionally, the Committee

[89] This is similar to section 8-1.2.2(a)(3) of ASME B30.8 – 2004, which specifies that the list and trim shall be the lesser of 5 degrees or the maximum recommended by the manufacturer.

[90] In this preamble the Agency uses the term "securing" and "secured" to refer collectively to the systems described in Options (1) – (4) in proposed paragraphs § 1926.1437(n)(5)(i) through (iv). The Agency notes that this differs from the term "positively secured" in the current Subpart N in 29 CFR 1926.550(f)(1)(iv), which requires that "mobile cranes on barges shall be positively secured." As OSHA has stated in letters of interpretation, the term "positively secured" in that Subpart N provision means "physically attached" – similar to the type of system described in Option 1 of proposed paragraphs (n)(5)(i). (See OSHA's interpretation letter to Mr. Gary C. Hay, October 12, 2004. (OSHA-2007-0066-0014).

determined that an exception is appropriate for use of mobile auxiliary cranes on a vessel. The proposed requirements for this type of equipment are outlined in proposed § 1926.1437(n)(5)(vi).

Proposed paragraphs (n)(5)(i) through (iv) set forth the four options from which the employer must choose to secure the land crane/derrick to the vessel/flotation device. The options to prevent shifting of the equipment include direct physical attachment, corralling, a rail system or a centerline cable system. All of these options serve the purpose of preventing inadvertent movement of the equipment away from its proper location on the vessel/flotation device, which can result in harm to employees working nearby, the equipment sliding off the vessel, or capsizing the vessel.

Note that 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 land crane/derrick's rated capacity. Rather, their purpose is, as discussed above, to prevent horizontal rolling or shifting away from the land crane/derrick's proper location.

Proposed paragraph (n)(5)(v) would require 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 Committee determined that expertise in floating crane/derrick design was essential to design a securing system that would meet the

selected option's requirements and prevent unintended movement of the equipment on the vessel.

Proposed paragraph (n)(5)(vi) would provide an exception under which, where the employer demonstrates that certain conditions have been met, mobile auxiliary cranes would not be required to be secured to a floating crane/derrick as outlined in proposed § 1926.1437(n)(5)(i) through (v) above.

The Committee determined that an exception to the application of these options would be appropriate in certain circumstances where a mobile crane travels on the deck of a floating crane/derrick. 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. Also, because of the size and design of the floating crane/derrick, it is less susceptible to the effects of wind, waves, and other environmental forces than other vessels. The Committee concluded that where the employer can demonstrate that the criteria in proposed § 1926.1437(n)(5)(vi)(A) through (F) have been met, there would be adequate protection against unintended horizontal movement of the mobile crane while on the deck of a floating crane/derrick.

As indicated by the language of this proposed provision, the Committee concluded that it would not be appropriate to expand this exception beyond its application to mobile auxiliary cranes used on the deck of a floating crane/derrick. Therefore, in such other

circumstances, even if the criteria in proposed § 1926.1437(n)(5)(vi)(A) through (F) were met, the employer would still have to use one of the four options in proposed § 1926.1437(n)(5)(i) through (iv).

Under proposed paragraph (n)(5)(vi)(A), a written plan that is designed and signed by a marine engineer or a registered professional engineer familiar with floating crane/derrick design would be required. Because of the specialized knowledge and skill needed for this work, and the potentially catastrophic consequences if this work was not done correctly, C-DAC believed that this documentation requirement is needed to ensure safety.

Under proposed paragraph (n)(5)(vi)(B), this plan would have to be designed so that the applicable requirements of proposed § 1926.1437 will be 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. An example of one aspect of such a plan would be that it would have to be designed so that the vessel's stability was such that, while operating within specified dynamic/environmental conditions (see proposed § 1926.1437(n)(5)(vi)(E) and (F)), the movement of the vessel will not cause the mobile crane to shift horizontally or for the vessel's or mobile crane's maximum list and trim to be exceeded.

Under proposed paragraph (n)(5)(vi)(C), the plan would have to specify the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate.

It would also have to specify the parameters (that is, limitations) of such movements and operation. For example, one aspect of the plan may be to specify that the mobile crane is permitted to move within one particular area without a load, and is permitted to handle a load only when in another particular area.

Under proposed paragraph (n)(5)(vi)(D), the employer would be required to mark the deck to identify the permitted areas for positioning, travel and operation of the mobile crane. This is necessary for the operator to be able to maneuver and operate the crane within the limitations identified in the plan.

Under proposed paragraph (n)(5)(vi)(E), the plan would have to specify the particular dynamic/environmental conditions that must be present for movement and operation of the mobile auxiliary crane on the vessel. Under proposed § 1926.1437(n)(5)(vi)(F), if the necessary dynamic/environmental conditions are not present, then the mobile auxiliary crane would be required to be secured according to one of the four options outlined in proposed § 1926.1437(n)(5)(i) through (iv). For example, the plan would have to address environmental conditions such as maximum amount of wind and wave action; if those were exceeded, the mobile crane would have to be secured using one of the four options.

In reviewing the C-DAC draft of proposed § 1926.1437(n)(5)(vi), the Agency realized that there is no explicit requirement that the employer implement the written plan.

Therefore, OSHA has modified the introductory language of the proposed paragraph as follows:

> (vi) Exception. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement to use Option (1), Option (2), Option (3), or Option (4) of this section does not apply where the employer demonstrates **implementation of a plan and procedures that meet** the following requirements: . . . (Emphasis added).

Proposed paragraph (n)(6) contains requirements regarding the barge, pontoon, vessel or other means of flotation on which the land crane/derrick will be located. The requirements of proposed § 1926.1437(n)(6) are identical to those listed at proposed paragraph (m)(5) of this section. These requirements are related to the stability of the vessel and its structural ability to support the land crane/derrick. These proposed provisions are designed to help prevent unintended movement while operating equipment and to prevent capsizing. The Committee determined it is necessary to include these requirements to provide a safe, stable work environment.

**Section 1438 Overhead and gantry cranes**

Currently, specific requirements for overhead and gantry cranes are found in section 1926.550(d) of Subpart N. Section 1926.550(d)(4) incorporates by reference ANSI B30.2.0–1967, safety code for "Overhead and Gantry Cranes." The general industry standard for overhead and gantry cranes, § 1910.179, is also derived from ANSI B30.2.0–1967. Therefore, the current requirements for overhead and gantry cranes are generally the same regardless of whether the equipment is used in general industry or construction.

As defined in proposed § 1926.1401, overhead and gantry cranes include 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. The Committee developed this definition to reflect the wide range of this type of equipment that has been developed.

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 believed that applying the general industry standard for overhead and gantry cranes, § 1910.179, to the use of those cranes for construction work would reduce compliance burdens without jeopardizing employee protection.

The Committee proposal therefore 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. For the former, this proposed rule would apply the requirements of § 1910.179, the general industry standard. For the latter, the C-DAC proposal would apply specific provisions of both this standard and § 1910.179.

**Paragraph 1438(a) Permanently installed overhead and gantry cranes**

Proposed § 1926.1438(a)(1) establishes the scope of § 1926.1438(a). By its terms, § 1926.1438(a) would pertain to overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others with fundamentally similar characteristics, when they are used in construction and are permanently installed in a facility.

Proposed paragraph (a)(2) would apply the requirements of § 1910.179 to the equipment listed in § 1926.1438(a)(1), with the exception of § 1910.179(b)(1). 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).

Paragraph (a)(1) only applies to these cranes if they are used in construction and are **permanently** installed in a facility. This will typically be equipment that is used in general industry but may also be used for construction purposes. For example, a manufacturing plant that uses an overhead crane for lifting large components may use that same crane when adding a new room to the facility or changing its floorplan. Under the proposed provision, the requirements of § 1910.179 would apply to both uses.

**Paragraph 1438(b) Overhead and gantry cranes that are not permanently installed in a facility**

Paragraph (b)(1) would provide the scope of § 1926.1438(b). By its terms, § 1926.1438(b) would pertain to overhead and gantry cranes, overhead/bridge cranes, semigantry, cantilever gantry, wall cranes, storage bridge cranes, launching gantry cranes, and similar equipment, when they are used in construction and are **not** permanently installed in a facility.

Proposed paragraph (b)(2) specifies which requirements would apply to the equipment identified in § 1926.1438(b)(1).

Proposed paragraph (b)(2)(i) would require overhead and gantry cranes not permanently installed in a facility to comply with §§ 1926.1400 through 1926.1414; 1926.1417 through 1926.1425; 1426(d), 1926.1427 through 1926.1434; 1926.1437, 1926.1439, and 1926.1441 of this standard. Sections 1926.1435, 1926.1436 and 1926.1440, entitled Tower cranes, Derricks, and Sideboom cranes, respectively, would not be applicable because they pertain to different kinds of equipment. Sections 1926.1415, 1926.1416 and 1926.1426(a) through (c) would not apply because they refer to devices not used on overhead and gantry cranes.

Proposed paragraph (b)(2)(ii) would incorporate by reference several requirements from § 1910.179.

Proposed paragraph (b)(2)(ii)(A) specifies the portions of § 1910.179 that would be 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 would 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

The C-DAC version of paragraph 1438(b)(2)(ii)(B) would have incorporated the definitions in § 1910.179(a) that do not differ from those in § 1926.1401 of this Subpart. Upon examining this provision, OSHA believes that it can be stated more clearly without changing its substance.

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 should apply under this section.

The Agency believes it will be consistent with C-DAC's intent and promote clarity to modify proposed § 1926.1438(b)(2)(ii)(B) to list the definitions in § 1910.179(a) that do not apply to overhead and gantry cranes under proposed § 1926.1438(b). Accordingly, OSHA has changed that paragraph to read as follows:

> (B) The definitions in § 1910.179(a) except for "hoist" and "load." For those words, the definitions in § 1926.1401 apply.

Proposed paragraph (b)(2)(ii)(C) would limit the application of § 1910.179(b)(2) to equipment identified in proposed § 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 would have to comply with the updated provisions of ASME B30.2–2001. Proposed § 1926.1438(b)(2)(ii)(C) is a transitional provision covering equipment manufactured between August 31, 1971 and September 19, 2001.

Proposed paragraph (b)(2)(iii) would have incorporated several sections of the 2001 version of ASME B.30.2 into this section to update the Subpart N of 29 CFR part 1926 provision, § 1926.550(d), which incorporates ANSI B.30.2.0–1967. 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 sections referenced are:

ASME B30.2-2001

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
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 proposed paragraph (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 proposed § 1926.1438(b)(2)(iii) are the same. Except for section 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 section 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 the reference in proposed § 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, proposed § 1926.1438(b)(2)(iii) would require 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 paragraph 2-3.5.1(b) of ASME B30.2–2005. The Committee believed 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.

**Section 1439 Dedicated pile drivers**

The term "dedicated pile driver" is defined in § 1926.1401 as follows:

> [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.

As the definition above indicates, this section covers equipment that is designed to function exclusively as a pile driver. Unlike the other equipment covered by Subpart N, dedicated pile drivers are not designed primarily to hoist, lower, and horizontally move suspended loads. However, the Committee decided to include dedicated pile drivers in this standard because of similarities to cranes with respect to hazards and functions. For a complete discussion of the Committee's rationale for the inclusion of dedicated pile drivers within this standard, see the discussion above of proposed § 1926.1400, *Scope*.

As discussed below, most of the provisions of this standard apply to dedicated pile drivers, but this section includes certain provisions that accommodate unique characteristics of such equipment. In addition to the requirements established by this standard, pile driving equipment will continue to be covered by § 1926.603, *Pile driving equipment*.

**Paragraph 1439(a)**

This proposed paragraph would apply most of the provisions of this proposed standard to dedicated pile drivers. The provisions that would not apply, or would apply with some modification, are specified in proposed § 1926.1439(b) through (e) (discussed below).

**Paragraph 1439(b)**

Under this proposed provision, proposed § 1926.1416(d)(3), which requires that cranes manufactured after February 28, 1992, be equipped with anti-two-blocking devices, would not apply to dedicated pile drivers. A note to this paragraph in the C-DAC draft states that anti two-block devices are required under proposed § 1926.1431(d)(5)(iv) when hoisting personnel. This note misstates the requirement of proposed § 1926.1431(d)(5)(iv), which provides that an anti two-block device is **not** required when hoisting personnel in pile driving operations. OSHA is therefore deleting the note to avoid inconsistency and conform to C-DAC's intent.

As discussed above in relation to proposed § 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 them to malfunction. However, because anti two-block protection is needed when hoisting personnel to prevent a sudden drop of a personnel platform should a two-block condition occur, the proposed rule specifies, in proposed § 1926.1431(p)(2), that when hoisting an employee in pile driving operations using a lattice boom crane, the employer 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, or use a spotter.

When using a telescopic boom crane, the employer must similarly 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. As discussed above in relation to proposed § 1926.1416(d)(3)(i), marking the cable is not sufficient to prevent two-blocking when extending the boom of a telescopic boom crane. Other requirements that apply when hoisting personnel for pile driving operations are also listed in proposed § 1926.1431(p) and are discussed under that paragraph.

**Paragraph 1439(c)**

This provision would apply the requirements of proposed § 1926.1416(e)(4) (load weighing and similar devices) to dedicated pile drivers, except that only dedicated pile drivers manufactured more than one year after the effective date of this standard would be required to be equipped with load weighing or rated capacity devices. The purpose of requiring load-weighing and rated capacity devices would be to provide dedicated pile driver operators with a reliable load weight prior to each lift to prevent the equipment from being overloaded. The Committee believed that this phase-in period would be appropriate because there are some technical challenges with designing this type of equipment to work consistently and reliably on dedicated pile drivers.

The C-DAC draft would have required dedicated pile drivers manufactured after January 1, 2008 to be equipped with load weighing or rated capacity devices. As explained in the Introduction, OSHA has changed the January 1, 2008 date to "more than one year after the effective date of this standard" wherever that date appears in the C-DAC document. OSHA seeks public comment on the current 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 the appropriate date for requiring future dedicated pile drivers to be equipped with such devices.

**Paragraph 1439(d)**

Under this provision, the only aspects of proposed § 1926.1433 (Design, construction and testing) that would apply to dedicated pile drivers would be proposed § 1926.1433(e) and (f). In § 1926.1433, proposed § 1926.1433(a) through (d) apply to specific types of equipment other than dedicated pile drivers. By contrast, proposed § 1926.1433(e) and (f) would apply to equipment in general (see the explanation of proposed § 1926.1433 above).

**Paragraph 1439(e)**

This proposed paragraph would require pile driver operators to be qualified or certified pursuant to § 1926.1427. The Committee concluded that there was no reason to exclude dedicated pile drivers from the requirements of that section; in its view, the concerns

underlying the need for § 1926.1427 (see the discussion of that proposed section above) are equally applicable to the operation of dedicated pile drivers.

Proposed " 1926.1439(e) would modify the application of § 1926.1427 in one respect. Dedicated pile driver operators would have to have a qualification or certification applicable either to dedicated pile drivers or equipment that is most similar to dedicated pile drivers. This addresses a concern of the Committee that there are relatively few dedicated pile drivers in use. As a result, even with the four year phase-in period provided under § 1926.1427, certification testing specific to dedicated pile drivers may be unavailable due to lack of market demand. Similarly, there may be a lack of auditors for auditing employer qualification programs for dedicated pile driver operators under proposed § 1926.1427(c).

However, most of the aspects involved in the safe operation of a dedicated pile driver are similar to those involved with operating equipment that performs the same function as a dedicated pile driver. For example, there is substantial similarity in the operation of a crane with a pile driving attachment and the operation of a dedicated pile driver. C-DAC believed that an operator who is qualified or certified to operate a crane with a pile driving attachment would have the knowledge and skill to operate a dedicated pile driver safely. 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.

**Section 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."

This is the definition of "side boom tractor" in ASME B30.14-2004, "Side Boom Tractors," which serves as the basis for most of the requirements of this proposed section. C-DAC included a definition of "side boom tractor" in its original draft that stated only that the term was synonymous with "sideboom crane." However, this proposed section uses "sideboom crane" exclusively. To avoid any confusion that could be caused by the use of two different terms and to provide a meaningful definition of "sideboom crane," OSHA has deleted the definition of "side boom tractor" from § 1926.1401 and substituted the above definition of "sideboom crane." OSHA has also substituted "sideboom crane" for "side boom tractor" in § 1926.1400, *Scope*.

This proposed section identifies which of the other sections of the proposed standard would apply to this equipment and sets additional requirements. These more limited requirements for this equipment reflect the particular construction and more limited functions of sideboom cranes. For a discussion of the Committee's rationale for the inclusion of sideboom cranes within this standard, see the preamble of § 1400, *Scope*.

**Paragraph 1440(a)**

Proposed paragraph (a) 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). The Committee exempted sideboom cranes from the requirements of these four sections because the Committee believed that, in light of the limited capacity and relative simplicity of operation of sideboom cranes, these requirements would be unnecessary.

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 felt that these small sideboom cranes should be exempted from the scope of this Subpart. In light of this suggestion, the SBREFA panel recommended that OSHA ask for public comment about the appropriateness of such an exemption for these small sideboom cranes. OSHA requests comments on this issue.

**Paragraph 1440(b)**

This proposed paragraph addresses the hazards posed by boom free fall (that is, "live" booms). For equipment other than sideboom cranes, as explained above in the discussion of proposed § 1926.1426 (Free fall and controlled load lowering), C-DAC determined that, in general, the use of such equipment with live booms needs to be prohibited.

However, it also found that it would be appropriate to allow equipment manufactured before consensus standards had prohibited live booms to be used as long as certain limitations were applied. The prohibition in § 1926.1426 therefore applies to equipment manufactured from October 31, 1984 onwards. Equipment manufactured before that date with live booms may only be used where the specified limitations are met.[91]

C-DAC applied a similar approach to sideboom cranes in proposed § 1926.1440(b), which applies most of § 1926.1426 to sideboom cranes. The only difference is the cut-off date for the use of sideboom cranes with live booms. As explained above in the discussion of proposed § 1926.1426(a)(2), C-DAC concluded that, in light of the history of the ANSI B30.5 prohibition against live booms, most equipment covered by this proposed 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, C-DAC recognized that sideboom cranes with live booms continued to be manufactured after 1984.

Consequently, under proposed § 1926.1440(b), the cut-off date for using sideboom cranes with live booms is the effective date of this standard. Sideboom cranes in which the boom is designed to free fall that were manufactured prior to that date could continue to be used except under the circumstances specified in proposed § 1926.1426(a)(1).

[91] Under proposed §1926.1426(a)(2)(i), the use of cranes in which the boom is designed to free fall (live boom) is limited to situations where both of the following criteria are met: (1) none of the free fall prohibitions outlined in proposed § 1926.1426(a)(1) are present and § 1926.1426(a)(2) the equipment was manufactured prior to October 31, 1984.

**Paragraph 1440(c)**

As drafted by C-DAC, this proposed paragraph would have required that sideboom cranes meet certain requirements of ASME B30.14-1996 with addenda ASME B30.14a-1997, B30.14b-1999, and B30.14c -2001, "Side Boom Tractors." Since the Committee completed its work, ASME has consolidated the requirements of the 1996 version with those in the supplements, and these are now found in ASME B30.14–2004. In that consolidation, ASME did not substantively change any of the provisions of those prior consensus standards. Accordingly, OSHA has modified the C-DAC paragraph to refer to the 2004 version of the ASME standard.

In deciding which sections of ASME B30.14 to incorporate in this section, the Committee was mindful that, as noted in the discussion of § 1926.1440(a), most provisions of this proposed standard apply to sideboom cranes. To avoid any duplication, conflicts or possible confusion, the Committee wanted to avoid incorporating provisions of the ASME standard that dealt with issues addressed by other provisions of this standard. The provisions of ASME B30.14 incorporated by the Committee through this section consist of requirements that are specific to sideboom cranes. The Committee believed that these ASME requirements are necessary and appropriate with respect to this equipment.

**Paragraph 1440 (c)(i) through Paragraph (c)(viii)**. These proposed paragraphs set forth sections of ASME B30.14–2004 which would be incorporated by reference to apply

to sideboom cranes. Those sections are section 14-1.1 ("Load Ratings"), section 14-1.3 ("Side Boom Tractor Travel"), section 14-1.5 ("Ropes and Reeving Accessories"), section 14-1.7.1 ("Booms"), section 14-1.7.2 ("General Requirements—Exhaust Gases"), section 14-1.7.3 ("General Requirements—Stabilizers [Wheel-Type Side Boom Tractors]"), section 14-1.7.4 ("General Requirements—Welded Construction"), and section 14-1.7.6 ("General requirements—Clutch and Brake Protection"). The Committee found that each of these would provide appropriate employee protection.

**Paragraph 1440 (c)(ix) through Paragraph (c)(xii)**. These proposed paragraphs set forth sections of ASME B30.14–2004 which would be incorporated by reference to apply to sideboom cranes, but with some exceptions or with only certain paragraphs selected from a section. Those sections are section 14-2.2.2 ("Testing—Rated Load Test"), except that it applies only to equipment that has been modified or repaired; paragraph (a) of section 14-3.1.2 ("Operator Qualifications") except that the phrase "when required by law" would be omitted; Paragraphs (e), (f)(1) through (4), (6), and (7), (h), and (i) of section 14-3.1.3 (Operating Practices), and paragraphs (j), (l),and (m) of section 14-3.2.3 (Moving the Load).

**Section 1441 Requirements for equipment with a rated hoisting/lifting capacity of 2,000 pounds or less**

Proposed § 1926.1441 would establish requirements for equipment with a maximum-rated hoisting/lifting capacity of 2,000 pounds. Equipment in this category is inherently

less hazardous than higher-capacity equipment for several reasons. First, the reduced mass of these loads makes them easier to manipulate. Second, the working radius of such equipment is very limited, which reduces the zone of danger involved. Third, the equipment itself is less complex to operate, which places fewer demands on the operator's ability to maneuver the equipment and the load safely.

Consequently, the Committee believed that not all of the requirements proposed for higher-capacity equipment should apply to this relatively light-duty equipment. For example, the Committee believed that the operator certification requirement of proposed § 1926.1427, which was developed with the complexities and hazards of heavy equipment in mind, should not apply to the low-capacity equipment addressed in this section. This proposed section identifies the sections of this proposal that the Committee believed need to apply to equipment with a capacity of 2,000 pounds or less and contains provisions that would apply specifically to this category of equipment.

Under the C-DAC document, this section would have applied to equipment with a "manufacturer-rated" hoisting/lifting capacity of 2,000 pounds or less. However, as discussed below, § 1926.1441(j) was intended to address equipment designed and built at the jobsite, rather than manufactured equipment. Changing the term "manufacturer-rated" in the title and regulatory text to "rated" will clarify that this section applies to both jobsite-built equipment and manufactured equipment. OSHA requests public comment on this change.

The 2,000 pound cutoff for this section corresponds to that found in a number of consensus standards. For example, the ANSI standards that are currently incorporated by reference into Subpart N (B30.2–1967 for overhead and gantry cranes; B30.5 – 1968 for crawler, locomotive and truck cranes; and B30.6–1969 for derricks) do not apply to equipment with a hoisting/lifting capacity of 2,000 pounds or less. ASME B30.5–2004 continues to exclude equipment whose capacity is 2,000 pounds or less.[92]

The requirements of 29 CFR part 1926 subpart N that do not incorporate consensus standards by reference apply regardless of the equipment's capacity, so equipment with a capacity of 2,000 pounds or less is currently subject to those requirements. The Committee believed that the requirements in proposed § 1926.1441 would be more appropriate for this category of equipment and would be adequate to protect employees.

In 2004, as discussed above, C-DAC found the 2,000 pound threshold for the application of this section, which is consistent with the 2004 ASME standard and prior ANSI standards, to be appropriate. The Agency is interested in information on whether there have been changes in technology or other considerations that would suggest a different threshold capacity for equipment covered by this proposed section. OSHA solicits public comment on this issue.

**Paragraph (a)**

[92] There are some consensus standards that do not have a capacity threshold. For example, the current ASME B30.6 – 2003 on derricks, and ASME B30.2 – 2003 on overhead and gantry cranes no longer limit their application by hoisting/lifting capacity. Further, the current ASME standard for floating cranes and derricks (ASME B30.8 – 2004) and for construction tower cranes (ASME B30.3 – 2004) similarly do not limit their application by hoisting/lifting capacity.

Proposed paragraph (a) sets forth sections of the proposed standard that would apply, in their entirety, to equipment with a rated capacity of 2,000 pounds or less to the same extent that those sections would apply to that type of equipment with a rated load capacity in excess of 2,000 pounds. *Tower cranes* (§ 1926.1435), *Derricks* (§ 1926.1436), *Floating cranes & land cranes/derricks on barges* (§ 1926.1437), and *Overhead and gantry cranes* (§ 1926.1438) are included in the list and thus would be subject to uniform requirements regardless of rated capacity. The Committee determined that the hazards addressed by these sections 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 believed that proposed §§ 1926.1407 through 1926.1411 on power line safety should apply to all equipment regardless of rated capacity. Similarly, the proposed sections on *Scope* (§ 1926.1400), *Definitions* (§ 1926.1401), *Ground conditions* (§ 1926.1402), *Wire rope* (§§ 1926.1413 through 1926.1414), *Authority to stop operation* (§ 1926.1418), *Signals* (§§ 1926.1419 through 1926.1422), *Fall protection* (§ 1926.1423), *Free fall/controlled load lowering* (§ 1926.1426), *Multiple crane lifts* (§ 1926.1432), and *Equipment modifications* (§ 1926.1434) are listed and would apply to equipment with a rated capacity of 2,000 pounds or less to the same extent that those sections would apply to that type of equipment with a rated capacity in excess of 2,000 pounds.

The hazards addressed by the sections not listed in § 1926.1441(a) are dealt with in the remainder of this proposed section in a manner that takes into account the lower capacity of the equipment. The discussion below explains how the Committee believed those hazards should be addressed for the equipment covered by this section.

Note that proposed § 1926.1441(b) (discussed below) addresses assembly/disassembly, and identifies some sections and paragraphs elsewhere in the standard that are applicable to this category of equipment (it also provides other assembly/disassembly requirements tailored to this category). A note to this effect has been added to the regulatory text of proposed § 1926.1441(a), as follows:

> Note: Under paragraph (b)(1) of this section, § 1926.1403 (Assembly/Disassembly – selection of manufacturer or employer procedures) and § 1926.1406 (Assembly/Disassembly – employer procedures) also apply.

**Paragraph (b) Assembly/disassembly**

**Paragraph (b)(1)**. This proposed paragraph identifies the provisions related to assembly and disassembly that would apply to equipment with rated capacities of 2,000 pounds or less. The Committee identified two applicable Sections: § 1926.1403 (Assembly/Disassembly – selection of manufacturer or employer procedures) and § 1926.1406 (Assembly/Disassembly – employer procedures). Sections 1926.1404 (Assembly/Disassembly – general requirements) and § 1926.1405 (Disassembly – additional requirements for disassembly of booms and jibs) were not included. The Committee believed that those comprehensive assembly/disassembly procedures are

unnecessary for this category of equipment, which typically involves substantially less complexity.

**Paragraph (b)(2) Components and Configuration**

**Paragraph (b)(2)(i)**. This proposed paragraph sets forth two options for selecting components and configuration of the equipment that affect capacity or safe operation. This paragraph, as well as the four paragraphs below, mirror § 1926.1404(m)(1), (m)(1)(i), (m)(1)(ii), (m)(2), and (n) of this subpart. See § 1926.1404(m) for further explanation of these provisions.

**Paragraph (b)(2)(i)(A)**. This first option would allow employers to select and configure components of the equipment in accordance with the manufacturer instructions, recommendations, limitations, and specifications. Furthermore, when the manufacturer instructions are not available, this provision would require a registered professional engineer, familiar with the type of equipment involved, to approve, in writing, the selection and configuration of components.

**Paragraph (b)(2)(i)(B)**. In this second option, employers would be able to select and configure components of the equipment in accordance with equipment modifications that meet the requirements of § 1926.1434 (Equipment modifications).

**Paragraph (b)(2)(ii)**. **Post-assembly inspection.** This proposed paragraph would require employers to conduct an equipment inspection when assembly is complete in order to ensure compliance with § 1926.1441(b)(2)(i) above. The employer would be required to conduct such post-assembly inspections in a manner that complied with proposed § 1926.1412(c). The same requirement applies to higher-capacity equipment under proposed § 1926.1404(m)(2). Ensuring that the assembled equipment aligns with the manufacturer instructions, recommendations, limitations, and specifications, would prevent hazards from arising and ensure the safe operation of the equipment.

**Paragraph (b)(3). Manufacturer prohibitions.** This proposed paragraph would require employers to comply with applicable manufacturer prohibitions when using equipment with manufacturer-rated hoisting/lifting capacities of 2,000 pounds or less. The same requirement applies to higher-capacity equipment under proposed § 1926.1404(n). The Committee agreed on this provision because manufacturers' prohibitions are designed to prevent hazards that can arise with the use of their products.

**Paragraph 1441(c) Operation — Procedures**

**Paragraph (c)(1)**. This proposed paragraph would require 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 proposed § 1926.1417(a). The Committee agreed on this provision because

manufacturer procedures are designed to prevent hazards that can arise with the use of their products.

**Paragraph (c)(2) Unavailable operation procedures** [93]

**Paragraph (c)(2)(i)**. In the event that manufacturer procedures are not available, this paragraph would require the employer to develop, and ensure compliance with, its own procedures necessary for the safe operation of the equipment and its attachments. This paragraph is designed so that safe operation procedures, whether they come from the manufacturer or an employer, are utilized.

**Paragraph (c)(2)(ii)**. This proposed paragraph would require that when employers develop procedures as outlined in the previous paragraph, the procedures for the operational controls must be developed by a qualified person. The Committee concluded that, in light of the critical nature of the operational controls and the degree of expertise needed to develop safe procedures for their use, it is necessary that they be developed by a qualified person.

**Paragraph (c)(2)(iii)**. When manufacturer procedures are unavailable, this proposed paragraph would require that operational procedures related to equipment capacity be developed and signed by a professional engineer familiar with the equipment. The Committee concluded that, in light of the critical nature of such procedures and the high

[93] The requirements in this paragraph are the same as those that apply to higher-capacity equipment under proposed § 1926.1417(b).

degree of complexity needed to develop them, a registered professional engineer who is familiar with the equipment is needed for this task. In addition, for the same reasons as discussed with respect to proposed § 1926.1417(b)(3), the Committee concluded that it is necessary that they be signed by the engineer.

**Paragraph (c)(3) Accessibility**

**Paragraph (c)(3)(i)**. This proposed paragraph would require employers to make the load chart available to the operator at the control station. The Committee intended this provision to help prevent cranes from being used to perform operations beyond their capacities. The Committee believed 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.

A similar requirement applies to higher-capacity equipment under proposed § 1926.1417(c)(1). However, § 1926.1417(c)(1) requires that the load chart be available in the cab. Because the equipment covered by this section may not have a cab, this proposed paragraph requires the chart to be available at the control station.

**Paragraph (c)(3)(ii)**. This proposed paragraph would require that procedures applicable to equipment operation, including recommended operating speeds, special hazard warnings, instructions, and the operator's manual, be readily available for use by the operator. The Committee intended operators to have easy access to these materials

because that information is needed to operate the equipment safely. A similar requirement applies to higher-capacity equipment under proposed § 1926.1417(c)(1), but this provision omits the reference to "the cab" for reasons explained above with respect to proposed § 1926.1441(c)(3)(i).

**Paragraph (c)(3)(iii)**. Where rated capacities are available at the control station only in electronic form, and in the event that a failure makes the rated capacities inaccessible, this proposed paragraph would require that the operator immediately cease operations or follow safe shut-down procedures until the rated capacities become available again. The same requirement applies to higher capacity equipment under proposed § 1926.1417(c)(2). The Committee agreed that it is unsafe to continue to operate the equipment if the rated capacities are inaccessible to the operator.

**Paragraph (d) Safety devices and operational aids**

**Paragraph (d)(1).** This proposed paragraph would require employers to maintain originally-equipped safety devices and operational aids in accordance with manufacturer procedures. The Committee believed that the full range of safety devices and operational aids required by proposed §§ 1926.1415 and § 1926.1416 were generally not needed for this relatively low-capacity equipment to operate safely.

However, C-DAC 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.

**Paragraph (d)(2). Anti two-blocking** By its terms, this proposed paragraph would require that equipment covered by this section that is manufactured more than one year after the effective date of this standard be either equipped with an anti-two block device that would meet the requirements of proposed § 1926.1416(d)(3) or be designed so that no damage or load failure would occur in the event of a two-block situation.

The provision identifies an example of equipment designed to prevent equipment damage load failure – where 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 occurs, the power unit simply stalls out.

The purpose of this paragraph is to prevent equipment damage and/or failure stemming from contact between a component on the hoist line and the boom tip, which occurs during a two-block. 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 is designed to prevent a two-block from occurring. The second option is designed to prevent equipment damage and

load failure in the event of a two-block. The Committee believed that each option would, for this category of equipment, be equally protective of employee safety.

As discussed under proposed § 1926.1416, *Operational aids*, the Committee believed that anti two-block devices should be required on higher-capacity cranes manufactured after the date that ANSI/ASME B30.5 began to require them. Consequently, proposed § 1926.1416(d)(3) states that telescopic boom cranes and lattice boom cranes manufactured after February 28, 1992 are required to have an anti two-block device. However, none of the various versions of ANSI/ASME B30.5 has applied to equipment with a capacity under 2,000 pounds. C-DAC believed that it would be inappropriate to apply this requirement to equipment manufactured before either a voluntary consensus standard or federal requirement has been in place. Therefore, proposed § 1926.1441(d)(2) would only apply to equipment manufactured more than one year after the effective date of this standard.

As discussed above, an anti two-block device used to comply with proposed 1926.1441(d)(2) must meet the requirements for such devices in proposed § 1926.1416(d)(3). Proposed § 1926.1416(d)(3) addresses two types of anti two-block devices: the warning type and the automatic prevention type (these are explained above in the discussion of proposed § 1926.1416(d)(3)). The type required depends on the type of crane and the date of manufacture. However, the automatic prevention type is required on all equipment manufactured more than one year after the effective date of this standard. Since proposed § 1926.1441(d)(2) only applies to equipment with a capacity of

2,000 pounds or less manufactured more than one year after the effective date of the standard, an anti two-block device on such equipment would need to be the automatic prevention type.

Note that, under proposed § 1926.1441(d)(1) (discussed above), equipment of 2,000 pounds or less capacity manufactured prior to the standard's effective date, if manufactured with an anti-two-block device, would be required to have that device properly maintained. For further discussion of anti-two-blocking devices, see the explanation in proposed § 1926.1416, *Operational aids*.

**Paragraph (e) Operator qualifications**

This proposed paragraph would require that, before operating equipment, the operator is trained on the safe operation of the type of equipment the operator will be using. The Committee believed that familiarizing operators with safe operation techniques would help minimize operator error and thereby reduce the likelihood of accidents and injuries. However, the Committee concluded that the operator certification/qualification procedures that would be required for higher capacity equipment under proposed § 1926.1427 was not needed for this lighter and less complicated equipment.

**Paragraph 1441(f) Signal person qualifications**

This proposed paragraph would require employers to ensure that signal persons are trained in the proper use of signals applicable to the use of equipment with a rated capacity of 2,000 pounds or less. Though the equipment covered by this section has limited capacity, in some circumstances its safe operation depends on signals given by a signal person. In that event, this paragraph would ensure 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 that would be required for higher capacity equipment under proposed § 1428 were not needed for this equipment.

**Paragraph 1441(g) Keeping clear of the load**

This proposed paragraph states that proposed § 1926.1425 is applicable to equipment with a rated capacity of 2,000 pounds or less, with the exception of proposed § 1926.1425(c)(3). Proposed § 1926.1425(c)(3) would require materials to be rigged by a qualified rigger. The Committee believed that, in light of the limited capacity of this equipment, it was unnecessary to require a qualified rigger.

**Paragraph 1441(h) Inspections**

The general provision on inspections, § 1926. 1412, would not apply to this equipment. Instead, this proposed paragraph would require that the equipment be inspected pursuant

to the manufacturer's procedures. The Committee believed that inspections pursuant to manufacturers' procedures would be sufficient to detect conditions that could lead to equipment failure because manufacturers typically recommend procedures that are designed to prevent hazards that can arise with the use of their products. The Committee concluded that the comprehensive inspection procedures that would be required for higher capacity equipment under proposed § 1926.1412 were not needed for this lighter and less complicated equipment.

**Paragraph 1441(i) [*Reserved*.]**

This paragraph is reserved because it is inconvenient for the reader to determine whether (i) is used as a letter or a Roman numeral.

**Paragraph 1441(j) Hoisting personnel**

This proposed paragraph would prohibit the practice of using equipment with manufacturer-rated load capacities of 2,000 pounds or less to hoist personnel. The Committee believed that this equipment is inherently unsuited to lifting personnel safely due to its low capacity and typically light construction.

**Paragraph 1441(k) Design**

This proposed paragraph would require that the equipment be designed by a qualified engineer. The Committee was concerned that some employers may design and construct equipment in this category themselves, rather than using equipment built by a manufacturer. This provision is intended to ensure that the design of such equipment would be sufficient from a safety standpoint.

## 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, 655(b) (authorizing promulgation of standards pursuant to notice and comment), 654(b) (requiring employers to comply with OSHA standards)).

A safety or health standard is a standard "which 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" (29 U.S.C. 652(8)).

A safety standard is reasonably necessary or appropriate within the meaning of Sec.

652(8) if it substantially reduces or eliminates significant risk, is economically and technologically feasible, is cost effective, 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 a relevant national consensus standard.

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. *American Textile Mfrs. Institute* v. *OSHA*, 452 U.S. 490, 513 (1981) ("*ATMI*"); *AISI* v. *OSHA*, 939 F.2d 975, 980 (D.C. Cir. 1991) ("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 *ATMI*, 452 U.S. at 530 n. 55; *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. *ATMI*, 453 U.S. at 514 n. 32; *International Union, UAW* v. *OSHA*, 37 F.3d 665, 668 (D.C. Cir. 1994) ("LOTO III").

Sec. 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).

Safety standards must be highly protective. See 58 FR at 16614-16615; *LOTO III*, 37

F.3d at 669. Finally, whenever practical, standards shall "be expressed in terms of objective criteria and of the performance desired." *Id*.

## B. Preliminary Economic Analysis and Initial Regulatory Flexibility Analysis

Summary

*Affected Industries*

The proposal would affect employers and employees in a variety of different construction industries in which 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. For purposes of this preliminary economic analysis (PEA), the Agency has grouped affected establishments, by industry, into the following categories:

- 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 (or referred to simply as just “Crane Lessees” throughout this preliminary economic analysis).

The full industrial profile of affected firms and establishments, including information on number of employees, revenues, and profits, is presented below in section 3 with data on affected employers presented in Table B-2.

*Benefits*

The proposed standard addressing construction work involving cranes and derricks is expected to reduce accidents, fatalities, and injuries in the construction industry. The Agency estimates that 53 fatalities and 155 injuries would be avoided annually from compliance with the provisions of the proposed standard. Applying an average monetary value of $50,000 per prevented injury and a value of $7.5 million per prevented fatality, the Agency estimates the monetized benefit at about $406 million annually. The Agency believes that affected employers and employees will also benefit from the additional clarity of the revised standards as well as their comprehensiveness. Table B-1 provides a summary of the benefits, costs, and net benefits of the proposed standard. Net benefits are estimated to be $283 million annually.

**Table B-1**
**Annual Benefits, Costs, and Net Benefits**

| | |
|---|---|
| Annualized Costs | |
| Crane Assembly/Disassembly | $33.5 million |
| Power Line Safety | $30.8 million |
| Crane Inspections | $21.6 million |
| Operator Qualification and Certification | $37.3 million |
| Total Annual Costs: | $123.2 million |
| | |
| Annual Benefits | |
| Number of Injuries Prevented | 155 |
| Number of Fatalities Prevented | 53 |

| | |
|---|---|
| Total Monetized Benefits | $406 million |
| Annual Net Benefits (Benefits Minus Costs): | $283 million |

Source: OSHA Office of Regulatory Analysis
Benefits base year 2006;
Costs based on wages in BLS *Employment and Earnings 2004.*

*Compliance Costs*

The estimated compliance costs for this proposed standard represent the additional resources necessary for employers to achieve full compliance. The Agency believes provisions in four areas of the proposed standard will generate the largest costs for employers: crane assembly/disassembly; power-line safety; inspections; and operator qualification and certification. Estimated costs do not include costs when employers are already complying with the new requirements of the proposed standard. The total annualized costs of compliance with the proposed standard are estimated to be about $123 million.

OSHA solicits comments from the public regarding the ranges of cost and benefits calculated in the economic analysis.

*Economic Impacts*

To assess the economic impacts associated with the proposed rule, OSHA compared the estimated employer costs with employer revenues and profits. The costs of compliance with the proposed rule are not large in relation to the corresponding annual financial flows. The economic impacts are presented in Table B-13. At most, the estimated costs of compliance represent about 0.3 percent (less than 1 percent) of revenues for each affected industry. Alternatively, the estimated compliance costs also

represent less than 1 percent of profits, for the average establishment among the affected industries.

The impact of the proposal measured by the ratio of costs to profits varies across the affected sectors. Among the industries in the Crane Lessees (in the construction industry) sector, which includes about 142,500 of the 164,500 affected establishments, average employers are expected to have costs that represent much less than 1 percent of profits. Within the sector of employers which Own but Do Not Rent, affected establishments in 11 of the 30 industry sectors have average costs as high as a few percent of profits (from 2 to 6 percent).

The economic impact of the proposed rulemaking is most likely to consist of a small increase in prices for affected construction projects--less than 0.3 percent, on average. (Note that costs/impacts will be far less for the construction industry in its entirety, which consists of over 700,000 establishments and over $1 trillion in revenue.) It is unlikely that a price increase of this magnitude will significantly alter the amount of construction goods demanded. If the compliance costs of the proposed rule can be substantially recouped with a minimal increase in prices, there will be little effect on profits.

OSHA concludes preliminarily that compliance with the requirements of the proposed rulemaking is economically feasible in every affected industry sector. In addition, based on an analysis of the costs and economic impacts associated with this rulemaking, OSHA preliminarily concludes that the effects of the proposed standard on international trade, employment, wages, and economic growth for the United States would be negligible.

*Initial Regulatory Flexibility Analysis*

OSHA has analyzed the impact of the proposed rule on small entities and has prepared an Initial Regulatory Flexibility Analysis (IRFA) (in section 8, below), describing the potential effects on small entities. The IRFA includes a discussion of the Small Business Advocacy Review Panel (SBARP) process that has been completed for this proposed standard. The SBARP process provided small businesses the opportunity to comment on a draft of the proposed standard and on the corresponding economic analysis. The SBARP subsequently submitted a report to OSHA which summarized these comments and made specific findings and recommendations regarding the draft proposed standard. The Panel's recommendations are presented in section 8 of this PEA. Table B-15 presents the impacts on small entities. Costs as a percent of revenues range from 0.01 to 0.26 percent (less than 1 percent); costs as a percent of profit range from 0.03 to 6.6 percent.

1. Introduction

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. Consistent with these requirements, OSHA has prepared a Preliminary Economic Analysis (PEA) and an Initial Regulatory

Flexibility Analysis to accompany this proposal. The proposal on cranes and derricks in construction will increase the protection of construction workers from hazardous working conditions in and around cranes.

It has been determined that this is an economically significant action under E.O. 12866 and a major rule under the Small Business Regulatory Enforcement Fairness Act (SBREFA). In addition, as required by the RFA, the Agency has assessed the potential impacts of this proposal on small entities and has prepared an Initial 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. Because this proposed rule would have costs of over $100 million in any given year, this proposed rule would establish a federal mandate for the private sector. The analysis presented for compliance under E. O. 12866 also serves as the UMRA analysis.

The purpose of this analysis is to identify the establishments and industries affected by the rule; evaluate its costs, benefits, and economic impacts; assess the technological and economic feasibility of the proposal for affected industries; and evaluate the appropriateness of regulatory non-regulatory alternatives to the rule.

This PEA has been developed according to the requirements of the 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.

*Methodology*

The Agency's occupational safety and health standards are required to be "reasonably necessary or appropriate":

> (8) The term "occupational safety and health standard" means a standard which 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.

E.O. 12866 further defines appropriate regulatory goals and how regulations should be analyzed, and pursuant to the E.O. OSHA develops an economic analysis to estimate benefits and costs. A comparison of estimated benefits and costs from the economic analysis further addresses whether an occupational standard is reasonably necessary. Since 2002, under the direction of the Office and Management and Budget, the Agency has also provided a "monetized" value of benefits for avoided injuries, illnesses, and fatalities from its standards, which permits comparison of benefits and costs where required.

For all significant occupational safety and health standards, OSHA derives estimates of benefits and costs as annualized values, as the Agency believes these are the simplest and most understandable ways to weigh and assess the impact of its standards.

Computing annualized estimates focuses Agency analysis on information from current conditions and recent years which the Agency deems the best information—most accurate and reliable—to analyze a standard's impact on employers and employees. OSHA typically uses a time period of ten years for its analysis, unless there are significant long-term effects not captured within a ten-year time frame. In this case, adding additional years to the time frame of the analysis would not change any major conclusions.

To isolate and describe only the effects of a new standard, the Agency carefully distinguishes, for both benefits and costs, the change induced by the new standard without regard to compliance with existing standards. So, when injuries or fatalities have occurred because existing standards were not adhered to, the Agency neither counts such avoidable accidents as a benefit of the proposed new standard nor includes as an additional cost meeting existing occupational standards. This analysis assumes that all costs are incurred in the first year following the promulgation of the final standard and that benefits result immediately, although some costs will actually likely be incurred over a longer horizon since the standard has phase-in periods for some provisions.

The Agency employs a "willingness to pay" (WTP) approach in estimating benefits. This is a two-step process in which, for the cranes and derricks' proposal, the past 10 years of accident reports were studied to estimate the number of fatalities and injuries, and also the number that would be avoided by full compliance with the proposed standard. Secondly, the Agency uses values from the WTP approach to produce a monetary value of benefits. The WTP approach applied by many economic studies estimates the "value of a statistical life" (VSL) based on data collected about job risks

and the "risk premium" in wages that is paid to employees in riskier jobs. The VSL is used as a metric by many government regulatory authorities, such as National Highway Traffic Safety Administration and the Environmental Protection Agency, but is particularly appropriate for occupational standards since it is derived from occupational risks and wages.

The Agency's calculation of estimates for benefits and costs, summarized and compared in the tables on net benefits, is implicitly one that looks at society as a whole. Estimated costs are borne by all affected employers while benefits from the WTP approach are market-derived estimates of employees' valuation of job risk and reward (economic feasibility, discussed in section 7 below focuses on employer and industry economic impacts without regard to benefits). The VSL represents to some extent the employees' value of taking on additional job risks and describes the value to employees of avoiding fatality and injury. The monetary value of an (avoided) injury from the WTP approach is based on survey results. Summing together estimates of costs and benefits that impact different parts of society is an approach that is considered (by economists) to represent the welfare of society as a whole.

The primary alternative to a WTP approach is a cost of injury (COI) approach. A COI approach estimates such factors as medical costs for injuries, the costs of work disruption from accidents and accident investigations, indirect costs to employers (absenteeism and hiring costs, for example), lost wages or job opportunities to employees, rehabilitation, and many other potential sources of costs to all parties. The COI approach results in ascribing costs and benefits to many involved entities: the employer, the employee, workers' compensation programs, medical insurance, federal

disability programs, and government /taxpayers, for example. A COI approach does not capture a value for loss of life, pain and suffering, impacts on families, and similar parameters, and for that reason the Agency believes that the VSL better represents a monetary value that is consistent with the purposes of the OSH Act, placing great value on workers' health and lives.

The remainder of this part of the preamble on is organized as follows:

2. Identification of Market Failure and Need for Regulation
3. Industry Profile
4. Benefits and Net Benefits
5. Technological Feasibility
6. Costs of Compliance
7. Economic Feasibility and Impacts
8. Initial Regulatory Flexibility Analysis
9. References

2. Identification of Market Failure and Need for Regulation

The justification for imposing appropriate occupational safety and health standards generally, and for adopting this change to the cranes and derricks standard in particular, is that without these requirements, fatality and injury risks to employees would remain unacceptably high. Workplace risks and resulting injuries and costs would be too high from a moral- and social-preference perspective, as determined by Congress through the passage of the Occupational Safety and Health Act. In addition, risks would be too high in terms of imposing large net costs (both pecuniary and non-pecuniary) on society, producing an inefficient allocation of resources, and reducing overall social welfare.

"Market failure" is a term used by economists to describe when the allocation of goods and services by a market is not efficient, in the sense that it is possible for at least

one person to be made better off without making anyone else worse off (termed "Pareto efficiency"). One common cause of market failure is that the person responsible for a decision does not bear the full costs or consequences of that decision. When this occurs, the person responsible for the decision will not fully consider all of the costs involved, and, as a result, may arrive at an inappropriate decision. In the case of occupational injuries, the employer has the primary decision-making responsibility, and does not, in fact, bear the full costs of occupational injuries. As a result, employers will tend to allocate less to occupational safety than would be efficient if all costs of occupational injuries were considered.

Who bears the costs of an employee injury, which include loss of income, medical care costs, the non-monetary burdens the injury imposes, and other outcomes? Some of these costs, particularly medical costs and a portion of income loss, are paid for through workers' compensation. While some employers self insure, and pay the workers' compensation costs directly, the overwhelming majority of employers purchase (and are required to purchase) workers' compensation insurance. Thus, in most cases, employers do not directly pay for workers' compensation to the injured worker. The remainder of the costs of the injury is normally borne by the employee, though some of the costs may be borne by the government in the form of welfare. (In almost all states, workers' compensation is an exclusive remedy, meaning that an employee may not sue his employer for a work-related injury.)

In principle, both employees and insurers could contract with employers for payment in advance for the risks incurred. Insurers charge premiums for their insurance. Workers could, in theory, demand increased pay for increased risk, and there is evidence

that workers do demand increased pay for more dangerous occupations, work in more dangerous industries, and exposure to well known hazardous substances. In this situation, there is not an externality, where an externality is defined as damage to an outside party who is not party to a market agreement. There are, however, several informational and institutional problems that prevent an ideal set of payments for risks incurred.

The first requirement for reasonable valuation of risk in transfers of risk between parties is that the risk be known. Further, for the estimate of risk to affect the behavior of employers, it is necessary that employees and insurers be able to differentiate the risk among different employers, not just be able to assess the risk across all employers in an industry. In the case of relatively rare accidents such a serious crane accidents, this is quite difficult to do. As a result, simply looking at the past record will not provide much useful information concerning relative risk among employers. The employers themselves may be equally uncertain about the risks associated with their practices.

Even if such information on past performance were available, there is no guarantee that future performance will be identical to past performance. Different management or even the same management (with different objectives, financial performance or schedule) may do things differently than they have in past. Further, once the risk has been transferred by contract to employees and insurers, the employer has reduced incentives to maintain a low level of risk. This phenomenon is a constant problem in insurance, where it is known as a moral hazard—the tendency of the insured to act with less care as a result of having insurance. As a result, the only way for an insurance company to estimate the risk of crane accidents for a specific employer is through monitoring actual employer practices that affect crane safety—an expensive

method of obtaining information and one that insurance companies do not perform, the Agency concludes. In addition, workers' compensation insurance uses, and, in most states is required by law to use, an experience rating system. Experience rating ties the quoted premium closely to a combination of all similar occupations in all firms and the individual firm's actual record over the previous three years. For very small firms, this means that, in practice, the individual firm's record has no impact on their insurance premium. Even quite large firms pay, through insurance premium increases, less than the full costs of accidents. Further, the use of experience rating makes it difficult for insurers to make use of information from monitoring and inspection of safety practices, even if they had such information.

Employees also have problems obtaining and using this information. First, employees may simply be unacquainted with safe practices—as these are commonly taught by employers. (One effect of the proposed standard's requirement for crane operator certification is to assure that crane operators will be acquainted with rules for crane safety, and have the appropriate skills to apply them.) Second, information on safety is commonly not available before taking a job. Third, wages are sometimes determined by industry contracts, with no room for added risk premiums for individual employers. Finally, there are significant costs in many cases to leaving a job, which means that even if the employee realizes a job is less safe than some other available jobs, the employee may be reluctant to leave the job.

In summary, the market failure in job safety is that employers commonly transfer the costs of job safety to other parties, and a combination of informational and institutional constraints prevents the costs of the transfer from actually reflecting the risk

to the individual employer—instead employers pay to transfer the risk at a cost closer to the average costs for the occupation rather than their own costs reflecting their own risks. As result, employers do not pay the full costs if they have above average risks or poor safety practices. Under these circumstances, the need for regulation is established by the significant risk presented by crane and derrick operations (see section 4).

3. Industrial Profile

The proposed standard would affect establishments across a variety of different construction industries with work involving cranes and derricks. Table B-2 presents data on the numbers of affected firms, establishments, employees, and average establishment revenues and profits. The Agency sorted establishments, by industry, into five sectors according to their crane or equipment activities, as follows:

- 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 (or just "Crane Lessees").

**Table B-2**
**Industrial Profile of Affected Firms and Establishments for the Proposed Standard**

| NAIC | Industry | Affected Firms | Affected Estab's | Affected Employees | Profit Rate | Average Per Estab. Revenues $1,000 | Average Per Estab. Profits $1,000 |
|---|---|---|---|---|---|---|---|
| **Crane Rental with Operators** | | | | | | | |
| 238990 | All Other Specialty Trade Cont. | 1,183 | 1,240 | 16,244 | 4.10% | $1,918 | $79 |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | | |
| 532412 | Const./Min./For. Machine & Equip. | 2,137 | 4,631 | 50,409 | 4.00% | $3,289 | $132 |
| **Own and Rent Cranes with Operators** | | | | | | | |
| 236115 | New Single-Family Housing Const. | 168 | 168 | 261 | 4.41% | $233 | $10 |
| 236118 | Residential Remodelers | 21 | 21 | 45 | 4.41% | $528 | $23 |
| 236210 | Industrial Building Construction | 8 | 10 | 1,067 | 4.41% | $14,656 | $646 |
| 236220 | Commercial and Institutional Building | 21 | 28 | 757 | 4.41% | $4,603 | $203 |
| 237110 | Water and Sewer Line and Related Struct. | 47 | 62 | 1,432 | 4.65% | $4,570 | $213 |
| 237120 | Oil and Gas Pipeline and Related Struct. | 16 | 21 | 1,457 | 4.65% | $6,822 | $317 |
| 237130 | Power and Communication Line and Rel. | 36 | 36 | 666 | 4.65% | $2,720 | $126 |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | 6,456 | 4.65% | $12,483 | $580 |
| 237990 | Other Heavy and Civil Engineering Const. | 143 | 191 | 5,857 | 4.65% | $5,394 | $251 |
| 238110 | Poured Concrete Foundation and Struct. | 263 | 263 | 4,328 | 4.65% | $2,256 | $105 |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | 7,389 | 4.65% | $2,868 | $133 |
| 238130 | Framing Contractors | 20 | 20 | 120 | 3.90% | $200 | $8 |
| 238150 | Glass and Glazing Contractors | 41 | 41 | 328 | 3.90% | $631 | $25 |
| 238170 | Siding Contractors | 3 | 3 | 18 | 3.90% | $827 | $32 |
| 238190 | Other Foundation, Structure, and Building | 26 | 35 | 1,145 | 3.90% | $2,802 | $109 |
| 238210 | Electrical Contractors | 12 | 12 | 176 | 3.90% | $1,629 | $63 |
| 238220 | Plumbing, Heating, and Air-Conditioning | 2 | 3 | 196 | 3.90% | $5,835 | $227 |
| 238290 | Other Building Equipment Contractors | 104 | 138 | 4,076 | 3.90% | $3,801 | $148 |
| 238320 | Painting and Wall Covering Contract. | 20 | 20 | 159 | 3.90% | $962 | $37 |
| 238910 | Site Preparation Contractors | 311 | 311 | 4,706 | 3.90% | $2,146 | $84 |
| | **Subtotal** | **1,576** | **1,803** | **40,639** | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Own but Do Not Rent** | | | | | | | |
| 236115 | New Single family housing construction | 2,915 | 2,915 | 13,621 | 4.41% | $1,057 | $47 |
| 236116 | New Multifamily housing construction | 220 | 220 | 2,219 | 4.41% | $3,792 | $167 |
| 236117 | New housing operative builders | 1,302 | 1,302 | 12,015 | 4.41% | $5,338 | $235 |
| 236118 | Residential Remodelers | 827 | 827 | 3,201 | 4.41% | $544 | $24 |
| 236210 | Industrial building construction | 235 | 277 | 9,359 | 4.41% | $6,132 | $270 |
| 236220 | Commercial and Institutional Bldg.Const. | 3,718 | 3,718 | 71,536 | 4.41% | $6,479 | $286 |
| 237110 | Water and Sewer Line Const. | 922 | 1,230 | 20,306 | 4.65% | $2,630 | $122 |
| 237120 | Oil and gas pipeline construction | 104 | 138 | 9,277 | 4.65% | $8,167 | $380 |
| 237130 | Power and communication line const. | 225 | 300 | 12,600 | 4.65% | $5,769 | $268 |
| 237210 | Land subdivision | 0 | 0 | 0 | 4.65% | $289 | $13 |
| 237310 | Highway, street and bridge const. | 84 | 111 | 4,308 | 4.65% | $7,266 | $338 |
| 237990 | Other heavy and civil eng. | 516 | 516 | 7,563 | 4.65% | $2,076 | $97 |
| 238110 | Poured Concrete foundation and struct. | 269 | 269 | 3,070 | 4.65% | $1,252 | $58 |
| 238120 | Structural steel and precast concrete | 400 | 400 | 7,249 | 4.65% | $2,018 | $94 |
| 238130 | Framing Contractors | 1,083 | 1,083 | 11,834 | 3.90% | $998 | $39 |
| 238140 | Masonry Contractors | 129 | 129 | 1,303 | 3.90% | $788 | $31 |
| 238150 | Glass & Glazing Contractors | 53 | 53 | 504 | 3.90% | $1,187 | $46 |
| 238160 | Roofing Contractors | 232 | 232 | 2,262 | 3.90% | $991 | $39 |
| 238170 | Siding Contractors | 33 | 33 | 215 | 3.90% | $641 | $25 |
| 238190 | Other foundation, structure, building, ext. | 14 | 14 | 158 | 3.90% | $1,254 | $49 |
| 238210 | Electrical Contractors | 63 | 63 | 771 | 3.90% | $1,312 | $51 |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 87 | 87 | 974 | 3.90% | $1,346 | $52 |
| 238290 | Other building equipment cont. | 45 | 59 | 1,237 | 3.90% | $2,383 | $93 |
| 238310 | Drywall and insulation contractors | 0 | 0 | 0 | 3.90% | $1,573 | $61 |
| 238320 | Painting and wall covering contractors | 39 | 39 | 234 | 3.90% | $433 | $17 |
| 238330 | Flooring Contractors | 0 | 0 | 0 | 3.90% | $760 | $30 |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | 0 | 3.90% | $655 | $26 |
| 238350 | Finish Carpentry contractors | 0 | 0 | 0 | 3.90% | $517 | $20 |
| 238390 | Other building finishing contractors | 0 | 0 | 0 | 3.90% | $1,304 | $51 |
| 238910 | Site Preparation | 302 | 302 | 2,825 | 3.90% | $1,228 | $48 |
| | **Subtotal** | **13,815** | **14,316** | **198,641** | | | |
| **Crane Lessees in the Construction Industry** | | | | | | | |
| 236115 | New Single family housing construction | 29,236 | 29,236 | 136,601 | 4.41% | $2,116 | $93 |
| 236116 | New Multifamily housing construction | 2,199 | 2,199 | 22,192 | 4.41% | $7,606 | $335 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 236117 | New housing operative builders | 13,022 | 13,022 | 120,146 | 4.41% | $10,692 | $472 |
| 236118 | Residential Remodelers | 8,275 | 8,275 | 32,021 | 4.41% | $5,442 | $240 |
| 236210 | Industrial building construction | 2,777 | 2,777 | 93,931 | 4.41% | $6,307 | $278 |
| 236220 | Commercial and Institutional Bldg.Construction | 37,208 | 37,208 | 715,896 | 4.41% | $6,490 | $286 |
| 237110 | Water and Sewer Line Const. | 12,357 | 12,357 | 204,085 | 4.65% | $2,629 | $122 |
| 237120 | Oil and gas pipeline construction | 1,052 | 1,403 | 94,176 | 4.65% | $8,254 | $384 |
| 237130 | Power and communication line const. | 2,263 | 3,017 | 126,753 | 4.65% | $11,295 | $525 |
| 237210 | Land subdivision | 0 | 0 | 0 | 4.65% | $0 | $0 |
| 237310 | Highway, street and bridge const. | 843 | 1,124 | 43,471 | 4.65% | $72,437 | $3,367 |
| 237990 | Other heavy and civil eng. | 5,251 | 5,251 | 77,036 | 4.65% | $3,950 | $184 |
| 238110 | Poured Concrete foundation and struct. | 1,358 | 1,358 | 15,498 | 4.65% | $24,877 | $1,157 |
| 238120 | Structural steel and precast concrete | 4,321 | 4,321 | 78,266 | 4.65% | $2,019 | $94 |
| 238130 | Framing Contractors | 10,841 | 10,841 | 118,502 | 3.90% | $1,331 | $52 |
| 238140 | Masonry Contractors | 1,286 | 1,286 | 13,035 | 3.90% | $15,762 | $614 |
| 238150 | Glass & Glazing Contractors | 529 | 529 | 5,080 | 3.90% | $12,086 | $471 |
| 238160 | Roofing Contractors | 2,319 | 2,319 | 22,620 | 3.90% | $9,923 | $387 |
| 238170 | Siding Contractors | 332 | 332 | 2,152 | 3.90% | $12,932 | $504 |
| 238190 | Other foundation, structure, building, ext. | 139 | 139 | 1,599 | 3.90% | $26,387 | $1,028 |
| 238210 | Electrical Contractors | 626 | 626 | 7,712 | 3.90% | $132,080 | $5,147 |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 875 | 875 | 9,744 | 3.90% | $135,367 | $5,275 |
| 238290 | Other building equipment cont. | 457 | 609 | 12,662 | 3.90% | $23,770 | $926 |
| 238310 | Drywall and insulation contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238320 | Painting and wall covering contractors | 389 | 389 | 2,346 | 3.90% | $43,317 | $1,688 |
| 238330 | Flooring Contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238350 | Finish Carpentry contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238390 | Other building finishing contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238910 | Site Preparation | 3,050 | 3,050 | 28,543 | 3.90% | $12,380 | $482 |
| | **Subtotal** | **141,004** | **142,542** | **1,984,066** | | | |
| | **Total** | **159,715** | **164,532** | **2,289,999** | | | |

Source: U.S. Census Bureau, Economic Census, 2002 for establishments, employees, revenues, except Crane Rental w/o Operators group

Dunn and Bradstreet, Market Profiles, 2002 for data for Crane Rental w/o Operators group

Profit rates from Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002

Affected establish estimates from OSHA/Office of Regulatory Analysis (ORA)

These sectors have an estimated total of about 164,500 affected establishments. Crane Lessees in the Construction Industry (just "Crane Lessees" hereafter) have almost 90 percent of the firms and employees affected by the proposed standard. The profile was constructed by combining two kinds of sources: 1) general data on numbers of establishments, firms, revenues, employees, and profits for affected individual industries, and 2) data on the number or percentage of establishments in the industries that use cranes.

*General Data Sources*

Data from the U.S. Bureau of the Census (CB) was used to develop the industry profile estimates (which include establishments, employees, and revenues) for the five sectors, except the Crane Rental without Operators sector, which was developed using 2002 Dunn and Bradstreet (D&B) data, except for estimates of the number of firms which was based on CB data. The Agency used 2002 D&B data for the Crane Rental without Operators sector because these data matched best with SBA data for estimating the characteristics of small firms in that sector.

Profit rates were taken from the §2002 Source Book Statistics of Income" published by the Internal Revenue Service. The profit rates were calculated by dividing the reported net income by total receipts for each 3-digit NAIC, and were applied to each industry falling within that 3-digit NAIC. For example, for NAIC 236 Building Construction, OSHA used the calculated profit rate of 4.41 percent for all industries performing building construction (residential and non-residential).

*Adjustments for Use of Cranes*

OSHA used the "2002 Economic Census" of the Census Bureau (CB) for data on numbers of firms, establishments, and employees, by size, for establishments that rent cranes (Crane Rental with Operators, Crane Rental without Operators). To estimate the number of establishments that Own but Do Not Rent Cranes and those that only lease cranes (see Table B-3), the Agency applied several adjustments to the CB "2002 Economic Census" data. First, adjustments were made so that estimates of establishments would be consistent with the data from CB which identified establishments that report crane rental revenue. OSHA reviewed the construction industry sub-sectors in the "NAICS Manual 2007" to determine the type of work activities that would require the use of a crane. Some of the industries affected by the proposal consist entirely of contractors and general contractors—either of whom might be the lessee of a crane. In some cases, OSHA determined that general contractors in residential construction would lease cranes instead of the trade contractor. Secondly, during the SBAR panel process some small entity representatives stated that some establishments that were categorized as Crain Lessees (in the construction industry) do in fact own their own cranes, and that some who were categorized as owning cranes typically lease them, or do both. Table B-3 shows the adjustments the Agency made to estimate the number of establishments renting cranes in each industry (which are reflected in Table B-2) and the Agency's rationale.

**TABLE B-3**
**Industrial Profile Adjustments for Crane Lessees for All Establishments**

| NAIC | Industry Description | Establishments (2002 Economic Census) | OSHA Assumption | Revised Estimate |
|---|---|---|---|---|
| 236115 | New Single-Family Housing Const. | 58,472 | Estimated that 50 percent would contract out instead of leasing the crane themselves. | 29,236 |
| 236116 | New Multifamily Housing Const. | 4,397 | Estimated that 50 percent would contract out instead of leasing the crane themselves. | 2,199 |
| 236117 | New Housing Operative Builders | 26,043 | Estimated that 50 percent would contract out instead of leasing the crane themselves. | 13,022 |
| 236118 | Residential Remodelers | 82,750 | Estimated that only 10 percent of the establishments perform work that requires a crane. Only new buildings may require them. | 8,275 |
| 236210 | Industrial Building Construction | 2,777 | All estimated to be affected. | 2,777 |
| 236220 | Commercial and Institutional Bldg. Const. | 37,208 | All estimated to be affected. | 37,208 |
| 237110 | Water and Sewer Line Const. | 12,357 | All estimated to be affected. | 12,357 |
| 237120 | Oil and Gas Pipeline Const. | 1,403 | All estimated to be affected. | 1,403 |
| 237130 | Power and Communication Line Const. | 6,034 | Estimated that 50 percent (only in Power Line Construction) would involve work that requires a crane. | 3,017 |
| 237210 | Land Subdivision | 8,403 | Work performed does not require crane. | 0 |
| 237310 | Highway, Street, and Bridge Const. | 11,239 | Estimate only 10 percent (larger | 1,124 |

| | | | | |
|---|---|---|---|---|
| | | | employers) would use cranes. Street and highway construction would typically not require them. | |
| 237990 | Other Heavy and Civil Eng. | 10,502 | Estimated that only 50 percent would need a crane. | 5,251 |
| 238110 | Poured Concrete Foundation and Struct. | 27,151 | Estimated that only 5 percent would perform tasks that require a crane. In many cases a site crane performs lifting. | 1,358 |
| 238120 | Structural Steel and Precast Concrete | 4,321 | All estimated to be affected. | 4,321 |
| 238130 | Framing Contractors | 14,455 | Estimated that 75 percent would need a crane that would typically not be leased by the residential general contractor. | 10,841 |
| 238140 | Masonry Contractors | 25,720 | Estimated that only 5 percent would perform work that requires a crane. For new multi-story structures, the site crane lifts materials. | 1,286 |
| 238150 | Glass and Glazing Contractors | 5,294 | Estimated that only 10 percent would perform work that requires a crane. Typically only use powered personnel platforms. | 529 |
| 238160 | Roofing Contractors | 23,192 | Estimated only 10 percent would need a crane. Typically use site crane for any high rise building projects. | 2,319 |
| 238170 | Siding Contractors | 6,632 | Estimated that only 5 percent would need a crane. Most of the work is done on scaffolds, ladders, platforms. | 332 |

| | | | | |
|---|---|---|---|---|
| 238190 | Other Foundation, Structure, Bldg. Ext. | 2,786 | Estimated that only 5 percent would need a crane. | 139 |
| 238210 | Electrical Contractors | 62,586 | Estimated that only 1 percent would need a crane. | 626 |
| 238220 | Plumbing, Heating, Air Conditioning Cont. | 87,501 | Estimated that only 1 percent would need a crane. | 875 |
| 238290 | Other Building Equipment Const. | 6,087 | Estimated that only 10 percent would need a crane. | 609 |
| 238310 | Drywall and Insulation Contractors | 19,598 | Work performed does not require crane. Site crane used on multi-story structures. | 0 |
| 238320 | Painting and Wall Coverings Contractors | 38,943 | Estimated that only 1 percent would need a crane. | 389 |
| 238330 | Flooring Contractors | 12,865 | Work performed does not require crane. | 0 |
| 238340 | Tile and Terrazzo Contractors | 8,950 | Work performed does not require crane. | 0 |
| 238350 | Finish Carpentry Contractors | 35,087 | Work performed does not require crane. | 0 |
| 238390 | Other Building Finishing Contractors | 3,729 | Work performed does not require crane. | 0 |
| 238910 | Site Preparation | 30,496 | Estimated that only 10 percent of establishments (large employers that work on high rises) would require cranes. | 3,050 |

*Affected Establishments and Employees*

This section describes OSHA's method for estimating the number of affected establishments and employees in construction for each of the five affected construction industry sectors. The Agency derived estimates of the number of affected employees and establishments primarily from CB data on establishments, employees, annual payroll, and revenues (see Table B-2).

The CB also collects data on establishments that have reported revenue from renting cranes with operators ("cranes," which are more numerous than derricks, will be used throughout this section as shorthand for "cranes and derricks"). This data was acquired via special data runs by CB for OSHA. This data includes crane-rental revenue percentages which OSHA used to determine separate estimates for those establishments that 1) rent cranes with operators as their main revenue source, and 2) rent their cranes to other firms when they are not using them. Thus, the Agency was able to compile profile estimates for employers who 1) provide crane rental with operators (which are only found in NAIC 238990), and 2) own and rent cranes with operators (which are found across several NAICS codes). The Crane Rental without Operators category consists of establishments in NAICS 532412 that rent cranes without operators (also known as bare rentals) that fall within the scope of this proposal. Estimates for the Own but Do Not Rent category are based on the assumption that ten percent of all establishments in the construction industry own their own craned, but do not rent them when they are not using them. The last category, Crane Lessees, consists of all of the other construction establishments that do not own their own cranes, but only lease cranes from crane-rental companies or other companies that own cranes. In preparing this profile of industries

affected by the proposal, OSHA assumed that the proposed rule would affect all establishments that either rent or use cranes in construction activities.

Among the affected crane-rental industries, the largest is the Crane Rental without Operators (bare rentals) (NAICS 532412 Construction/Mining/Forestry Machine and Equipment Rental), with an estimated 4,631 affected establishments and 50,409 employees. The largest crane-use industry is Commercial and Institutional Building Construction (NAICS 236220), with an estimated 37,208 affected establishments and 715,896 employees.

*Crane Rental with Operators*

This sector consists of 1,240 affected establishments (part of NAICS 238990 All Other Specialty Trade Contractors) that rent cranes with operators. These establishments employ 16,244 employees and have total revenues of $1.9 billion. The profit rate for this NAIC is 4.1 percent. The CB data did not report estimates of the number of firms. The Agency estimated the number of firms by assuming a 1:1 ratio of establishments to firms in the less-than-20-employee size class. For all other size classes, the Agency multiplied the number of establishments by 75 percent to estimate the number of firms. These ratios of establishments to firms are typical for the size classes in the construction industry. Based on revenues for this sector and an estimate of the total number of cranes in use, the Agency estimated that each crane generates about $400,000 in average annual revenue, and so estimated the average number of cranes per establishment, by size class, by dividing the average revenues per establishment by $400,000. The Agency estimated that there is, on average, one crane operator for each crane in this sector since this category rents cranes with operators.

*Crane Rental without Operators (bare rentals)*

Establishments that rent cranes without operators (bare rentals) are incorporated into NAICS 532412 Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing. The Agency estimated that there are 4,631 affected establishments in this NAIC engaged in construction activity, with over 50,000 employees and revenues of $3.2 billion. The profit rate for this industry is 4.0 percent. Since the D&B data did not report estimates of the number of firms, OSHA used 2002 Small Business Administration (SBA) data for firms in the less-than-20-employee size class (the only size class in this category considered to be small by SBA). An estimate of the number of cranes was derived by dividing the revenues per establishment by the estimated $250,000 that each crane generates in average annual revenue (less than the average revenue per crane rented with operators). The Agency estimated that the ratio of cranes-to-operators is 4:1 for this category since establishments in this category rent cranes without operators.

*Own and Rent Cranes with Operators*

The CB identified establishments that own cranes and rent them when they are not being used. These 1,803 establishments employ 40,639 employees with total annual revenues of $6 billion. The profit rate for the firms in these sectors ranged from 3.9 to 4.7 percent. The Agency assumed a 1:1 ratio of establishments to firms, in most cases, for those establishments with less than 20 employees. For all others, the Agency multiplied the number of establishments by 75 percent to estimate the number of firms. To derive an estimate of the number of cranes, OSHA divided the per establishment

revenues by the $400,000 which each crane generates in average annual revenue. The Agency used a 1:1 ratio of cranes-to-operators to estimate the number of crane Operators.

*Own but Do Not Rent*

To estimate the number of establishments that Own but Do Not Rent, the Agency subtracted those establishments that own and rent cranes from the total number of construction firms per NAICS sector. This difference was then multiplied by 10 percent to estimate the number of establishments that own cranes but do not rent them. Since most cranes in construction are leased, 10 percent seemed a reasonable estimate of establishments that own cranes but do not rent them. The CB provided estimates of establishments, employees, and revenues per NAICS sector. To estimate the number of firms, the Agency used employment data from the CB to estimate the average number of employees per establishment. The Agency assumed a 1:1 ratio of establishments to firms for those establishments that averaged less than 20 employees. For all others, the Agency multiplied the number of establishments by 75 percent to estimate the number of firms. The profit rate for these firms is the same as for firms in the Own and Rent Cranes with Operators category. An estimate of the number of cranes was derived by assuming that each establishment would own, on average, one crane. The Agency assumed a 1:1 ratio of cranes-to-operators for this sector. (Data on the number of cranes and crane jobs is also presented in section 6 Costs of Compliance.)

*Crane Lessees (in the construction industry)*

The Agency assumed that any NAICS identified from the CB data that could rent a crane would likely do so, and included all establishments in those NAICS industries as possible leasees of cranes. The corresponding estimate of the number of firms was derived using the same procedure described above for the Own but Do Not Rent category. Using the estimates from three sectors (Crane Rental with Operators, Crane Rental without Operators, and Own and Rent Cranes with Operators), OSHA concluded that, among the cranes that are rented, 74 percent are rented without operators and 26 percent with operators.

*Estimates of Number of Cranes and Crane Jobs*

The Agency estimates that there are 96,206 cranes that would fall under the scope of the proposal. The Preliminary Initial Regulatory Flexibility Analysis (PIRFA) estimated the number of cranes at 91,997. Based on comments from small entity representatives (SERs) during the SBREFA panel meetings, OSHA increased its estimate of the number of cranes in the Own but Do Not Rent category by increasing to 10 percent the fraction of all construction establishments that may own cranes but not rent them. OSHA also expanded the Crane Lessees category to include light and heavy construction entities. This expansion accounts for the difference in estimates of establishments, firms, and employees between the PIRFA and in this PEA.

In the PIRFA, the Agency estimated the number of crane jobs at 368,000 annually, or four jobs per crane. For the purposes of this analysis, a crane job is defined as beginning when the crane is put into use and ending when the crane is either moved

(which triggers an assessment of ground conditions and power lines) or when an increasingly hazardous situation occurs (e.g., excess rain which affects ground conditions) which triggers other requirements of the standard. While no SER provided an alternative estimate, some stated that the Agency's estimate of crane jobs was extremely low. As a result of these comments, the Agency increased its estimate of the number of crane jobs to almost 860,000 for all establishments and increased the average number of annual jobs per crane to 9. OSHA requests comment on these estimates. (Estimates of the number of cranes and crane jobs can be found in section 5 Costs of Compliance.)

*Estimates of Small Entities*

The Small Business Administration (SBA) publishes industry-specific size criteria that classify businesses as small entities. The SBA criteria for small entities in the construction industry are based on revenue, rather than the number of employees. OSHA used 2002 CB "Economic Census" data to associate these revenue criteria with employment size classes. For each industry sector, the Agency used CB data to calculate average revenues for entities of each employment size class and then matched the SBA revenue criterion for that industry with the size class that had the largest average revenues not exceeding the SBA criterion.

Table B-4 shows the estimated number of construction small entities that meet the SBA criteria for each sector. As shown, the SBA revenue criteria are so large, given the size of typical construction entities, that virtually all entities in the industries fall within the SBA definition of small entities. Almost 99 percent of all construction establishments are small entities, following the SBA criteria. In addition to the SBA-defined small

entities, the Agency estimated the number of establishments that are very small (having less than 20 employees). Table B-5 shows the industrial profile for this size class.

**Table B-4**
**Industrial Profile of SBA Defined Small Entities for the Proposed Standard**

| Category | NAIC | Industry | SBA Size Standard (Less Than) | Affected Firms | Affected Estabs | Affected Employees | Profit Rate | Avg. Revenues Per Estab. ($1,000) | Avg. Profits Per Estab. ($1,000) |
|---|---|---|---|---|---|---|---|---|---|
| | **Crane Rental with Operators** | | | | | | | | |
| | 238990 | All Other Specialty Trade Cont. | $13.0 mil. | 1,171 | 1,223 | 13,473 | 4.10% | $1,551 | $64 |
| | **Crane Rental without Operators (Bare Rentals)** | | | | | | | | |
| | 532412 | Const./Min./For. Machine & Equip. | $6.5 mil | 1,782 | 3,927 | 20,459 | 4.00% | $935 | $37 |
| | **Own and Rent Cranes with Operators** | | | | | | | | |
| | 236115 | New Single-Family Housing Const. | $31.0 mil. | 168 | 168 | 261 | 4.41% | $233 | $10 |
| | 236118 | Residential Remodelers | $31.0 mil. | 21 | 21 | 45 | 4.41% | $528 | $23 |
| | 236210 | Industrial Building Construction | $31.0 mil. | 8 | 10 | 1,067 | 4.41% | $14,656 | $646 |
| | 236220 | Commercial and Institutional Building | $31.0 mil. | 21 | 28 | 757 | 4.41% | $4,603 | $203 |
| | 237110 | Water and Sewer Line and Related Struct. | $31.0 mil. | 47 | 62 | 1,432 | 4.65% | $4,570 | $213 |
| | 237120 | Oil and Gas Pipeline and Related Struct. | $31.0 mil. | 16 | 21 | 1,457 | 4.65% | $6,822 | $317 |
| | 237130 | Power and Communication Line and Rel. | $31.0 mil. | 36 | 36 | 666 | 4.65% | $2,720 | $126 |
| | 237310 | Highway, Street, and Bridge Construction | $31.0 mil. | 76 | 101 | 6,456 | 4.65% | $12,483 | $580 |
| | 237990 | Other Heavy and Civil Engineering Const. | $31.0 mil. | 143 | 191 | 5,857 | 4.65% | $5,394 | $251 |
| | 238110 | Poured Concrete Foundation and Struct. | $13.0 mil. | 263 | 263 | 4,328 | 4.65% | $2,256 | $105 |
| | 238120 | Structural Steel and Precast Concrete | $13.0 mil. | 239 | 319 | 7,389 | 4.65% | $2,868 | $133 |
| | 238130 | Framing Contractors | $13.0 mil. | 20 | 20 | 120 | 3.90% | $200 | $8 |
| | 238150 | Glass and Glazing Contractors | $13.0 mil. | 41 | 41 | 328 | 3.90% | $631 | $25 |
| | 238170 | Siding Contractors | $13.0 mil. | 3 | 3 | 18 | 3.90% | $827 | $32 |
| | 238190 | Other Foundation, Structure, and Building | $13.0 mil. | 26 | 35 | 1,145 | 3.90% | $2,802 | $109 |
| | 238210 | Electrical Contractors | $13.0 mil. | 12 | 12 | 176 | 3.90% | $1,629 | $63 |
| | 238220 | Plumbing, Heating, and Air-Conditioning | $13.0 mil. | 2 | 3 | 196 | 3.90% | $5,835 | $227 |
| | 238290 | Other Building Equipment Contractors | $13.0 mil. | 104 | 138 | 4,076 | 3.90% | $3,801 | $148 |
| | 238320 | Painting and Wall Covering Contract. | $13.0 mil. | 20 | 20 | 159 | 3.90% | $962 | $37 |
| | 238910 | Site Preparation Contractors | $13.0 mil. | 311 | 311 | 4,706 | 3.90% | $2,146 | $84 |
| | | **Subtotal** | | **1,576** | **1,803** | **40,639** | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Own but Do Not Rent** | | | | | | | | |
| 236115 | New Single family housing construction | $31.0 mil. | 2,906 | 2,906 | 11,578 | 4.41% | $1,000 | $44 |
| 236116 | New Multifamily housing construction | $31.0 mil. | 213 | 213 | 1,886 | 4.41% | $3,400 | $150 |
| 236117 | New housing operative builders | $31.0 mil. | 1,263 | 1,263 | 10,212 | 4.41% | $5,104 | $225 |
| 236118 | Residential Remodelers | $31.0 mil. | 825 | 825 | 2,721 | 4.41% | $543 | $24 |
| 236210 | Industrial building construction | $31.0 mil. | 223 | 262 | 7,955 | 4.41% | $2,570 | $113 |
| 236220 | Commercial and Institutional Bldg.Const. | $31.0 mil. | 3,615 | 3,615 | 60,805 | 4.41% | $3,661 | $161 |
| 237110 | Water and Sewer Line Const. | $31.0 mil. | 918 | 1,223 | 17,260 | 4.65% | $2,324 | $108 |
| 237120 | Oil and gas pipeline construction | $31.0 mil. | 98 | 131 | 7,885 | 4.65% | $3,743 | $174 |
| 237130 | Power and communication line const. | $31.0 mil. | 218 | 291 | 10,710 | 4.65% | $4,656 | $216 |
| 237210 | Land subdivision | $6.0 mil. | 0 | 0 | 0 | 4.65% | $0 | $0 |
| 237310 | Highway, street and bridge const. | $31.0 mil. | 70 | 93 | 3,662 | 4.65% | $3,225 | $150 |
| 237990 | Other heavy and civil eng. | $31.0 mil. | 502 | 502 | 6,429 | 4.65% | $1,500 | $70 |
| 238110 | Poured Concrete foundation and struct. | $13.0 mil. | 108 | 108 | 2,609 | 4.65% | $1,000 | $47 |
| 238120 | Structural steel and precast concrete | $13.0 mil. | 388 | 388 | 6,161 | 4.65% | $1,425 | $66 |
| 238130 | Framing Contractors | $13.0 mil. | 1,061 | 1,061 | 10,059 | 3.90% | $798 | $31 |
| 238140 | Masonry Contractors | $13.0 mil. | 128 | 128 | 1,108 | 3.90% | $675 | $26 |
| 238150 | Glass & Glazing Contractors | $13.0 mil. | 49 | 49 | 428 | 3.90% | $900 | $35 |
| 238160 | Roofing Contractors | $13.0 mil. | 230 | 230 | 1,922 | 3.90% | $801 | $31 |
| 238170 | Siding Contractors | $13.0 mil. | 33 | 33 | 183 | 3.90% | $600 | $23 |
| 238190 | Other foundation, structure, building, ext. | $13.0 mil. | 10 | 10 | 134 | 3.90% | $900 | $35 |
| 238210 | Electrical Contractors | $13.0 mil. | 60 | 60 | 655 | 3.90% | $1,100 | $43 |
| 238220 | Plumbing, Heating and Airconditioning Cont. | $13.0 mil. | 86 | 86 | 828 | 3.90% | $1,100 | $43 |
| 238290 | Other building equipment cont. | $13.0 mil. | 34 | 45 | 1,051 | 3.90% | $1,664 | $65 |
| 238310 | Drywall and insulation contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238320 | Painting and wall covering contractors | $13.0 mil. | 37 | 37 | 199 | 3.90% | $419 | $16 |
| 238330 | Flooring Contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238340 | Tile and Terrazzo contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238350 | Finish Carpentry contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238390 | Other building finishing contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238910 | Site Preparation | $13.0 mil. | 271 | 271 | 2,401 | 3.90% | $962 | $37 |
| | **Subtotal** | | **13,346** | **13,831** | **168,845** | | | |
| **Crane Lessees in the Construction Industry** | | | | | | | | |
| 236115 | New Single family housing construction | $31.0 mil. | 29,229 | 29,229 | 136,566 | 4.41% | $2,116 | $93 |
| 236116 | New Multifamily housing construction | $31.0 mil. | 2,130 | 2,130 | 21,496 | 4.41% | $7,606 | $335 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 236117 | New housing operative builders | $31.0 mil. | 12,634 | 12,634 | 116,566 | 4.41% | $10,692 | $472 |
| 236118 | Residential Remodelers | $31.0 mil. | 8,274 | 8,274 | 32,018 | 4.41% | $5,442 | $240 |
| 236210 | Industrial building construction | $31.0 mil. | 2,633 | 2,633 | 75,701 | 4.41% | $6,307 | $278 |
| 236220 | Commercial and Institutional Bldg.Construction | $31.0 mil. | 36,174 | 36,174 | 696,001 | 4.41% | $6,490 | $286 |
| 237110 | Water and Sewer Line Const. | $31.0 mil. | 12,296 | 12,296 | 152,308 | 4.65% | $2,629 | $122 |
| 237120 | Oil and gas pipeline construction | $31.0 mil. | 1,000 | 1,333 | 67,108 | 4.65% | $8,254 | $384 |
| 237130 | Power and communication line const. | $31.0 mil. | 2,211 | 2,948 | 92,891 | 4.65% | $11,295 | $525 |
| 237210 | Land subdivision | $6.0 mil. | 0 | 0 | 0 | 4.65% | $0 | $0 |
| 237310 | Highway, street and bridge const. | $31.0 mil. | 775 | 1,033 | 29,967 | 4.65% | $72,437 | $3,367 |
| 237990 | Other heavy and civil eng. | $31.0 mil. | 5,214 | 5,214 | 76,493 | 4.65% | $3,950 | $184 |
| 238110 | Poured Concrete foundation and struct. | $13.0 mil. | 1,339 | 1,339 | 15,282 | 4.65% | $24,877 | $1,157 |
| 238120 | Structural steel and precast concrete | $13.0 mil. | 4,203 | 4,203 | 76,129 | 4.65% | $2,019 | $94 |
| 238130 | Framing Contractors | $13.0 mil. | 10,631 | 10,631 | 116,199 | 3.90% | $1,331 | $52 |
| 238140 | Masonry Contractors | $13.0 mil. | 1,283 | 1,283 | 13,000 | 3.90% | $15,762 | $614 |
| 238150 | Glass & Glazing Contractors | $13.0 mil. | 526 | 526 | 5,051 | 3.90% | $12,086 | $471 |
| 238160 | Roofing Contractors | $13.0 mil. | 2,299 | 2,299 | 22,426 | 3.90% | $9,923 | $387 |
| 238170 | Siding Contractors | $13.0 mil. | 331 | 331 | 2,145 | 3.90% | $12,932 | $504 |
| 238190 | Other foundation, structure, building, ext. | $13.0 mil. | 136 | 136 | 1,563 | 3.90% | $26,387 | $1,028 |
| 238210 | Electrical Contractors | $13.0 mil. | 615 | 615 | 7,579 | 3.90% | $132,080 | $5,147 |
| 238220 | Plumbing, Heating and Airconditioning Cont. | $13.0 mil. | 863 | 863 | 9,615 | 3.90% | $135,367 | $5,275 |
| 238290 | Other building equipment cont. | $13.0 mil. | 441 | 588 | 9,168 | 3.90% | $23,770 | $926 |
| 238310 | Drywall and insulation contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238320 | Painting and wall covering contractors | $13.0 mil. | 389 | 389 | 2,344 | 3.90% | $43,317 | $1,688 |
| 238330 | Flooring Contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238340 | Tile and Terrazzo contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238350 | Finish Carpentry contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238390 | Other building finishing contractors | $13.0 mil. | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238910 | Site Preparation | $13.0 mil. | 3,021 | 3,021 | 28,276 | 3.90% | $12,380 | $482 |
| | **Subtotal** | | **138,645** | **140,120** | **1,805,890** | | | |
| | **Total** | | **156,520** | **160,905** | **2,049,306** | | | |

Source: U.S. Census Bureau, Economic Census, 2002 for establishments, revenues, except Crane Rental w/o Operators group
Dunn and Bradstreet, Market Profiles, 2002 for data for Crane Rental w/o Operators group
Profit rates from Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002
Affected establish estimates from OSHA/Office of Regulatory Analysis (ORA)

Cost/establishment figures estimated by OSHA/ORA
Cost as a percent of revenue = Avg. establishment cost/avg establishment revenue

**Table B-5**
**Industrial Profile of Very Small Entities (Less than 20 Employees) by Major Category**

| Category | NAIC | Industry | Firms | Estab's | 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. | 1,013 | 1,013 | 4,824 | 4.10% | $614 | $25 |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | | | |
| | 532412 | Const./Min./For. Machine & Equip. | 1,782 | 3,927 | 20,459 | 4.00% | $935 | $37 |
| **Own and Rent Cranes with Operators** | | | | | | | | |
| | 236115 | New Single-Family Housing Const. | 168 | 168 | 261 | 4.41% | $233 | $10 |
| | 236118 | Residential Remodelers | 21 | 21 | 45 | 4.41% | $528 | $23 |
| | 236210 | Industrial Building Construction | 8 | 10 | 1,067 | 4.41% | $14,656 | $646 |
| | 236220 | Commercial and Institutional Building | 21 | 28 | 757 | 4.41% | $4,603 | $203 |
| | 237110 | Water and Sewer Line and Related Struct. | 47 | 62 | 1,432 | 4.65% | $4,570 | $213 |
| | 237120 | Oil and Gas Pipeline and Related Struct. | 16 | 21 | 1,457 | 4.65% | $6,822 | $317 |
| | 237130 | Power and Communication Line and Rel. | 36 | 36 | 666 | 4.65% | $2,720 | $126 |
| | 237310 | Highway, Street, and Bridge Construction | 76 | 101 | 6,456 | 4.65% | $12,483 | $580 |
| | 237990 | Other Heavy and Civil Engineering Const. | 143 | 191 | 5,857 | 4.65% | $5,394 | $251 |
| | 238110 | Poured Concrete Foundation and Struct. | 263 | 263 | 4,328 | 4.65% | $2,256 | $105 |
| (All other sectors in this category have no very small affected firms) | | | | | | | | |
| | | **Subtotal** | **798** | **901** | **22,326** | | | |
| **Own Cranes But Do Not Rent Them** | | | | | | | | |
| | 236115 | New Single family housing construction | 2,763 | 2,763 | 12,910 | 4.41% | $823 | $36 |
| | 236116 | New Multifamily housing construction | 197 | 197 | 1,987 | 4.41% | $1,350 | $60 |
| | 236117 | New housing operative builders | 1,206 | 1,206 | 11,127 | 4.41% | $1,854 | $82 |
| | 236118 | Residential Remodelers | 808 | 808 | 3,126 | 4.41% | $443 | $20 |
| | 236210 | Industrial building construction | 209 | 209 | 7,076 | 4.41% | $1,247 | $55 |
| | 236220 | Commercial and Institutional Bldg.Construction | 2,943 | 2,943 | 56,620 | 4.41% | $1,526 | $67 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 237110 | Water and Sewer Line Const. | 900 | 900 | 14,864 | 4.65% | $702 | $33 |
| 237120 | Oil and gas pipeline construction | 63 | 63 | 4,224 | 4.65% | $708 | $33 |
| 237130 | Power and communication line const. | 207 | 207 | 8,703 | 4.65% | $655 | $30 |
| 237210 | Land subdivision | 0 | 0 | 0 | 4.65% | $0 | $0 |
| 237310 | Highway, street and bridge const. | 66 | 66 | 2,558 | 4.65% | $976 | $45 |
| 237990 | Other heavy and civil eng. | 378 | 378 | 5,549 | 4.65% | $589 | $27 |
| 238110 | Poured Concrete foundation and struct. | 46 | 46 | 527 | 4.65% | $494 | $23 |
| 238120 | Structural steel and precast concrete | 90 | 90 | 1,625 | 4.65% | $659 | $31 |
| 238130 | Framing Contractors | 981 | 981 | 10,728 | 3.90% | $374 | $15 |
| 238140 | Masonry Contractors | 115 | 115 | 1,165 | 3.90% | $343 | $13 |
| 238150 | Glass & Glazing Contractors | 44 | 44 | 418 | 3.90% | $619 | $24 |
| 238160 | Roofing Contractors | 206 | 206 | 2,013 | 3.90% | $447 | $17 |
| 238170 | Siding Contractors | 31 | 31 | 202 | 3.90% | $408 | $16 |
| 238190 | Other foundation, structure, building, ext. | 10 | 10 | 115 | 3.90% | $394 | $15 |
| 238210 | Electrical Contractors | 54 | 54 | 671 | 3.90% | $444 | $17 |
| 238220 | Plumbing, Heating and Airconditioning Contractors | 77 | 77 | 861 | 3.90% | $509 | $20 |
| 238290 | Other building equipment cont. | 30 | 30 | 624 | 3.90% | $714 | $28 |
| 238310 | Drywall and insulation contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238320 | Painting and wall covering contractors | 37 | 37 | 222 | 3.90% | $265 | $10 |
| 238330 | Flooring Contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238350 | Finish Carpentry contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238390 | Other building finishing contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238910 | Site Preparation | 271 | 271 | 2,536 | 3.90% | $497 | $19 |
| | **Subtotal** | **11,733** | **11,733** | **150,451** | | | |
| **Crane Lessees in the Construction Industry** | | | | | | | |
| 236115 | New Single family housing construction | 28,449 | 28,449 | 132,922 | 4.41% | $1,645 | $73 |
| 236116 | New Multifamily housing construction | 1,968 | 1,968 | 19,865 | 4.41% | $2,700 | $119 |
| 236117 | New housing operative builders | 12,059 | 12,059 | 111,265 | 4.41% | $3,708 | $164 |
| 236118 | Residential Remodelers | 8,099 | 8,099 | 31,341 | 4.41% | $4,431 | $195 |
| 236210 | Industrial building construction | 2,170 | 2,170 | 62,390 | 4.41% | $1,247 | $55 |
| 236220 | Commercial and Institutional Bldg.Construction | 29,651 | 29,651 | 570,496 | 4.41% | $1,526 | $67 |
| 237110 | Water and Sewer Line Const. | 9,867 | 9,867 | 122,221 | 4.65% | $702 | $33 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 237120 | Oil and gas pipeline construction | 740 | 740 | 37,254 | 4.65% | $708 | $33 |
| 237130 | Power and communication line const. | 2,203 | 2,203 | 69,416 | 4.65% | $1,311 | $61 |
| 237210 | Land subdivision | 0 | 0 | 0 | 4.65% | $0 | $0 |
| 237310 | Highway, street and bridge const. | 727 | 727 | 21,081 | 4.65% | $9,762 | $454 |
| 237990 | Other heavy and civil engg. | 4,624 | 4,624 | 67,830 | 4.65% | $1,177 | $55 |
| 238110 | Poured Concrete foundation and struct. | 1,213 | 1,213 | 13,844 | 4.65% | $9,888 | $460 |
| 238120 | Structural steel and precast concrete | 3,428 | 3,428 | 62,091 | 4.65% | $659 | $31 |
| 238130 | Framing Contractors | 9,953 | 9,953 | 108,788 | 3.90% | $498 | $19 |
| 238140 | Masonry Contractors | 1,150 | 1,150 | 11,655 | 3.90% | $6,859 | $267 |
| 238150 | Glass & Glazing Contractors | 472 | 472 | 4,528 | 3.90% | $6,194 | $241 |
| 238160 | Roofing Contractors | 2,067 | 2,067 | 20,160 | 3.90% | $4,465 | $174 |
| 238170 | Siding Contractors | 312 | 312 | 2,027 | 3.90% | $8,155 | $318 |
| 238190 | Other foundation, structure, building, ext. | 122 | 122 | 1,404 | 3.90% | $7,885 | $307 |
| 238210 | Electrical Contractors | 545 | 545 | 6,719 | 3.90% | $44,376 | $1,729 |
| 238220 | Plumbing, Heating and Airconditioning Contractors | 774 | 774 | 8,614 | 3.90% | $50,865 | $1,982 |
| 238290 | Other building equipment cont. | 435 | 435 | 6,783 | 3.90% | $7,667 | $299 |
| 238310 | Drywall and insulation contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238320 | Painting and wall covering contractors | 370 | 370 | 2,228 | 3.90% | $26,527 | $1,034 |
| 238330 | Flooring Contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238350 | Finish Carpentry contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238390 | Other building finishing contractors | 0 | 0 | 0 | 3.90% | $0 | $0 |
| 238910 | Site Preparation | 2,739 | 2,739 | 25,631 | 3.90% | $4,974 | $194 |
| | **Subtotal** | **124,135** | **124,135** | **1,520,554** | | | |
| | **Total** | **139,461** | **141,709** | **1,718,614** | | | |

Source: U.S. Census Bureau, Economic Census, 2002

Dunn and Bradstreet, Market Profiles, 2002

Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002

*Wages*

Taking the ratio of total payroll (from CB's "2002 Economic Census") to total employment, OSHA calculated an average annual salary of $35,352 per employee. This estimate includes both production and non-production employees. OSHA compared this CB annual salary estimate with a salary estimate that is based on weekly earnings of $724.66 for a production or non-supervisory employee in 2002, as reported by Bureau of Labor Statistics' (BLS) "Employment and Earnings, January 2003." On an annual basis, the BLS salary is calculated as $37,682 (fringe benefits not included), which differs only slightly with the CB salary estimate. The Agency chose to rely on the BLS wage data for this analysis due to their breakdown into different employment categories using its National Industry-Specific Occupational Employment and Wage Estimates Survey. Estimated wages include: base gross pay rate, cost-of-living allowances, guaranteed pay, hazardous pay, incentive pay including commissions and production bonuses, on-call pay, and tips. The estimates exclude: back pay, jury duty pay, overtime pay, severance pay, shift differentials, non-production bonuses, and tuition

reimbursement (BLS, 2000). To produce a total wage that reflects total compensation for employees in affected industries, OSHA adjusted the average base annual wage ($37,682) to include fringe benefits. BLS estimates the percentage of fringe benefits based on survey data for aggregate worker categories. In this analysis, OSHA used an average fringe-benefit rate of 40 percent.

4. Benefits and Net Benefits

This section reviews the population at risk of occupational injury or death in construction and estimates the benefits from the proposal. OSHA believes that compliance with the proposal will yield substantial benefits in terms of lives saved, injuries avoided, and accident-related cost savings. The proposal addresses several areas that will impose compliance costs: crane assembly/disassembly; power-line safety; inspections; and operation qualification and certification. Although the proposal also includes other new provisions, they primarily update, consolidate, and clarify existing requirements. The Agency is only providing quantitative estimates of benefits for the new provisions listed above, although OSHA believes that all of the provisions are reasonably related to preventing injuries and fatalities which, in turn, will reduce expenditures for medical care, rehabilitation, death benefits, and lost work time (but note that these are not part of the calculated benefits, or cost savings, since the Agency is relying on a willingness to pay approach).

To assess the benefits, a historical analysis of the frequency of fatalities and injuries among employees in construction was conducted using OSHA and BLS data.

*Data Sources*

The data sources that the Agency determined are the most reliable to estimate benefits are OSHA's Integrated Management Information System (IMIS), the BLS Census of Fatal Occupational Injuries (CFOI), and the BLS survey of Occupational Injuries and Illnesses. Because not all accidents are included in the relevant data bases, the actual number of preventable fatalities and injuries addressed by this rulemaking may be somewhat higher. However, OSHA does not currently have a basis for estimating how many pertinent fatalities or injuries may have occurred that would not be represented by the relevant data sources. OSHA requests information and comments from the public regarding this issue.

*Fatality Benefits*

OSHA's analysis of the number of fatalities estimated to be averted by the proposal proceeds in two steps: 1) determine the number of fatalities currently occurring, and the types and causes of these fatalities; and 2) determine the proposal's ability to avert various types of fatalities (assuming full compliance). As discussed above, only those fatalities that would have been prevented through compliance with the four new provisions noted above were estimated in the benefits analysis. To estimate the number of fatalities associated with cranes and derricks, the Agency first averaged 10 years of construction fatality data (1994-2003) from the CFOI database. Based on the CFOI data, an average of 1,123 fatalities occurred each year during that time period in the construction industry.

According to a study from the Construction Industry Research and Policy Center (CIRPC), at least 8 percent of the total construction fatalities are crane related (CIRPC, Beavers, Moore, Rinehart, and Schriver, Report 35, March, 2005 and Journal of Construction and Engineering Management, 2006). This percentage when applied to the yearly average fatalities, results in an estimated average of 89.8 crane-related fatalities in the construction industry annually.

To determine avoidable deaths under the proposal, OSHA reviewed accident abstracts from the IMIS database from 1995 to 2005. These abstracts consist of general-duty clause citations under the OSH Act and existing 29 CFR 1926.550 citations. In reviewing these data, OSHA determined that 29 fatalities were similar to the types of accidents addressed by the existing rule or proposal. Of these 29 fatalities, OSHA determined that 17 (or 59 percent) would have been averted by compliance with the proposal. This ratio was applied to the estimated annual average of crane-related fatalities (89.8) to preliminarily estimate the fatality benefits of the proposal—i.e., 53 avoided fatalities annually. These are potentially avoided fatalities because the estimate assumes perfect compliance with the proposed standard. Table B-6 outlines the avoided fatalities under the proposed standard.

**Table B-6**
**Cranes and Derricks Benefits Analysis (Fatalities)**

| | | Yearly Average |
|---|---|---|
| 1 | CFOI Construction Fatalities | 1,123 |
| 2 | Number of Fatalties that are crane related (8% of #1) | 89.8 |
| 3 | Total Avoidable Crane-Related Fatalities (59% of #2) | 53.0 |

Sources: ORA, OSHA; BLS CFOI database; IMIS Fatality/Catastrophe Reports; CIRPC report March, 2005.

*Injury Benefits*

To estimate the avoidable injuries, the Agency relied on the number of injuries involving cranes in the construction industry from 1995 to 2004 using the BLS Survey of Occupational Injuries and Illnesses. The assessment of avoidable injuries is presented in Table B-7. The Agency obtained from BLS special data runs with estimates of the number of cases involving days away from work associated with cranes in construction for the 10 years (1995-2004). In using those data to assess potential benefits, OSHA is assuming that the reported injuries encompass most of the attributes related to accidents where cranes are the true source. These BLS data do not differentiate between crane-related cases that are "struck by" or "contact with electric current," but the Agency assumes that the majority of crane-reported cases are from these two causes.

As shown in Table B-7, over a ten-year period, 263 injuries per year occurred involving cranes in construction. To estimate the number of potentially avoidable struck-by cases, the Agency multiplied the 263 injuries each year by its ratio of avoidable cases (59 percent) derived from the fatality data. Thus, the Agency preliminarily estimates that the proposal will avoid 155 injuries annually.

**Table B-7**

**Cranes and Derricks Benefits Analysis (Injuries)**

**Annual Average**

| | |
|---|---|
| 1. Number of Injury Cases in Construction Involving Cranes (CIDAFW) | 263 |
| 2. Avoidable Cases (59% of #1 above) | 155 |

Sources: OSHA/ORA; BLS Survey of Occupational Injuries and Illnesses.

*Monetized Benefits*

For informational purposes, the Agency monetized both the avoidable fatalities and injuries based on willingness-to-pay values of $7.5 million per death and $50,000 per injury. OSHA has followed EPA's approach to monetizing the reduction in the risk of premature mortality, as presented in "The Benefits and Costs of the Clean Air Act of 1990 to 2010" (EPA, 1999) and applied in the Radon in Drinking Water regulation. EPA's approach is presented in Chapter 7 of EPA's "Guidelines for Preparing Economic Analyses," which provides a detailed review of the methods for estimating mortality risk values and summarizes the values obtained in the literature (EPA, 2000). EPA identified 26 studies that it considered relevant. Synthesizing the results of these studies, EPA arrived at a mean value for a statistical life (VSL) of $4.8 million in 1990 dollars. EPA employs this central estimate, updated for inflation, in its regulatory analyses. OSHA has updated EPA's mean VSL for 1990 using the consumer price index (CPI calculator, CPI home page), adjusted for income elasticity (GDP data, Bureau of Economic Analysis, Dept. of Commerce), and applied a value of $7.5 million to each premature fatality avoided (2006 base year). In applying these values, OSHA estimates that the annual monetized value of the 53 potentially avoidable fatalities is $397.5 million. The estimated

monetized value of avoiding the 155 injuries is $8.5 million. Thus, total monetized benefits are $406 million.

*Non-Quantified Benefits*

OSHA believes that there are non-quantified injury benefits that are likely to result from other provisions of the proposal, and the 155 injuries should be considered a minimum estimate. The proposed provisions for signal persons, fall protection, work-area control, multiple lifts, hoisting personnel, and training, among others, are expected to result in safer working conditions that will reduce injuries to construction workers. Also, OSHA believes that employers and employees will benefit from the reorganization and plain language used in the proposal, which will make it easier for employers to comply with the requirements and, thus, improve construction safety conditions.

**Net Benefits**

| | |
|---|---|
| Annualized Costs | |
| Crane Assembly/Disassembly | $33.5 million |
| Power Line Safety | $30.8 million |
| Crane Inspections | $21.6 million |
| Operator Qualification and Certification | $37.3 million |
| Total Annual Costs: | $123.2 million |
| Annual Benefits | |
| Number of Injuries Prevented | 155 |
| Number of Fatalities Prevented | 53 |
| Monetized Benefits ($50,000 per injury and $7.5 million per fatality prevented) | $406 million |
| Net Monetized Benefits (Benefits Minus Costs): | $283 million annually |

*Sensitivity of estimates*

The estimate of benefits is most sensitive to the estimated percentage of current annual fatalities that can be avoided by full compliance with the proposed standard. The percentage of fatalities that will be avoided is also applied to the estimate of avoided injuries involving cranes and derricks in construction. OSHA closely examined available reports of 29 fatalities that were related to the provisions in the existing and proposed standards and found that 17 would be prevented if measures in the proposal standard had been followed, or about 59 percent. Since the 29 detailed reports are a sample of all crane-related fatalities, the true benefits depend on how well the 29 cases reviewed represent the actual accidents involving cranes. So, if the true percentage of avoided fatalities varied from the estimate by 10 percent (49 or 69 percent instead of 59 percent) there would be a 10 percent change in the number fatalities and injuries prevented. The Agency believes that its estimate of annual fatalities involving cranes (about 90) in the construction industry is much less sensitive than the estimate of the percentage of fatalities avoided, because both the estimate of the annual number of all construction fatalities (1,123) and percentage related to cranes and derricks were based on 10 years of data.

According to the Agency's models for estimating costs and (monetized) benefits, the proposed standard generates considerable positive net benefits; that is, the benefits are much greater than costs. For net benefits to fall to zero, the Agency would have had to overestimate the number of fatalities prevented by the standard by several fold, from the estimated 55 fatalities prevented to about 16. Alternatively (for zero net benefits), the Agency would have had to underestimate the number of cranes and derricks in use—and the annual number of construction projects where cranes are used--by threefold, from

about 96,000 cranes and derricks to 300,000. In that case estimated compliance costs would rise to over $400 million annually, or about equal to the value of estimated monetary benefits.

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 proposal, and assessed their technological feasibility. As a result of this review, OSHA has determined that compliance with the requirements of the proposal is technologically feasible for all affected industries. The proposal 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 the proposed requirements can be achieved with readily and widely available technologies. Some buinesses in the affected industries already implement the requirements of the proposed 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 welcomes comments regarding this conclusion.

6. Costs of Compliance

This section presents the estimated costs of compliance for the proposed standard for cranes and derricks in construction. The estimated costs represent the additional costs necessary for employers to achieve full compliance, and these estimates do not include costs associated with current practices, or "baseline" activities, that affected employers already perform. If a national consensus standard exists, OSHA takes that standard as the "baseline" reflecting current practices--costs are attributed for provisions in the proposal that are over and above current practices. If, however, the standard is more stringent than the consensus standard, all employers incur compliance costs solely attributable to the OSHA regulation.

Table B-8 presents the total annualized estimated costs by provision across industry sectors. Information about how costs were calculated for each of the four major provisions is presented below. Table B-9 presents the average cost per affected establishment across industries. The total annualized cost of compliance with the proposed rule is estimated to be about $123 million. The major provisions generating employer compliance costs are: assembly/disassembly, power-line safety, inspections, and operator qualification and certification**.** There are provisions in the standard that may generate minor, but new, costs for affected employers. These provisions are noted in detailed estimates of paperwork costs in that section of the preamble below. The Agency seeks comment on whether these costs are covered under current practices, or are of sufficient magnitude to affect the overall total of costs of the proposal.

Estimation of Compliance Costs

The costs of compliance presented in this analysis are based on data from the CB "2002 Economic Census," IRS Statistics of Income "2002 Corporate Source Book," and D&B "2002 Market Profiles." OSHA's cost model was originally developed as part of the Preliminary Initial Regulatory Flexibility Analysis (PIRFA), prepared for the Small Business Advocacy Review Panel (the Panel). The Panel process solicited comment from small businesses which would be impacted by the new standard, and the Panel provided recommendations and findings to OSHA. (The Panel's recommendations and findings are presented in detail in section 8 Initial Regulatory Flexibility Analysis.) That initial cost analysis has been revised in response to comments from the Panel's small entity representatives (SERs), additional information received from potentially affected small businesses, and in response to the Panel's recommendations and findings.

**Table B-8**
**Annualized Compliance Cost By Sector and Major Provision**

| NAIC | Industry | Number of Affected Firms | Number of Affected Estab's | Crane Assembly/ Disassembly | Power Line Safety | Crane Inspections | Operator Qualification Certification | Total Annualized Cost |
|---|---|---|---|---|---|---|---|---|
| **Crane Rental with Operators** | | | | | | | | |
| 238990 | All Other Specialty Trade Contractors | 1,183 | 1,240 | - | - | $1,315,126 | $2,550,661 | $3,865,787 |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | | | |
| 532412 | Const./Min./For. Machine and Equipment | 2,137 | 4,631 | - | - | $13,614,435 | $6,601,232 | $20,215,667 |
| **Own and Rent Cranes with Operators** | | | | | | | | |
| 236115 | New Single-Family Housing Construction | 168 | 168 | $19,067 | $17,572 | $22,341 | $42,467 | $101,447 |
| 236118 | Residential Remodelers | 21 | 21 | $5,388 | $4,966 | $6,314 | $12,001 | $28,669 |
| 236210 | Industrial Building Construction | 8 | 10 | $71,285 | $65,697 | $83,526 | $158,770 | $379,278 |
| 236220 | Commercial and Institutional Bldg. Construction | 21 | 28 | $62,687 | $57,773 | $73,452 | $139,621 | $333,534 |
| 237110 | Water and Sewer Line Construction | 47 | 62 | $137,822 | $127,018 | $161,489 | $306,965 | $733,293 |
| 237120 | Oil and Gas Pipeline Construction | 16 | 21 | $69,686 | $64,223 | $81,653 | $155,209 | $370,772 |
| 237130 | Power and Communication Line Construction | 36 | 36 | $47,622 | $43,889 | $55,800 | $106,068 | $253,380 |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | $613,268 | $565,193 | $718,580 | $1,365,910 | $3,262,951 |
| 237990 | Other Heavy and Civil Engineering Construction | 143 | 191 | $501,156 | $461,870 | $587,216 | $1,116,207 | $2,666,449 |
| 238110 | Poured Concrete Foundations and Structures | 263 | 263 | $288,546 | $265,927 | $338,097 | $642,669 | $1,535,239 |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | $444,986 | $410,103 | $521,401 | $991,103 | $2,367,593 |
| 238130 | Framing Contractors | 20 | 20 | $1,941 | $1,789 | $2,274 | $4,323 | $10,326 |
| 238150 | Glass and Glazing Contractors | 41 | 41 | $12,589 | $11,603 | $14,751 | $28,040 | $66,984 |
| 238170 | Siding Contractors | 3 | 3 | $1,207 | $1,112 | $1,414 | $2,688 | $6,421 |
| 238190 | Other Foundation, Structure, and Bldg. Contr's | 26 | 35 | $47,708 | $43,968 | $55,901 | $106,259 | $253,836 |
| 238210 | Electrical Contractors | 12 | 12 | $9,506 | $8,761 | $11,139 | $21,173 | $50,579 |
| 238220 | Plumbing, Heating, and Aircond. Contractors | 2 | 3 | $8,515 | $7,847 | $9,977 | $18,965 | $45,304 |
| 238290 | Other Building-Equipment Contractors | 104 | 138 | $255,141 | $235,140 | $298,955 | $568,266 | $1,357,502 |
| 238320 | Painting and Wall-Covering Contractors | 20 | 20 | $9,360 | $8,626 | $10,967 | $20,847 | $49,800 |
| 238910 | Site-Preparation Contractors | 311 | 311 | $324,607 | $299,161 | $380,350 | $722,986 | $1,727,104 |
| | **Subtotal** | **1,576** | **1,803** | **$2,932,087** | **$2,702,239** | **$3,435,597** | **$6,530,537** | **$15,600,459** |
| **Own but Do Not Rent** | | | | | | | | |
| 236115 | New Single-Family Housing Construction | 2,915 | 2,915 | $567,182 | $522,720 | $664,580 | $1,263,264 | $3,017,746 |
| 236116 | New Multifamily Housing Construction | 220 | 220 | $42,774 | $39,421 | $50,119 | $95,269 | $227,584 |
| 236117 | New Housing Operative Builders | 1,302 | 1,302 | $253,346 | $233,486 | $296,852 | $564,270 | $1,347,955 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 236118 | Residential Remodelers | 827 | 827 | $160,958 | $148,340 | $188,598 | $358,495 | $856,391 |
| 236210 | Industrial Building Construction | 235 | 277 | $53,835 | $49,615 | $63,080 | $119,904 | $286,433 |
| 236220 | Commercial and Institutional Bldg. Construction | 3,718 | 3,718 | $723,374 | $666,669 | $847,595 | $1,611,147 | $3,848,786 |
| 237110 | Water and Sewer Line Construction | 922 | 1,230 | $239,212 | $220,460 | $280,290 | $532,788 | $1,272,749 |
| 237120 | Oil and Gas Pipeline Construction | 104 | 138 | $26,888 | $24,780 | $31,506 | $59,887 | $143,061 |
| 237130 | Power and Communication Line Construction | 225 | 300 | $58,349 | $53,775 | $68,368 | $129,958 | $310,449 |
| 237210 | Land Subdivision | 0 | 0 | $0 | $0 | $0 | $0 | $0 |
| 237310 | Highway, Street, and Bridge Construction | 84 | 111 | $21,670 | $19,971 | $25,391 | $48,265 | $115,298 |
| 237990 | Other Heavy and Civil Engineering Construction | 516 | 516 | $100,305 | $92,442 | $117,530 | $223,407 | $533,685 |
| 238110 | Poured Concrete Foundations and Structures | 269 | 269 | $52,313 | $48,212 | $61,297 | $116,516 | $278,338 |
| 238120 | Structural Steel and Precast Concrete | 400 | 400 | $77,863 | $71,759 | $91,234 | $173,421 | $414,278 |
| 238130 | Framing Contractors | 1,083 | 1,083 | $210,636 | $194,124 | $246,807 | $469,142 | $1,120,708 |
| 238140 | Masonry Contractors | 129 | 129 | $25,019 | $23,058 | $29,316 | $55,725 | $133,118 |
| 238150 | Glass and Glazing Contractors | 53 | 53 | $10,220 | $9,419 | $11,975 | $22,763 | $54,378 |
| 238160 | Roofing Contractors | 232 | 232 | $45,117 | $41,580 | $52,864 | $100,487 | $240,047 |
| 238170 | Siding Contractors | 33 | 33 | $6,449 | $5,943 | $7,556 | $14,363 | $34,311 |
| 238190 | Other Foundation, Structure, and Bldg. Contr's | 14 | 14 | $2,676 | $2,466 | $3,136 | $5,961 | $14,239 |
| 238210 | Electrical Contractors | 63 | 63 | $12,174 | $11,220 | $14,265 | $27,116 | $64,775 |
| 238220 | Plumbing, Heating, and Aircond. Contractors | 87 | 87 | $17,024 | $15,689 | $19,947 | $37,916 | $90,576 |
| 238290 | Other Building-Equipment Contractors | 45 | 59 | $11,574 | $10,667 | $13,562 | $25,779 | $61,583 |
| 238310 | Drywall and Insulation Contractors | 0 | 0 | $0 | $0 | $0 | $0 | $0 |
| 238320 | Painting and Wall-Covering Contractors | 39 | 39 | $7,573 | $6,979 | $8,873 | $16,867 | $40,292 |
| 238330 | Flooring Contractors | 0 | 0 | $0 | $0 | $0 | $0 | $0 |
| 238340 | Tile and Terrazzo Contractors | 0 | 0 | $0 | $0 | $0 | $0 | $0 |
| 238350 | Finish Carpentry Contractors | 0 | 0 | $0 | $0 | $0 | $0 | $0 |
| 238390 | Other Building Finishing Contractors | 0 | 0 | $0 | $0 | $0 | $0 | $0 |
| 238910 | Site-Preparation Contractors | 302 | 302 | $58,728 | $54,124 | $68,813 | $130,803 | $312,468 |
| | **Subtotal** | **13,815** | **14,316** | **$2,785,259** | **$2,566,921** | **$3,263,555** | **$6,203,513** | **$14,819,248** |
| **Crane Lessees in the Construction Industry** | | | | | | | | |
| 236115 | New Single-Family Housing Construction | 29,236 | 29,236 | $5,688,159 | $5,242,261 | - | $3,167,261 | $14,097,680 |
| 236116 | New Multifamily Housing Construction | 2,199 | 2,199 | $427,740 | $394,210 | - | $238,173 | $1,060,123 |
| 236117 | New Housing Operative Builders | 13,022 | 13,022 | $2,533,464 | $2,334,864 | - | $1,410,675 | $6,279,003 |
| 236118 | Residential Remodelers | 8,275 | 8,275 | $1,609,985 | $1,483,777 | - | $896,466 | $3,990,228 |
| 236210 | Industrial Building Construction | 2,777 | 2,777 | $540,293 | $497,939 | - | $300,844 | $1,339,077 |
| 236220 | Commercial and Institutional Bldg.Construction | 37,208 | 37,208 | $7,239,192 | $6,671,707 | - | $4,030,901 | $17,941,801 |
| 237110 | Water and Sewer Line Construction | 12,357 | 12,357 | $2,404,179 | $2,215,714 | - | $1,338,687 | $5,958,580 |
| 237120 | Oil and Gas Pipeline Construction | 1,052 | 1,403 | $272,968 | $251,570 | - | $151,993 | $676,530 |
| 237130 | Power and Communication Line Construction | 2,263 | 3,017 | $586,988 | $540,973 | - | $326,844 | $1,454,806 |
| 237210 | Land Subdivision | 0 | 0 | $0 | $0 | - | $0 | $0 |
| 237310 | Highway, Street, and Bridge Construction | 843 | 1,124 | $218,666 | $201,525 | - | $121,757 | $541,948 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 237990 | Other Heavy and Civil Engineering Construction | 5,251 | 5,251 | $1,021,635 | $941,548 | - | $568,863 | $2,532,047 |
| 238110 | Poured Concrete Foundations and Structures | 1,358 | 1,358 | $264,125 | $243,420 | - | $147,069 | $654,614 |
| 238120 | Structural Steel and Precast Concrete | 4,321 | 4,321 | $840,694 | $774,792 | - | $468,112 | $2,083,598 |
| 238130 | Framing Contractors | 10,841 | 10,841 | $2,109,275 | $1,943,927 | - | $1,174,479 | $5,227,681 |
| 238140 | Masonry Contractors | 1,286 | 1,286 | $250,204 | $230,591 | - | $139,318 | $620,113 |
| 238150 | Glass and Glazing Contractors | 529 | 529 | $103,000 | $94,926 | - | $57,352 | $255,278 |
| 238160 | Roofing Contractors | 2,319 | 2,319 | $451,224 | $415,852 | - | $251,249 | $1,118,325 |
| 238170 | Siding Contractors | 332 | 332 | $64,516 | $59,459 | - | $35,924 | $159,898 |
| 238190 | Other Foundation, Structure, and Bldg. Contr's | 139 | 139 | $27,102 | $24,978 | - | $15,091 | $67,171 |
| 238210 | Electrical Contractors | 626 | 626 | $121,767 | $112,222 | - | $67,802 | $301,791 |
| 238220 | Plumbing, Heating, and Aircond. Contractors | 875 | 875 | $170,242 | $156,897 | - | $94,794 | $421,932 |
| 238290 | Other Building-Equipment Contractors | 457 | 609 | $118,487 | $109,199 | - | $65,976 | $293,661 |
| 238310 | Drywall and Insulation Contractors | 0 | 0 | $0 | $0 | - | $0 | $0 |
| 238320 | Painting and Wall-Covering Contractors | 389 | 389 | $75,768 | $69,828 | - | $42,189 | $187,784 |
| 238330 | Flooring Contractors | 0 | 0 | $0 | $0 | - | $0 | $0 |
| 238340 | Tile and Terrazzo Contractors | 0 | 0 | $0 | $0 | - | $0 | $0 |
| 238350 | Finish Carpentry Contractors | 0 | 0 | $0 | $0 | - | $0 | $0 |
| 238390 | Other Building Finishing Contractors | 0 | 0 | $0 | $0 | - | $0 | $0 |
| 238910 | Site-Preparation Contractors | 3,050 | 3,050 | $593,330 | $546,819 | - | $330,376 | $1,470,526 |
| | **Subtotal** | **141,004** | **142,542** | **$27,733,005** | **$25,558,997** | **-** | **$15,442,194** | **$68,734,196** |
| | **Total** | **159,715** | **164,532** | **$33,450,351** | **$30,828,157** | **$21,628,713** | **$37,328,136** | **$123,235,357** |

Source: U.S. Census Bureau, Economic Census, 2002
Dunn and Bradstreet, Market Profiles, 2002
Data from Table 2 for affected firms and establishments
Cost estimates from OSHA cost model, ORA

**Table B-9**
**Annualized Compliance Costs Per Establishments By Sector**

| NAIC | Industry | Number of Affected Firms | Number of Affected Estab's | Annualized Compliance Cost | Cost Per Estab. |
|---|---|---|---|---|---|
| **Crane Rental with Operators** | | | | | |
| 238990 | All Other Specialty Trade Contractors | 1,183 | 1,240 | $3,865,787 | $3,118 |
| **Crane Rental without Operators (Bare Rentals)** | | | | | |
| 532412 | Const./Min./For. Machine and Equipment | 2,137 | 4,631 | $20,215,667 | $4,365 |
| **Own and Rent Cranes with Operators** | | | | | |
| 236115 | New Single-Family Housing Construction | 168 | 168 | $101,447 | $604 |
| 236118 | Residential Remodelers | 21 | 21 | $28,669 | $1,365 |
| 236210 | Industrial Building Construction | 8 | 10 | $379,278 | $37,928 |
| 236220 | Commercial and Institutional Building | 21 | 28 | $333,534 | $11,912 |
| 237110 | Water and Sewer Lines and Related Structures | 47 | 62 | $733,293 | $11,827 |
| 237120 | Oil and Gas Pipelines and Related Structures | 16 | 21 | $370,772 | $17,656 |
| 237130 | Power and Communication Lines and Related Struct. | 36 | 36 | $253,380 | $7,038 |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | $3,262,951 | $32,306 |
| 237990 | Other Heavy and Civil Engineering Construction | 143 | 191 | $2,666,449 | $13,960 |
| 238110 | Poured Concrete Foundations and Structures | 263 | 263 | $1,535,239 | $5,837 |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | $2,367,593 | $7,422 |
| 238130 | Framing Contractors | 20 | 20 | $10,326 | $516 |
| 238150 | Glass and Glazing Contractors | 41 | 41 | $66,984 | $1,634 |
| 238170 | Siding Contractors | 3 | 3 | $6,421 | $2,140 |
| 238190 | Other Foundation, Structure, and Building Contractors | 26 | 35 | $253,836 | $7,252 |
| 238210 | Electrical Contractors | 12 | 12 | $50,579 | $4,215 |
| 238220 | Plumbing, Heating, and Air-Conditioning Contractors | 2 | 3 | $45,304 | $15,101 |
| 238290 | Other Building-Equipment Contractors | 104 | 138 | $1,357,502 | $9,837 |
| 238320 | Painting and Wall-Covering Contractors | 20 | 20 | $49,800 | $2,490 |
| 238910 | Site Preparation Contractors | 311 | 311 | $1,727,104 | $5,553 |
| | **Subtotal** | **1,576** | **1,803** | **$15,600,459** | |
| **Own but Do Not Rent** | | | | | |
| 236115 | New Single-Family Housing Construction | 2,915 | 2,915 | $3,017,746 | $1,035 |
| 236116 | New Multifamily Housing Construction | 220 | 220 | $227,584 | $1,035 |
| 236117 | New Housing Operative Builders | 1,302 | 1,302 | $1,347,955 | $1,035 |
| 236118 | Residential Remodelers | 827 | 827 | $856,391 | $1,035 |
| 236210 | Industrial Building Construction | 235 | 277 | $286,433 | $1,035 |
| 236220 | Commercial and Institutional Bldg.Construction | 3,718 | 3,718 | $3,848,786 | $1,035 |
| 237110 | Water and Sewer Lines and Related Structures | 922 | 1,230 | $1,272,749 | $1,035 |
| 237120 | Oil and Gas Pipelines and Related Structures | 104 | 138 | $143,061 | $1,035 |
| 237130 | Power and Communication Lines and Related Struct. | 225 | 300 | $310,449 | $1,035 |
| 237210 | Land Subdivision | 0 | 0 | $0 | $0 |
| 237310 | Highway, Street, and Bridge Construction | 84 | 111 | $115,298 | $1,035 |
| 237990 | Other Heavy and Civil Engineering | 516 | 516 | $533,685 | $1,035 |

| | | | | | |
|---|---|---|---|---|---|
| | Construction | | | | |
| 238110 | Poured Concrete Foundations and Structures | 269 | 269 | $278,338 | $1,035 |
| 238120 | Structural Steel and Precast Concrete | 400 | 400 | $414,278 | $1,035 |
| 238130 | Framing Contractors | 1,083 | 1,083 | $1,120,708 | $1,035 |
| 238140 | Masonry Contractors | 129 | 129 | $133,118 | $1,035 |
| 238150 | Glass and Glazing Contractors | 53 | 53 | $54,378 | $1,035 |
| 238160 | Roofing Contractors | 232 | 232 | $240,047 | $1,035 |
| 238170 | Siding Contractors | 33 | 33 | $34,311 | $1,035 |
| 238190 | Other Foundation, Structure, and Building Contractors | 14 | 14 | $14,239 | $1,035 |
| 238210 | Electrical Contractors | 63 | 63 | $64,775 | $1,035 |
| 238220 | Plumbing, Heating, and Air-Conditioning Contractors | 87 | 87 | $90,576 | $1,035 |
| 238290 | Other Building-Equipment Contractors | 45 | 59 | $61,583 | $1,035 |
| 238310 | Drywall and Insulation Contractors | 0 | 0 | $0 | $0 |
| 238320 | Painting and Wall-Covering Contractors | 39 | 39 | $40,292 | $1,035 |
| 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 Contractors | 302 | 302 | $312,468 | $1,035 |
| | **Subtotal** | **13,815** | **14,316** | **$14,819,248** | |
| | | | | | |
| **Crane Lessees in the Construction Industry** | | | | | |
| 236115 | New Single-Family Housing Construction | 29,236 | 29,236 | $14,097,680 | $482 |
| 236116 | New Multifamily Housing Construction | 2,199 | 2,199 | $1,060,123 | $482 |
| 236117 | New Housing Operative Builders | 13,022 | 13,022 | $6,279,003 | $482 |
| 236118 | Residential Remodelers | 8,275 | 8,275 | $3,990,228 | $482 |
| 236210 | Industrial Building Construction | 2,777 | 2,777 | $1,339,077 | $482 |
| 236220 | Commercial and Institutional Bldg.Construction | 37,208 | 37,208 | $17,941,801 | $482 |
| 237110 | Water and Sewer Lines and Related Structures | 12,357 | 12,357 | $5,958,580 | $482 |
| 237120 | Oil and Gas Pipelines and Related Structures | 1,052 | 1,403 | $676,530 | $482 |
| 237130 | Power and Communication Lines and Related Struct. | 2,263 | 3,017 | $1,454,806 | $482 |
| 237210 | Land Subdivision | 0 | 0 | $0 | $0 |
| 237310 | Highway, Street, and Bridge Construction | 843 | 1,124 | $541,948 | $482 |
| 237990 | Other Heavy and Civil Engineering Construction | 5,251 | 5,251 | $2,532,047 | $482 |
| 238110 | Poured Concrete Foundations and Structures | 1,358 | 1,358 | $654,614 | $482 |
| 238120 | Structural Steel and Precast Concrete | 4,321 | 4,321 | $2,083,598 | $482 |
| 238130 | Framing Contractors | 10,841 | 10,841 | $5,227,681 | $482 |
| 238140 | Masonry Contractors | 1,286 | 1,286 | $620,113 | $482 |
| 238150 | Glass and Glazing Contractors | 529 | 529 | $255,278 | $482 |
| 238160 | Roofing Contractors | 2,319 | 2,319 | $1,118,325 | $482 |
| 238170 | Siding Contractors | 332 | 332 | $159,898 | $482 |
| 238190 | Other Foundation, Structure, and Building Contractors | 139 | 139 | $67,171 | $482 |
| 238210 | Electrical Contractors | 626 | 626 | $301,791 | $482 |
| 238220 | Plumbing, Heating, and Air-Conditioning Contractors | 875 | 875 | $421,932 | $482 |
| 238290 | Other Building-Equipment Contractors | 457 | 609 | $293,661 | $482 |
| 238310 | Drywall and Insulation Contractors | 0 | 0 | $0 | $0 |
| 238320 | Painting and Wall-Covering Contractors | 389 | 389 | $187,784 | $482 |
| 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 Contractors | 3,050 | 3,050 | $1,470,526 | $482 |
| | **Subtotal** | **141,004** | **142,542** | **$68,734,196** | |
| | | | | | |
| | **Total** | **159,715** | **164,532** | **$123,235,357** | |

Source: U.S. Census Bureau, Economic Census, 2002
Dunn and Bradstreet, Market Profiles, 2002
Data from Table 2 for number of affected establishments
Cost estimates from OSHA cost model, ORA

*Estimates of Cranes and Crane Jobs*

The Agency estimates that there are about 164,500 establishments using about 96,000 cranes that would fall under the scope of the proposal. In the PIRFA, the Agency had estimated the number of cranes at about 92,000, with fewer establishments using them. Based on comments from the Panel's SERs, OSHA increased the estimated number of cranes in the Own but Do Not Rent category. OSHA also broadened and increased the industries and establishments in the Crane Lessees' category--which has almost 90 percent of all affected establishments--to include light and heavy construction entities. These revisions account for the difference in estimated establishments, firms, and employees between the PIRFA and this PEA.

In the PIRFA, the Agency estimated the total annual number of crane jobs at 368,000, or about 4 jobs per crane. For the purposes of this analysis, a crane job is defined as beginning when the crane is put into use at a site and ending when the crane is either moved (which triggers an assessment of ground conditions and power lines) or when an increasingly hazardous situation occurs (e.g., excess rain which affects ground conditions) which triggers other requirements of the standard (e.g., post-assembly inspection, re-assembly, ground conditions assessment, power lines assessment). While no SER provided an alternative estimate of the number of crane jobs performed, some stated that OSHA's estimate was extremely low--and that rented cranes are used much more frequently. Also, a few SERs stated that some establishments that were categorized as Crane Lessees own their own cranes, and some employers categorized as owning cranes typically lease them, or both own and lease their own cranes. As a result of these comments, the Agency increased its estimate of the number of cranes in use, as noted

above, and increased the annual average number of crane jobs *per establishment* to five. With the increase in the number of establishments in the Crane Lessee sector and the number of cranes in use, the total number of annual crane jobs is estimated to be about 860,000 per year. (Also as a result of these changes, the intensity of use of rental cranes is estimated to be much higher—on average over ten jobs per year, *per rental* crane.) These revisions in the cost model resulted in a higher estimated total cost for the proposed standard compared to the PIRFA, as more establishments and cranes are affected; however, these revisions increase the average estimated per establishment cost only slightly. Table B-10 presents information on numbers of cranes and crane jobs across affected industry sectors

**Table B – 10**
**Estimates of Cranes, Crane Jobs, and Affected Crane Operators**
**for All Establishments**

| NAIC | Industry | Number of Affected Firms | Number of Affected Estab's | Total Cranes | Crane Jobs | Affected Operators |
|---|---|---|---|---|---|---|
| **Crane Rental with Operators** | | | | | | |
| 238990 | All Other Specialty Trade Contractors | 1,183 | 1,240 | 5,886 | - | 5,886 |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | |
| 532412 | Constr./Min./For. Maching and Equipment | 2,137 | 4,631 | 60,934 | - | 15,233 |
| **Own and Rent Cranes with Operators** | | | | | | |
| 236115 | New Single-Family Housing Construction | 168 | 168 | 98 | 490 | 98 |
| 236118 | Residential Remodelers | 21 | 21 | 28 | 138 | 28 |
| 236210 | Industrial Building Construction | 8 | 10 | 366 | 1,832 | 366 |
| 236220 | Commercial and Institutional Bldg. Constr. | 21 | 28 | 322 | 1,611 | 322 |
| 237110 | Water and Sewer Line Construction | 47 | 62 | 708 | 3,542 | 708 |
| 237120 | Oil and Gas Pipeline Construction | 16 | 21 | 358 | 1,791 | 358 |
| 237130 | Power and Communication Line Constr. | 36 | 36 | 245 | 1,224 | 245 |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | 3,152 | 15,760 | 3,152 |
| 237990 | Other Heavy and Civil Engineering Constr. | 143 | 191 | 2,576 | 12,879 | 2,576 |
| 238110 | Poured Concrete Foundations and Struct's | 263 | 263 | 1,483 | 7,415 | 1,483 |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | 2,287 | 11,436 | 2,287 |
| 238130 | Framing Contractors | 20 | 20 | 10 | 50 | 10 |
| 238150 | Glass and Glazing Contractors | 41 | 41 | 65 | 324 | 65 |
| 238170 | Siding Contractors | 3 | 3 | 6 | 31 | 6 |
| 238190 | Other Foundation, Struct., and Bldg. Contr's | 26 | 35 | 245 | 1,226 | 245 |
| 238210 | Electrical Contractors | 12 | 12 | 49 | 244 | 49 |
| 238220 | Plumb., Heat., and Aircond. Contractors | 2 | 3 | 44 | 219 | 44 |
| 238290 | Other Building-Equipment Contractors | 104 | 138 | 1,311 | 6,557 | 1,311 |
| 238320 | Painting and Wall-Covering Contractors | 20 | 20 | 48 | 241 | 48 |
| 238910 | Site-Preparation Contractors | 311 | 311 | 1,668 | 8,342 | 1,668 |
| | **Subtotal** | **1,576** | **1,803** | **15,070** | **75,352** | **15,070** |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Own but Do Not Rent** | | | | | | |
| 236115 | New Single-Family Housing Construction | 2,915 | 2,915 | 2,915 | 14,576 | 2,915 |
| 236116 | New Multifamily Housing Construction | 220 | 220 | 220 | 1,099 | 220 |
| 236117 | New Housing Operative Builders | 1,302 | 1,302 | 1,302 | 6,511 | 1,302 |
| 236118 | Residential Remodelers | 827 | 827 | 827 | 4,136 | 827 |
| 236210 | Industrial Building Construction | 235 | 277 | 277 | 1,384 | 277 |
| 236220 | Commercial and Institutional Bldg. Constr. | 3,718 | 3,718 | 3,718 | 18,590 | 3,718 |
| 237110 | Water and Sewer Line Construction | 922 | 1,230 | 1,230 | 6,148 | 1,230 |
| 237120 | Oil and Gas Pipeline Construction | 104 | 138 | 138 | 691 | 138 |
| 237130 | Power and Communication Line Constr. | 225 | 300 | 300 | 1,500 | 300 |
| 237210 | Land Subdivision | 0 | 0 | 0 | 0 | 0 |
| 237310 | Highway, Street, and Bridge Construction | 84 | 111 | 111 | 557 | 111 |
| 237990 | Other Heavy and Civil Engineering Constr. | 516 | 516 | 516 | 2,578 | 516 |
| 238110 | Poured Concrete Foundations and Struct's | 269 | 269 | 269 | 1,344 | 269 |
| 238120 | Structural Steel and Precast Concrete | 400 | 400 | 400 | 2,001 | 400 |
| 238130 | Framing Contractors | 1,083 | 1,083 | 1,083 | 5,413 | 1,083 |
| 238140 | Masonry Contractors | 129 | 129 | 129 | 643 | 129 |
| 238150 | Glass and Glazing Contractors | 53 | 53 | 53 | 263 | 53 |
| 238160 | Roofing Contractors | 232 | 232 | 232 | 1,159 | 232 |
| 238170 | Siding Contractors | 33 | 33 | 33 | 166 | 33 |
| 238190 | Other Foundation, Struct., and Bldg. Constr. | 14 | 14 | 14 | 69 | 14 |
| 238210 | Electrical Contractors | 63 | 63 | 63 | 313 | 63 |
| 238220 | Plumb., Heat., and Aircond. Contractors | 87 | 87 | 87 | 437 | 87 |
| 238290 | Other Building-Equipment Contractors | 45 | 59 | 59 | 297 | 59 |
| 238310 | Drywall and Insulation Contractors | 0 | 0 | 0 | 0 | 0 |
| 238320 | Painting and Wall-Covering Contractors | 39 | 39 | 39 | 195 | 39 |
| 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 Contractors | 302 | 302 | 302 | 1,509 | 302 |
| | **Subtotal** | **13,815** | **14,316** | **14,316** | **71,578** | **14,316** |
| **Crane Lessees in the Construction Industry** | | | | | | |
| 236115 | New Single-Family Housing Construction | 29,236 | 29,236 | - | 146,180 | 7,309 |
| 236116 | New Multifamily Housing Construction | 2,199 | 2,199 | - | 10,993 | 550 |
| 236117 | New Housing Operative Builders | 13,022 | 13,022 | - | 65,108 | 3,255 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 236118 | Residential Remodelers | 8,275 | 8,275 | - | 41,375 | 2,069 |
| 236210 | Industrial Building Construction | 2,777 | 2,777 | - | 13,885 | 694 |
| 236220 | Commercial and Institutional Bldg. Constr. | 37,208 | 37,208 | - | 186,040 | 9,302 |
| 237110 | Water and Sewer Line Construction | 12,357 | 12,357 | - | 61,785 | 3,089 |
| 237120 | Oil and Gas Pipeline Construction | 1,052 | 1,403 | - | 7,015 | 351 |
| 237130 | Power and Communication Line Constr. | 2,263 | 3,017 | - | 15,085 | 754 |
| 237210 | Land Subdivision | 0 | 0 | - | 0 | 0 |
| 237310 | Highway, Street, and Bridge Construction | 843 | 1,124 | - | 5,620 | 281 |
| 237990 | Other Heavy and Civil Engineering Constr. | 5,251 | 5,251 | - | 26,255 | 1,313 |
| 238110 | Poured Concrete Foundations and Struct's | 1,358 | 1,358 | - | 6,788 | 339 |
| 238120 | Structural Steel and Precast Concrete | 4,321 | 4,321 | - | 21,605 | 1,080 |
| 238130 | Framing Contractors | 10,841 | 10,841 | - | 54,206 | 2,710 |
| 238140 | Masonry Contractors | 1,286 | 1,286 | - | 6,430 | 322 |
| 238150 | Glass and Glazing Contractors | 529 | 529 | - | 2,647 | 132 |
| 238160 | Roofing Contractors | 2,319 | 2,319 | - | 11,596 | 580 |
| 238170 | Siding Contractors | 332 | 332 | - | 1,658 | 83 |
| 238190 | Other Foundation, Struct., and Bldg. Constr. | 139 | 139 | - | 697 | 35 |
| 238210 | Electrical Contractors | 626 | 626 | - | 3,129 | 156 |
| 238220 | Plumb., Heat., and Aircond. Contractors | 875 | 875 | - | 4,375 | 219 |
| 238290 | Other Building-Equipment Contractors | 457 | 609 | - | 3,045 | 152 |
| 238310 | Drywall and Insulation Contractors | 0 | 0 | - | 0 | 0 |
| 238320 | Painting and Wall-Covering Contractors | 389 | 389 | - | 1,947 | 97 |
| 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 Contractors | 3,050 | 3,050 | - | 15,248 | 762 |
| | **Subtotal** | **141,004** | **142,542** | **-** | **712,711** | **35,636** |
| | **Total** | **159,715** | **164,532** | **96,206** | **859,641** | **86,141** |

Source: U.S. Census Bureau, Economic Census, 2002 for establishments and firm, except Crane Rental w/o Operators group
Dunn and Bradstreet, Market Profiles, 2002 for data for Crane Rental w/o Operators group
Profit rates from Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002
Affected establish estimates from OSHA/Office of Regulatory Analysis (ORA)

**Table B-11**

**Unit Cost Estimates for the Cranes and Derricks Proposed Standard**

| Section | Requirement | Incremental Time | Employee Type (Wage) |
|---|---|---|---|
| Assembly/Disassembly (All Cases) | Assess power line issues and ground conditions | 30 minutes per assessment (15 minutes for power line conditions and 15 minutes for ground conditions) | Assembly/Disassembly (AD) Supervisor ($36.22) |
| Power Line Safety - Assembly/Disassembly (Near Power Lines) (Estimated as 25% of Cases) | Line Contact Determination | 15 minutes per incidence | Qualified Person ($36.33) |
| | Planning Meeting & Voltage Information Request | 20 minutes | AD Supervisor ($36.22)<br>Operator ($31.37)<br>Rigger ($18.59)<br>Employee ($16.16) |
| | A dedicated spotter is needed<br>Spotter training | 2 hours per incident<br>15 minutes (each) | Employee ($16.16)<br>Employee ($16.16), AD Supervisor ($36.22) |
| Power Line Safety - Operations (Option 2 or 3) – Occurs in 30% of the jobs where cranes were not assembled near a power line (75%). | Elevated Warning Line and 20-foot determination | 15 minutes | Employee ($16.16) |
| | Planning Meeting & Voltage Information Request | 20 minutes | Supervisor ($36.22), Operator ($31.37), Rigger ($18.59), Employee ($16.16) |
| | Proximity Alarm/Other Operational Aids (25 % of Incidents) | 0 minutes | Crane Operator ($31.37) |
| | Dedicated Spotter (75% of Incidents) | 4 hours Per Incident<br>15 minutes (instruction) | Employee ($16.16)<br>Employee ($16.16), Supervisor ($36.22) |
| Power Line Safety – Operations (Closer Than Table A) Occurs in the 5% of the jobs where cranes were not assembled near a power line (75%). | Minimum Clearance Determination | 1 hour | Professional Engineer (PE) ($63.59) |
| | Planning Meeting | 2 hours | Power Line Owner and PE ($63.59 each) |
| | Dedicated Spotter | 4 hours | Employee ($16.16) |
| | Elevated Warning Line | 15 minutes | Employee ($16.16) |
| | Equipment Grounding | 30 minutes | PE ($63.59) |
| | Insulating Link | $427 (Annualized Cost) | |

| | | | |
|---|---|---|---|
| | Written Procedures | Developed during planning meeting | |
| | Barricades | 15 minutes | Employee ($16.16) |
| | Limit Access | Discussed during instruction/training | |
| | Non-Conductive Rigging | Already being done | |
| | Deactivate Automatic Re-energizer | 30 minutes | Line Owner or PE ($63.59) |
| Crane Inspections | Monthly Inspection | 15 minutes per crane in addition to current time spent (includes 2 minutes per crane for recordkeeping) | Competent Person ($20.15) |
| | Annual Inspection | 15 minutes per crane in addition to current time spent (includes 2 minutes per crane for recordkeeping) | Qualified Person ($36.33) |
| | Repair Inspections | 15 minutes per crane (includes 2 minutes per crane for recordkeeping) | Qualified Person ($36.33) |
| Operator Training for Certification/ Qualification | Certify operators | Wages for operator's training time (16 hours) for a 2-day course with examination. OSHA has included 2 additional hours for travel time. Thus, the total operator's training time is 18 hours.<br>Also, the cost for a 2-day course ($7,200) divided by 15 employees per class or about $480 per person. OSHA used an estimate of $500 per person. This estimate includes 2 minutes for recordkeeping. In addition to these costs, the cost for the actual examination averages about $250 per person.<br><br>This totals about $1,314 per person (not annualized). | |

Source: Office of Regulatory Analysis; BLS "Employment and Earnings, 2003."

*Ground Conditions and Assembly/Disassembly*

The proposal requires employers to ensure that site and ground conditions are adequate for safe assembly/disassembly (A/D) operations, including meeting ground condition criteria. Initially, an A/D supervisor must assess the ground conditions for

conformance with those criteria and assess the site for suitability for assembly and disassembly. Accordingly, before beginning assembly/disassembly, the A/D supervisor would have to make the determination that ground-bearing conditions are adequate to support the equipment during assembly/disassembly. In addition, the A/D supervisor would have to consider the adequacy of site conditions that might affect the safety of assembly or disassembly. For example, at a construction site in an industrial facility with overhead piping carrying hazardous materials, the A/D supervisor would have to consider the potential for the equipment contacting the piping in determining where and how to conduct the assembly/disassembly operations.

The following is an example of how OSHA determined the cost for A/D operations. The cost for these operations for the Own-and-Rent-Cranes-with-Operators sector in NAIC 236115 was estimated to be $19,067 annually (Table B-8). OSHA calculated this cost as follows:

- **Determining power-line and ground conditions for all jobs** = $8,873 (490 crane jobs/year x 0.5 hour of supervisor wage ($36.22/hour));
- **Marking work zones** = $495 (490 crane jobs/year x 25% jobs near power lines x 0.25 hour of employee wage ($16.04/hour));
- **Holding assembly-planning meetings** = $4,137 (490 crane jobs/year (490) x 0.25 hour x (supervisor wage ($36.22/hour) + laborer wage ($16.04/hour) + crane operator wage ($31.36/hour) + rigger wage ($18.59/hour)));
- **Using dedicated spotters under Options 2 or 3** = $3,958; (490 crane jobs/year x 25% of jobs x 2 hours x employee wage ($16.04/hour)); and
- **Training spotters** = $1,604 (490 crane jobs/year x 25% of jobs requiring spotters x 0.25 hours x (supervisor wage ($36.22/hour) and laborer wage ($16.04/hour))).

Some subtotals above may not exactly match the figures in parenthesis due to rounding factors.

C-DAC believed that crane tip-over incidents caused by inadequate ground conditions are a significant cause of injuries and fatalities. Conditions that increase the risk of such accidents include ground that is wet or muddy, poorly graded, or that consists of loose fill (or otherwise disturbed soil) that has not been sufficiently compacted. The Committee believed that requiring adequate ground conditions will prevent many of these accidents.

To perform these assessments, OSHA estimates that 30 minutes, on average, of assembly/disassembly (AD) supervisor time would be needed for each crane job (Table B-11). While there are requirements for disassembly, the Agency estimates that all of the costs will be incurred during the assembly process. Most of the problems dealing with disassembly are prohibited practices, which do not involve new costs to employers.

Many SERs offered input on the time needed to make the ground-condition assessment. While some time estimates were given, one SER stated that the time to assure adequate site assessment was not the issue; rather, the whole team needed to have input to assess the operations, including the crane operator. Another SER stated "this cost is part of normal operations." Due to the range of estimates, OSHA believes that the 30-minute estimate is reasonable.

The Agency did not assume any current baseline for the costs of this provision, and seeks comment about current practices.

*Power-Line Safety*

Under the proposed standard, before beginning crane 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 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. The Agency estimates that it will take a qualified person about 15 minutes to mark the work zone with flags and then determine whether the crane could come closer than 20 feet to a power line.

If the 20-foot determination is positive, then the employer would be required to take additional steps. Specifically, the employer would be required to meet the proposed requirements under 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, the employer would not be required to take any further action.

The Agency estimates that 25 percent of all crane jobs would require that the crane be assembled or disassembled near a power line, which will take an estimated average of 15 additional minutes of a qualified person's time. If the crane operations 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, or (3) contact the utility owner/operator to get the line voltage and maintain the appropriate distance (listed in Table A of the proposal). If the employer chooses 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. The

employer in either case is required to implement additional preventive encroachment measures, including having a planning meeting with the operator and other workers who will be in the area of the crane, erecting an elevated warning line, and using either a proximity alarm, operational aids/limiting devices, a dedicated spotter, or an insulating link. The Agency estimated that a designated spotter would be used in 75 percent of the cases and a proximity alarm would be used in the remaining 25 percent of cases. The Agency estimated that: the spotter would be on duty an average of 2 hours per incident; 25 percent of cranes are already equipped with proximity alarms (at no new cost to employers); and operators would use the proximity alarm instead of a dedicated spotter. Therefore, Agency did not estimate compliance costs for retrofitting cranes with proximity alarms.

Many SERs commented on this provision. The majority of them believed that, most of the time, a dedicated spotter would be used; accordingly, OSHA made no changes to the assumptions used to develop the costs for this provision. The Agency did not assume any baseline current practices for this provision, and seeks comment on this assumption.

For cranes that are not assembled near power lines (75 percent of all crane jobs), there are times when those cranes will operate closer than 20 feet to a power line, thus triggering the encroachment precautions in the proposed standard. The Agency estimates that this situation will occur 30 percent of the time, thereby affecting 22.5 percent of all these crane jobs (i.e., 30 percent x 75 percent = 22.5 percent of all crane-assembly jobs not near power lines).

The responses from the SERs as to the number of jobs that required cranes to work closer than 20 feet to a power line varied. One SER stated that as much as 50 percent of his jobs could be within 20 feet of power lines. Another SER stated that 7.3 percent of their jobs are within 20 feet of power lines, and .04 percent of jobs are within 10 feet of power lines. One SER stated that great variation exists in power-line situations; this SER had no any power-line conflicts during the previous year, but in other years, the SER reported having three or four such conflicts. This SER stated further that after 20 years of crane-operation experience, his company had only been within two feet of a power line once, and then the power company was able to cut the power temporarily until the crane operations were finished.

The proposed standard allows employers to operate cranes closer than the minimum approach distances outlined in Table A. The Agency estimates that the remaining 5 percent of crane jobs (of the 75 percent that will operate close to a power line, but not be assembled near one) are required to do all of the following:

1) determine minimum clearance (1 hour of professional engineer time);
2) conduct a planning meeting (2 hours each of line owner time and professional engineer time);
3) provide a dedicated spotter (4 hours per job);
4) erect an elevated warning line (15 minutes of laborer time);
5) use an insulating link ($427 annualized cost);
6) ground equipment (30 minutes of professional engineer time);
7) develop written procedures (during the meeting between the line owner and professional engineer);

8) erect barricades (15 minutes of laborer time);

9) limit access to employees (by informing employees of the limits during training, and by using barricades);

10) provide non-conductive rigging (already being done under consensus standards and current industry practice); and

11) deactivate automatic re-energizers (30 minutes for the line owner or professional engineer).

Due to the closeness of the power line to the crane operations in these situations, many SERs stated that they perform duties similar to those required by the proposed standard. Some even stated that they go beyond what is required in the proposal by establishing "no swing" zones, marking boundaries of these zones with safety fencing and signs, and assigning a spotter to stay in communication with the operator to keep the crane boom out of the swing zone. Another SER stated that the power line could either be de-energized or relocated until the project is completed. This opinion was not shared by many other SERs, who believed that getting the power line de-energized is not an option. One SER stated that OSHA has failed to recognize the logistics of a power-line situation, which involve meetings, planning, and making preparations. This SER continued by stating that the utility company often adds costs through delays, and that costs of preparation are substantial and not accounted for by OSHA. Also, each job is specific, and it would be irresponsible to generalize the costs to do this work. Another SER stated that OSHA's estimates of costs were too low because OSHA omitted necessary travel time and support equipment, and underestimated wages. OSHA believes

its estimates accurately reflect the (average) costs attributable to the proposed provisions on power-line safety, but requests comment from the public on the estimates.

The following is an example of how OSHA determined the cost of the proposed power-line safety requirements. The total cost of these requirements for the Own-and-Rent-Cranes-with-Operators sector in NAIC 236115 was estimated to be $17,752 (Table B-8), which is the sum of annual costs for operations near power lines ($3,714) and operations closer to power lines than the distances specified in Table A ($13,858). These cost estimates are based on this sector's use of 98 cranes on 490 jobs (Table B-10), as well as the unit costs described in Table B-11.

The cost of operations near power lines ($3,714) was estimated as follows:

- **Hold planning meetings** = $3,269 (490 crane jobs/year x 75 percent of crane-assembly jobs not near power lines x 30 percent of jobs near power lines x 0.25 hour x (wages for 2 laborers (2 x $16.04/hour) + crane-operator wage ($31.36/hour) + rigger wage ($18.59/hour) + qualified-person wage ($36.33/hour))); and

- **Determine location for elevated warning line and 20-foot distance** = $445 (490 crane jobs/year x 75 percent of crane-assembly jobs not near power lines x 30 percent of jobs near power lines x 0.25 hour of employee wages ($16.04/hour).

For operations near power lines closer than the distances specified in Table A, the Agency estimated annual cost ($13,858) as follows:

- **Determine minimum clearance distance** = $1,168 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected x 1.00 hour x professional-engineer (or equivalent) wage ($63.59/hour));

- **Hold a planning meeting** = $3,516 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected jobs x (2.00 hours x professional engineer (or equivalent) wage ($63.59/hour) + 4.00 hours dedicated-spotter wage ($16.04/hour)));

- **Insulation for power line** = $7,846 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected jobs x $427/insulation

unit ($15,000/unit annualized over 10 years at 7 percent with 5 crane jobs/unit/year));

- **Determine location for elevated warning lines** = $74 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected jobs x 0.25 hour x laborer wage ($16.04/hour));

- **Ground equipment** = $584 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected jobs x 0.50 hour x professional engineer (or equivalent) wage ($63.59/hour));

- **Erect and remove barricades** = $74 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected jobs x 0.25 hour x laborer wage ($16.04/hour)); and

- **Deactivate automatic re-energizer** = $584 (490 crane jobs/year x 75 percent crane-assembly jobs not near power lines x 5 percent affected jobs x 0.50 hour x power-line owner wage ($63.59/hour)).

*Inspections*

The proposed standard requires several crane inspections. The Agency did not attribute any costs to daily visual inspections because these are already required in some instances and are a common industry practice. However, monthly, annual, and repair inspections will result in some incremental compliance costs attributable to the proposed standard.

Depending upon the type of crane, the current standard already requires monthly inspections and documentation for some equipment. Further, the current standard requires annual inspections (and documentation) of hoisting machinery. The Agency estimates that additional measures outlined in the proposed standard would result in some incremental cost increase. Thus, the Agency estimates an additional 15 minutes per crane for each type of inspection (including time spent for recordkeeping) is needed to comply with the additional measures in the proposed standard—the time necessary for a

competent person to conduct a monthly inspection and for a qualified person to conduct an annual inspection.

OSHA also estimates that employers would incur a cost to re-inspect cranes that have been repaired. The Agency estimates that 10 percent of all cranes will be repaired annually. The Agency further estimates that an additional 15 minutes of a qualified person's time would be needed to re-inspect the crane. The 15 minutes is an additional, incremental amount as employers are already performing some kind of equipment re-inspection to ensure that the equipment is safe to operate.

The following is an example of how OSHA determined the cost of the proposed inspection requirements. The total annual cost of these requirements for the Own-and-Rent-Cranes-with-Operators sector in NAIC 236115 was estimated to be $22,341 (Table B-8). This cost estimate is based on this sector operating 98 cranes (Table B-10). The total cost consists of the sum of costs for annual and monthly inspections, as well as inspections following crane repairs, determined as follows:

- Monthly inspections = $21,362 (98 cranes x 12 months x 0.5 hours (Table B-11) x competent-person wage ($36.33/hour));
- Annual inspections = $890 (98 cranes x 0.25 hours (from Table B-11) x qualified-person wage ($36.22/hour));
- Re-inspections following repairs = $89 (98 cranes x 0.1 repaired cranes x 0.25 hours (Table B-11) x qualified person wage ($36.33)).

The annual and monthly inspections were non-controversial among the SERs, but the shift inspections sparked considerable response. One SER did not believe that the proposed standard should dictate that inspections must be performed prior to each shift. Also, the SER stated that some deficiencies only become apparent after operations begin. Implementing remedies then impacts the work, putting the operator in a difficult

situation. This SER requested that OSHA align the proposal with the provisions in ANSI B30.5-2.1.2, which calls for "frequent inspections" at "daily to monthly intervals." Another SER believed that the required inspections would make operations safer, and his company would not have difficulty accepting them. Likewise, another SER stated that his company currently performs many of the inspections that are included in the proposed standard, but does not document the inspections as the proposal requires.

OSHA concludes that its time estimates (Table B-11) for inspections presented in the PIRFA are reasonable. The Agency seeks comment on these estimates, including the cost and extent of inspection documentation.

*Operator Certification*

The proposed standard requires operators to be certified or qualified. The Agency assumes only one operator for each crane, on average, in all crane-using sectors, and one operator for every four cranes in firms that rent cranes without operators. In addition, OSHA estimated a 23 percent annual turnover among crane operators, and that about one-third of the replacement operators (i.e., 8 percent of all operators) would require certification/qualification; accordingly, OSHA assumes that the remaining replacements are properly certified/qualified crane operators.

Compared to the current standards, the proposed standard requires more information that operators must know and understand, necessitating more training resources. Of the total number of existing operators, the Agency estimates that 70 percent would need to be certified or qualified. The remainder would already be certified as a result of existing state and local requirements.

To estimate the cost for crane operators' certification/qualification, the Agency used the least-cost option: employees attending a two-day test preparation course and taking the necessary examinations to be certified to operate a crane. This method would cost about $1,314 per operator (not annualized, see Table B-11 for details of this estimated cost). This figure reflects the total cost of the course, test, recordkeeping, and wages for operator course time. The Agency also estimates that 15 percent of the total number of operators needing certification/qualification would fail the first test and need to retake the test-preparation course. Eight percent would need to be certified/qualified each year due to employee turnover; that is, training of new entrants rather than certified/qualified operators moving within the industry. OSHA's estimates also include the time needed to develop and retain certification/qualification records. The Agency has assumed that employers will pay for both the course and employee wages during training, and seeks comment on this assumption. In this regard, some industries such as commercial trucking and aviation require employees to pay wholly or partially for their training or certification.

The annualized cost of training/certification is $750 per operator in course expenses and 18 hours for wages at $31.36/hour to attend a course, which is about $1,314, or $187 when annualized over 10 years at 7 percent. In addition, there are annual costs for training new entrants (8 percent of all operators) and for operators to retake the course and tests (15 percent of all operators). For example, from Table B-8, the total cost of this provision for the Own-and-Rent-Cranes-with-Operators sector in NAIC 236115 is $42,467, assuming the industry has an estimated 98 operators (Table B-10). The total cost of this provision was determined as follows:

- Initial training (annualized) = $12,828 (98 operators x 70 percent (baseline training/certification) x $187 (annualized training cost));
- Training for new entrants = $10,302 (98 operators x 8 percent (new entrants) x $1,314 (non-annualized training cost); and
- Retaking training = $19,316 (98 operators x 15 percent (operators needing to retake training) x $1,314 (non-annualized training cost)).

Many SERs objected to provisions in the proposed standard for operator certification/qualification, though some SERs found that the proposed standard adequately addresses a long-neglected problem for the construction industry. One SER expressed concern that his operator, due to his difficulty in taking written tests, would not be able to pass a written exam. The proposed standard allows for written tests to be administered orally as long as the employee can demonstrate the level of literacy needed to use the manufacturer's written procedures for the class/type of equipment that he/she would be operating. Also, the Panel recommended that OSHA consider and solicit public comment on allowing an operator to be certified for a specific, limited type of operation. In such a case, a defined set of parameters would limit the operator to simple, relatively low-risk operations. OSHA seeks 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.

Some SERs were concerned that, to become certified/qualified, employees would have to be proficient in English. These SERs were concerned that, as a result, the certification/qualification requirement would be burdensome for employers who have operators who are unable to speak English. The Panel stated that the proposed standard does not require that the certification/qualification process be administered in English.

First, the proposed rule allows employees to take the written portion of the certification/qualification test orally; there is no requirement that testing be done in English. In such a case, the operator candidate would have to demonstrate the ability to read and locate relevant information in the equipment manual and other related materials. However, the proposed standard does not specify that such materials be in English. In short, the candidates must have a level of literacy commensurate with the materials. If materials are in the candidate's language, the terms of the provision would be met.

*Provisions in the Proposed Standard without Major Cost*

The provisions described above contain the requirements OSHA believes will result in major costs for affected employers. There are, of course, numerous other requirements in the proposal that the Agency assumes will not impose any compliance costs. OSHA notes, however, that even if some of these provisions resulted in costs to employers, they would not, in total, be of a magnitude to affect the economic feasibility findings of this PEA. The compliance costs of the proposed rule are small with respect to the average revenues and profits of affected establishments. Even if there were additional costs placed on employers by the proposed rule, it would not "'threaten massive dislocation' to or imperil the existence of the industry" (*United Steelworkers v. Marshall*, 647 F.2d 1189, 1265 (D.C. Cir. 1980) (cert. denied) (cites omitted)). (Section 7 of this PEA also discusses economic feasibility.) The Agency seeks comments on this and all assumptions used in this analysis.

Many of the provisions in the proposed rule are similar to existing national consensus standards. In some instances, the C-DAC incorporated national consensus

standards by reference. (See, e.g., proposed 1926.1414(c)(4)(ii)(C); 1926.1423(c)(2)(i); 1926.1433(b); 1926.1436(c)(1)(ii); 1926.1438(b)(2)(iii); 1926.1440(c). In other instances, the C-DAC adopted the substantive requirements of a national consensus standard, but clarified the text and made it enforceable. For example, most of the requirements in proposed 1926.1436, *Derricks* are similar to those in ANSI/ASME B30.6-2003, while proposed 1926.1426, *Free Fall and Controlled Load Lowering* includes the protective methods and mechanisms found in ASME B30.5-2004. These national consensus standards reflect industry current practices and are the baseline against which the new, incremental costs and benefits of the proposed rule are measured. Therefore, if the proposed rule requires a level of safety equivalent to that in an existing national consensus standard, then no difference exists between the proposed regulatory language and the baseline, and the proposed rule imposes no additional cost on employers. If, however, the proposed standard is more stringent than the consensus standard, the Agency concludes that all employers would incur new, incremental compliance costs solely attributable to the OSHA rule.

In addition, some of the provisions in the proposal are already required by, or based on provisions in, existing Subpart N. Section 1926.1425, *Keeping Clear of the Load*, for example, sets forth requirements to ensure that employees are protected from struck-by hazards associated with lifted and suspended loads. A similar requirement to keep employees clear of "loads about to be lifted and suspended" is in existing Subpart N at 1926.550(a)(19). Also, as explained in the Summary and Explanation section of the preamble above, proposed 1926.1431, *Hoisting Personnel* essentially duplicates existing requirements of Subpart N, as does proposed 1926.1418, *Authority to Stop Operation*.

(See, also, proposed 1424, *Work Area Control* and proposed 1434, *Equipment Modifications*.) Because OSHA assumes employers are already complying with the requirements in existing Subpart N, provisions in the proposal that essentially duplicate these requirements would result in no incremental compliance costs to employers.

Finally, as described above, the members of the C-DAC had vast experience with cranes/derricks and, when appropriate, developed requirements that reflect current industry practices. For some provisions, the Committee determined that a different approach was warranted (e.g., power-line safety and operator qualification/certification). As described above, OSHA provided estimated costs for these provisions.

In the table below, OSHA identifies provisions in the proposed rule that do not result in new, incremental compliance costs and provides its rationale for this determination. During the SBAR Panel process, SERs did not identify any of the provisions in the table below as imposing significant new costs.

**Table B-12**

**Provisions for which OSHA Did Not Estimate New, Incremental Costs**

| Proposed Requirement | Consensus Standard /Comment |
|---|---|
| 1413 Wire Rope -- inspections<br><br>(b) *Monthly inspections* – (1) Each month an inspection shall be conducted in accordance with paragraph 1413(a) (wire rope shift inspection).<br><br>(c) *Annual/comprehensive* – (1) At least every 12 months, wire ropes in use on equipment shall be inspected by a qualified person in accordance with paragraph 1413 | Reflects similar concepts found in ASME B30.5 (2004) |

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| (a) (shift inspection). | |
| 1415 Safety devices<br><br>(a) Safety devices. The following safety devices are required on all equipment covered by this Subpart, unless otherwise specified: (1) Crane level indicator; (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 shall have locks, except for portal cranes and floating cranes; (5) Hydraulic outrigger jacks shall have an integral holding device/check valve; and (6) Equipment on rails shall have rail clamps and rail stops, except for portal cranes.<br><br>(b) Proper operation required. Operations shall not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations. Operations shall not resume until the device is again working properly. Alternative measures are not permitted to be used. | Similar devices are found in ASME B30.5 (2004).<br><br>While ASME does not require work to be delayed if the devices are not in proper working order—which the proposal does require. Current crane inspection requirements provide that any deficiencies be identified. |
| 1416 Operational aids<br><br>(a) The devices listed in this section ("listed operational aids") are required on all equipment covered by this Subpart, unless otherwise specified.<br><br>(d) Category 1 operational aids and alternative measures: (1) Boom hoist limiting device; (2) Luffing jib limiting device; (3) Anti two-blocking device.<br><br>(e) Category 2 operational aids: (1) Boom angle or radius indicator; (2) Jib angle indicator if the equipment has a luffing jib; (3) Boom length indicator if the equipment has a telescopic boom, except where the load rating is independent of the boom | Similar to requirements in ASME B30.5-2004. |

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| length; (4) Load weighing and similar devices; (5) Outrigger position (horizontal beam extension) sensor/monitor if the equipment has outriggers; and (5)(ii) Hoist drum rotation indicator if the drum is not visible from the operator's station. | |
| 1417 Operation<br><br>(u)(2) Where traveling with a load, the employer shall 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. | OSHA believes this duty is currently performed by a supervisor or other personnel in accord with similar provisions in ASME B30.5 (2004) |
| 1423 Fall protection<br><br>(b)(1) Boom Walkways. Equipment manufactured more than one year after effective date of standard with lattice booms shall 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. | The proposal requires all new equipment built with lattice booms to have walkways. The Agency estimates this will add $4,000 to the crane's price, a small percentage of a crane's cost. There is no requirement to retrofit existing cranes, and, therefore, no estimated costs imposed on employers. |
| 1428 Signal Person Qualifications<br><br>Paragraph (a)(3) requires that the signal personal evaluation be documented | The Agency believes this is a very minor cost and seeks comment on current practices from the public. |
| 1430 Training<br><br>(g)(1) The employer shall ensure that<br><br>employees required to be trained under this Subpart are evaluated to confirm that they understand the information provided in the training. | The proposal includes an employer evaluation. OSHA believes this evaluation is currently being made by employers; thus the Agency did not estimate additional compliance costs |

| | |
|---|---|
| 1432 Multiple-crane/derrick lifts<br>Plan development [paragraph (a)] is required before lifts with more than one piece of equipment.<br><br>(b)(2) Supervisors must review the plan with workers. | 2004 ANSI B30.5 --3.2.1.5(k)<br>A designated person (DP) is responsible for multi-crane lifts. The DP must analyze the operation, direct all personnel, and address changes in crane ratings, load position, boom location, ground support, and speed, which the Agency believes is equivalent to the proposal.<br><br>The Agency seeks comment on whether 1432(b)(2) is current industry practice. The Agency's paperwork package has estimated that this function may entail some costs; however, if it is current practice this provision would not add a new cost of compliance. |
| 1433 Design, construction, and testing.<br><br>These provisions explicitly reference ANSI B30.5, SAE J 987 and 1063 for criteria. | 2004 ANSI 30.5 Chapters 5.1 and 5.2<br><br>The Agency believes that the consensus standards are equivalent to provisions in the proposal. |
| 1437 Floating cranes/derricks<br>Paragraph (n)(2) refers to reducing the rating of land cranes used on vessels | 2004 ANSI B30.5-1.1.1(e) specifies that this determination be made by the manufacturer or a qualified person. The Agency believes this is equivalent to the proposal. |

*Sensitivity of estimates*

The primary variable affecting the estimate of the total cost of the standard is the Agency's estimate of the number of cranes, and, secondarily, the average annual number of jobs performed per crane. All four of the major provisions that generate costs (operator certification, assembly/disassembly, inspections, and power-line safety) depend on the number of cranes. Costs for operators' certification and inspections are almost wholly a function of the number of cranes. The total estimated cost of the proposal varies directly and in rough proportion to the estimate of the number of cranes, with some minor

dependence on the industries in which cranes are found. (The Agency has also estimated costs for operator certification as if all operators will be certified in the first year of the proposed four-year phase-in period. If included in the analysis, this factor (the 4-year phase-in) could introduce sources of variation in employers' costs as well.) The Agency's estimate of the average annual number of jobs per crane drives costs for jobsite assembly/disassembly and power-line safety provisions and is a secondary source of variability of cost estimates. However, this statistic introduces possible variability on the economic impact on employers, since it affects individual employer costs. In comparison, the estimate of the total number of cranes affects overall cost estimates without affecting individual employer costs in the cost model.

When the initial one-time cost of operator qualification/certification is annualized with a 3 percent rather than a 7 percent discount rate, the annual total costs are little affected. The cost for that provision alone falls to about $35.3 million annually from about $37.3 million; similarly reducing total annual costs from about $123 million to $121 million, or less than two percent. The overall costs are therefore not sensitive to the discount rate used in cost modeling.

7. Economic Feasibility and Impacts

This section presents OSHA's analysis of the potential economic impacts of the proposal and an assessment of economic feasibility. A separate analysis of the potential economic impacts on small entities (as defined by the criteria established 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 Initial 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. Cir. 1980)). The court also found that a standard that is financially burdensome or threatens the survival of some companies in an industry is also not sufficient to render it infeasible. Further, he 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 proposed 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-13. This table is considered a screening analysis because it measures costs as a percentage 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; that is, 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 from its profits.

When demand is inelastic, establishments can recover all the costs of compliance simply by raising the prices they charge for that service; under this scenario, profits are untouched. On the other hand, when demand is elastic, establishments cannot recover all the costs simply by passing the cost increase through in the form of a price increase; instead, they must absorb some of the increase from their 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). Specifically, if demand is completely inelastic (i.e., price elasticity is 0),

then the impact of compliance costs that amount to 1 percent of revenues would be a 1 percent increase in the price of the product or service, with no decline in

**Table B- 13**
**Estimates of Economic Impacts for Affected Establishments Across Industry Sectors**

| NAIC | Industry | Affected Firms | Affected Estab's | 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. | 1,183 | 1,240 | $1,918 | $79 | $3,118 | 0.16% | 3.97% |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | | | |
| 532412 | Const./Min./For. Machine & Equip. | 2,137 | 4,631 | $3,289 | $132 | $4,365 | 0.13% | 3.32% |
| **Own and Rent Cranes with Operators** | | | | | | | | |
| 236115 | New Single-Family Housing Const. | 168 | 168 | $233 | $10 | $604 | 0.26% | 5.87% |
| 236118 | Residential Remodelers | 21 | 21 | $528 | $23 | $1,365 | 0.26% | 5.87% |
| 236210 | Industrial Building Construction | 8 | 10 | $14,656 | $646 | $37,928 | 0.26% | 5.87% |
| 236220 | Commercial and Institutional Building | 21 | 28 | $4,603 | $203 | $11,912 | 0.26% | 5.87% |
| 237110 | Water and Sewer Line and Related Struct. | 47 | 62 | $4,570 | $213 | $11,827 | 0.26% | 5.57% |
| 237120 | Oil and Gas Pipeline and Related Struct. | 16 | 21 | $6,822 | $317 | $17,656 | 0.26% | 5.57% |
| 237130 | Power and Communication Line and Rel. | 36 | 36 | $2,720 | $126 | $7,038 | 0.26% | 5.57% |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | $12,483 | $580 | $32,306 | 0.26% | 5.57% |
| 237990 | Other Heavy and Civil Engineering Const. | 143 | 191 | $5,394 | $251 | $13,960 | 0.26% | 5.57% |
| 238110 | Poured Concrete Foundation and Struct. | 263 | 263 | $2,256 | $105 | $5,837 | 0.26% | 5.57% |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | $2,868 | $133 | $7,422 | 0.26% | 5.57% |
| 238130 | Framing Contractors | 20 | 20 | $200 | $8 | $516 | 0.26% | 6.64% |
| 238150 | Glass and Glazing Contractors | 41 | 41 | $631 | $25 | $1,634 | 0.26% | 6.64% |
| 238170 | Siding Contractors | 3 | 3 | $827 | $32 | $2,140 | 0.26% | 6.64% |
| 238190 | Other Foundation, Structure, and Building | 26 | 35 | $2,802 | $109 | $7,252 | 0.26% | 6.64% |
| 238210 | Electrical Contractors | 12 | 12 | $1,629 | $63 | $4,215 | 0.26% | 6.64% |
| 238220 | Plumbing, Heating, and Air-Conditioning | 2 | 3 | $5,835 | $227 | $15,101 | 0.26% | 6.64% |
| 238290 | Other Building Equipment Contractors | 104 | 138 | $3,801 | $148 | $9,837 | 0.26% | 6.64% |
| 238320 | Painting and Wall Covering Contract. | 20 | 20 | $962 | $37 | $2,490 | 0.26% | 6.64% |
| 238910 | Site Preparation Contractors | 311 | 311 | $2,146 | $84 | $5,553 | 0.26% | 6.64% |
| | **Subtotal** | **1,576** | **1,803** | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Own but Do Not Rent** | | | | | | | | |
| 236115 | New Single family housing construction | 2,915 | 2,915 | $1,057 | $47 | $1,035 | 0.10% | 2.22% |
| 236116 | New Multifamily housing construction | 220 | 220 | $3,792 | $167 | $1,035 | 0.03% | 0.62% |
| 236117 | New housing operative builders | 1,302 | 1,302 | $5,338 | $235 | $1,035 | 0.02% | 0.44% |
| 236118 | Residential Remodelers | 827 | 827 | $544 | $24 | $1,035 | 0.19% | 4.31% |
| 236210 | Industrial building construction | 235 | 277 | $6,132 | $270 | $1,035 | 0.02% | 0.38% |
| 236220 | Commercial and Institutional Bldg.Const. | 3,718 | 3,718 | $6,479 | $286 | $1,035 | 0.02% | 0.36% |
| 237110 | Water and Sewer Line Const. | 922 | 1,230 | $2,630 | $122 | $1,035 | 0.04% | 0.85% |
| 237120 | Oil and gas pipeline construction | 104 | 138 | $8,167 | $380 | $1,035 | 0.01% | 0.27% |
| 237130 | Power and communication line const. | 225 | 300 | $5,769 | $268 | $1,035 | 0.02% | 0.39% |
| 237210 | Land subdivision | 0 | 0 | $289 | $13 | $0 | 0.00% | 0.00% |
| 237310 | Highway, street and bridge const. | 84 | 111 | $7,266 | $338 | $1,035 | 0.01% | 0.31% |
| 237990 | Other heavy and civil eng. | 516 | 516 | $2,076 | $97 | $1,035 | 0.05% | 1.07% |
| 238110 | Poured Concrete foundation and struct. | 269 | 269 | $1,252 | $58 | $1,035 | 0.08% | 1.78% |
| 238120 | Structural steel and precast concrete | 400 | 400 | $2,018 | $94 | $1,035 | 0.05% | 1.10% |
| 238130 | Framing Contractors | 1,083 | 1,083 | $998 | $39 | $1,035 | 0.10% | 2.66% |
| 238140 | Masonry Contractors | 129 | 129 | $788 | $31 | $1,035 | 0.13% | 3.37% |
| 238150 | Glass & Glazing Contractors | 53 | 53 | $1,187 | $46 | $1,035 | 0.09% | 2.24% |
| 238160 | Roofing Contractors | 232 | 232 | $991 | $39 | $1,035 | 0.10% | 2.68% |
| 238170 | Siding Contractors | 33 | 33 | $641 | $25 | $1,035 | 0.16% | 4.14% |
| 238190 | Other foundation, structure, building, ext. | 14 | 14 | $1,254 | $49 | $1,035 | 0.08% | 2.12% |
| 238210 | Electrical Contractors | 63 | 63 | $1,312 | $51 | $1,035 | 0.08% | 2.02% |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 87 | 87 | $1,346 | $52 | $1,035 | 0.08% | 1.97% |
| 238290 | Other building equipment cont. | 45 | 59 | $2,383 | $93 | $1,035 | 0.04% | 1.11% |
| 238310 | Drywall and insulation contractors | 0 | 0 | $1,573 | $61 | $0 | 0.00% | 0.00% |
| 238320 | Painting and wall covering contractors | 39 | 39 | $433 | $17 | $1,035 | 0.24% | 6.14% |
| 238330 | Flooring Contractors | 0 | 0 | $760 | $30 | $0 | 0.00% | 0.00% |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | $655 | $26 | $0 | 0.00% | 0.00% |
| 238350 | Finish Carpentry contractors | 0 | 0 | $517 | $20 | $0 | 0.00% | 0.00% |
| 238390 | Other building finishing contractors | 0 | 0 | $1,304 | $51 | $0 | 0.00% | 0.00% |
| 238910 | Site Preparation | 302 | 302 | $1,228 | $48 | $1,035 | 0.08% | 2.16% |
| | **Subtotal** | **13,815** | **14,316** | | | | | |
| **Crane Lessees in the Construction Industry** | | | | | | | | |
| 236115 | New Single family housing construction | 29,236 | 29,236 | $2,116 | $93 | $482 | 0.02% | 0.52% |
| 236116 | New Multifamily housing construction | 2,199 | 2,199 | $7,606 | $335 | $482 | 0.01% | 0.14% |
| 236117 | New housing operative builders | 13,022 | 13,022 | $10,692 | $472 | $482 | 0.00% | 0.10% |
| 236118 | Residential Remodelers | 8,275 | 8,275 | $5,442 | $240 | $482 | 0.01% | 0.20% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 236210 | Industrial building construction | 2,777 | 2,777 | $6,307 | $278 | $482 | 0.01% | 0.17% |
| 236220 | Commercial and Institutional Bldg.Construction | 37,208 | 37,208 | $6,490 | $286 | $482 | 0.01% | 0.17% |
| 237110 | Water and Sewer Line Const. | 12,357 | 12,357 | $2,629 | $122 | $482 | 0.02% | 0.39% |
| 237120 | Oil and gas pipeline construction | 1,052 | 1,403 | $8,254 | $384 | $482 | 0.01% | 0.13% |
| 237130 | Power and communication line const. | 2,263 | 3,017 | $11,295 | $525 | $482 | 0.00% | 0.09% |
| 237210 | Land subdivision | 0 | 0 | $0 | $0 | $0 | 0.00% | 0.00% |
| 237310 | Highway, street and bridge const. | 843 | 1,124 | $72,437 | $3,367 | $482 | 0.00% | 0.01% |
| 237990 | Other heavy and civil eng. | 5,251 | 5,251 | $3,950 | $184 | $482 | 0.01% | 0.26% |
| 238110 | Poured Concrete foundation and struct. | 1,358 | 1,358 | $24,877 | $1,157 | $482 | 0.00% | 0.04% |
| 238120 | Structural steel and precast concrete | 4,321 | 4,321 | $2,019 | $94 | $482 | 0.02% | 0.51% |
| 238130 | Framing Contractors | 10,841 | 10,841 | $1,331 | $52 | $482 | 0.04% | 0.93% |
| 238140 | Masonry Contractors | 1,286 | 1,286 | $15,762 | $614 | $482 | 0.00% | 0.08% |
| 238150 | Glass & Glazing Contractors | 529 | 529 | $12,086 | $471 | $482 | 0.00% | 0.10% |
| 238160 | Roofing Contractors | 2,319 | 2,319 | $9,923 | $387 | $482 | 0.00% | 0.12% |
| 238170 | Siding Contractors | 332 | 332 | $12,932 | $504 | $482 | 0.00% | 0.10% |
| 238190 | Other foundation, structure, building, ext. | 139 | 139 | $26,387 | $1,028 | $482 | 0.00% | 0.05% |
| 238210 | Electrical Contractors | 626 | 626 | $132,080 | $5,147 | $482 | 0.00% | 0.01% |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 875 | 875 | $135,367 | $5,275 | $482 | 0.00% | 0.01% |
| 238290 | Other building equipment cont. | 457 | 609 | $23,770 | $926 | $482 | 0.00% | 0.05% |
| 238310 | Drywall and insulation contractors | 0 | 0 | $0 | $0 | $0 | 0.00% | 0.00% |
| 238320 | Painting and wall covering contractors | 389 | 389 | $43,317 | $1,688 | $482 | 0.00% | 0.03% |
| 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 | 3,050 | 3,050 | $12,380 | $482 | $482 | 0.00% | 0.10% |
| | **Subtotal** | **141,004** | **142,542** | | | | | |
| | **Total** | **159,715** | **164,532** | | | | | |

Source: U.S. Census Bureau, Economic Census, 2002 for establishments, revenues, except Crane Rental w/o Operators group
Dunn and Bradstreet, Market Profiles, 2002 for data for Crane Rental w/o Operators group
Profit rates from Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002
Affected establish estimates from OSHA/Office of Regulatory Analysis (ORA)
Cost/establishment figures from Table B-9
Cost as a percent of revenue = Avg. establishment cost/avg establishment revenue

demand or profits. 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. If the 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 savings resulting from 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 remain in business and maintain approximately the same 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-13 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. In the Own and Rent Cranes with Operators sector, the impacts for a number of sectors are identical. This effect is an artifact of the cost model, which estimates the number of cranes, and hence costs, based on revenues. Since profits are also derived from revenues, the impacts parallel one another in several industry sectors.

As is evident from the data and estimates in Table B-13, average establishment costs of compliance for the proposal 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 at most, less than 0.26 percent (or 0.0026) of average establishment revenues. In most sectors it is lower.

The impact of the proposal measured by the ratio of costs to profits varies across the affected sectors. Among the sectors in the Crane Lessees sector, which includes about 142,500 of the 164,500 affected establishments, average employers are expected to have costs that represent much less than 1 percent of profits. Within the sector of employers Own but Do Not Rent, affected establishments in 11 of the 30 sectors have average costs as high as a few percent of profits (from 2 to 6 percent). This estimate of impact on costs as a percentage of profits is low, but OSHA notes that, for a few individual industries, the costs as a percentage of profits may be "significant" (over 5 percent). The Agency believes that in part the impact measure is high because the cost of compliance is compared with average revenues and profits for the industry as a whole. There are many very small employers across these industries, while it is likely that only larger employers own cranes. In that case, the average establishment's estimated revenue and profit are lower than that of affected establishments that own cranes, resulting in a

too-high ratio (or percentage) of costs to profits for the affected employers. The Agency seeks comment on this.

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 3 to 4 percent of profits. In the Own and Rent Cranes with Operators sectors, costs as a percentage of profits are estimated at 5 to 6 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 actually own cranes. Consequently, the average establishment revenues and profits may be considerably 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 seeks comment and additional data on this issue.

The Agency preliminarily concludes that the proposal 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 proposal fall well within the bounds of economic feasibility in each industry sector. Costs of 0.25 percent of revenues and 5 percent of profits will not

threaten the existence of the construction industry or the potential use of cranes in construction. OSHA does not expect compliance with the requirements of the proposal to threaten the viability of employers or the competitive structure of any of the affected industry sectors.

For several reasons, the Agency believes that the impact of compliance costs will be less than estimates in Table B-13. The economic impact of the proposal is most likely to consist of a very small increase in prices for construction projects involving work with cranes (0.26 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 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 proposal are substantially recouped with an increase in rental prices, there would be little effect on profits.

Given the small incremental increases in prices potentially resulting from compliance with the proposed standard and the lack of readily available substitutes for the products and services provided by the covered 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.

8. Initial Regulatory Flexibility Analysis

The Regulatory Flexibility Act, as amended in 1996, requires the preparation of an Initial Regulatory Flexibility Analysis (IRFA) for certain 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 proposed rule on small entities;
2. a description of the reasons why action by the agency is being considered;
3. a succinct statement of the objectives of, and legal basis for, the proposed rule;
4. a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
5. a description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirements and the type of professional skills necessary for preparation of the report or record;
6. an identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap or conflict with the proposed rule; and
7. a description and discussion of any significant alternatives to the proposed rule that accomplish the stated objectives of applicable statutes and that minimize any significant economic impact of the proposed rule on small entities, including:

a) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;

b) the clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;

c) the use of performance rather than design standards; and

d) an exemption from coverage of the rule, or any part thereof, for such small entities.

The Regulatory Flexibility Act further states that the required elements of the IRFA may be performed in conjunction with or as part of any other agenda or analysis required by any other law if such other analysis satisfies the relevant provisions.

*1. Impact of the proposed rule on small entities.*

OSHA has analyzed the potential impact of the proposed standards on small entities. The total annual cost of compliance with the proposal for small entities is estimated to be $105 million, as shown by industry in Table B-14. 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 identifier.

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-15. OSHA expects that among small entities potentially affected by the proposal, the average increase in prices necessary to completely offset the compliance costs would be 0.08 percent. The average price increase necessary to completely offset compliance costs would not exceed 0.26 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

**Table B- 14**
**Annualized Compliance Costs for SBA Defined Small Entities by Major Category**

| Category | Industry | Firms | Estabs. | Annualized Compliance Costs | Cost Per Estab. |
|---|---|---|---|---|---|
| **Crane Rental with Operators** | | | | | |
| 238990 | All Other Specialty Trade Cont. | 1,171 | 1,223 | $3,114,525 | $2,661 |
| **Crane Rental without Operators (Bare Rentals)** | | | | | |
| 532412 | Const./Min./For. Machine & Equip. | 1,782 | 3,927 | $4,870,341 | $1,240 |
| **Own and Rent Cranes with Operators** | | | | | |
| 236115 | New Single-Family Housing Const. | 168 | 168 | $101,447 | $604 |
| 236118 | Residential Remodelers | 21 | 21 | $28,669 | $1,365 |
| 236210 | Industrial Building Construction | 8 | 10 | $379,278 | $37,928 |
| 236220 | Commercial and Institutional Building | 21 | 28 | $333,534 | $11,912 |
| 237110 | Water and Sewer Line and Related Struct. | 47 | 62 | $733,293 | $11,827 |
| 237120 | Oil and Gas Pipeline and Related Struct. | 16 | 21 | $370,772 | $17,656 |
| 237130 | Power and Communication Line and Rel. | 36 | 36 | $253,380 | $7,038 |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | $3,262,951 | $32,306 |
| 237990 | Other Heavy and Civil Engineering Const. | 143 | 191 | $2,666,449 | $13,960 |
| 238110 | Poured Concrete Foundation and Struct. | 263 | 263 | $1,535,239 | $5,837 |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | $2,367,593 | $7,422 |
| 238130 | Framing Contractors | 20 | 20 | $10,326 | $516 |
| 238150 | Glass and Glazing Contractors | 41 | 41 | $66,984 | $1,634 |
| 238170 | Siding Contractors | 3 | 3 | $6,421 | $2,140 |
| 238190 | Other Foundation, Structure, and Building | 26 | 35 | $253,836 | $7,252 |
| 238210 | Electrical Contractors | 12 | 12 | $50,579 | $4,215 |
| 238220 | Plumbing, Heating, and Air-Conditioning | 2 | 3 | $45,304 | $15,101 |
| 238290 | Other Building Equipment Contractors | 104 | 138 | $1,357,502 | $9,837 |
| 238320 | Painting and Wall Covering Contract. | 20 | 20 | $49,800 | $2,490 |
| 238910 | Site Preparation Contractors | 311 | 311 | $1,727,104 | $5,553 |
| | **Subtotal** | **1,576** | **1,803** | **$15,600,459** | |
| **Own but Do Not Rent** | | | | | |
| 236115 | New Single family housing construction | 2,906 | 2,906 | $3,008,274 | $1,035 |
| 236116 | New Multifamily housing construction | 213 | 213 | $220,441 | $1,035 |
| 236117 | New housing operative builders | 1,263 | 1,263 | $1,307,790 | $1,035 |
| 236118 | Residential Remodelers | 825 | 825 | $854,352 | $1,035 |
| 236210 | Industrial building construction | 223 | 262 | $271,527 | $1,035 |
| 236220 | Commercial and Institutional Bldg.Const. | 3,615 | 3,615 | $3,741,748 | $1,035 |
| 237110 | Water and Sewer Line Const. | 918 | 1,223 | $1,266,435 | $1,035 |
| 237120 | Oil and gas pipeline construction | 98 | 131 | $135,815 | $1,035 |
| 237130 | Power and communication line const. | 218 | 291 | $301,443 | $1,035 |
| 237210 | Land subdivision | 0 | 0 | $0 | $0 |
| 237310 | Highway, street and bridge const. | 70 | 93 | $96,478 | $1,035 |
| 237990 | Other heavy and civil eng. | 502 | 502 | $519,969 | $1,035 |
| 238110 | Poured Concrete foundation and struct. | 108 | 108 | $111,349 | $1,035 |
| 238120 | Structural steel and precast concrete | 388 | 388 | $402,062 | $1,035 |
| 238130 | Framing Contractors | 1,061 | 1,061 | $1,098,374 | $1,035 |
| 238140 | Masonry Contractors | 128 | 128 | $132,658 | $1,035 |
| 238150 | Glass & Glazing Contractors | 49 | 49 | $50,247 | $1,035 |

| | | | | | |
|---|---|---|---|---|---|
| 238160 | Roofing Contractors | 230 | 230 | $237,708 | $1,035 |
| 238170 | Siding Contractors | 33 | 33 | $33,902 | $1,035 |
| 238190 | Other foundation, structure, building, ext. | 10 | 10 | $10,476 | $1,035 |
| 238210 | Electrical Contractors | 60 | 60 | $62,427 | $1,035 |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 86 | 86 | $89,073 | $1,035 |
| 238290 | Other building equipment cont. | 34 | 45 | $46,573 | $1,035 |
| 238310 | Drywall and insulation contractors | 0 | 0 | $0 | $0 |
| 238320 | Painting and wall covering contractors | 37 | 37 | $38,219 | $1,035 |
| 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 | 271 | 271 | $280,543 | $1,035 |
| | **Subtotal** | **13,346** | **13,831** | **$14,317,883** | |
| **Crane Lessees in the Construction Industry** | | | | | |
| 236115 | New Single family housing construction | 29,229 | 29,229 | $14,094,064 | $482 |
| 236116 | New Multifamily housing construction | 2,130 | 2,130 | $1,026,851 | $482 |
| 236117 | New housing operative builders | 12,634 | 12,634 | $6,091,909 | $482 |
| 236118 | Residential Remodelers | 8,274 | 8,274 | $3,989,842 | $482 |
| 236210 | Industrial building construction | 2,633 | 2,633 | $1,269,640 | $482 |
| 236220 | Commercial and Institutional Bldg.Construction | 36,174 | 36,174 | $17,443,203 | $482 |
| 237110 | Water and Sewer Line Const. | 12,296 | 12,296 | $5,929,165 | $482 |
| 237120 | Oil and gas pipeline construction | 1,000 | 1,333 | $642,776 | $482 |
| 237130 | Power and communication line const. | 2,211 | 2,948 | $1,421,534 | $482 |
| 237210 | Land subdivision | 0 | 0 | $0 | $0 |
| 237310 | Highway, street and bridge const. | 775 | 1,033 | $498,115 | $482 |
| 237990 | Other heavy and civil eng. | 5,214 | 5,214 | $2,514,205 | $482 |
| 238110 | Poured Concrete foundation and struct. | 1,339 | 1,339 | $645,501 | $482 |
| 238120 | Structural steel and precast concrete | 4,203 | 4,203 | $2,026,698 | $482 |
| 238130 | Framing Contractors | 10,631 | 10,631 | $5,126,057 | $482 |
| 238140 | Masonry Contractors | 1,283 | 1,283 | $618,425 | $482 |
| 238150 | Glass & Glazing Contractors | 526 | 526 | $253,832 | $482 |
| 238160 | Roofing Contractors | 2,299 | 2,299 | $1,108,729 | $482 |
| 238170 | Siding Contractors | 331 | 331 | $159,368 | $482 |
| 238190 | Other foundation, structure, building, ext. | 136 | 136 | $65,676 | $482 |
| 238210 | Electrical Contractors | 615 | 615 | $296,584 | $482 |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 863 | 863 | $416,363 | $482 |
| 238290 | Other building equipment cont. | 441 | 588 | $283,487 | $482 |
| 238310 | Drywall and insulation contractors | 0 | 0 | $0 | $0 |
| 238320 | Painting and wall covering contractors | 389 | 389 | $187,673 | $482 |
| 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 | 3,021 | 3,021 | $1,456,783 | $482 |
| | **Subtotal** | **138,645** | **140,120** | **$67,566,479** | |
| | **Total** | **156,520** | **160,905** | **$105,469,687** | |

Source: U.S. Census Bureau, Economic Census, 2002
Dunn and Bradstreet, Market Profiles, 2002
Data from Table 2 for number of affected establishments
Cost estimates from OSHA cost model, ORA

**Table B - 15**
**Economic Impacts for SBA Defined Small Entities by Major Categories**

| Category | Industry | Firms | 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. | 1,171 | 1,223 | $1,551 | $64 | $2,661 | 0.17% | 4.18% |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | | | |
| 532412 | Const./Min./For. Machine & Equip. | 1,782 | 3,927 | $935 | $37 | $1,240 | 0.13% | 3.32% |
| **Own and Rent Cranes with Operators** | | | | | | | | |
| 236115 | New Single-Family Housing Const. | 168 | 168 | $233 | $10 | $604 | 0.26% | 5.87% |
| 236118 | Residential Remodelers | 21 | 21 | $528 | $23 | $1,365 | 0.26% | 5.87% |
| 236210 | Industrial Building Construction | 8 | 10 | $14,656 | $646 | $37,928 | 0.26% | 5.87% |
| 236220 | Commercial and Institutional Building | 21 | 28 | $4,603 | $203 | $11,912 | 0.26% | 5.87% |
| 237110 | Water and Sewer Line and Related Struct. | 47 | 62 | $4,570 | $213 | $11,827 | 0.26% | 5.57% |
| 237120 | Oil and Gas Pipeline and Related Struct. | 16 | 21 | $6,822 | $317 | $17,656 | 0.26% | 5.57% |
| 237130 | Power and Communication Line and Rel. | 36 | 36 | $2,720 | $126 | $7,038 | 0.26% | 5.57% |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | $12,483 | $580 | $32,306 | 0.26% | 5.57% |
| 237990 | Other Heavy and Civil Engineering Const. | 143 | 191 | $5,394 | $251 | $13,960 | 0.26% | 5.57% |
| 238110 | Poured Concrete Foundation and Struct. | 263 | 263 | $2,256 | $105 | $5,837 | 0.26% | 5.57% |
| 238120 | Structural Steel and Precast Concrete | 239 | 319 | $2,868 | $133 | $7,422 | 0.26% | 5.57% |
| 238130 | Framing Contractors | 20 | 20 | $200 | $8 | $516 | 0.26% | 6.64% |
| 238150 | Glass and Glazing Contractors | 41 | 41 | $631 | $25 | $1,634 | 0.26% | 6.64% |
| 238170 | Siding Contractors | 3 | 3 | $827 | $32 | $2,140 | 0.26% | 6.64% |
| 238190 | Other Foundation, Structure, and Building | 26 | 35 | $2,802 | $109 | $7,252 | 0.26% | 6.64% |
| 238210 | Electrical Contractors | 12 | 12 | $1,629 | $63 | $4,215 | 0.26% | 6.64% |
| 238220 | Plumbing, Heating, and Air-Conditioning | 2 | 3 | $5,835 | $227 | $15,101 | 0.26% | 6.64% |
| 238290 | Other Building Equipment Contractors | 104 | 138 | $3,801 | $148 | $9,837 | 0.26% | 6.64% |
| 238320 | Painting and Wall Covering Contract. | 20 | 20 | $962 | $37 | $2,490 | 0.26% | 6.64% |
| 238910 | Site Preparation Contractors | 311 | 311 | $2,146 | $84 | $5,553 | 0.26% | 6.64% |
| | **Subtotal** | **1,576** | **1,803** | | | | | |
| **Own but Do Not Rent** | | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 236115 | New Single family housing construction | 2,906 | 2,906 | $1,000 | $44 | $1,035 | 0.10% | 2.35% |
| 236116 | New Multifamily housing construction | 213 | 213 | $3,400 | $150 | $1,035 | 0.03% | 0.69% |
| 236117 | New housing operative builders | 1,263 | 1,263 | $5,104 | $225 | $1,035 | 0.02% | 0.46% |
| 236118 | Residential Remodelers | 825 | 825 | $543 | $24 | $1,035 | 0.19% | 4.32% |
| 236210 | Industrial building construction | 223 | 262 | $2,570 | $113 | $1,035 | 0.04% | 0.91% |
| 236220 | Commercial and Institutional Bldg.Const. | 3,615 | 3,615 | $3,661 | $161 | $1,035 | 0.03% | 0.64% |
| 237110 | Water and Sewer Line Const. | 918 | 1,223 | $2,324 | $108 | $1,035 | 0.04% | 0.96% |
| 237120 | Oil and gas pipeline construction | 98 | 131 | $3,743 | $174 | $1,035 | 0.03% | 0.59% |
| 237130 | Power and communication line const. | 218 | 291 | $4,656 | $216 | $1,035 | 0.02% | 0.48% |
| 237210 | Land subdivision | 0 | 0 | $0 | $0 | $0 | 0.00% | 0.00% |
| 237310 | Highway, street and bridge const. | 70 | 93 | $3,225 | $150 | $1,035 | 0.03% | 0.69% |
| 237990 | Other heavy and civil eng. | 502 | 502 | $1,500 | $70 | $1,035 | 0.07% | 1.48% |
| 238110 | Poured Concrete foundation and struct. | 108 | 108 | $1,000 | $47 | $1,035 | 0.10% | 2.23% |
| 238120 | Structural steel and precast concrete | 388 | 388 | $1,425 | $66 | $1,035 | 0.07% | 1.56% |
| 238130 | Framing Contractors | 1,061 | 1,061 | $798 | $31 | $1,035 | 0.13% | 3.33% |
| 238140 | Masonry Contractors | 128 | 128 | $675 | $26 | $1,035 | 0.15% | 3.94% |
| 238150 | Glass & Glazing Contractors | 49 | 49 | $900 | $35 | $1,035 | 0.12% | 2.95% |
| 238160 | Roofing Contractors | 230 | 230 | $801 | $31 | $1,035 | 0.13% | 3.32% |
| 238170 | Siding Contractors | 33 | 33 | $600 | $23 | $1,035 | 0.17% | 4.43% |
| 238190 | Other foundation, structure, building, ext. | 10 | 10 | $900 | $35 | $1,035 | 0.12% | 2.95% |
| 238210 | Electrical Contractors | 60 | 60 | $1,100 | $43 | $1,035 | 0.09% | 2.42% |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 86 | 86 | $1,100 | $43 | $1,035 | 0.09% | 2.42% |
| 238290 | Other building equipment cont. | 34 | 45 | $1,664 | $65 | $1,035 | 0.06% | 1.60% |
| 238310 | Drywall and insulation contractors | 0 | 0 | $0 | $0 | $0 | 0.00% | 0.00% |
| 238320 | Painting and wall covering contractors | 37 | 37 | $419 | $16 | $1,035 | 0.25% | 6.34% |
| 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 | 271 | 271 | $962 | $37 | $1,035 | 0.11% | 2.76% |
| | **Subtotal** | **13,346** | **13,831** | | | | | |
| **Crane Lessees in the Construction Industry** | | | | | | | | |
| 236115 | New Single family housing construction | 29,229 | 29,229 | $2,116 | $93 | $482 | 0.02% | 0.52% |
| 236116 | New Multifamily housing construction | 2,130 | 2,130 | $7,606 | $335 | $482 | 0.01% | 0.14% |
| 236117 | New housing operative builders | 12,634 | 12,634 | $10,692 | $472 | $482 | 0.00% | 0.10% |
| 236118 | Residential Remodelers | 8,274 | 8,274 | $5,442 | $240 | $482 | 0.01% | 0.20% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 236210 | Industrial building construction | 2,633 | 2,633 | $6,307 | $278 | $482 | 0.01% | 0.17% |
| 236220 | Commercial and Institutional Bldg.Construction | 36,174 | 36,174 | $6,490 | $286 | $482 | 0.01% | 0.17% |
| 237110 | Water and Sewer Line Const. | 12,296 | 12,296 | $2,629 | $122 | $482 | 0.02% | 0.39% |
| 237120 | Oil and gas pipeline construction | 1,000 | 1,333 | $8,254 | $384 | $482 | 0.01% | 0.13% |
| 237130 | Power and communication line const. | 2,211 | 2,948 | $11,295 | $525 | $482 | 0.00% | 0.09% |
| 237210 | Land subdivision | 0 | 0 | $0 | $0 | $0 | 0.00% | 0.00% |
| 237310 | Highway, street and bridge const. | 775 | 1,033 | $72,437 | $3,367 | $482 | 0.00% | 0.01% |
| 237990 | Other heavy and civil eng. | 5,214 | 5,214 | $3,950 | $184 | $482 | 0.01% | 0.26% |
| 238110 | Poured Concrete foundation and struct. | 1,339 | 1,339 | $24,877 | $1,157 | $482 | 0.00% | 0.04% |
| 238120 | Structural steel and precast concrete | 4,203 | 4,203 | $2,019 | $94 | $482 | 0.02% | 0.51% |
| 238130 | Framing Contractors | 10,631 | 10,631 | $1,331 | $52 | $482 | 0.04% | 0.93% |
| 238140 | Masonry Contractors | 1,283 | 1,283 | $15,762 | $614 | $482 | 0.00% | 0.08% |
| 238150 | Glass & Glazing Contractors | 526 | 526 | $12,086 | $471 | $482 | 0.00% | 0.10% |
| 238160 | Roofing Contractors | 2,299 | 2,299 | $9,923 | $387 | $482 | 0.00% | 0.12% |
| 238170 | Siding Contractors | 331 | 331 | $12,932 | $504 | $482 | 0.00% | 0.10% |
| 238190 | Other foundation, structure, building, ext. | 136 | 136 | $26,387 | $1,028 | $482 | 0.00% | 0.05% |
| 238210 | Electrical Contractors | 615 | 615 | $132,080 | $5,147 | $482 | 0.00% | 0.01% |
| 238220 | Plumbing, Heating and Airconditioning Cont. | 863 | 863 | $135,367 | $5,275 | $482 | 0.00% | 0.01% |
| 238290 | Other building equipment cont. | 441 | 588 | $23,770 | $926 | $482 | 0.00% | 0.05% |
| 238310 | Drywall and insulation contractors | 0 | 0 | $0 | $0 | $0 | 0.00% | 0.00% |
| 238320 | Painting and wall covering contractors | 389 | 389 | $43,317 | $1,688 | $482 | 0.00% | 0.03% |
| 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 | 3,021 | 3,021 | $12,380 | $482 | $482 | 0.00% | 0.10% |
| | **Subtotal** | **138,645** | **140,120** | | | | | |
| | **Total** | **156,520** | **160,905** | | | | | |
| | | | | | | Simple Average of impacts: | **0.10%** | **2.29%** |

Source: U.S. Census Bureau, Economic Census, 2002 for establishments, revenues, except Crane Rental w/o Operators group
Dunn and Bradstreet, Market Profiles, 2002 for data for Crane Rental w/o Operators group
Profit rates from Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002
Affected establish estimates from OSHA/Office of Regulatory Analysis (ORA)
Cost/establishment figures from Table B-14
Cost as a percent of revenue = Avg. establishment cost/avg establishment revenue

through, the compliance costs could be completely absorbed through an average reduction in profits of 1.8 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 6.64 percent in any of the affected industries.

In order to further ensure that potential impacts on small entities were fully analyzed and considered, OSHA also separately examined the potential impacts of the proposed standards on very small entities, defined as employers with fewer than 20 employees. To assess the potential economic impact of the proposed standards 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-16. OSHA expects that among very small entities potentially affected by the proposed standards, the average increase in prices necessary to completely offset the compliance costs would be 0.11 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 2.60 percent among affected very small entities.

*2. A description of the reasons why action by the agency is being considered.*

Employees performing construction work involving cranes/derricks are potentially exposed to a variety of significant hazards that can and do cause serious injury

and death. OSHA estimates that 263 serious injuries and 89 fatalities occur annually among these workers.

**Table B - 16**

**Economic Impacts for Very Small Entities (Less than 20 Employees) by Major Category**

| Category | Industry | Firms | Estab's | 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. | 1,013 | 1,013 | 4,824 | 4.10% | $614 | $25 | $1,009 | 0.16% | 4.00% |
| **Crane Rental without Operators (Bare Rentals)** | | | | | | | | | | |
| 532412 | Const./Min./For. Machine & Equip. | 1,782 | 3,927 | 20,459 | 4.00% | $935 | $37 | $1,240 | 0.13% | 3.32% |
| **Own and Rent Cranes with Operators** | | | | | | | | | | |
| 236115 | New Single-Family Housing Const. | 168 | 168 | 261 | 4.41% | $233 | $10 | $604 | 0.26% | 5.87% |
| 236118 | Residential Remodelers | 21 | 21 | 45 | 4.41% | $528 | $23 | $1,365 | 0.26% | 5.87% |
| 236210 | Industrial Building Construction | 8 | 10 | 1,067 | 4.41% | $14,656 | $646 | $37,928 | 0.26% | 5.87% |
| 236220 | Commercial and Institutional Building | 21 | 28 | 757 | 4.41% | $4,603 | $203 | $11,912 | 0.26% | 5.87% |
| 237110 | Water and Sewer Line and Related Struct. | 47 | 62 | 1,432 | 4.65% | $4,570 | $213 | $11,827 | 0.26% | 5.57% |
| 237120 | Oil and Gas Pipeline and Related Struct. | 16 | 21 | 1,457 | 4.65% | $6,822 | $317 | $17,656 | 0.26% | 5.57% |
| 237130 | Power and Communication Line and Rel. | 36 | 36 | 666 | 4.65% | $2,720 | $126 | $7,038 | 0.26% | 5.57% |
| 237310 | Highway, Street, and Bridge Construction | 76 | 101 | 6,456 | 4.65% | $12,483 | $580 | $32,306 | 0.26% | 5.57% |
| 237990 | Other Heavy and Civil Engineering Const. | 143 | 191 | 5,857 | 4.65% | $5,394 | $251 | $13,960 | 0.26% | 5.57% |
| 238110 | Poured Concrete Foundation and Struct. | 263 | 263 | 4,328 | 4.65% | $2,256 | $105 | $5,837 | 0.26% | 6.64% |
| (All other sectors in this category have no very small affected firms) | | | | | | | | | | |
| | | **798** | **901** | **22,326** | | | | | | |
| **Own Cranes But Do Not Rent Them** | | | | | | | | | | |
| 236115 | New Single family housing construction | 2,763 | 2,763 | 12,910 | 4.41% | $823 | $36 | $1,035 | 0.13% | 2.85% |
| 236116 | New Multifamily housing construction | 197 | 197 | 1,987 | 4.41% | $1,350 | $60 | $1,035 | 0.08% | 1.74% |
| 236117 | New housing operative builders | 1,206 | 1,206 | 11,127 | 4.41% | $1,854 | $82 | $1,035 | 0.06% | 1.27% |
| 236118 | Residential Remodelers | 808 | 808 | 3,126 | 4.41% | $443 | $20 | $1,035 | 0.23% | 5.30% |
| 236210 | Industrial building construction | 209 | 209 | 7,076 | 4.41% | $1,247 | $55 | $1,035 | 0.08% | 1.88% |
| 236220 | Commercial and Institutional Bldg.Construction | 2,943 | 2,943 | 56,620 | 4.41% | $1,526 | $67 | $1,035 | 0.07% | 1.54% |
| 237110 | Water and Sewer Line Const. | 900 | 900 | 14,864 | 4.65% | $702 | $33 | $1,035 | 0.15% | 3.17% |
| 237120 | Oil and gas pipeline construction | 63 | 63 | 4,224 | 4.65% | $708 | $33 | $1,035 | 0.15% | 3.14% |
| 237130 | Power and communication line const. | 207 | 207 | 8,703 | 4.65% | $655 | $30 | $1,035 | 0.16% | 3.40% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 237210 | Land subdivision | 0 | 0 | 0 | 4.65% | $0 | $0 | $0 | 0.00% | 0.00% |
| 237310 | Highway, street and bridge const. | 66 | 66 | 2,558 | 4.65% | $976 | $45 | $1,035 | 0.11% | 2.28% |
| 237990 | Other heavy and civil eng. | 378 | 378 | 5,549 | 4.65% | $589 | $27 | $1,035 | 0.18% | 3.78% |
| 238110 | Poured Concrete foundation and struct. | 46 | 46 | 527 | 4.65% | $494 | $23 | $1,035 | 0.21% | 4.50% |
| 238120 | Structural steel and precast concrete | 90 | 90 | 1,625 | 4.65% | $659 | $31 | $1,035 | 0.16% | 3.38% |
| 238130 | Framing Contractors | 981 | 981 | 10,728 | 3.90% | $374 | $15 | $1,035 | 0.28% | 7.10% |
| 238140 | Masonry Contractors | 115 | 115 | 1,165 | 3.90% | $343 | $13 | $1,035 | 0.30% | 7.75% |
| 238150 | Glass & Glazing Contractors | 44 | 44 | 418 | 3.90% | $619 | $24 | $1,035 | 0.17% | 4.29% |
| 238160 | Roofing Contractors | 206 | 206 | 2,013 | 3.90% | $447 | $17 | $1,035 | 0.23% | 5.95% |
| 238170 | Siding Contractors | 31 | 31 | 202 | 3.90% | $408 | $16 | $1,035 | 0.25% | 6.52% |
| 238190 | Other foundation, structure, building, ext. | 10 | 10 | 115 | 3.90% | $394 | $15 | $1,035 | 0.26% | 6.74% |
| 238210 | Electrical Contractors | 54 | 54 | 671 | 3.90% | $444 | $17 | $1,035 | 0.23% | 5.99% |
| 238220 | Plumbing, Heating and Airconditioning Contractors | 77 | 77 | 861 | 3.90% | $509 | $20 | $1,035 | 0.20% | 5.22% |
| 238290 | Other building equipment cont. | 30 | 30 | 624 | 3.90% | $714 | $28 | $1,035 | 0.15% | 3.72% |
| 238310 | Drywall and insulation contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238320 | Painting and wall covering contractors | 37 | 37 | 222 | 3.90% | $265 | $10 | $1,035 | 0.39% | 10.01% |
| 238330 | Flooring Contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238350 | Finish Carpentry contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238390 | Other building finishing contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238910 | Site Preparation | 271 | 271 | 2,536 | 3.90% | $497 | $19 | $1,035 | 0.21% | 5.34% |
| | **Subtotal** | **11,733** | **11,733** | **150,451** | | | | | | |
| **Crane Lessees in the Construction Industry** | | | | | | | | | | |
| 236115 | New Single family housing construction | 28,449 | 28,449 | 132,922 | 4.41% | $1,645 | $73 | $482 | 0.03% | 0.66% |
| 236116 | New Multifamily housing construction | 1,968 | 1,968 | 19,865 | 4.41% | $2,700 | $119 | $482 | 0.02% | 0.40% |
| 236117 | New housing operative builders | 12,059 | 12,059 | 111,265 | 4.41% | $3,708 | $164 | $482 | 0.01% | 0.29% |
| 236118 | Residential Remodelers | 8,099 | 8,099 | 31,341 | 4.41% | $4,431 | $195 | $482 | 0.01% | 0.25% |
| 236210 | Industrial building construction | 2,170 | 2,170 | 62,390 | 4.41% | $1,247 | $55 | $482 | 0.04% | 0.88% |
| 236220 | Commercial and Institutional Bldg.Construction | 29,651 | 29,651 | 570,496 | 4.41% | $1,526 | $67 | $482 | 0.03% | 0.72% |
| 237110 | Water and Sewer Line Const. | 9,867 | 9,867 | 122,221 | 4.65% | $702 | $33 | $482 | 0.07% | 1.48% |
| 237120 | Oil and gas pipeline construction | 740 | 740 | 37,254 | 4.65% | $708 | $33 | $482 | 0.07% | 1.46% |
| 237130 | Power and communication line const. | 2,203 | 2,203 | 69,416 | 4.65% | $1,311 | $61 | $482 | 0.04% | 0.79% |
| 237210 | Land subdivision | 0 | 0 | 0 | 4.65% | $0 | $0 | $0 | 0.00% | 0.00% |
| 237310 | Highway, street and bridge const. | 727 | 727 | 21,081 | 4.65% | $9,762 | $454 | $482 | 0.00% | 0.11% |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 237990 | Other heavy and civil engg. | 4,624 | 4,624 | 67,830 | 4.65% | $1,177 | $55 | $482 | 0.04% | 0.88% |
| 238110 | Poured Concrete foundation and struct. | 1,213 | 1,213 | 13,844 | 4.65% | $9,888 | $460 | $482 | 0.00% | 0.10% |
| 238120 | Structural steel and precast concrete | 3,428 | 3,428 | 62,091 | 4.65% | $659 | $31 | $482 | 0.07% | 1.57% |
| 238130 | Framing Contractors | 9,953 | 9,953 | 108,788 | 3.90% | $498 | $19 | $482 | 0.10% | 2.48% |
| 238140 | Masonry Contractors | 1,150 | 1,150 | 11,655 | 3.90% | $6,859 | $267 | $482 | 0.01% | 0.18% |
| 238150 | Glass & Glazing Contractors | 472 | 472 | 4,528 | 3.90% | $6,194 | $241 | $482 | 0.01% | 0.20% |
| 238160 | Roofing Contractors | 2,067 | 2,067 | 20,160 | 3.90% | $4,465 | $174 | $482 | 0.01% | 0.28% |
| 238170 | Siding Contractors | 312 | 312 | 2,027 | 3.90% | $8,155 | $318 | $482 | 0.01% | 0.15% |
| 238190 | Other foundation, structure, building, ext. | 122 | 122 | 1,404 | 3.90% | $7,885 | $307 | $482 | 0.01% | 0.16% |
| 238210 | Electrical Contractors | 545 | 545 | 6,719 | 3.90% | $44,376 | $1,729 | $482 | 0.00% | 0.03% |
| 238220 | Plumbing, Heating and Airconditioning Contractors | 774 | 774 | 8,614 | 3.90% | $50,865 | $1,982 | $482 | 0.00% | 0.02% |
| 238290 | Other building equipment cont. | 435 | 435 | 6,783 | 3.90% | $7,667 | $299 | $482 | 0.01% | 0.16% |
| 238310 | Drywall and insulation contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238320 | Painting and wall covering contractors | 370 | 370 | 2,228 | 3.90% | $26,527 | $1,034 | $482 | 0.00% | 0.05% |
| 238330 | Flooring Contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238340 | Tile and Terrazzo contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238350 | Finish Carpentry contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238390 | Other building finishing contractors | 0 | 0 | 0 | 3.90% | $0 | $0 | $0 | 0.00% | 0.00% |
| 238910 | Site Preparation | 2,739 | 2,739 | 25,631 | 3.90% | $4,974 | $194 | $482 | 0.01% | 0.25% |
| | **Subtotal** | **124,135** | **124,135** | **1,520,554** | | | | | | |
| | **Total** | **139,461** | **141,709** | **1,718,614** | | | | | | |

Source: U.S. Census Bureau, Economic Census, 2002 for establishments, revenues, except Crane Rental w/o Operators group
Dunn and Bradstreet, Market Profiles, 2002 for data for Crane Rental w/o Operators group
Profit rates from Internal Revenue Service, Statistics of Income 2002 Corporation Source Book, 2002
Affected establish estimates from OSHA/Office of Regulatory Analysis (ORA)
Cost/establishment figures from Table B-14
Cost as a percent of revenue = Avg. establishment cost/avg establishment revenue

Although some of these incidents may have been prevented with better compliance with existing safety standards, research and analyses conducted by OSHA have found that most injuries and fatalities would be prevented through compliance with the proposed standard. .In this regard, the existing OSHA standards for the construction industry do not directly address all of the hazards associated with work involving cranes/derricks in a comprehensive manner. An estimated 53 fatalities and 155 injuries would be prevented annually through full compliance with the proposed standard. An additional and more complete discussion of the reasons why this standard is being proposed by the Agency is provided above in the Summary and Explanation section of the Preamble.

*3. Statement of the objectives of, and legal basis for, the proposed 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 155 injuries and 53 fatalities would be prevented annually through compliance with the proposed standard. Another objective of the proposed 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).

*4. Description of and estimate of the number of small entities to which the proposed rule will apply.*

OSHA has completed a preliminary analysis of the economic impacts associated with this proposal, including an analysis of the type and number of small entities to which the proposed rule would apply, as described above. In order 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 proposal is estimated to potentially affect a total of 160,905 small entities, as shown in Tables B-14 and 15. Included in this number are an estimated 141,709 entities with fewer than 20 employees (Table B-16).

*5. Description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule.*

OSHA is proposing a standard which would address the work practices to be used, and other requirements to be followed, for performing construction work involving

cranes/derricks. Employers would be required to keep certain records associated with inspections and operator certification/qualification as specified by the proposed standard. Regular reporting would not be required by the proposed standard; however, employers would be required to demonstrate compliance with the recordkeeping requirements as part of OSHA compliance inspections.

Other compliance requirements of the proposed standard include, as required, the assembly and disassembly requirements, encroachment prevention precautions when working near power lines, and ground condition and power line assessments.

The preamble to the proposed standard provides a comprehensive description of, and further detail regarding, the provisions of the proposed rulemaking. A description of the types of business entities which would be subject to the new and revised requirements, and the types of professional skills necessary for compliance with the requirements, is presented in the preceding chapters of this economic analysis.

*6. Federal rules which may duplicate, overlap or conflict with the proposed rule.*

OSHA recognizes that this standard may overlap with provisions in other construction standards, such as those standards addressing general training requirements. OSHA has clarified the relationship between the proposed standard and other pre-existing construction standards which may be applicable to cranes/derricks in the summary and explanation section of this preamble. Finally, OSHA has not identified any other Federal rules which may duplicate, overlap, or conflict with the proposal, and requests comments from the public regarding this determination.

*7. Alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.*

OSHA and C-DAC evaluated many alternatives to the proposed standards to ensure that the proposed requirements would accomplish the stated objectives of applicable statutes and would minimize any significant economic impact of the proposal on small entities. In developing the proposal, OSHA took into account the resources available to small entities. An exemption from coverage of the rule for small entities was not considered to be a viable option because the safety and health of the affected employees would be unduly jeopardized. Other regulatory alternatives were recommended by the Small Business Advocacy Review Panel, which was convened for purposes of soliciting comments on the proposal from affected small entities. A discussion of these alternatives is provided below.

Nonregulatory alternatives were also considered for occupational hazards associated with construction work involving cranes/derricks. These alternatives were discussed above in section 2 Identification of Market Failure and Need for Regulation.

*Alternatives considered and changes made in response to comments from small entities and recommendations from the Small Business Advocacy Review Panel*

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. In response to the Panel's recommendations, OSHA revised many of its assumptions, estimates of unit costs, and aspects of its economic model from the PIRFA for this PEA. These revisions are noted throughout the PEA, but principally in the sections for the industrial profile and estimates of costs of compliance.

*Panel Report Recommendations and Alternatives*

Small entity representatives (SERs) had an opportunity to meet with the Panel and comment on the draft proposal, as well as submit written comments to the Panel afterward. Some SERs who are in the business of supplying construction materials, and who deliver those materials to construction sites, believed that the proposed standard should not apply to their work. While there are many circumstances in which such businesses are not in the scope of the standard, there may be some circumstances in which they would be within the scope of the standard. The Panel

recommended that OSHA consider excluding them from the scope of the standard, and solicit 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. OSHA has addressed this issue in the scope section of the preamble.

Some SERs favored the operator certification/qualification section, and some SERs were opposed to various aspects of it. The Panel anticipated that there would be considerable public comment on the proposed rule regarding this issue. The Panel recommended that OSHA consider the information and range of opinions that were presented by the SERs on this issue when analyzing their comments. As noted above, the Panel recommended that OSHA include, as part of its preliminary economic analysis, an analysis of the costs, economic impacts, and benefits of operator certification/qualification. Also, based on the SERs' comments, the Panel recommended 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 and model of crane. OSHA has addressed this issue in the operator qualification and certification section of the preamble and in this PEA.

Some SERs described crane operators whose abilities were limited to operating particular equipment in a very limited set of circumstances. They believed that these operators are fully capable of doing the work, but would be unable to pass certification tests that require knowledge and abilities beyond these limited circumstances. In response to these comments, the Panel recommended that OSHA consider, and solicit public comment on, expanding these provisions to allow an operator to be certified for

specific, limited circumstances. Such circumstances would be defined by a set of parameters that, taken together, would limit an operation to simple, low-risk operations. Also, the Panel recommended that OSHA consider and solicit 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. OSHA requests comment on these issue.

A SER commented that it would be burdensome for small employers in remote areas to send their operators long distances to have them tested, and that it may be difficult or costly to arrange to have an accredited testing organization come to their area to administer the tests. The Panel recommended that OSHA consider and solicit public comment on allowing the written and practical tests described in Option (1) of proposed § 1926.1427(b) to be administered by an accredited educational institution. Also, this issue has been addressed in the preamble.

Lastly, some SERs were concerned that in order to become certified or qualified under proposed § 1926.1427, employees would have to be proficient in English. These SERs were concerned that, as a result, the certification/qualification requirement would be burdensome for employers who have operators who are unable to speak in English. The Panel noted that the C-DAC document does not state that the certification/qualification process be administered in English. The proposed rule also allows employees to take the written portion of the certification/qualification test orally. In such a case, the operator candidate (under § 1926.1427(h) and (j)) would have to demonstrate the ability to read and locate relevant information in the equipment manual and other related materials. However, the proposed rule does not specify that such

written materials would have to be in English. The candidate must have a level of literacy commensurate with these materials; as long as the materials are in the candidate's language, the terms of this provision would be met. The Panel recommended that OSHA provide this interpretation in a Small Business Compliance Guide. OSHA has more fully discussed this in the preamble and intends to provide this interpretation in compliance guidance.

Table B-17 below lists the recommendations made by the Panel and presents the Agency's answers or responses. In the right-hand column of the table, where "discussion" of an issue is referred to in the preamble, it means in the Summary and Explanation section.

**Table B-17**
**Responses to SBREFA Panel Recommendations**
**(also found in Table 4 of the Preamble)**

| SBREFA PANEL recommendation | OSHA response |
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| 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 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 has included homebuilding industries in the "Own but Do Not Rent "and "Crane Lessees" industrial profile categories.<br><br>OSHA has presented a discussion in the preamble of this rule of specific equipment that meets that functional definition of a crane.<br><br>The estimate of crane jobs per year has |

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| | increased from 368,000 total annually (or 4 jobs per crane on average) to 860,000 (or 9 jobs per crane on average). |
| The Panel recommends that OSHA review its estimates for the direct costs of operator certification and seek comment on these cost estimates. | OSHA has reviewed its cost estimates in the PEA for operator certification and seeks comment on the estimates and methodology. |
| 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 seeks 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.<br><br>OSHA has included 2 hours of travel time per operator into the unit costs for operator certification.<br><br>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. The Agency seeks further comment from the public. |
| 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 seeks comment on the methodology used to calculate all of the costs in the PEA, which includes the costs for assessing ground conditions.<br><br>OSHA assumed that inspection of ground conditions is normal business practice, and that, as a result, provisions in the proposal only add minor costs to this practice. The method of estimating costs is explained in detail in section 6 Costs of Compliance. |
| 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." |
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| 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 section 1412, *Inspections*, OSHA's current standard at 29 CFR 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 proposal would list the inspection requirements in one place rather than rely on incorporated consensus standards. OSHA does not believe this proposed standard imposes significant new requirements for inspections. Paragraph 1413(a) explicitly says that booming down is not required for shift (and therefore monthly) inspections.<br><br>Similarly, OSHA does not believe that inspection of any of those items would require removal of non-hinged inspection plates. In the discussion of proposed § 1412, OSHA requests public comment on these points |
| 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. | Existing Subpart N, at 29 CFR 1926.550(a)(2), requires load charts; this is not a new cost. Subpart N does not require manuals. OSHA believes 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 believes that the cost of obtaining a copy of a manual should be modest and solicits comment on how many owners or operators do not have full manuals for their cranes or derricks. |
| 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 has already placed additional materials into the rulemaking docket to aid in the reproduction of the benefits analysis. The Agency has also developed a full benefits analysis (section 4 of this PEA) which includes the methodology and data sources for the calculations. |
| The Panel recommends that OSHA consider and | OSHA addresses this recommendation in |

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| 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. | the discussion of proposed paragraph 1400(c)(8) and solicits public comment on the 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 explains in the discussion of proposed paragraph 1402(e) how the various employers, including the controlling entity, the employer whose employees operate the equipment, and the employer of the A/D supervisor share responsibility for ensuring adequate ground conditions. |
| 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 addresses this recommendation in the discussion of proposed paragraph 1412(e) and solicits public comment on the issue. |
| 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 addresses this recommendation in the discussion of proposed paragraph 1412(d) and solicits 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 paragraph 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 addresses the recommendation in the discussion of proposed paragraph 1412(a) and solicits comment on the issues raised in the recommendation. |
| 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 paragraph 1412(d)(1) of the proposed rule, OSHA explains that the shift inspection may be completed during the shift. |
| The Panel recommends that OSHA solicit public comment about whether it is necessary to clarify the requirement of proposed paragraph 1412(d)(1)(xi) that the equipment be inspected for "level position." | OSHA addresses this recommendation in the discussion of proposed paragraph 1412(d)(1)(xi) and requests public comment on the issues raised in the recommendation. |

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| The Panel recommends that OSHA solicit comment on whether paragraph 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 paragraph (f)(2)(xiv)(D) of § 1412 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 proposed 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 paragraph (f)(2)(xx) of § 1412 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." | Proposed paragraph 1412(f)(2)(xx) does not require the corrective action to which the SER refers. If an inspection under proposed paragraph 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. | OSHA addresses this recommendation in the discussion of proposed paragraph 1412(f) and requests public comment on the issue. |
| 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. | OSHA addresses this recommendation in the discussion of proposed paragraph 1412(e) and requests public comment on the issue. |
| 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 addresses this recommendation in the discussion of proposed paragraph 1416(d) and solicits public comment on the issue. |

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| The Panel recommends that the provision on fall protection (proposed § 1423) be proposed as written and that OSHA explain in the preamble how and why the Committee arrived at this provision. | In the discussion of proposed § 1423, OSHA explains the Committee's rationale underlying the proposed section. |
| The Panel recommends that OSHA consider the potential advantages of and solicit public comment on adding provisions to proposed § 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 addresses these recommendations in the discussion of proposed § 1427 and requests public comment on the issues raised by the Panel. |
| 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. | The issue is discussed in the explanation of the proposed rule for § 1926.1427(h). |
| The Panel recommends soliciting public comment on whether the phrase "equipment capacity and type" in proposed paragraph 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 addresses this recommendation in the discussion of proposed paragraph 1427(b)(1)(ii)(B) and requests public comment on the issue. |
| The Panel recommends that OSHA ask for public comment on whether the rule needs to state more clearly that paragraph 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 addresses this recommendation in the discussion of proposed paragraph 1430(c) and requests public comment on the issue. |

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| 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 addresses this recommendation in the discussion of proposed paragraph 1430(c) and requests public comment on the issue. |
| 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 (1427(f)) should have additional training beyond that required in the C-DAC document at paragraph 1427(f)(2)(iii)(B). | OSHA addresses this recommendation in the discussion of proposed paragraph 1430(c) and requests public comment on the issue. |
| 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 paragraph 1437(n)(2).<br><br>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. | OSHA addresses these recommendations in the discussion of proposed paragraph 1437(n)(2) and requests public comment on the issues. |
| The Panel recommends that OSHA consider and ask for comment on whether it would be appropriate to exempt from the rule small side boom cranes incapable of lifting above the height of a truck bed and with a capacity of not more than 6,000 pounds. | OSHA addresses this recommendation in the discussion of proposed paragraph 1440(a) and requests public comment on the issue. |
| 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. OSHA requests comment on how and whether the proposal can be shortened or simplified—made easier to understand—and the effect of that on addressing construction hazards. |
| 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 | OSHA will consider developing such an aid as a separate guidance document |

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| what inspections are needed and when they must be done. | |
| 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 things. OSHA notes that it cannot cite an employer for failing to have documentation not explicitly called for in a standard. See also the discussion under proposed paragraph 1402(e). |
| The Panel recommends soliciting public comment on whether the word "days" as used in sections 1416(d) and 1416(e) should be clarified to mean calendar days or business days. | OSHA addresses this recommendation in the discussion of proposed paragraph 1416(d) and requests public comment on the issue. |
| The Panel recommends that OSHA carefully discuss what is included and excluded from the scope of this standard. | OSHA discusses in detail the types of machinery that are included under this proposed standard and those that are excluded in the explanation of § 1400. |
| The Panel recommends that OSHA gather data and analyze the effects of already existing certification requirements. | OSHA has obtained and evaluated a study by the Construction Safety Association of Ontario showing that Ontario's certification requirement has led to a substantial decrease in crane-related fatalities there. |
| 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. | OSHA addresses this recommendation in the discussion of proposed paragraph 1400(c) and requests public comment on the issue. |
| 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 will consider them along with the other public comments on the proposed rule. |
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| 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 addresses this recommendation in the discussion of proposed paragraph 1427(j)(1) and requests public comment on the issue. |
| 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 addresses this recommendation in the discussion of proposed paragraph 1427(j)(1) and requests public comment on the issue. |
| 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 addresses this recommendation in the discussion of paragraph 1427(b)(3) and requests public comment on the issue. |
| 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. | OSHA addresses this recommendation in the discussion of proposed paragraph 1427(h)(1) and requests public comment on the issues. |
| 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 | OSHA will issue a Small Business Compliance Guide after a final rule is issued and will explain these points in the Guide. |

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| and understand. | |

9. References

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U.S. Bureau of the Census, "Economic Census," 2002

## C. OMB Review Under the Paperwork Reduction Act of 1995

The proposed Cranes and Derricks in Construction Standard contains collection-of-information (paperwork) requirements that are subject to review by the Office of Management and Budget ("OMB") under the Paperwork Reduction Act of 1995 ("PRA-95"), 44 U.S.C. 3501 et seq., and OMB's regulations at 5 CFR part 1320. The Paperwork Reduction Act defines "collection of information" as "the obtaining, causing to be obtained, soliciting, or requiring the disclosure to third parties or the public of facts or opinions by or for an agency regardless of form or format . . . ." (44 U.S.C. 3502(3)(A).) OSHA submitted the collection-of-information requirements identified in this NPRM to OMB for review (44 U.S.C. 3507(d)). OSHA solicits comments on the collection-of-

information requirements and the estimated burden hours associated with these collections, including comments on the following:

- Whether the proposed collection-of-information requirements are necessary for the proper performance of the Agency's functions, including whether the information is useful;
- The accuracy of OSHA's estimate of the burden (time and cost) of the information-collection requirements, including the validity of the methodology and assumptions used;
- The quality, utility, and clarity of the information collected; and
- Ways to minimize the burden on employers who must comply, for example, by using automated or other technological techniques for collecting and transmitting information.

The title, description of the need for and proposed use of the information, description of the respondents, and frequency of response of the information collections are described below, along with an estimate of the annual reporting burden and cost as required by 5 CFR 1320.5(a)(1)(iv) and 1320.8(d)(2).

**Title**: Cranes and Derricks in Construction (29 CFR part 1926 subpart CC).

**Description and Proposed Use of the Collections of Information**: The proposed standard would impose new information-collection requirements for purposes of PRA-95. The collection-of-information requirements in the proposed standard have not been

approved by OMB. These provisions are needed to protect the health and safety of employees who work with equipment at construction worksites.

The paperwork requirements would impose a duty to produce and maintain records on employers who implement controls and take other measures to protect employees from hazards related to cranes and derricks used in construction. Accordingly, each construction business that has employees who operate or are in the vicinity of cranes and derricks would be required to 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 would have access to the records to determine compliance under conditions specified by the proposed standard. An employer's failure to generate and disclose the information required in this standard will affect significantly the Agency's effort to control and reduce injuries and fatalities related to the use of cranes and derricks in construction.

Table 4 below identifies and describes the new collections of information contained in the proposed standard.

**Table 4**
**Collection-of-Information Requirements of the Proposed Standard**

| **Information-Collection Requirements** | | | |
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| **1926.1402(c)(2)** | **1926.1413(a)(4)(ii)(A)** | **1926.1427(c)(5)(iv)** | **1926.1436(c)(2)(ii)** |
| **1926.1403(b)** | **1926.1413(a)(4)(iii)(F)** | **1926.1427(e)(1)** | **1926.1436(c)(2)(iii)** |
| **1926.1404(f)(2)** | **1926.1413(a)(4)(v)** | **1926.1427(h)(1)** | **1926.1436(d)(1)** |

| Information-Collection Requirements | | | |
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| **1926.1404(h)(4)** | **1926.1413(b)(3)** | **1926.1428(a)(3)** | **1926.1436(g)(1)(ii)** |
| **1926.1404(h)(6)** | **1926.1413(c)(4)** | **1926.1428(b)** | **1926.1436(g)(2)** |
| **1926.1404(j)** | **1926.1414(c)(2)(iii)** | **1926.1430(a)** | **1926.1436(g)(3)** |
| **1926.1404(k)** | **1926.1414(c)(3)(i)** | **1926.1430(b)** | **1926.1436(g)(4)** |
| **1926.1404(m)(1)(i)** | **1926.14(c)(3)(iii)** | **1926.1430( c)(1)** | **1926.1436(h)** |
| **1926.1407(b)(3)(i)(D)** | **1926.1415(a)(1)(ii)** | **1926.1431(e)(12)** | **1926.1437(c)(2)(ii)** |
| **1926.1407(g)** | **1926.1416(d)** | **1926.1431(o)(3)** | **1926.1437(g)** |
| **1926.1408(b)(1)** | **1926.1416(e)** | **1926.1431(p)(4)** | **1926.1437(h)(6)** |
| **1926.1408(b)(4)(ii)(D)** | **1926.1416(e)(4)** | **1926.1431(r)** | **1926.1437(m)(4)** |
| **1926.1408(g)** | **1926.1417(b)(1)** | **1926.1431(s)** | **1926.1437(n)(1)** |
| **Table A** | **1926.1417(b)(2)** | **1926.1432(a)** | **1926.1437(n)(2)** |
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| **1926.1410(c)(1)** | **1926.1417(c)(1)** | **1926.1433(d)(1)(ii)** | **1926.1437(n)(3)(ii)** |
| **1926.1410(d)** | **1926.1417(e)(1)(iv)** | **1926.1433(d)(5)** | **1926.1437(n)(5)(v)** |
| **1926.1410(d)(2)(iv)** | **1926.1417(f)(1)** | **1926.1434(a)(1)(i)** | **1926.1437(n)(5)(vi)** |
| **1926.1410(e)** | **1926.1417(j)** | **1926.1434(a)(1)(ii)** | **1926.1439(e)** |
| **1926.1410(f)** | **1926.1417(o)(3)(i)** | **1926.1434(a)(2)(i)** | **1926.1440(a)** |
| **1926.1410(j)** | **1926.1421(a)** | **1926.1434(a)(3)** | **1926.1441(b)(2)(i)(A)** |
| **1926.1411(b)(4)(iii)** | **1926.1422** | **1926.1434(b)** | **1926.1441(b)(2)(i)(B)** |
| **Table T** | **1926.1423(h)(2)** | **1926.1435(c)** | **1926.1441(c)(2)(i)** |
| **1926.1412(a)(1)(i)** | **1926.1424(a)(2)(i)** | **1926.1435(e)(5)`** | **1926.1441(c)(2)(ii)** |
| **1926.1412(b) (1)(ii)(A)** | **1926.1424(a)(2)(ii)** | **1926.1435(e)(5)(v)** | **1926.1441(c)(2)(iii)** |
| **1926.1412(c)(2)(i)** | **1926.1427(a)** | **1926.1435(e)(6)** | **1926.1441(c)(3)(i)** |
| **1926.1412(e)(3) (i)** | **1926.1427(b)** | **1926.1435(e)(6)(vi)** | **1926.1441(c)(3)(ii)** |
| **1926.1412(e)(3)(ii)** | **1926.1427(c)(1)(ii)** | **1926.1435(f)(2)(i)** | **1926.1441(e)** |
| **1926.1412(f)(6)** | **1926.1427(c)(2)(i)** | **1926.1435(f)(2)(ii)** | **1926.1441(f)** |
| **1926.1412(f)(7)** | **1926.1427(c)(5)(ii)** | **1926.1436(b)(3)** | |
| **1926.1412(g)(3)** | **1926.1427(c)(5)(iii)** | **1926.1436(c)(2)(i)** | |
| **1926.1412(h)** | **1926.1428(a)(2)** | **1926.1436(f)(3)** | |

**Affected Public**: Business or other for-profit.

**Number of Respondents**: 159,715 firms

**Frequency**: On occasion (for most of the information-collection requirements; determined by the use of cranes and derricks and employee training and certification);

annually (for equipment inspections).

**Average Time per Response**: Varies from 10 seconds (sounding an alarm) to two hours (developing written equipment operation procedures).

**Estimated Total Burden Hours**: 157,981 hours

**Estimated Costs (Operation and Maintenance)**: $1.4 million

*Submitting comments*. Members of the public who wish to comment on the paperwork requirements in this proposal must send their written comments to the *Office of Information and Regulatory Affairs, Attn: OSHA Desk Officer (RIN 1218-AC01), Office of Management and Budget, Room 10235, 725 17th Street NW., Washington, DC 20503*. The Agency encourages commenters to also submit their comments on these paperwork requirements to the rulemaking docket, along with their comments on other parts of the proposed rule. For instructions on submitting these comments to the rulemaking docket, see the sections of this *Federal Register* notice titled "Dates" and "Addresses."

*Docket and inquiries*. To access the docket to read or download comments and other materials related to this paperwork determination, including the complete Information Collection Request (ICR) (containing the Supporting Statement (describing the paperwork determinations in detail) and attachments) use the procedures described under the section of this notice titled "Addresses." You also may obtain an electronic copy of

the complete ICR by visiting the webpage http://www.reginfo.gov/public/do/PRAMain. Scroll under "Currently Under Review" to "Department of Labor (DOL)" to view all of the DOL's ICRs, including those ICRs submitted for proposed rulemakings. To make inquiries, or to request other information, contact Mr. Todd Owen, Directorate of Standards and Guidance, OSHA, Room N-3609, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210; telephone (202) 693-2222.

**D. Federalism**

The Agency reviewed the proposed rule according to the most recent Executive Order ("E.O.") on Federalism (E.O. 13132, 64 FR 43225). This E.O. requires that Federal agencies, to the extent possible, refrain from limiting State policy options, consult with States before taking actions that restrict their 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 law only with the expressed consent of Congress. In such cases, Federal agencies must limit preemption of State law to the extent possible.

Section 18 of the Occupational Safety and Health Act of 1970 ("the Act"; 29 U.S.C. 667) expressly provides OSHA with authority to preempt State occupational safety and health standards to the extent that the Agency promulgates a Federal standard under Section 6 of the Act. Accordingly, Section 18 of the Act authorizes the Agency to preempt State promulgation and enforcement of requirements dealing with occupational safety and

health issues covered by OSHA standards unless the State has an OSHA-approved occupational safety and health plan (namely, is a State-Plan State). (See *Gade v. National Solid Wastes Management Association*, 112 S. Ct. 2374 (1992).)

With respect to States that do not have OSHA-approved plans, the Agency concludes that this proposed rule would conform to the preemption provisions of the Act. Additionally, Section 18 of the Act prohibits States without approved plans from issuing citations for violations of OSHA standards; the Agency finds that the proposed rulemaking would not expand this limitation. Therefore, for States that do not have approved occupational safety and health plans, this proposed rule would not affect the preemption provisions of Section 18 of the Act.

OSHA has authority under E.O. 13132 to promulgate the proposed rule in 29 CFR Part 1926 because the employee exposures related to cranes and derricks used in construction addressed by the proposed requirements are national in scope. The Agency concludes that the requirements in this proposed rule would provide employers in every State with critical information to use when protecting their employees from the hazards presented when working with cranes and derricks. However, while OSHA drafted the proposed requirements to protect employees in every State, Section 18(c)(2) of the Act permits State-Plan States and Territories to develop and enforce their own standards for cranes and derricks used in construction provided these requirements are at least as effective in providing safe and healthful employment and places of employment as the final requirements that result from this proposal.

In summary, this proposed rule complies with E.O. 13132. In States without OSHA-approved State Plans, Congress expressly provides for OSHA standards to preempt State job safety and health rules in areas addressed by the Federal standards; in these States, this rule limits State policy options in the same manner as every standard promulgated by the Agency. In States with OSHA-approved State Plans, this rulemaking does not significantly limit State policy options.

**E. State-Plan States**

Section 18(c)(2) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 667(c)(2)) requires State-Plan States to adopt mandatory standards promulgated by OSHA. Accordingly, the 24 States and two Territories with their own OSHA-approved occupational safety and health plans would have to adopt provisions comparable to the provisions in this proposed rule within six months after the Agency publishes the final rule that it develops from this proposal. The Agency believes that the proposed rule would provide employers in State-Plan States and Territories with critical information and methods necessary to protect their employees when working with cranes and derricks in construction. The 24 States and two Territories with State 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, New Jersey, New York, and the Virgin Islands have OSHA-approved State Plans that apply to State and local

government employees only. Until a State-Plan State/Territory promulgates its own comparable provisions base on the final rule developed from this proposal, Federal OSHA will provide the State/Territory with interim enforcement assistance, as appropriate.

**F. Unfunded Mandates Reform Act**

OSHA reviewed this proposed 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). As discussed above in section V.B. of this preamble ("Preliminary Economic Analysis and Initial Regulatory Flexibility Analysis"), the Agency estimates that compliance with this proposed rule would require private-sector employers to expend about $123 million each year. However, while this proposed rule establishes a federal mandate in the private sector, it is not a significant regulatory action within the meaning of Sec. 202 of the UMRA (2 U.S.C. 1532).

Under voluntary agreement with OSHA, some States enforce compliance with their State standards on public sector entities, and these agreements specify that these State standards must be equivalent to OSHA standards. Thus, although OSHA has included compliance costs for the affected public sector entities in its analysis of the expected impacts associated with the proposal, the proposal would not involve any unfunded mandates being imposed on any State or local government entity. Consequently, this proposed rule does not meet the definition of a "Federal intergovernmental mandate" (see Sec. 421(5) of the UMRA (2 U.S.C. 658(5))). Therefore, for the purposes of the UMRA,

the Agency preliminarily certifies that this proposed rule does not mandate that State, local, and tribal governments adopt new, unfunded regulatory obligations, nor does the proposed rule increase the expenditures by the private sector of more than $100 million a year.

**G. Applicability of Existing Consensus Standards**

Some of the types of equipment subject to this proposed 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 proposed § 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). Where newer

versions of the ASME standards were issued after the Committee finished its work, OSHA has examined the updated standards to determine if their provisions deviate in a significant way from provisions on which C-DAC relied. Those updated standards have been entered into the record of this rulemaking. For the most part, OSHA did not find significant deviations between the updated versions and the versions before the Committee. In the few instances where deviations occurred, OSHA has identified those deviations and asked for public comment on any issues they raise.

As discussed in detail in the Summary and Explanation of the proposed standard, a number of provisions in this proposal contain concepts that are similar to those in provisions in the various ASME standards. However, the Committee determined in most instances that, for reasons of enforceability, clarity or ease of use, the wording of those concepts needed to be modified.

For some issues, the ASME standards do not address issues covered by this proposal, or the Committee determined that a different approach is needed. For example, in the provisions on inspections (§§ 1926.1412 and 1926.1413), C-DAC 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), C-DAC adopted approaches with no comparable counterparts in the ASME standards.

In some instances, C-DAC determined that it was appropriate to incorporate ASME standards by reference, in whole or in part. For example, in proposed § 1926.1433, Design, construction and testing, the proposed rule incorporates by reference ANSI B30.5-1968, safety code for "Crawler, Locomotive, and Truck Cranes," "PCSA Standard No. 2," for crawler, truck and locomotive cranes manufactured prior to [EFFECTIVE DATE OF THE FINAL RULE], and incorporates portions of ASME B30.5a-2004, "Mobile and Locomotive Cranes," for mobile (including crawler and truck) and locomotive cranes manufactured on or after [EFFECTIVE DATE OF THE FINAL RULE].

## H. Review of the Proposed Standard by the Advisory Committee for Construction Safety and Health

The proposed subpart would add requirements to the existing standards in 29 CFR part 1926 that protect employees from hazards associated with the use of cranes and derricks in construction. OSHA's regulation governing the Advisory Committee on Construction Safety and Health (ACCSH) at 29 CFR 1912.3 requires OSHA to consult with ACCSH whenever the Agency proposes a rule that involves the occupational safety and health of construction employees. OSHA distributed the C-DAC Consensus Document to the ACCSH members one month prior to their scheduled October 11, 2006 meeting. At the meeting, OSHA took questions from the ACCSH members regarding the C-DAC Consensus Document. On October 12, 2006, the OSHA staff provided answers to these questions to the ACCSH members. ACCSH discussed the issues related to the C-DAC Consensus Document and then adopted a resolution supporting it and recommending that

OSHA use it as the basis for a proposed standard. (ACCSH 2006-1, Ex. 101x, pp. 248-49).

**I. Public Participation—Comments and Hearings**

OSHA encourages members of the public to participate in this rulemaking by submitting comments on the proposal and documentary evidence. In this regard, the Agency invites interested parties having knowledge of, or experience with, cranes and derricks in construction to participate in this process, and welcomes any pertinent data and cost information that will provide it with the best available evidence on which to develop the final regulatory requirements.

*Comments*. The Agency invites interested parties to submit written data, views, and arguments concerning this proposal. In particular, the Agency welcomes comments on its determination of the economic or other regulatory impacts of the proposed rule on the regulated community. When submitting comments, follow the procedures specified above in the sections titled "Dates" and "Addresses." The comments must clearly identify the provision of the proposal being addressed, the position taken with respect to each issue, and the basis for that position. Comments, along with supporting data and references, received by the end of the specified comment period will become part of the proceedings record, and will be available electronically for public inspection at the Federal eRulemaking Portal (http://www.regulations.gov), or may be read at the OSHA Docket Office, Room N-2625, 200 Constitution Ave., NW., Washington. (See the section of this *Federal Register* notice titled "Addresses" for additional information on how to access these documents.)

*Informal Public Hearings*. Requests for a hearing should be submitted to the Agency as set forth above under the sections of this notice titled "Dates" and "Addresses."

**J. List of Subjects in 29 CFR Part 1926**

Construction industry, Occupational safety and health, Safety.

## VI. AUTHORITY AND SIGNATURE

Edwin G. Foulke, Jr., 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 proposal 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); and 29 CFR Part 1911.

Signed at Washington, DC on _____, 2008

_____

**Edwin G. Foulke, Jr.,**

*Assistant Secretary of Labor for Occupational Safety and Health*.

## VII. PROPOSED AMENDMENTS TO STANDARDS

For the reasons stated in the preamble of this proposed rule, the Agency is proposing to amend 29 CFR Part 1926 to read as follows:

**PART 1926—[AMENDED]**

**Subpart M–Fall Protection**

1. The authority citation for subpart M of 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.

2. Section 1926.500 is amended by revising paragraph (a)(2)(ii) 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.

* * * * *

**Subpart N—Cranes, Derricks, Hoists, Elevators, and Conveyors**

3. The authority citation for subpart N of 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). Section 1926.550 also issued under 29 CFR part 1911.

4. The heading to subpart N of 29 CFR part 1926 is revised to read as follows:

**Subpart N--Hoists, Elevators, and Conveyors**

* * * * *

**§ 1926.550 [Reserved]**

5. Section 1926.550 is removed and reserved.

6. 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 R—Steel Erection**

7. 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.

8. Section 1926.753 is amended by revising paragraph (a) to read as follows:

*  *  *  *  *

(a) All the provisions of subpart CC apply to hoisting and rigging with the exception of § 1926.1431(a).

*  *  *  *  *

9. Section 1926.753 is amended by revising paragraph (c)(4) to read as follows:

**§ 1926.753 Hoisting and rigging.**

*  *  *  *  *

(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 V—Power Transmission and Distribution**

10. 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.

11. 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 covered by subpart CC that is used for work covered by this subpart (subpart V), including cranes and other lifting equipment, shall comply with subparts CC and O of this part.

(2) 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), when used in these industries for auguring holes to set power and utility poles, or handling associated materials to be installed or removed from utility poles, must meet the applicable minimum clearance distance in Table V-1 in § 1926.950.

(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.

12. Subparts AA and BB are reserved and Subpart CC is added to read as follows:

**Subpart CC—Cranes and Derricks in Construction**

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Appendix D to Subpart CC of part 1926--Assembly/Disassembly- Sample Procedures for Minimizing the Risk of Unintended Dangerous Boom Movement
Appendix E 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 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 fixed jib ("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 1400(a) 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) 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), when used in these industries for auguring holes to set power and utility

poles, or handling associated materials to be installed or removed from utility poles.

(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).

(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 used for the erection of communication towers.

(13) Tree trimming and tree removal work.

(14) Anchor handling with a vessel or barge using an affixed A-frame.

(15) Roustabouts.

(d) All sections of this standard 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 shall establish, effectively communicate to the relevant persons, and enforce work rules, to ensure compliance with such provisions.

**§ 1926.1401 Definitions.**

*A/D supervisor (Assembly/Disassembly supervisor)* means an individual who meets this standard's requirements for an A/D supervisor, 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.

*Assist crane* means a crane used to assist in assembling or disassembling a crane.

*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."

*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 latticed boom sections during assembly/ disassembly and under outrigger 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 an employer builder/constructor of equipment.

*Calculate* includes use of a calculator.

*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 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)*: In order 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 rope 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 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 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 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 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.

*Non-conductive* 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 controls* means levers, switches, pedals and other devices for controlling equipment operation.

*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").

*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 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 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 floatation 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 Upperstructure.

*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.

*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 engine and operating machinery 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 rope made of wire.

**§ 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 shall not be assembled or used unless ground conditions are firm, drained (except for marshes/wetlands), 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.

(c) The controlling entity shall:

(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) that are identified in documents (such as site drawings, as-built drawings, and soil analyses) if they are available to the controlling entity.

(d) If there is no controlling entity for the project, the requirement in paragraph (c)(1) of this section shall 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 supervisor or the operator determines that ground conditions do not meet the requirements in paragraph (b) of this section, that person's employer shall 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.

**§ 1926.1403 Assembly/Disassembly – selection of manufacturer or employer procedures.**

When assembling and disassembling equipment (or attachments), the employer shall 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.

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

(a) *Supervision – competent-qualified person*.

(1) Assembly/disassembly must be supervised 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 supervisor").

(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 supervisor.

(b) *Knowledge of procedures*. The A/D supervisor must understand the applicable assembly/disassembly procedures.

(c) *Review of procedures*. The A/D supervisor must review the applicable assembly/disassembly procedures immediately prior to the commencement of assembly/disassembly unless the A/D supervisor has applied them to the same type and configuration of equipment (including accessories, if any) so that they are already known and understood.

(d) *Crew instructions*.

(1) Before commencing assembly/disassembly operations, the A/D supervisor must determine that the crew members understand 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 with respect to the crew member's understanding regarding that task.

(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 shall 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 shall not move any part of the equipment (or load) until the operator:

(i) Gives a warning that is understood by the crew member as a signal that the equipment (or load) is about to be moved and allows time for the crew member to get to a safe position, or

(ii) 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 supervisor 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 D 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 shall not be exceeded for the equipment being assembled/disassembled.

(h) *Addressing specific hazards*. The A/D supervisor supervising the assembly/disassembly operation must address the hazards associated with the operation with methods to protect the employees from them, as follows:

(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 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 in order to prevent exceeding rated capacity limits for the assist crane.

(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 D 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), or 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 unexpected movement from inadequately supported counterweights and from hoisting counterweights.

(10) *Boom hoist brake failure*. Where reliance is placed on the boom hoist brake to prevent boom movement during assembly/disassembly, the brake shall be tested 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 shall be used.

(11) *Loss of backward stability*. Backward stability must be considered before swinging the upperworks, travel, and when attaching or removing equipment components. See, for example, Figure 1.

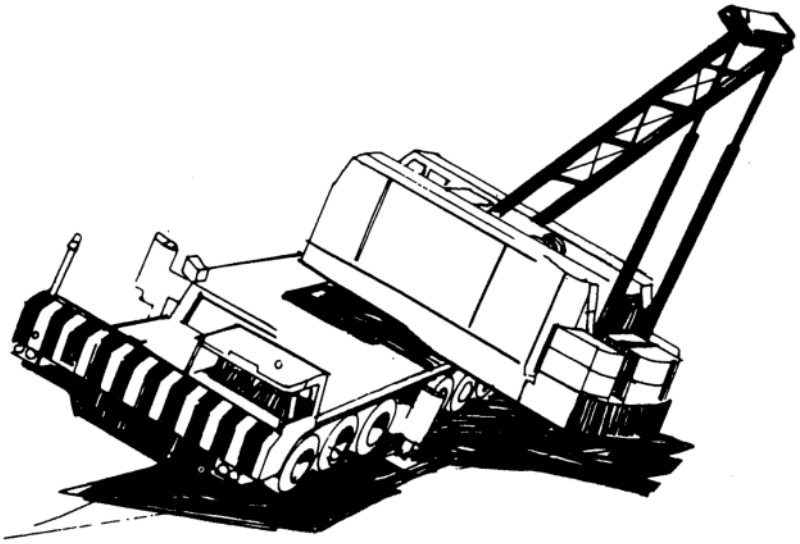

Figure 1. Lack of backward stability results in superstructure toppling.

(12) *Wind speed and weather*. Wind speed and weather must be considered so that the safe assembly/disassembly of the equipment is not compromised.

(i) [*Reserved*.]

(j) *Cantilevered boom sections*. Manufacturer limitations on the maximum amount of boom supported only by cantilevering shall not be exceeded. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved shall determine this limitation in writing, which shall not be exceeded.

(k) *Weight of components*. The weight 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, 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) *Manufacturer prohibitions*. The employer must comply with applicable manufacturer prohibitions.

(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 shall not have a jib attached during pile driving operations.

(q) *Outriggers*. When the load to be handled and the operating radius require the use of outriggers, or at any time when outriggers are used, the following requirements shall be met:

(1) The outriggers shall be either fully extended or, if manufacturer procedures permit, deployed as specified in the load chart.

(2) The outriggers shall 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).

(3) When outrigger floats are used, they shall be attached to the outriggers.

(4) Each outrigger shall be visible to the operator or to a signal person during extension and setting.

(5) Outrigger blocking shall:

(i) Meet the requirements in paragraphs (h)(2) and (h)(3) of this section.

(ii) Be placed only under the outrigger float/pad of the outrigger jack or, where the outrigger is designed without a jack, under the outer bearing surface of the extended outrigger beam.

(6) For locomotive cranes, when using outriggers to handle loads, the manufacturer's procedures shall be followed. When lifting loads without using

outriggers, the manufacturer's procedures shall be met regarding truck wedges or screws.

**§ 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. See, for example, Figure 2.

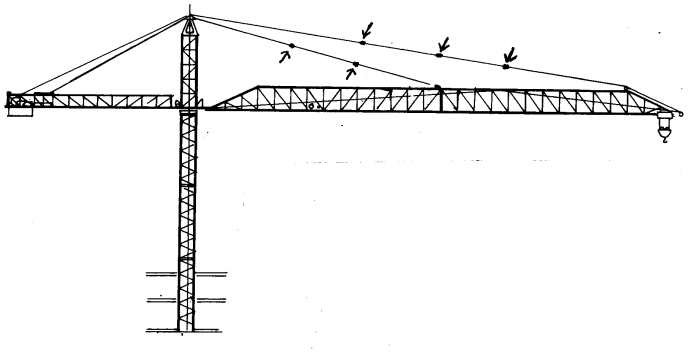

Figure 2. Pins (indicated by arrows) are not to be removed while pendants remain in tension.

(b) None of the pins (top and 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. See, for example, Figures 3 and 4.

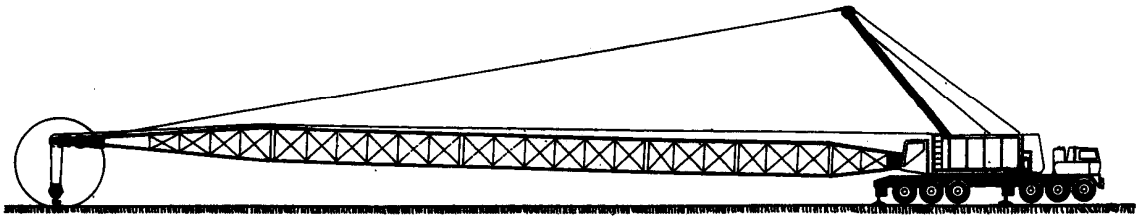

Figure 3. Pendant is in tension while connected to uppermost boom section, and no pins are to be removed.

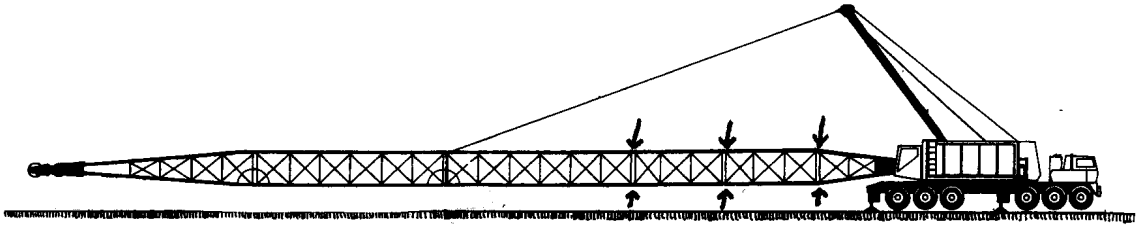

Figure 4. Pendant is in tension, and pins between pendant attachment point and crane body (indicated by arrows) are not to be removed. Note that, because the cantilevered portion of the boom is not supported, only the bottom pins ahead of the pendant may be removed. See Figure 6.

(c) None of the pins (top and 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). See, for example, Figure 5.

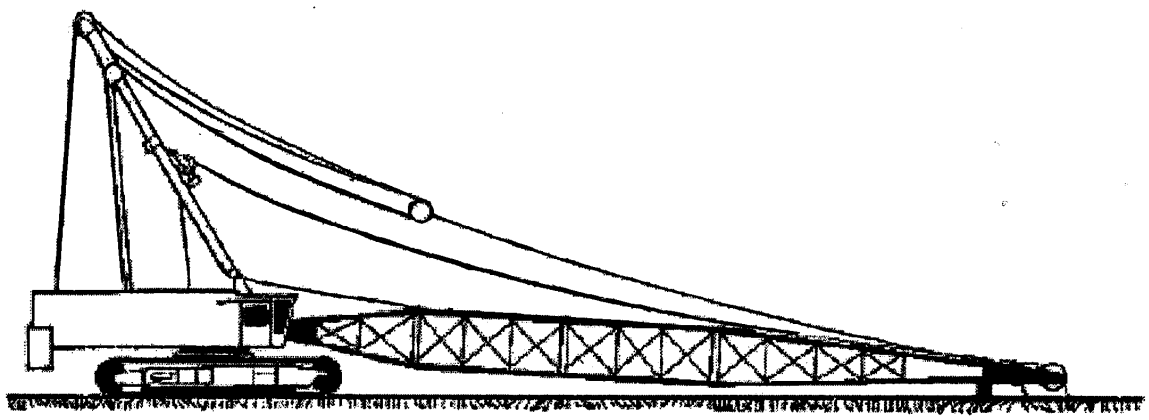

Figure 5. Uppermost boom section is resting on ground, and no pins between uppermost boom section and crane body are to be removed.

(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. See, for example, Figures 6 and 7.

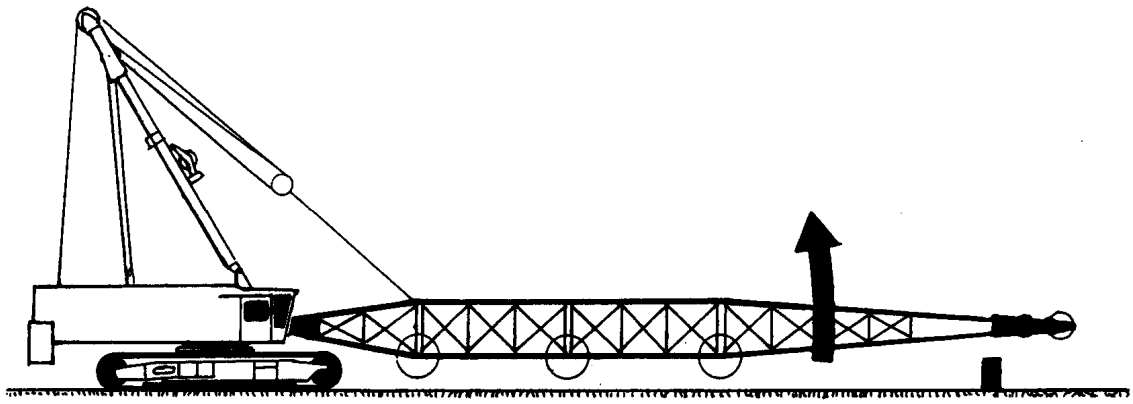

Figure 6. Cantilevered portion of boom is not supported, and top pins therefore are not to be removed. Bottom pins (circled) may be removed.

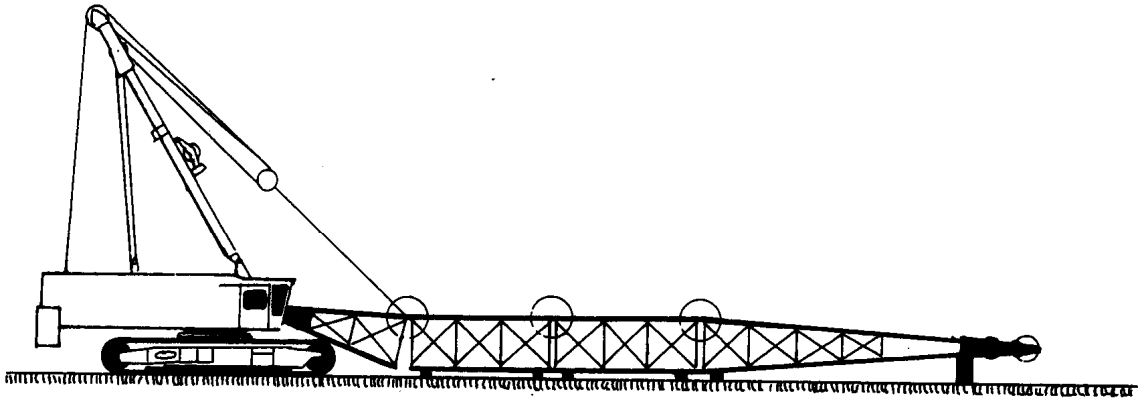

Figure 7. Cantilevered portion of boom is supported, and top pins (circled) may therefore be removed.

**§ <u>1926.1406 Assembly/Disassembly – employer procedures – general requirements</u>.**

(a) When using employer procedures instead of manufacturer procedures for assembling or disassembling, the employer shall ensure that the procedures are designed to:

(1) Prevent unintended dangerous movement, and to prevent collapse, of all parts of the equipment.

(2) Provide adequate support and stability of all parts of the equipment during the assembly/disassembly process.

(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 approach distance to the power line permitted under Table A (see § 1926.1408). If so, then the employer must follow the requirements in paragraph (b) 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, the following requirements must be met:

(1) Conduct a planning meeting with the Assembly/Disassembly supervisor (A/D supervisor), 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 non-conductive.

(3) At least one of the following additional measures must be in place :

(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, in accordance with § 1926.1420 (Radio, telephone, or other electronic transmission of signals).

(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) Defining a work zone by demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibit 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, 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).

(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 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 shall be deenergized or the following precautions shall be taken when necessary to dissipate induced voltages:

(1) The equipment shall be provided with an electrical ground.

(2) Non-conductive rigging or an insulating link/device shall be used.

(g) *Training*.

(1) Operators and crew assigned to work with the equipment shall be trained on the following:

(i) The procedures to be followed in the event of electrical contact with a power line. Such training shall 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.

(E) The need for crew in the area to avoid approaching or touching the equipment.

(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.

(2) Employees working as dedicated spotters shall be trained to enable them to effectively perform their task, including training on the applicable requirements of this section.

(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, shall 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 that wherever the distance "20 feet" is specified, the distance "50 feet" shall be substituted.

**§ 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 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 of this part 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)(2)(iii) or (iv) 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 shall include:

(1) If the power line is 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 before work begins.

(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.

(5) Non-conductive 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 non-conductive 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 shall 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.

(10) Only personnel essential to the operation shall be 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 shall 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) are documented and immediately available on-site.

(f) The equipment user and utility owner/operator 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 and all employers of employees involved in the work shall identify one person who will direct the implementation of the procedures. The person

identified in accordance with this paragraph shall direct the implementation of the procedures and shall 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 shall 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, shall meet the manufacturer's procedures for use and conditions of use.

**§ 1926.1411 Power line safety – while traveling.**

(a) This section establishes procedures and criteria that must be met for equipment traveling under a power line on the construction site with no load.

(b) The employer shall 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 shall ensure that a dedicated spotter who is in continuous contact with the 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 shall ensure that:

(i) The power lines are illuminated or another means of identifying the location of the lines shall be used.

(ii) A safe path of travel is identified and used.

**Table T – Minimum Clearance Distances While Traveling With No Load And Boom/Mast Lowered**

| Voltage (nominal, kV, alternating current) | While Traveling – Minimum clearance distance (feet) |
|---|---|
| up to 0.75 | 4 (while traveling/boom lowered) |
| over .75 to 50 | 6 (while traveling/boom lowered) |
| over 50 to 345 | 10 (while traveling/boom lowered) |
| over 345 to 750 | 16 (while traveling/boom lowered) |
| Over 750 to 1,000 | 20 (while traveling/boom lowered) |
| 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 operator aid, critical part of a control system, power plant, braking system, load-sustaining structural components, load hook, or in-use operating mechanism) or capacity shall be inspected by a qualified person after such modifications/additions have been completed, prior to initial use. The inspection shall meet the following requirements:

(i) The inspection shall assure that the modifications or additions have been done in accordance with the approval obtained pursuant to § 1926.1434 (Equipment modifications).

(ii) The inspection shall include functional testing.

(2) Equipment shall 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), shall be inspected by a

qualified person after such a repair or adjustment has been completed, prior to initial use. The inspection shall meet the following requirements:

(i) The qualified person shall 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 shall:

(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 shall ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer shall 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 shall include functional testing.

(4) Equipment shall 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, (b)(1)(ii) of this section).

(c) *Post-assembly*.

(1) Upon completion of assembly, the equipment shall 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 shall:

(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 shall ensure that the criteria are developed by the qualified person. If an RPE is needed, the employer shall 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 shall 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 shall begin a visual inspection prior to each shift, which shall be completed before or during that shift. The inspection shall consist of observation for apparent deficiencies. Disassembly is not required as part of this inspection unless the results of the visual inspection or trial operation indicate that further investigation necessitating disassembly is needed. Determinations made in conducting the inspection shall be reassessed in light of observations made during operation. At a minimum the inspection shall include 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 and supporting foundations, ground water accumulation, or similar conditions.

(xi) The equipment for level position, both 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.

(xiv) Safety devices and operational aids for proper operation.

(2) If any deficiency in paragraphs (d)(1)(i) through (xiv) 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 shall 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 shall be removed from service until it has been corrected.

(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 shall be taken prior to using the equipment.

(e) *Monthly*.

(1) Each month the equipment is in service it shall be inspected in accordance with paragraph (d) (each shift) of this section.

(2) Equipment shall 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 shall be documented 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 shall be retained for a minimum of three months.

(f) *Annual/comprehensive*.

(1) At least every 12 months the equipment shall be inspected by a qualified person in accordance with paragraph (d) (each shift) of this section except that the corrective action set forth in this paragraph (f), *Annual/comprehensive*, of this section shall apply.

(2) In addition, at least every 12 months, the equipment shall be inspected by a qualified person for 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 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: missing.

(xix) Operator seat: unusable.

(xx) Originally equipped steps, ladders, handrails, guards: missing.

(xxi) Steps, ladders, handrails, guards: in unusable/unsafe condition.

(3) This inspection shall 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 shall 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 shall be removed from service until it has been corrected.

(6) If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer shall ensure that the deficiency is checked in the monthly inspections.

(7) *Documentation of annual/comprehensive inspection*. The following information shall be documented and maintained 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.

(iii) This document shall be retained for a minimum of 12 months.

(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 shall stop using the equipment and a qualified person shall:

(1) Inspect the equipment for structural damage.

(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 shall inspect those items/conditions.

(3) If a deficiency is found, the employer shall 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 shall 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 operator 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 than the requirements of this section shall be followed. Additional documentation requirements by the manufacturer are not required.

**§ 1926.1413 Wire rope – inspection.**

(a) *Shift inspection.*

(1) A competent person shall begin a visual inspection prior to each shift, which shall be completed before or during that shift. The inspection shall consist of observation of wire ropes (running and standing) that are reasonably 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 (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) Electrical contact with a power line.

(C) A broken strand.

(3) *Critical review items*. The competent person shall give particular attention to:

(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 adjacent to end connections.

(v) Wire rope at and on equalizer sheaves.

(4) *Removal from service*.

(i) If a deficiency in Category I (see paragraph (a)(2)(i) of this section) is identified, an immediate determination shall 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 shall be prohibited until:

(A) The wire rope is replaced, 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.

(ii) If a deficiency in Category II (see paragraph (a)(2)(ii)of this section) is identified, the employer shall comply with *Option A* (see paragraph (a)(2)(ii) (A) of this section) or *Option B* (see paragraph (a)(2)(ii)(B)of this section), as follows:

(A) *Option A*. Consider the deficiency to constitute a safety hazard where it meets the wire rope manufacturer's established criterion for removal from service or meets a different criterion that the wire rope manufacturer has approved in writing for that specific wire rope. If the deficiency is considered a safety hazard,

operations involving use of the wire rope in question shall be prohibited until the wire rope is replaced, or the damage is removed in accordance with all of the requirements and restrictions in paragraph (a)(4)(i)(B) of this section.

(B) *Option B*. Institute the alternative measures specified in paragraph (4)(iii) of this section.

(iii) *Alternative measures for a Category II deficiency*. The wire rope may continue to be used if the employer ensures that the following measures are implemented:

(A) A qualified person assesses the deficiency in light of the load and other conditions of use and determines it is safe to continue to use the wire rope as long as the conditions established under this paragraph are met.

(B) A qualified person establishes the parameters for the use of the equipment with the deficiency, including a reduced maximum rated capacity.

(C) A qualified person establishes a specific number of broken wires, or diameter reduction that, when reached, will require the equipment to be taken out of service until the wire rope is replaced, or the damage is removed in accordance with all of the requirements and restrictions in paragraph (a)(4)(i)(B) of this section.

(D) A qualified person sets a time limit, not to exceed 30 days from the date the deficiency is first identified, by which the wire rope must be replaced, or the damage removed in accordance with all of the requirements and restrictions in paragraph (a)(4)(i)(B) of this section.

(E) The workers who will conduct the shift inspections are informed of this deficiency and the measures taken under this paragraph.

(F) The qualified person's findings and procedures in paragraphs (a)(4)(iii)(A) through (D) of this section are documented.

(iv) If a deficiency in Category III is identified, operations involving use of the wire rope in question shall be prohibited until:

(A) The wire rope is replaced, 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.

(v) 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 shall 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 shall be conducted in accordance with paragraph (a) (shift inspection) of this section.

(2) Wire ropes on equipment shall not be used until an inspection under this paragraph demonstrates that no corrective action under paragraph (a)(4) of this section is required.

(3) The inspection shall 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 shall be inspected by a qualified person in accordance with paragraph (a) (shift inspection) of this section.

(2) In addition, at least every 12 months, the wire ropes in use on equipment shall be inspected by a qualified person, as follows:

(i) The inspection shall be for deficiencies of the types listed in paragraph (a)(2) of this section.

(ii) The inspection shall be complete and thorough, covering the surface of the entire length of the wire ropes, with particular attention given to:

(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 in contact with saddles, equalizer sheaves or other sheaves where rope travel is limited.

(D) Wire rope subject to reverse bends.

(E) Wire rope passing over sheaves.

(F) Wire rope at or near terminal ends.

(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 shall 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 shall 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 shall be prohibited until:

(A) The wire rope is replaced, 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.

(ii) If the qualified person determines that, though not presently a safety hazard, the deficiency needs to be monitored, the employer shall ensure that the deficiency is checked in the monthly inspections.

(4) The inspection shall be documented according to § 1926.1412(f)(7) (annual/comprehensive inspection documentation).

(d) Rope lubricants that are of the type that hinder inspection shall not be used.

**§ <u>1926.1414 Wire rope – selection and installation criteria</u>.**

(a) 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.

(b) *Boom hoist reeving*.

(1) Fiber core ropes shall not be used for boom hoist reeving, except for derricks.

(2) Rotation resistant ropes shall be used for boom hoist reeving only where the requirements of paragraph (c) of this section are met.

(c) *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 shall not be used for duty cycle or repetitive lifts.

(ii) Rotation resistant ropes (including Types I, II and III) shall have an operating design factor of no less than 3.5.

(iii) Type I shall 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 shall have an operating design factor of no less than 5, except where the requirements of paragraph (c)(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 shall be met for each lifting operation:

(i) A qualified person shall inspect the rope in accordance with § 1926.1413(a). The rope shall 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 shall be considered a hazard.

(ii) Operations shall be conducted in such a manner and at such speeds as to minimize dynamic effects.

(iii) Each lift made under these provisions shall be recorded in the monthly and annual inspection documents. Such prior uses shall 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 shall not be used for boom hoist reeving, except where the requirements of paragraph (c)(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, the following requirements shall be met:

(A) The drum shall 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, section 5-1.3.2 (a), (a)(2) through (a)(4), (b) and (d), 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 shall 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 shall be not less than five.

(F) The operating design factor for these ropes shall 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 shall be capable of handling rated capacities and speeds as specified by the manufacturer.

(d) Wire rope clips used in conjunction with wedge sockets shall 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.

(e) Socketing shall be done in the manner specified by the manufacturer of the wire rope or fitting.

(f) Prior to cutting a wire rope, seizings shall be placed on each side of the point to be cut. The length and number of seizings shall 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 shall 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 shall be tagged-out or 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 shall have locks, except for portal cranes and floating cranes.

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

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

(b) *Proper operation required*. Operations shall not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations. Operations shall not resume until the device is again working properly. 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.

(b) Operations shall not begin unless the listed operational aids are in proper working order, except where the employer meets the specified temporary alternative measures.

More protective alternative measures specified by the crane/derrick manufacturer, if any, shall be followed.

(c) If a listed operational aid stops working properly during operations, the operator shall 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 shall be repaired no later than 7 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, the repair shall be completed within 7 days of receipt of the parts.

(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)*:

(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 was not originally equipped with a boom hoist limiting device, at least one of the measures in paragraphs (d)(1)(i)(A) through (C) of this section shall be used, on a permanent basis.

(2) *Luffing jib limiting device*.

(i) Equipment with a luffing jib shall 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.

(3) *Anti two-blocking device*.

(i) Telescopic boom cranes manufactured after February 28, 1992, shall 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, shall 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(s) must prevent such damage/failure or provide adequate warning for all points where two-blocking could occur.

(B) Lattice boom cranes, and derricks, manufactured one year after the effective date of this standard shall 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.

(e) *Category II operational aids and alternative measures*. Operational aids listed in this paragraph that are not working properly shall 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 shall be completed within 7 days of receipt of the parts.

(1) *Boom angle or radius indicator*. The equipment shall have a boom angle or radius indicator readable from the operator's station. *Temporary alternative measures*: Radii or boom angle shall 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 shall 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 of the following methods shall be used:

(i) Mark the boom with measured marks to calculate boom length; or

(ii) Calculate boom length from boom angle and radius measurements; or

(iii) Measure the boom with a measuring device.

(4) *Load weighing and similar devices*. Equipment (other than derricks) manufactured after March 29, 2003 with a rated capacity over 6,000 pounds shall 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 shall be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information shall be provided to the operator prior to the lift.

(5) The following devices are required on equipment manufactured after January 1, 2008:

(i) Outrigger position (horizontal beam extension) sensor/monitor if the equipment has outriggers. *Temporary alternative measures*: the operator shall verify that the position of the outriggers is correct (in accordance with manufacturer procedures) before beginning operations requiring outrigger deployment.

(ii) Hoist drum rotation indicator if the drum is not visible from the operator's station. *Temporary alternative measures*: Mark 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 shall 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 shall 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, shall 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 shall not engage in any practice that diverts his/her attention while actually engaged in operating the crane, such as the use of cell phones (other than when used for signal communications) or other attention-diverting activities.

(e) *Leaving the equipment unattended.*

(1) The operator shall not leave the controls while the load is suspended, except where 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 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), shall be permitted in the fall zone.

(2) The provisions in paragraph (e) of this section do not apply to working gear (such as slings, spreader bars, ladders, and welding machines) where the load is not suspended over 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 shall 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 shall 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 shall 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 shall 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 shall 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 shall determine whether it is necessary to implement manufacturer recommendations for securing the equipment.

(i) [*Reserved*.]

(j) The operator shall be familiar with the equipment and its proper operation. If adjustments or repairs are necessary, the operator shall promptly inform the person designated by the employer to receive such information and, where there are successive shifts, to the next operator.

(k) Safety devices and operational aids shall 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 shall 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 shall consider the effect of wind, ice, and snow on equipment stability and rated capacity.

(o) *Compliance with rated capacity*.

(1) The equipment shall not be operated in excess of its rated capacity.

(2) The operator shall not be required to operate the equipment in a manner that would violate paragraph (o)(1) of this section.

(3) *Load weight*. The operator shall 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 shall be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (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 shall be provided to the operator prior to the lift; or

(ii) The operator shall 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 shall 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 shall not contact any obstruction.

(q) The equipment shall not be used to drag or pull loads sideways.

(r) On wheel-mounted equipment, no loads shall be lifted over the front area, except as permitted by the manufacturer.

(s) The operator shall 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 shall 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 shall 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 shall be such that the load does not swing out beyond the radius at which it can be controlled.

(w) A tag or restraint line shall be used if necessary to prevent rotation of the load that would be hazardous.

(x) The brakes shall be adjusted in accordance with manufacturer procedures to prevent unintended movement.

(y) The operator shall obey a stop (or emergency stop) signal, irrespective of who gives it.

(z) *Swinging locomotive cranes*. A locomotive crane shall not be swung into a position where it is reasonably foreseeable that 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 shall 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 shall 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 shall 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 (see Appendix B of this subpart for an example). The following requirements apply to the use of non-standard hand signals:

(2) *Non-standard hand signals*. When using non-standard hand signals, the signal person, operator, and lift supervisor (where there is one) shall 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) There is a national consensus standard for the new 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 shall be maintained. If that ability is interrupted at any time, the operator shall 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 shall not resume until the operator and signal person agree that the problem has been resolved.

(h) Only one person gives 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 shall 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 for identifying the crane/derrick each signal is for must be used, as follows:

(1) for each signal, prior to giving the function/direction, the signal person shall identify the crane/derrick the signal is for, or

(2) an equally effective method of identifying which crane/derrick the signal is for must be used.

**§ 1926.1420 Signals – radio, telephone or other electronic transmission of signals.**

(a) The device(s) used to transmit signals shall be tested on site before beginning operations to ensure that the signal transmission is clear and reliable.

(b) Signal transmission must be through a dedicated channel. **Exception:** Multiple cranes/derricks and one or more signal persons may share a dedicated channel for the purpose of coordinating operations.

(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 supervisor (if there is one), shall 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 substituted, there is confusion about the voice signals, or a voice signal is to be changed.

(b) Each voice signal shall 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 supervisor (if there is one), shall 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 readily available at the site.

**§ 1926.1423 Fall protection**.

(a) *Application*.

(1) Paragraphs (b), (c)(2), (d) and (e) of this section apply to all equipment covered by this subpart except tower cranes.

(2) Paragraph (c)(1), (f) and (h) of this section applies to all equipment covered by this subpart.

(3) Paragraph (g) of this section applies only to tower cranes.

(b) *Boom walkways*.

(1) Equipment manufactured more than one year after the effective date of this standard with lattice booms shall 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 shall 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, grabrails, guardrails and railings*.

(1) The employer shall maintain originally-equipped steps, handholds, ladders and guardrails/railings/grabrails in good condition.

(2) Equipment manufactured more than one year after the effective date of this standard shall 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 shall meet the following criteria:

(i) Steps, ladders and guardrails/railings/ grabrails shall meet the requirements of SAE J185 (May 2003) or ISO 11660-2 (1994), except where infeasible.

(ii) Walking/stepping surfaces, except for crawler treads, shall have slip-resistant features/properties (such as diamond plate metal, strategically placed grip tape, expanded metal, or slip-resistant paint).

(d) For non-assembly/disassembly work, the employer shall 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.

(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.

(e) For assembly/disassembly work, the employer shall 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.

(f) *Anchorage criteria*.

(1) *Anchorages for fall arrest and positioning device systems*.

(i) Personal fall arrest systems and positioning systems shall 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 would not be met.

(ii) Attachable anchor devices (portable anchor devices that are attached to the equipment) shall meet the applicable anchorage criteria in § 1926.502.

(2) *Anchorages for restraint systems*. Restraint systems shall 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.

(g) *Tower cranes*.

(1) For non-erecting/dismantling work, the employer shall 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/dismantling work, the employer shall 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.

(h) *Anchoring to the load line*. A fall arrest system is permitted to be anchored to the crane/derrick's hook (or other part of the load line) where 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 shall be at the work site and informed that the equipment is being used for this purpose.

**§ 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 shall:

(i) Instruct employees 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:** where it is neither feasible to erect such barriers on the ground nor on the equipment, the hazard areas shall be clearly marked by a combination of warning signs (such as "Danger – Swing/Crush Zone" or "Danger – This Thing's Gonna Swing and Crunch You – Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the

employer shall train the employees 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 (1), the operator shall not rotate the superstructure until the operator:

(A) Gives a warning that is understood by the employee as a signal that the superstructure is about to be rotated and allows time for the employee to get to a safe position, or

(B) Is informed in accordance with a pre-arranged system of communication that the employee is in a safe position.

(b) *Multiple equipment coordination*. Where any part of a crane/derrick is within the working radius of another crane/derrick, the controlling entity shall institute a system to

coordinate operations. If there is no controlling entity, the employers shall 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 shall be used, to the extent consistent with public safety.

(b) While the operator is not moving a suspended load, no employee shall be within the fall zone, except for employees:

(1) Engaged in hooking, unhooking or guiding a load, or

(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, the following criteria shall be met:

(1) The materials being hoisted shall be rigged to prevent unintentional displacement.

(2) Hooks with self-closing latches or their equivalent shall be used. **Exception:** "J" hooks are permitted to be used for setting wooden trusses.

(3) The materials shall be rigged by a qualified rigger.

(d) *Receiving a load*. Only employees needed to receive a load shall be 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 shall be directly under the load.

(2) Only employees essential to the operation shall be in the fall zone (but not directly under the load).

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.

(iv) The load is over a shaft.

(v) The load is over a cofferdam, except where there are no employees in the fall zone.

(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 (see paragraph (a)(1) of this section), the boom hoist shall 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 shall 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 shall 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 shall be considered brake or locking devices for purposes of this subpart.

(4) Hydraulic boom cylinders shall have an integrally mounted holding device.

(c) *Preventing uncontrolled retraction.* Hydraulic telescoping booms shall 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 clearance distance to each side of the power line.

(4) The load is over a shaft or cofferdam.

**§ 1926.1427 Operator qualification and certification.**

(a) The employer must ensure that, prior to operating any equipment covered under § 1926.1400, the operator is either qualified or certified to operate the equipment in accordance with one of the options in paragraphs (b) through (e) of this section, or is operating the equipment during a training period in accordance with paragraph (f) of this section. 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 rated hoisting/lifting capacity of 2,000 pounds or less (see § 1926.1441).

(b) *Option 1*: *Certification by an accredited crane/derrick 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) A certification issued under this option is portable.

(3) 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 shall meet the following requirements:

(1) The written and practical tests shall be either:

(i) Developed by an accredited crane/derrick 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/derrick operator testing organization (see paragraph (b) of this section).

(B) The auditor is not an employee of the employer.

(C) The approval shall 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.

(2) *Administration of tests*.

(i) The written and practical tests shall be administered under circumstances approved by the auditor as meeting nationally recognized test administration standards.

(ii) The auditor shall be certified to evaluate the administration of the written and practical tests by an accredited crane/derrick operator testing organization (see paragraph (b) of this section).

(iii) The auditor shall not be an employee of the employer.

(iv) The audit shall be conducted in accordance with nationally recognized auditing standards.

(3) The employer program shall be audited within 3 months of the beginning of the program and every 3 years thereafter.

(4) The employer program shall 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 shall 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 shall 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 her designated representative upon request.

(6) A qualification under this paragraph is:

(i) Not portable.

(ii) Valid for 5 years.

(d) *Option 3. Qualification by the U.S. military*.

(1) For purposes of this section, an operator is considered qualified if he/she has a current operator qualification issued by the U.S. military for operation of the equipment.

(2) A qualification under this paragraph is:

(i) Not portable.

(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/derrick 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/derrick 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.*

(1) An employee who is not qualified or certified under this section is permitted to operate equipment where the requirements of paragraph (f)(2) of this section are met.

(2) An employee who has not passed both the written and practical tests required under this section is permitted to operate equipment as part of his/her training where the following requirements are met:

(i) The employee ("trainee/apprentice") shall be provided with sufficient training prior to operating the equipment to enable the trainee to operate the equipment safely under limitations established by this section (including continuous supervision) and any additional limitations established by the employer.

(ii) The tasks performed by the trainee/apprentice while operating the equipment shall be within the trainee's ability.

(iii) *Supervisor*. While operating the equipment, the trainee/apprentice shall be continuously supervised by an individual ("operator's supervisor") who meets the following requirements:

(A) The operator's supervisor is an employee or agent of the trainee's/apprentice's employer.

(B) The operator's supervisor 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.

(C) While supervising the trainee/apprentice, the operator's supervisor performs no tasks that detract from the supervisor's ability to supervise the trainee/apprentice.

(D) For equipment other than tower cranes: the operator's supervisor and the trainee/apprentice shall be in direct line of sight of each other. In addition, they shall communicate verbally or by

hand signals. For tower cranes: the operator's supervisor and the trainee/apprentice shall be in direct communication with each other.

(iv) *Continuous supervision*. The trainee/apprentice shall be supervised by the operator's supervisor at all times, except for short breaks where the following are met:

(A) The break lasts no longer than 15 minutes and there is no more than one break per hour.

(B) Immediately prior to the break the operator's supervisor informs the trainee/apprentice of the specific tasks that the trainee/apprentice is to perform and limitations that he/she is to adhere to during the operator supervisor's break.

(C) The specific tasks that the trainee/apprentice will perform during the operator supervisor's break are within the trainee's/apprentice's abilities.

(v) The trainee/apprentice shall not operate the equipment in any of the following circumstances:

(A) 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.

(B) If the equipment is used to hoist personnel.

(C) In multiple-equipment lifts.

(D) If the equipment is used over a shaft, cofferdam, or in a tank farm.

(E) For multiple-lift rigging, except where the operator's supervisor determines that the trainee's/apprentice's 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) Written tests under this section are permitted to be administered verbally, with answers given verbally, where the operator candidate:

(1) Passes a written demonstration of literacy relevant to the work.

(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.

(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 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 E of this subpart applicable to the specific type of equipment the individual will operate. Use of the Appendix E of this subpart 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 audible 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) As of the effective date of this standard, until four years after the effective date of the standard, the following requirements apply:

(i) Operators of equipment covered by this standard are required to be 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

employee shall be provided with the necessary training prior to operating the equipment. The employer shall ensure that the operator is evaluated to confirm that he/she understands the information provided in the training.

(2) The effective date of paragraphs (a) through (j) and (m) of this section is [4 YEARS AFTER THE EFFECTIVE DATE OF THE FINAL RULE].

(l) [*Reserved*.]

(m) *Definitions*.

(1) *"Portable."* Any employer of an operator with a certification that is portable under this section meets the requirements of paragraph (a) of this section with respect to that operator.

(2) "*Not portable*." Where an operator has a qualification that is not portable under this section, the 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.

**§ 1926.1428 Signal person qualifications.**

(a) The employer of the signal person shall ensure that each signal person meets the Qualification Requirements (paragraph (c) of this section) prior to giving any signals. This requirement shall 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 showing that the signal person meets the Qualification Requirements (see paragraph (c) of this section).

(2) *Option (2) – Employer's qualified evaluator*. The employer has its qualified evaluator assess the individual and determine 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 documentation for whichever option is used shall be available while the signal person is employed by the employer.

(b) If subsequent actions by the signal person indicate that the individual may 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 paragraph (c)(1) through (4) of this section through a verbal 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 the following requirements are met:

(1) The operation is limited to those functions necessary to perform maintenance, inspect or verify the performance of the equipment.

(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, safe limitations, characteristics and hazards associated with the type of equipment.

(b) Maintenance and repair personnel shall meet the definition of a qualified person with respect to the equipment and maintenance/repair tasks performed.

**§ 1926.1430 Training**.

The employer shall provide training as follows:

(a) *Overhead powerlines*. Employees specified in § 1926.1408(g)(Power line safety; training) shall be trained in accordance with the requirements of that paragraph.

(b) *Signal persons*. Employees who will be assigned to work as signal persons who do not meet the requirements of § 1926.1428(c) shall be trained in the areas addressed in that paragraph.

(c) *Operators*.

(1) Operators who are not qualified or certified under § 1926.1427 shall be trained in the areas addressed in § 1926.1427(j). Retraining shall be provided if necessary for re-qualification or re-certification or if the operator does not pass a qualification or certification test.

(2) Operators shall be trained 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, 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.

(ii) Where available, the manufacturer's emergency procedures for halting unintended equipment movement.

(d) *Competent persons and qualified persons*. Competent persons and qualified persons shall be trained regarding the requirements of this subpart applicable to their respective roles.

(e) *Crush/pinch points*. Employees who work with the equipment shall be instructed to keep clear of holes, and crush/pinch points and the hazards addressed in § 1926.1424 (Work area control).

(f) *Tag-out*. Operators and other employees authorized to start/energize equipment or operate equipment controls (such as maintenance and repair employees), shall be trained in the tag-out procedures in § 1926.1417(f).

(g) *Training administration*.

(1) The employer shall ensure that employees required to be trained under this subpart are evaluated to confirm that they understand the information provided in the training.

(2) Refresher training in relevant topics shall be provided when, based on the conduct of the employee or an evaluation of the employee's knowledge, there is an indication that retraining is necessary.

**§ 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 worksite, 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 shall 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 shall 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 shall have them all extended and locked. The amount of extension shall be the same for all outriggers 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) shall 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 shall 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) shall 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 shall be engaged.

(5) *Devices*.

(i) Equipment (except for derricks) with a variable angle boom shall be equipped with:

(A) A boom angle indicator, readily visible to the operator.

(B) A boom hoist limiting device.

(ii) Equipment with a luffing jib shall be equipped with:

(A) A jib angle indicator, readily visible to the operator.

(B) A jib hoist limiting device.

(iii) Equipment with telescoping booms shall be equipped with a device to indicate the boom's extended length clearly to the operator, or shall have measuring marks on the boom.

(iv) *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) shall 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.

(v) *Controlled load lowering***.** The load line hoist drum shall 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)).

(vi) *Proper operation required***.** Personnel hoisting operations shall 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 shall safely stop operations. Personnel hoisting operations shall not resume until the device is again working properly. Alternative measures are not permitted.

(6) Direct attachment of a personnel platform to a luffing jib is prohibited.

(e) *Personnel platform criteria.*

(1) The personnel platform and attachment/suspension system shall be designed for hoisting personnel by a qualified person familiar with structural design.

(2) The system used to connect the personnel platform to the equipment shall allow the platform to remain within 10 degrees of level, regardless of boom angle.

(3) The suspension system shall 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), shall 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 shall be performed by a certified welder familiar with the weld grades, types and material specified in the platform design.

(6) The personnel platform shall be equipped with a guardrail system which meets the requirements of subpart M of this part, and shall 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 shall 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) shall:

(i) Not swing outward.

(ii) Be equipped with a device that prevents accidental opening.

(9) Headroom shall be sufficient to allow employees to stand upright in the platform.

(10) In addition to the use of hard hats, employees shall be protected by overhead protection on the personnel platform when employees are exposed to falling objects. The platform overhead protection shall 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 shall be smooth enough to prevent injury.

(12) The weight of the platform and its rated capacity shall be conspicuously posted on the platform with a plate or other permanent marking.

(f) *Personnel platform loading*.

(1) The personnel platform shall not be loaded in excess of its rated capacity.

(2) *Use*.

(i) Personnel platforms shall be used only for employees, their tools, and the materials necessary to do their work. Platforms shall 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 shall 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 shall 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) shall 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 shall be connected to a master link or shackle (see paragraph (g) 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 shall be capable of supporting without failure at least ten times the maximum intended load.

(4) Eyes in wire rope slings shall be fabricated with thimbles.

(5) Bridles and associated rigging for suspending the personnel platform shall be used only for the platform and the necessary employees, their tools and materials necessary to do their work, and shall not be used for any other purpose when not hoisting personnel.

(h) *Trial lift and inspection*.

(1) A trial lift with the unoccupied personnel platform loaded at least to the anticipated liftweight shall 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 for all locations, shall be performed.

(2) The trial lift shall be performed immediately prior to each shift in which personnel will be hoisted. In addition, the trial lift shall 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 shall 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 shall:

(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 shall be hoisted a few inches 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 shall be free of deficiencies in accordance with § 1926.1413(a).

(B) Multiple part lines shall not be twisted around each other.

(C) The primary attachment shall be centered over the platform.

(D) If the load rope is slack, the hoisting system shall 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 shall be corrected before hoisting personnel.

(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 shall 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 shall 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 shall 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 shall 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.

(4) Personnel hoisting shall 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 shall be performed in a slow, controlled, cautious manner, with no sudden movements of the equipment or the platform.

(2) Platform occupants shall:

(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 shall be secured to the structure where the work is to be performed, unless securing to the structure would create a greater hazard.

(4) If the platform is tied to the structure, the operator shall not move the platform until the operator receives confirmation that it is freely suspended.

(5) Tag lines shall be used when necessary to control the platform.

(6) *Platforms without controls*. Where the platform is not equipped with controls, the equipment operator shall remain at the equipment controls at all times while the platform is occupied.

(7) *Platforms with controls*. Where the platform is equipped with controls, 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 the equipment controls, or in the personnel platform, or 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 shall determine if, in light of the wind conditions, it is not safe to lift personnel. If it is not, the lifting operation shall not begin (or, if already in progress, shall be terminated).

(ii) *Other weather and environmental conditions*. A qualified person shall 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 shall not begin (or, if already in progress, shall be terminated).

(9) Employees being hoisted shall 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 shall be provided and use a personal fall arrest system. The system shall be attached to a structural member within the personnel platform.

(ii) The fall arrest system, including the attachment point (anchorage) used to comply with paragraph (i), shall meet the requirements in § 1926.502.

NOTE: When working over or near water, the requirements of § 1926.106 apply.

(11) *Other load lines*.

(i) No lifts shall 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, the following criteria shall be met:

(A) Equipment travel shall be restricted to a fixed track or runway.

(B) Where a runway is used, it shall 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) Travel shall be limited to boom length.

(D) The boom shall be parallel to the direction of travel, except where it is safer to do otherwise.

(E) A complete trial run shall 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 shall 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 shall 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, the following requirements shall be met:

(1) The employee shall 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 "boatswains chair."

(ii) A signal person shall be stationed at the shaft opening.

(iii) The employee shall be hoisted in a slow, controlled descent and ascent.

(iv) The employee shall use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick.

(v) The fall protection equipment shall meet the applicable requirements in § 1926.502.

(vi) The boatswain's chair itself (excluding the personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vii) No more than one person shall be hoisted at a time.

(p) *Hoisting personnel for pile driving operations*. When hoisting an employee in pile driving operations, the following requirements shall be met:

(1) The employee shall 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. 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.

(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 shall be hoisted in a slow, controlled descent and ascent.

(iii) The employee shall 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 shall meet the applicable requirements in § 1926.502.

(q) [*Reserved*.]

(r) *Hoisting personnel for marine transfer*. When hoisting employees solely for transfer to or from a marine worksite, the following requirements shall be met:

(1) The employee shall 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 shall be used only for transferring workers.

(iii) The number of workers occupying the transfer device shall not exceed the maximum number it was designed to hold.

(iv) Each employee shall 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 shall be met:

(1) The employee shall be in a personnel platform except where use of a personnel platform is infeasible; in such a case, a boatswain's chair shall 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 shall be hoisted in a slow, controlled descent and ascent.

(iii) The employee shall use personal fall protection equipment, including a full body harness, attached independent of the crane/derrick.

(iv) The fall protection equipment shall meet the applicable requirements in § 1926.502.

(v) The boatswain's chair itself (excluding the personal fall arrest system anchorages), shall be capable of supporting, without failure, its own weight and at least five times the maximum intended load.

(vi) No more than one person shall 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 supervised 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.

(2) The supervisor must review the plan 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 [EFFECTIVE DATE OF THE FINAL RULE] shall meet the applicable requirements for design, construction, and

testing as prescribed in ANSI B30.5–1968, “Crawler, Locomotive, and Truck Cranes,” “PCSA Standard No. 2,” 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 [EFFECTIVE DATE OF THE FINAL RULE] shall meet the following portions of ASME B30.5–2004, “Mobile and Locomotive Cranes,” 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 [EFFECTIVE DATE OF THE FINAL RULE] shall meet the prototype testing requirements in Test Option A or Test Option B of this section.

Note: Prototype testing of crawler, locomotive and truck cranes manufactured prior to the effective date of the standard 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, Table 1, shall be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J1063, Table 2 shall be met.

(ii) The following applies to equipment with pendant supported lattice booms: All the tests listed in SAE J987, Table 1, shall be performed to load all critical structural elements to their respective limits. All the strength margins listed in SAE J987, Table 2 shall be met.

(2) *Test Option B*. The testing and verification requirements of CEN's EN 13000 (2004) shall be met. In applying the CEN standard, the following additional requirements shall 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 meet the strength margins listed in SAE J1063 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 meet the strength margins listed in SAE J987 Table 2.

(iii) *Analysis verification*. The physical testing requirements under SAE J1063 and SAE J987 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 shall 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 shall 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 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 shall clearly indicate the areas where no load is to be handled.

(iv) Recommended reeving for the hoist lines shall 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 shall be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths and the number of parts of the line in use.

(3) Hook and ball assemblies and load blocks shall be marked with their rated capacity and weight.

(4) *Latching hooks*.

(i) Hooks shall 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, shall 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 shall 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 shall be maintained in legible condition.

(6) An accessible fire extinguisher shall be on the equipment.

(7) *Cabs*. Equipment with cabs shall meet the following requirements:

(i) Cabs shall 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) shall be designed to prevent inadvertent opening or closing while traveling or operating the machine. Swinging doors adjacent to the operator shall open outward. Sliding operator doors shall open rearward.

(iii) *Windows*.

(A) The cab shall have windows in front and on both sides of the operator. Forward vertical visibility shall 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 shall be designed so that they can be secured to prevent inadvertent closure.

(C) Windows shall 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 shall 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 shall 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 shall 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 shall 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 shall be protected from damage to the extent feasible.

(11) The equipment shall 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 shall be:

(i) Of a size and thermal capacity sufficient to control loads with the minimum recommended reeving.

(ii) Adjustable to permit compensation for lining wear to maintain proper operation.

(13) *Hydraulic load hoists*. Hydraulic drums shall 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 paragraph (a)(1), (a)(2), or (a)(3) 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.

(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 shall 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 shall 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 supervisor shall address the following:

(i) *Foundations and structural supports*. The A/D supervisor shall verify that tower crane foundations and structural supports are installed in accordance with their design.

(ii) *Loss of backward stability*. Backward stability must be considered 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 shall 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 shall 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 shall be located such that no crane may 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 shall:

(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.

(iii) Ensure that no part of the climbing procedure takes place when wind exceeds the speed recommended by the manufacturer or, where the

manufacturer does not specify this information, the speed determined by a qualified person.

(8) *Counterweight/ballast.*

(i) Equipment shall 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 shall 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 shall 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 shall be provided at both ends of travel of the trolley.

(3) *Proper operation required*. Operations shall not begin unless the devices listed in this section are in proper working order. If a device stops working properly during operations, the operator shall safely stop operations. Operations shall not resume until the device is again working properly. 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 shall 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, shall be followed.

(4) If an operational aid stops working properly during operations, the operator shall 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 shall be repaired no later than 7 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, the repair shall be completed within 7 days of receipt of the parts.

(i) *Trolley travel limiting device*. The travel of the trolley shall 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 shall 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 shall 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 shall 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.

(iii) *Anti two-blocking device*. The tower crane shall 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.

(iv) *Hoist drum lower limiting device*. Tower cranes manufactured more than one year after the effective date of this standard shall 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.

(v) *Load moment limiting device*. The tower crane shall have a device that prevents moment overloading. *Temporary alternative measures:* A radius indicating device shall be used (if the tower crane is not equipped with a radius indicating device, the radius shall be measured to ensure the load is within the rated capacity of the crane). In addition, the weight of the load shall be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information shall be provided to the operator prior to the lift.

(vi) *Hoist line pull limiting device*. The capacity of the hoist shall be limited to prevent overloading, including each individual gear ratio if equipped with a multiple speed hoist transmission. *Temporary alternative measures:* The operator shall 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 shall be limited to prevent the travel bogies from running into the end stops or buffers. *Temporary alternative measures:* A spotter shall be used when operations are conducted within 10 feet of either end of the travel rail end stops.

(viii) *Boom hoist drum positive locking device*. The boom hoist drum shall be equipped with a device to positively lock the boom hoist drum. *Temporary alternative measures:* The device shall be manually set when required if an electric, hydraulic or automatic type is not functioning.

(6) *Category II operational aids and alternative measures*. Operational aids listed in this paragraph that are not working properly shall 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 shall be completed within 7 days of receipt of the parts.

(i) *Boom angle or hook radius indicator*.

(A) Luffing boom tower cranes shall have a boom angle indicator readable from the operator's station.

(B) Hammerhead tower cranes manufactured more than one year after the effective date of this standard shall have a hook radius indicator readable from the operator's station.

(C) *Temporary alternative measures*: Hook radii or boom angle shall be determined by measuring the hook radii or boom angle with a measuring device.

(ii) *Trolley travel deceleration device*. The trolley speed shall be automatically reduced prior to the trolley reaching the end limit in both directions. *Temporary alternative measure:* The operator shall reduce the trolley speed when approaching the trolley end limits.

(iii) *Boom hoist deceleration device*. The boom speed shall be automatically reduced prior to the boom reaching the minimum or maximum radius limit. *Temporary alternative measure*: The operator

shall reduce the boom speed when approaching the boom maximum or minimum end limits.

(iv) *Load hoist deceleration device*. The load speed shall be automatically reduced prior to the hoist reaching the upper limit. *Temporary alternative measure:* The operator shall reduce the hoist speed when approaching the upper limit.

(v) *Wind speed indicator*. A device shall be provided to display the wind speed and shall be mounted above the upper rotating structure on tower cranes. On self erecting cranes, it shall 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 more than one year after the effective date of this standard, shall 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 shall be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or by

other equally reliable means. This information shall 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."

(2) *Post-erection inspection*. In addition to the requirements in § 1926.1412(c), the following requirements shall be met:

(i) A load test using certified weights, or scaled weights using a certified scale with a current certificate of calibration, shall be conducted after each erection.

(ii) The load test shall be conducted in accordance with the manufacturer's instructions. Where these instructions are unavailable, a registered professional engineer familiar with the type of equipment involved shall develop written load test procedures.

(3) *Monthly*. The following additional items shall 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.

**§ 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 shall 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 shall 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 shall 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 shall be readily available at the job site to personnel responsible for the operation of the equipment.

(c) Construction.

(1) *General requirements*.

(i) Derricks shall 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 shall conform to recommended practices in ANSI/AWS D14.3 - 94 or D1.1 - 02.

(2) *Guy derricks*.

(i) The minimum number of guys shall 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 shall not be used unless the employer has the following guy information:

(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 shall have the following guy information:

(A) The amount of initial sag or tension.

(B) The amount of tension in guy line rope at anchor.

(iv) The mast base shall permit the mast to rotate freely with allowance for slight tilting of the mast caused by guy slack.

(v) The mast cap shall:

(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 shall be supported in the vertical position by at least two stifflegs; one end of each shall be connected to the top of the mast and the other end securely anchored.

(ii) The stifflegs shall be capable of withstanding the loads imposed at any point of operation within the load chart range.

(iii) The mast base shall:

(A) Permit the mast to rotate freely (when necessary).

(B) Permit deflection of the mast without binding.

(iv) The mast shall 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 shall:

(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 shall 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 shall ensure that the derrick is not used in an unstable position.

(ii) The base of the gin pole shall permit movement of the pole (when necessary).

(iii) The gin pole shall 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 shall 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 shall be used.

(2) *Guy derricks*.

(i) The mast base shall be anchored.

(ii) The guys shall be secured to the ground or other firm anchorage.

(iii) The anchorage and guying shall 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 shall be anchored.

(ii) The mast base and stifflegs shall 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 shall be suitable for the derrick work intended and shall be anchored to prevent displacement from the imposed loads.

(2) Base-mounted drum hoists.

(i) Base mounted drum hoists shall meet the requirements in the following sections of ASME B30.7–2001:

(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 shall 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 shall be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing shall 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 shall be conducted as follows:

(A) The test load shall be hoisted a vertical distance to assure that the load is supported by the hoist and held by the hoist brake(s).

(B) The test load shall be lowered, stopped and held with the brake(s).

(C) The hoist shall 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) and § 1926.1416(e)(1) (Boom angle or radius indicator) and § 1926.1416(e)(4) (Load weighing and similar devices).

(2) *Boom angle aid*. The employer shall ensure that either:

(i) The boom hoist cable shall be marked with caution and stop marks. The stop marks shall correspond to maximum and minimum allowable

boom angles. The caution and stop marks shall 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*. Derricks manufactured more than one year after the effective date of this standard with a maximum rated capacity over 6,000 pounds shall 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 shall be determined from a reliable source (such as the load's manufacturer), by a reliable calculation method (such as calculating a steel beam from measured dimensions and a known per foot weight), or by other equally reliable means. This information shall be provided to the operator prior to the lift.

(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), shall be approved by a qualified person.

(ii) If using a rock or hairpin anchorage, the qualified person shall determine if any special testing of the anchorage is needed. If so, it shall be tested accordingly.

(2) *Functional test*. Prior to initial use, new or reinstalled derricks shall be tested by a competent person with no hook load to verify proper operation. This test shall 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 shall be load tested by a competent person. The test load shall meet the following requirements:

(i) Test loads shall 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 shall the test load be less than the maximum anticipated load.

(ii) The test shall 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 shall not be used unless the competent person determines that the test has been passed.

(4) *Documentation*. Tests conducted under this paragraph shall be documented. The document shall contain the date, test results and the name of the tester. The

document shall be retained until the derrick is re-tested or dismantled, whichever occurs first.

(h) *Load testing repaired or modified derricks*. Derricks that have had repairs, modifications or additions affecting the derrick's capacity or safe operation shall be evaluated by a qualified person to determine if a load test is necessary. If it is, load testing shall 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 shall safely stop operations. This shall 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 shall not be handled on a winch head without the knowledge of the operator.

(2) While a winch head is being used, the operator shall 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 shall be engaged.

(2) When taken out of service for 30 days or more, the boom shall 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 shall be supervised by the A/D supervisor.

(o) Derrick operations shall be supervised by a competent person.

(p) *Inspections*. In addition to the requirements in § 1926.1412, the following additional items shall 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) Section 1926.1427 (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 (vessel/flotation device); all 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/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 § 1926.1416 (a)(2)(ii).

(2) The employer shall either:

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

(ii) The hazard areas shall be clearly marked by a combination of warning signs (such as "Danger – Swing/Crush Zone" or "Danger – This Thing's Gonna Swing and Crunch You – Zone") and high visibility markings on the equipment that identify the hazard areas. In addition, the employer shall train the employees 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. This shall be located in the cab or, where there is no cab, at the operator's station.

(2) Horn.

(3) Positive equipment house lock.

(4) *Wind speed and direction indicator*. A competent person shall determine if wind is a factor that needs to be considered; if it needs to be considered, a wind speed and direction indicator shall 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.

(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:

(1) Rated capacities (load charts) shall be posted at the operator's station. If the operator's station is moveable (such as with pendant-controlled equipment), the load charts shall be 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, shall be readily available on board.

(h) *Inspections*. In addition to meeting the requirements of § 1926.1412 for inspecting the crane/derrick, the employer shall ensure that the barge, pontoons, vessel or other means of flotation used to support a floating crane/derrick or land crane/derrick is inspected as follows:

(1) *Shift*. The means used to secure/attach the equipment to the vessel/flotation device shall be inspected for proper condition, including wear, corrosion, loose or missing fasteners, defective welds, and (where applicable) insufficient tension.

(2) *Monthly*. The vessel/ flotation device used shall be inspected for the following:

(i) The means used to secure/attach the equipment to the vessel/flotation device shall be inspected for proper condition, including wear, corrosion and (where applicable) insufficient tension.

(ii) Taking on water.

(iii) Deckload for proper securing.

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

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

(3) The shift and monthly inspections shall be conducted by a competent person. If any deficiency is identified, an immediate determination shall be made by a qualified person as to whether the deficiency constitutes a hazard. If the

deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.

(4) *Annual: external vessel/flotation device inspection*.

(i) The external portion of the barge, pontoons, vessel or other means of flotation used shall be inspected annually by a qualified person who has expertise with respect to vessels/flotation devices. The inspection shall include 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, and deformation.

(C) External evidence of leaks and structural damage.

(D) Four-corner draft readings.

(E) Firefighting equipment for serviceability.

(ii) Rescue skiffs, lifelines, work vests, life preservers and ring buoys shall be inspected for proper condition.

(iii) If any deficiency is identified, an immediate determination shall be made by the qualified person as to whether the deficiency constitutes a

hazard or, though not yet a hazard, needs to be monitored in the monthly inspections. If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.

(iv) If the qualified person determines that, though not presently a hazard, the deficiency needs to be monitored, the employer shall ensure that the deficiency is checked in the monthly inspections.

(5) *Quadrennial : internal vessel/flotation device inspection*.

(i) The internal portion of the barge, pontoons, vessel or other means of flotation used shall be surveyed once every 4 years by a marine engineer, marine architect, licensed surveyor, or other qualified person who has expertise with respect to vessels/flotation devices.

(ii) If any deficiency is identified, an immediate determination shall be 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.

(iii) If the deficiency is determined to constitute a hazard, the vessel/flotation device shall be removed from service until it has been corrected.

(iv) If the surveyor determines that, though not presently a hazard, the deficiency needs to be monitored, the employer shall ensure that 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 shall be documented in accordance with §§ 1926.1412 (e)(3) and 1926.1412(f)(7), respectively. The quadrennial inspection required in paragraph (h)(5) of this section shall be documented in accordance with § 1926.1412(f)(7), except that the documentation for that inspection shall be retained for a minimum of 4 years.

(i) [*Reserved*.]

(j) *Working with a diver*. The following additional requirements apply 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 shall not be used for any other purpose until the diver is back on board. When used for more than one diver, it shall not be used for any other purpose until all divers are back on board.

(2) The operator shall remain at the controls of the crane/derrick at all times.

(3) In addition to the requirements in §§ 1926.1419 through 1422 (Signals), either:

(i) A clear line of sight shall be maintained between the operator and tender, or

(ii) The signals between the operator and tender shall be transmitted electronically.

(4) The means used to secure the crane/derrick to the vessel/flotation device (see paragraph (n)(5) of this section) shall not allow any amount of shifting in any direction.

(k) The employer shall ensure that the manufacturer's specifications and limitations 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 manufacturer load charts applicable to operations on water shall not be exceeded. When using these charts, the employer shall comply with all parameters and limitations (such as dynamic/environmental parameters) applicable to the use of the charts.

(ii) The load charts shall take into consideration a minimum wind speed of 40 miles per hour.

(2) The requirements for maximum allowable list and maximum allowable trim as specified in Table M1 of this section shall be 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 equipment shall be stable under the conditions specified in Tables M2 and M3 of this section.

| 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 shall 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 shall 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 barge, pontoons, vessel or other means of flotation used shall:

(i) Be 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.

(n) *Land cranes/derricks*. For land cranes/derricks used on barges, pontoons, vessels or other means of flotation:

(1) The rated capacity of the equipment (load charts) applicable for use on land shall be 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 expected environmental conditions.

(iii) Ensure that 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 shall be done 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) *List and trim*.

(i) The maximum allowable list and the maximum allowable trim for the barge, pontoon, vessel or other means of flotation shall 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 shall not exceed the least of the following: 5 degrees, the amount specified by the crane/derrick manufacturer, or where 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 shall not exceed the amount specified by the crane/derrick manufacturer, or where an amount is not so specified, the amount specified by the qualified person.

(4) The following conditions shall be met:

(i) All deck surfaces of the barge, pontoons, vessel or other means of flotation used shall be above water.

(ii) The entire bottom area of the barge, pontoons, vessel or other means of flotation used shall be submerged.

(5) *Physical attachment, corralling, rails system and centerline cable system.* The employer shall meet the requirements in Option (1), Option (2), Option (3), or Option (4) of this section. Whichever option is used, the requirements of paragraph (v) must also be met.

(i) *Option (1) – Physical attachment.* The crane/derrick shall be 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 (this type of system allows the crane/derrick to lift up slightly from the surface of the vessel/means of flotation), 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 shall be prevented from shifting by installing barricade restraints (a corralling system). Corralling systems shall not allow any amount of shifting in any direction by the equipment.

(iii) *Option (3) – Rails.* The crane/derrick shall be prevented from shifting by being mounted on a rail system. Rail clamps and rail stops are

required unless the system is designed to prevent movement during operation by other means.

(iv) *Option (4) – Centerline cable system*. The crane/derrick shall be prevented from shifting by being mounted to a wire rope system. The wire rope system shall meet the following requirements:

(A) The wire rope and attachments shall be of sufficient size/strength to support the side load of crane/derrick.

(B) The wire rope shall be physically attached to the vessel/flotation device.

(C) The wire rope shall be attached to the crane/derrick by appropriate attachment methods (such as shackles or sheaves) on the undercarriage which 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 shall be installed to prevent the crane/derrick from passing the forward or aft end of the wire rope attachments.

(E) The crane/derrick shall be 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 shall be designed by a marine engineer, registered professional engineer familiar with floating crane/derrick design, or qualified person familiar with floating crane/derrick design.

(vi) *Exception*. For mobile auxiliary cranes used on the deck of a floating crane/derrick, the requirement to use Option (1), Option (2), Option (3), or Option (4) of this section does not apply where the employer demonstrates implementation of a plan and procedures that meet the following requirements:

(A) 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.

(B) The plan shall be designed so that the applicable requirements of this section will be met despite the position, travel, operation, and lack of physical attachment (or corralling, use of rails or cable system) of the mobile auxiliary crane.

(C) The plan shall specify the areas of the deck where the mobile auxiliary crane is permitted to be positioned, travel, and operate and the parameters/ limitations of such movements and operation.

(D) The deck shall be marked to identify the permitted areas for positioning, travel, and operation.

(E) The plan shall specify the dynamic/environmental conditions that must be present for use of the plan.

(F) If the dynamic/environmental conditions in paragraph (n)(5)(vi)(E) of this section are exceeded, the mobile auxiliary crane shall be physically attached or corralled in accordance with Option (1), Option (2) or Option (4) of this section.

(6) The barge, pontoons, vessel or other means of flotation used shall:

(i) Be 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.*

(1) This paragraph applies 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.

(2) The requirements of § 1910.179, except for § 1910.179(b)(1), apply to the equipment identified in paragraph (a)(1) of this section.

(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, 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 1414; §§ 1926.1417 through 1425; § 1926.1426(d), §§ 1926.1427 through 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) applies only to equipment identified in paragraph (b)(1) of this section manufactured before September 19, 2001.

(iii) For equipment manufactured on or after September 19, 2001, the following sections of ASME B.30.2–2005 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 this standard apply to dedicated pile drivers, except as specified in this section.

(b) Section 1926.1416(d)(3) (anti two-block device) does not apply.

(c) Section 1926.1416(e)(4) (Load weight/capacity devices) applies only to dedicated pile drivers manufactured more than one year after the effective date of this standard.

(d) In § 1926.1433, only §§ 1926.1433(e) and (f) apply to dedicated pile drivers.

(e) 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.

**§ <u>1926.1440 Sideboom cranes</u>.**

(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 [effective date of this standard].

(c) Sideboom cranes mounted on wheel or crawler tractors shall meet the following requirements of ASME B30.14–2004 (Side Boom Tractors):

(i) Section 14-1.1 ("Load Ratings").

(ii) Section 14-1.3 ("Side Boom Tractor Travel").

(iii) Section 14-1.5 ("Ropes and Reeving Accessories").

(iv) Section 14-1.7.1 ("Booms").

(v) Section 14-1.7.2 ("General Requirements – Exhaust Gases").

(vi) Section 14-1.7.3 ("General Requirements – Stabilizers (Wheel-Type Side Boom Tractors)").

(vii) Section 14-1.7.4 ("General Requirements – Welded Construction").

(viii) Section 14-1.7.6 ("General Requirements – Clutch and Brake Protection").

(ix) Section 14-2.2.2 ("Testing – Rated Load Test"), except that it applies only to equipment that has been modified or repaired.

(x) In section 14-3.1.2 ("Operator Qualifications"), paragraph (a), except the phrase "When required by law."

(xi) In section 14-3.1.3 ("Operating Practices"), paragraphs (e), (f)(1) – (4), (6), (7); (h), and (i).

(xii) 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.**

For equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less:

(a) The following sections of this subpart apply: § 1926.1400 (Scope); § 1926.1401 (Definitions); § 1926.1402 (Ground conditions); §§ 1926.1407 through 1411 (Power line safety); §§ 1926.1413 through 1414 (Wire rope); § 1926.1418 (Authority to stop operation); §§ 1926.1419 through 1422 (Signals); § 1926.1423 (Fall protection); § 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).

**Note**: Under paragraph (b)(1) of this section, § 1926.1403 (Assembly/Disassembly – selection of manufacturer or employer procedures) and § 1926.1406 (Assembly/Disassembly – employer procedures – general requirements) also apply.

(b) *Assembly/disassembly*.

(1) Sections 1926.1403 (Assembly/ Disassembly – Selection of manufacturer or employer procedures) and 1926.1406 (Assembly/ Disassembly – employer procedures) apply.

(2) *Components and configuration*.

(i) The selection of components and configuration of the equipment that affect the capacity or safe operation of the equipment must be in accordance with:

(A) Manufacturer instructions, recommendations, 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

(B) Approved modifications that meet the requirements of § 1926.1434 (Equipment modifications).

(ii) *Post-assembly inspection*. Upon completion of assembly, the equipment must be inspected to ensure 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 shall comply with all manufacturer procedures applicable to the operational functions of the equipment, including its use with attachments.

(2) *Unavailable operation procedures*.

(i) Where the manufacturer procedures are unavailable, the employer shall develop and ensure compliance with all procedures necessary for the safe operation of the equipment and attachments.

(ii) Procedures for the operational controls must be developed by a qualified person.

(iii) Procedures related to the capacity of the equipment must be developed and signed by a registered professional engineer familiar with the equipment.

(3) *Accessibility*.

(i) The load chart shall be 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, shall be readily available for use by the operator.

(iii) Where rated capacities are available at the control station 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) *Safety devices and operational aids*.

(1) Originally-equipped safety devices and operational aids shall be maintained in accordance with manufacturer procedures.

(2) *Anti two-blocking*. Equipment covered by this section manufactured more than one year after the effective date of this standard shall have either an anti two-block device that meets the requirements of § 1926.1416(d)(3), or shall be designed so that, in the event of a two-block situation, no damage will occur and

there will be no load failure (such as where the power unit will stall in the event of a two-block).

(e) *Operator qualifications*. The employer shall ensure that, prior to operating the equipment, the operator is trained on the safe operation of the type of equipment the operator will be using.

(f) *Signal person qualifications*. The employer shall ensure that signal persons are trained in the proper use of signals applicable to the use of the equipment.

(g) *Keeping clear of the load*. Section 1926.1425 applies, except for § 1926.1425(c)(3) (qualified rigger).

(h) *Inspections*. The equipment shall be inspected in accordance with manufacturer procedures.

(i) [*Reserved*.]

(j) *Hoisting personnel*. Hoisting personnel using equipment covered by this section is prohibited.

(k) *Design*. The equipment shall be designed by a qualified engineer.

**Appendix A to Subpart CC of Part 1926–Standard Hand Signals**

(Illustration to be added with final rule.)
**STOP –** With arm extended horizontally to the side, palm down, arm is swung back and forth.

(Illustration to be added with final rule.)
**HOIST –** With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.

(Illustration to be added with final rule.)
**RAISE BOOM –** With arm extended horizontally to the side, thumb points up with other fingers closed.

(Illustration to be added with final rule.)
**SWING –** With arm extended horizontally, index finger points in direction that boom is to swing.

(Illustration to be added with final rule.)
**RETRACT TELESCOPING BOOM –** With hands to the front at waist level, thumbs point at each other with other fingers closed.

(Illustration to be added with final rule.)
**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.

(Illustration to be added with final rule.)
**DOG EVERYTHING –** Hands held together at waist level.

(Illustration to be added with final rule.)

**LOWER –** With arm and index finger pointing down, hand and finger make small circles.

(Illustration to be added with final rule.)

**LOWER BOOM –** With arm extended horizontally to the side, thumb points down with other fingers closed.

(Illustration to be added with final rule.)

**EXTEND TELESCOPING BOOM –** With hands to the front at waist level, thumbs point outward with other fingers closed.

(Illustration to be added with final rule.)

**TRAVEL** – With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.

(Illustration to be added with final rule.)

**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.

(Illustration to be added with final rule.)

**MOVE SLOWLY –** A hand is placed in front of the hand that is giving the action signal.

(Illustration to be added with final rule.)

**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.

(Illustration to be added with final rule.)

**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.

(Illustration to be added with final rule.)

**USE MAIN HOIST –** A fist taps on top of the head. Then regular signal is given to indicate desired action.

(Illustration to be added with final rule.)

**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.

**Appendix B to Subpart CC of Part 1926–Use of Non-Standard Signals.**

The follow is an example of a situation where the use of the Standard Method for hand signals is infeasible: Due to background lighting conditions behind the signal person, there is insufficient contrast between the person's hand and the sky color. This prevents the operator from being able to clearly see the signal person's hand and fingers when extended out to either side.

**Appendix C to Subpart CC of Part 1926–Checklist for Determining if Hoisting Personnel is Permissible.**

**HOISTING PERSONNEL IS PERMITTED:** when the employer can show that the erection, use, and dismantling of conventional means of reaching the worksite, 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. See § 1926.1431(a).

**However**, the employer may hoist personnel without showing that the erection, use, and dismantling of conventional means of reaching the worksite would be more hazardous, or is not possible because of the project's structural design or worksite conditions:

1) when engaged in work covered by subpart R (Steel Erection) of this part. See § 1926.1431(a);

2) when using a personnel platform to hoist personnel for pile driving operations. See § 1926.1431(p)(3).

**HOISTING PERSONNEL IS ALWAYS PROHIBITED:** Even if hoisting personnel is otherwise permitted, it is prohibited:

1) when any part of the equipment would get closer than 20 feet to a power line that is 350 kV or less or 50 feet to a power line over 350 kV, unless the employer is engaged in Subpart V work. See § 1926.1431(n);

2) when equipment is traveling unless the equipment travels on fixed rails or the employer can demonstrate that there is no less hazardous way to perform the work. See § 1926.1431(k)(12). However, when the equipment is a derrick, it may not be used to hoist personnel while traveling under any circumstances. See § 1926.1431(k)(13);

3) when the equipment has a rated hoisting/lifting capacity of 2,000 pounds or less. See § 1926.1441(j).

**WHEN HOISTING PERSONNEL IS PERMITTED, A PERSONNEL PLATFORM MEETING THE REQUIREMENTS OF § 1431 MUST BE USED, EXCEPT:**

1) when hoisting personnel in drill shafts 8 feet or less in diameter, the employer may instead use either a personnel platform or a boatswain's chair. See § 1926.1431(o);

2) when hoisting personnel for pile driving operations the employer may instead use a boatswain's chair. See § 1926.1431(p);

3) when hoisting personnel for marine transfer, the employer may instead use a marine hoisted personnel transfer device. See § 1926.1431(r);

4) when hoisting personnel for storage tank, shaft, and chimney operations, the employer may instead use a boatswain's chair, but only if use of a personnel platform is infeasible. See § 1926.1431(s).

**Appendix D 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 supervisor 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.

To minimize the risk of unintended dangerous movement while the pins are removed, the A/D supervisor 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 supervisor'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 supervisor 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 supervisor determines that it is rigged over the center of gravity and can be moved into place without dangerous movement.

**Appendix E 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 and outriggers 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 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 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 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.