WEST VIRGINIA
SECRETARY OF STATE
KEN HECHLER
ADMINISTRATIVE LAW DIVISION

Form #4

FILED

Dec 22 1 07 AM '00

OFFICE OF WEST VIRGINIA SECRETARY OF STATE

NOTICE OF RULE MODIFICATION OF A PROPOSED RULE

AGENCY: West Virginia Division of Labor TITLE NUMBER: 42

CITE AUTHORITY WV Code 21-3D-3

AMENDMENT TO AN EXISTING RULE: YES X NO

IF YES, SERIES NUMBER OF RULE BEING AMENDED: 24

TITLE OF RULE BEING AMENDED: Crane Operator Certification Act

IF NO, SERIES NUMBER OF NEW RULE BEING PROPOSED:

TITLE OF RULE BEING PROPOSED:

THE ABOVE PROPOSED LEGISLATIVE RULE, FOLLOWING REVIEW BY THE LEGISLATIVE RULE MAKING REVIEW COMMITTEE IS HEREBY MODIFIED AS A RESULT OF REVIEW AND COMMENT BY THE LEGISLATIVE RULE-MAKING REVIEW COMMITTEE. THE ATTACHED MODIFICATIONS ARE FILED WITH THE SECRETARY OF STATE.

$5.20

WEST VIRGINIA DIVISION OF LABOR

319 Building Three, Capitol Complex • Charleston, West Virginia 25305

Phone (304) 558-7890 • Fax (304) 558-3797

HTTP://WWW.STATE.WV.US/LABOR

CECIL H. UNDERWOOD
Governor

STEVEN A. ALLRED
Commissioner

Facts and Circumstances

During the 2000 Regular Session, the West Virginia Legislature passed House Bill 4645. This bill was an amendment to WV Code §21-3D, Crane Operator Certification Act. This amendment was so extensive that it required the complete re-write of the Legislative rule, 42 CSR 24.

To facilitate a smooth transition into this regulatory process, the West Virginia Division of Labor assembled an advisory group to assist in the drafting of this rule. The group was intended to provide representation from all parties affected by the Act. This rule is the result of the efforts of that advisory group.

The Crane Operator Certification Advisory Group consisted of representatives from the following organizations:

WV Building and Construction Trades Council, AFL-CIO
Local #132, Operating Engineers
United Mine Workers of America, Dist. 17
United Steel Workers of America
Contractors Association of West Virginia
Associated Builders and Contractors, Inc.
All Crane & Equipment Rental Corp.
Anthony Crane and Equipment Rental
Anderson of West Virginia
Ahern and Associates, Inc.

WEST VIRGINIA DIVISION OF LABOR

319 Building Three, Capitol Complex • Charleston, West Virginia 25305

Phone (304) 558-7890 • Fax (304) 558-3797

HTTP://WWW.STATE.WV.US/LABOR

CECIL H. UNDERWOOD
Governor

STEVEN A. ALLRED
Commissioner

Summary of Changes

§42-24-1. No change.

§42-24-2. Filing and effective dates deleted and will be changed upon adoption of this rule amendment.

§42-24-3. Definitions were added for Class A certification, Class B certification and Approved Training Course as mandated by H.B. 4645. The existing definitions were re-numbered.

§42-24-4. No change.

§42-24-5.1. The effective date was changed to reflect the mandate of H.B. 4645. The word "mobile" was added for clarification and in compliance with the adopted standards of American National Standards Institute (ANSI) and the Occupational Safety and Health Administration (OSHA).

§42-24-6. House Bill 4645 mandated a two tiered classification system, one for national certification and one for state only certification. This section defines the minimum qualifications for each of the two classifications.

§42-24-7. This section addresses the examination process and involves several changes.

7.1(b). The original rule established the written examination to be administered by a private vendor. This has resulted in numerous complaints about high examination costs. It was therefore decided to provide the commissioner with an option to develop and administer a state level examination and reduce the costs to the applicant. The commissioner will continue to have the option to utilize the services of a private testing company.

7.1(c). As provided for in H.B. 4645, the commissioner has the option to accept a lesser passing score (not less than 60%) on the national examination for the issuance of Class B certifications only.

7.1(d). As provided for in H.B. 4645, a class B crane operator may be re-certified every fifth year by substituting the completion of an approved training course for the required written examination. Prior to H.B. 4645, the operator had to pass the written examination prior to the fifth year re-certification.

7.2. House Bill 4645 provided for two substitutions for the required practical examination:

> **(b) (1).** Any person who documents 2,000 hours of crane operating experience in the four years immediately preceding the date of application and applies for certification prior to September 1, 2001 shall not be required to take a practical examination. The Crane Operator Certification Advisory Group has requested and this proposed rule incorporates an extension of the experience substitution provision. This proposed provision would require a minimum of 250 hours of experience in all crane categories requested by the applicant with the total hours of experience being the minimum of 2000 hours as required by H.B. 4645. This is a safety issue. The Advisory Group was of the opinion that the Division of Labor should not "grandfather" an operator to operate a crane on which they had little or no experience. While this provision may exceed the statutory authority of the commissioner, it is requested that the provision be authorized by the adoption of this rule.
>
> **(b) (2).** As provided for by H.B. 4645, the successful completion of an approved training course may be substituted for the required practical examination.

§42-24-8. This section contains new subject matter. House Bill 4645 authorized the substitution of an approved training program for the written and practical examinations required for class B certifications. This section attempts to set the criteria for the composition and administering of approved training programs.

All changes to other sections involve re-numbering only.

42CSR24
Title 42
Legislative Rule
West Virginia Division of Labor
Series 24

Crane Operator Certification Act

§42-24-1. General.

1.1. Scope. This legislative rule governs certification, fees, examinations, training, powers and duties of the commissioner and penalties for violations in accordance with W.Va. Code §21-3D-1 et seq, and W.Va. Code §29A-3-1 et seq.

1.2. Authority. W.Va. Code §21-3D-3.

1.3. Filing Date. ~~March 26, 1999~~

1.4. Effective Date. ~~May 1, 1999~~

§42-24-2. Application and Enforcement.

2.1. Application. This legislative rule applies to the West Virginia Division of Labor and all persons, materials and transactions governed or otherwise defined under coverage of the Crane Operator Certification Act, W.Va. Code §21-3D-1 et seq.

2.2. Enforcement. The enforcement of this legislative rule is vested with the West Virginia Division of Labor.

§42-24-3. Definitions.

3.1. "Class A certification" means a certification issued to a person who has met all national level certification criteria as required by the National Commission for the Certification of Crane Operators (NCCCO).

3.2. "Class B certification" means a certification issued to a person who has met all state level certification criteria as required by the commissioner.

~~3.1.~~ 3.3. "Commissioner" means the commissioner of labor.

~~3.2.~~ 3.4. "Division" means the West Virginia Division of Labor.

3.5. "Approved training course" means a training course which has been reviewed and certified by the commissioner as complying with the requirements of section eight [§42-24-8] of this rule.

§42-24-4. Adoption of standards.

4.1. National standards. For the enforcement of this ~~article~~ rule, the American National Standards Institute (A.N.S.I.) code B30 and B30.5 are hereby incorporated by reference.

4.2. State standards. [RESERVED]

§42-24-5. Certification required; exemptions.

5.1. Effective the first day of ~~January~~ September, two ~~thousand~~ thousand-one, a person may not operate a mobile crane with a lifting capacity of five tons or more without certification issued under this rule.

5.2. A person is not required to obtain certification under this rule if the person:

(a) Is a member of the armed forces of the United States or an employee of the United States, when such member or employee is engaged in the work of a crane operator exclusively for the government unit;

(b) Is primarily the operator of farm machinery who is performing the work of a crane operator as part of an agricultural operation;

(c) Is operating a crane on an emergency basis when the emergency is an occurrence of an event, circumstance or situation that presents an imminent threat to persons or property and constitutes a serious health or safety hazard;

(d) Is operating a crane for personal use and not for profit on the site of real property which the person owns or leases;

(e) Is under the direct supervision of a certified crane operator when the certified crane operator is within close proximity to the controls of the crane; and

1. Who is enrolled in an industry recognized in-house training course based on the American National Standards Institute standards for

crane operators and who is employed by the entity that either taught the training course or contracted to have the training course taught, all of which is approved by the commissioner; or

2. Who is enrolled in an apprenticeship program or training program for crane operators approved by the United States Department of Labor, Bureau of Apprenticeship and Training;

(f) Is an employee of and operating a crane at the direction of any manufacturing plant or other industrial establishment, including any mill, factory, tannery, paper or pulp mill, mine, colliery, breaker or mineral processing operation, quarry, refinery or well, or is an employee of and operating a crane at the direction of the person, firm or corporation who owns or is operating such plant or establishment and on property owned or leased by such person, firm or corporation;

(g) Is an employee of a public utility operating a crane to perform work in connection with facilities used to provide public service under the jurisdiction of the West Virginia Public Service Commission, Federal Energy Regulatory Commission or the Federal Communications Commission; or

(h) Is operating timbering harvesting machinery associated with the production of timber and the manufacturing of wood products.

§42-24-6. Minimum Qualifications for Certification.

6.1. The commissioner shall certify an applicant for a class A certification who:

(a) Is at least eighteen years of age;

(b) Submits an application on forms provided by the commissioner;

(c) Submits copy of written examination scores as provided to the applicant by the NCCCO;

(d) Submits copy of practical examination scores as provided to the applicant by the NCCCO, or a statement of exemption if the practical examination was not required by the NCCCO;

(e) Submits a copy of a NCCCO certification card which reflects that the applicant is current and in good status;

(f) Presents the original, or a photographic copy, of a physician's certificate that he or she is physically qualified to drive a commercial motor vehicle as required by 49 CFR §391.41 current within on year of the date of application for certification, or an equivalent physician's certificate as approved by the commissioner; and

(g) Pays the application fee of seventy-five ($75) dollars.

~~6.1.~~ 6.2. The commissioner shall certify an applicant for a class B certification who:

(a) Is at least eighteen years of age;

(b) ~~Submit~~ Submits an application on forms provided by the commissioner;

(c) (1) ~~Pass~~ Passes the written examination, or

(2) Is exempted by the provisions of WV Code §21-3D-4(a)(3);

(d) (1) ~~Pass~~ Passes the practical examination, or ~~unless otherwise exempted by the provisions of section seven [§42-24-7.2(b)] of this rule. WV Code §21-3D-4(a)(4);~~

(2) Is exempted by the provisions of WV Code §21-3D-4(a)(4);

(e) Presents the original, or a photographic copy, of a physician's certificate that he or she is physically qualified to drive a commercial motor vehicle as required by 49 CFR §391.41 current within one year of the date of application for certification, or an equivalent physician's certificate as approved by the commissioner; and

(f) Pays the application fee of seventy-five ($75) dollars and all examination and/or training fees.

~~6.2.~~ 6.3. Certification under this rule ~~shall be~~ is valid throughout the state ~~and~~ , is not assignable or transferable, and is valid for one year from the date on which it was issued.

~~6.3.~~ 6.4. Upon receipt of a renewal application on a form provided by the commissioner and payment of a renewal fee of seventy-five ($75) dollars, the commissioner shall renew the class A or class B certification. *Provided, ~~however,~~* That the applicant shall meet the following special renewal requirements prior to renewal of a certification on each fifth anniversary of the original certification date:

(a) To renew a class B certification on the fifth anniversary of the initial certification date, the applicant shall pass a written examination or successfully complete an approved training course and provide a current physician's

certificate as required by this section. six ~~[§42-24-6.1(e)] this rule prior to renewal of a certification on each fifth anniversary of the original certification date~~.

(b) To renew a class A certification on the fifth anniversary of the initial certification date, the applicant shall provide a copy of a current and valid certification issued by the National Commission for the Certification of Crane Operators (NCCCO) and a current physician's certificate as required by this section.

§42-24-7. Examinations required.

7.1. Any person desiring a class B certification under the provisions of this article shall submit to the commissioner an application for examination on forms provided by the commissioner. The examination process consists of a written examination and a practical examination.

~~7.1.~~ 7.2. Written examination.

(a) All persons desiring class B certification under the provisions of this article shall pass a written examination. The contents of the examination shall be based on the standards adopted under section four of this rule. All applicants are required to pass a core examination which shall test the applicant's general knowledge of crane safety and the applicable code standards. In addition to the core examination, the applicant shall pass a specialty examination for each class of crane for which certification is desired. The classifications of cranes ~~is~~ are as follows:

1. Lattice boom truck crane;
2. Lattice boom crawler crane;
3. Small telescoping boom crane; and
4. Large telescoping boom crane.

(b) ~~A private testing agent approved by the Commissioner shall conduct the examinations. Examination fees shall be charged for each classification examination requested and are the responsibility of the individual applicant. The applicant shall pay all examination fees directly to the approved testing agent. The testing agent shall charge examination fees according to the rate schedule as established and approved by the Commissioner.~~ The commissioner shall provide for the written examination of all class B certification applicants. The commissioner may:

(1) Contract with a private testing agent to conduct the written examinations. The private testing agent shall charge examination fees according to a rate

schedule developed by the commissioner and the applicant shall pay all examination fees directly to the testing agent; or

(2) Develop a written examination process within the division to include a fees schedule not to exceed the actual cost of administering the examinations. The certification applicant shall pay all fees directly to the division in advance of the examination.

(c) The minimum passing score is a score of seventy (70%) percent for each examination. An applicant who fails the examination may request and the division or private testing agent shall provide the applicant with an analysis of his or her performance on the failed examination. An applicant who fails the examination shall be afforded the opportunity to be re-examined after thirty (30) days and upon the submission of a new application and the payment of the fees required.

(d) All persons issued class B certifications under the provisions of this ~~article~~ rule shall ~~be required to~~ repeat the written examination upon each fifth anniversary of the original certification date. *Provided, however*, A class B certification applicant may substitute the successful completion of an approved training course for the required written examination.

~~7.2.~~ 7.3. Practical examination.

(a) ~~[RESERVED] *The practical examination shall not be implemented until January 1, 2001, as provided for under WV Code §21-3D-3(a)(1). However, any person who applies for certification prior to that date and fails to meet the requirements for exemption of the practical examination as provided for under sub-division 7.2(b) of this rule, shall have the renewal of their certification conditioned on passing the practical examination.*~~ A person who applies for a class B certification shall be required to pass a practical examination as defined in Title 42 Code of State Regulations, Series 25 unless otherwise exempted by subsection b of section seven [§42-24-7.3(b)] of this section.

(b) (1) ~~Exemption from practical examination. Any~~ A person who documents at least two thousand hours of on-the-job experience operating a crane during the four years immediately preceding the date of application for certification, is entitled to certification without a practical examination if the ~~person~~ applicant applies for certification prior to the first day of ~~January, two thousand~~ September, two thousand-one. Documentation shall be by sworn affidavit on a form prescribed by the commissioner or an equivalent form approved by the commissioner. The applicant shall document at least two hundred-fifty hours for each crane category for which certification is requested. Provided that , Documentation of five hundred

(500) hours of experience as the operator of a large telescoping boom crane qualifies the applicant for the category of small telescoping boom crane as well as large telescoping boom crane.

(2) A person who documents the successful completion of an approved training course and makes application prior to September 1, 2001 is entitled to certification without a practical examination.

§42-24-8. Training.

8.1. The commissioner may approve crane operator training courses from private sector sources to qualify applicants for class B certifications. To qualify for approval as an acceptable course, the training provider shall submit a request for approval to include a detailed instructional curriculum, copies of all manuals and study guides, a procedure for measuring the knowledge gained by students, a list of instructors and their credentials, and a proposed fees schedule. The commissioner shall consider two levels of training as follows:

(a) A level one program is a basic training course structured for new operators and those operators pursuing initial state certification. The course shall consist of at least forty (40) hours of instructional time and follow the basic subject matter outline as defined in this section.

(b) A level two program is a refresher or continuing education course structured for certified crane operators. The course shall consist of at least twenty-four (24) hours of instructional time. A level two course is intended to further the education of the operator and provide regulatory and technological updates.

8.2. An approved training course should contain, at the minimum, instruction relative to the following subject matter:

(a) General crane knowledge to include types of cranes and their components, definition of terms and nomenclature;

(b) Familiarity with A.N.S.I and OSHA requirements for safe operations and manufacturer's operating manuals;

(c) Responsibilities of the site supervisor, the crane operator and the crane owner;

(d) Safety inspection procedures, accident prevention and maintenance;

(e) Procedures for assembling and dismantling cranes and their transportation;

(f) Crane set-up to include site preparation, counterweights, outriggers, rigging methods and materials;

(g) General operation to include safe operating procedures, signaling, principles of leverage and power transmission, the purpose and use of load charts and boom angles, picking loads and adjacent hazards; and

(h) The effect of overloading, instability and structural or functional failures.

8.3. The training provider shall develop a methodology to measure the level of knowledge gained by the student. This methodology shall provide the means to determine if the student has successfully completed the training course. Upon the successful completion of a training course, the provider shall provide to the student a completion certificate which shall contain the following information:

(a) The name and address of the training provider;

(b) The student's name and social security number;

(c) The date(s) and location of the training;

(e) The length of the training in hours;

(e) The title and level of training course; and

(f) The name and signature of the instructor.

8.4. The training provider shall provide to the commissioner a list of all scheduled training sessions and locations. The list shall be provided annually on or before the first day of January. The commissioner shall be notified of any modifications to the annual schedule within two (2) weeks of the date that the modifications are scheduled.

8.5. The commissioner shall compile and maintain a public listing of all approved training courses. The list shall be compiled annually and shall contain the following:

(a) The name and address of the training provider;

(b) The dates and locations of scheduled training courses;

(c) A schedule of fees; and

(d) The type of training available.

8.6. The commissioner shall provide for random site audits of approved training course to insure that the training provided adheres to the specified curriculum and that operators are being adequately trained to safely operate a crane.

~~§42-24-8~~ §42-24-9. Denial, suspension, revocation, or reinstatement of certification.

~~8.1.~~ 9.1. The commissioner may deny, suspend, revoke or reinstate certification.

~~8.2.~~ 9.2. A violation of ~~this article~~ West Virginia Code [§21-3D] or this rule is grounds for the denial, suspension, revocation or refusal to reinstate certification and permits the imposition of disciplinary action: *Provided*, That no disciplinary action against a crane operator may be imposed without a proper prior notice as served under West Virginia Code [§56-2-1], and an opportunity for hearing held before the commissioner or his designee under the provisions of West Virginia Code [§29A-5-1, et seq], the Administrative Procedures Act, wherein the crane operator shall be provided the opportunity to present evidence in person, by counsel or both and after which, if the commissioner finds a violation of this article has occurred, the commissioner may impose any disciplinary action permitted in the article or rule.

~~8.3.~~ 9.3. Operation of a crane in violation of ~~this article or other provision of this code~~ West Virginia Code [§21-3D] or this rule may result in the suspension of certification for not less than twenty-four hours nor more than one year, or revocation of certification until reinstated.

~~8.4.~~ 9.4. Each certified crane operator shall carry proof of certification on his or her person during operation of a crane.

~~8.5.~~ 9.5. A person whose certification has been revoked may apply for certification one year after the date of the revocation.

~~§42-24-9.~~ §42-24-10. Effect of accident.

~~9.1.~~ 10.1. The commissioner may suspend or revoke the certification of a person involved in an accident relating to the operation of a crane by that person: *Provided*, That no disciplinary action against a crane operator may be imposed without a proper prior notice as served under West Virginia Code [§56-2-1], and hearing held before the commissioner or his or her designee pursuant to West Virginia Code [§29A-5-1 *et seq]*, wherein the crane operator shall be provided the opportunity to present evidence in person, by counsel or both and after which, if the commissioner finds a violation of this article or rule has occurred, the commissioner may impose any disciplinary action permitted in this article.

~~9.2.~~ 10.2. If the commissioner makes a finding that the accident was caused by the actions or omissions of the certificate holder, the commissioner may require the

certificate holder to retake and pass the certification examination and/or demonstration before the certificate holder may apply to have the certification reinstated.

~~§42-24-10.~~ §42-24-11. Penalties.

~~10.1.~~ 11.1. A person required to obtain certification under this article or rule, who operates a crane without certification, is guilty of a misdemeanor and, upon conviction thereof, shall be fined not less than fifty dollars nor more than five hundred dollars for each violation.

~~10.2.~~ 11.2.(a). No person may knowingly or intentionally drive or operate a crane while:

1. Having any measurable alcohol in his or her system; or,

2. Under the influence of any controlled substance, as defined by West Virginia Code [§60A-1-101(d)]; or

3. Under the combined influence of alcohol and any controlled substance or any other drug.

(b) A person who violates this subsection is guilty of a misdemeanor and, upon conviction thereof, shall be fined not less than one hundred dollars nor more than one thousand dollars. In addition to the fine, the commissioner of labor shall revoke the person's certification for not less than one year.

~~10.3.~~ 11.3. An employer who knowingly employs, permits or directs a person to operate a crane without proper certification is guilty of a misdemeanor and, upon conviction thereof, shall be fined not less than one hundred dollars nor more than one thousand dollars for each violation.

~~10.4.~~ 11.4. A person, operating a crane, who fails to produce the certification within twenty-four hours after request of the commissioner or his or her authorized representative, is guilty of a misdemeanor and, upon conviction thereof, shall be fined not less than fifty dollars nor more than one hundred dollars.

~~10.5.~~ 11.5. If a person is convicted for an offense described in this section, and does not act to appeal the conviction within the time periods as hereinafter described, then the person's certification may be revoked or suspended in accordance with the provisions of this article and rule, and, further:

(a) The clerk of the court in which a person is convicted for an offense described in this section shall forward to the commissioner a transcript of the judgment of conviction. If the conviction is the judgment of a magistrate court, the

magistrate court clerk shall forward the transcript when the person convicted has not requested an appeal within twenty days of the sentencing for such conviction. If the conviction is the judgment of a circuit court, the circuit clerk shall forward the transcript when the person convicted has not filed a notice of intent to file a petition for appeal or writ of error within thirty days after the judgment was entered; and,

(b) If, upon examination of the transcript of the judgment of conviction, the commissioner determines that the person was convicted for any of the offenses described in this section, the commissioner shall make and enter an order revoking or suspending the person's certificate to operate a crane in this state. The order shall contain the reasons for the revocation or suspension and the revocation or suspension periods provided for by this article or by rule. Further, the order shall give the procedures for requesting a hearing. The person shall be advised in the order that because of the receipt of a transcript of the judgment of conviction by the commissioner a presumption exists that the person named in the transcript of the judgment of conviction is the person named in the commissioner's order and such constitutes sufficient evidence to support revocation or suspension and that the sole purpose for the hearing held under this section is for the person requesting the hearing to present evidence that he or she is not the person named in the transcript of the judgment of conviction. A copy of the order shall be forwarded to the person by registered or certified mail, return receipt requested. No revocation or suspension shall become effective until ten days after receipt of a copy of the order; and,

(c) The provisions of this subsection shall not apply if an order reinstating the crane operator's certification of the person has been entered by the commissioner prior to the receipt of the transcript of the judgment of conviction, and,

(d) For the purposes of this section, a person is convicted when the person enters a plea of guilty or is found guilty by a court or jury.

~~§42-24-11.~~ §42-24-12. Crane Operator Certification Fund; Fees; Disposition of Funds.

~~11.1.~~ 12.1. A crane operator certification fund is established in the state treasurer's office in accordance with West Virginia Code [§21-3D-8(a)]. Payments are authorized from this fund for the enforcement of ~~this article~~ West Virginia Code [§21-3D] and this rule.

~~11.2.~~ 12.2. The annual certification fee shall be seventy-five dollars ($75) which shall cover the costs incurred for the issuance or renewal of certificates.

~~§42-24-12.~~ §42-24-13. Reciprocity.

To the extent that other states provide for the certification of crane operators for similar action, the commissioner, in his or her discretion, may grant certification of the same or equivalent classification to persons certified by other states, without examination upon satisfactory proof furnished to the commissioner that the qualifications for the applicants are equal to the qualifications of the holders of similar certification in this state, and upon payment of the required application fee.

The American Society of Mechanical Engineers

AN AMERICAN NATIONAL STANDARD

MOBILE AND LOCOMOTIVE CRANES

ASME B30.5-2000

(Revision of ASME B30.5-1994)

SAFETY STANDARD FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

FOREWORD (00)

This American National Standard, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings, has been developed under the procedures accredited by the American National Standards Institute (formerly the United States of America Standards Institute). This Standard had its beginning in December 1916 when an eight-page Code of Safety Standards for Cranes, prepared by an ASME Committee on the Protection of Industrial Workers, was presented to the annual meeting of the ASME.

Meetings and discussions regarding safety on cranes, derricks, and hoists were held from 1920 to 1925, involving the ASME Safety Code Correlating Committee, the Association of Iron and Steel Electrical Engineers, the American Museum of Safety, the American Engineering Standards Committee (later changed to American Standards Association and subsequently to the USA Standards Institute), Department of Labor—State of New Jersey, Department of Labor and Industry — State of Pennsylvania, and the Locomotive Crane Manufacturers Association. On June 11, 1925, the American Engineering Standards Committee approved the ASME Safety Code Correlating Committee's recommendation and authorized the project with the U.S. Department of the Navy, Bureau of Yards and Docks, and ASME as sponsors.

In March 1926, invitations were issued to 50 organizations to appoint representatives to a Sectional Committee. The call for organization of this Sectional Committee was sent out October 2, 1926, and the committee organized November 4, 1926, with 57 members representing 29 national organizations. The Safety Code for Cranes, Derricks, and Hoists, ASA B30.2-1943, was created from the eight-page document referred to in the first paragraph. This document was reaffirmed in 1952 and widely accepted as a safety standard.

Due to changes in design, advancement in techniques, and general interest of labor and industry in safety, the Sectional Committee, under the joint sponsorship of ASME and the Naval Facilities Engineering Command, U.S. Department of the Navy, was reorganized as an American National Standards Committee on January 31, 1962, with 39 members representing 27 national organizations.

The format of the previous code was changed so that separate volumes (each complete as to construction and installation; inspection, testing, and maintenance; and operation) would cover the different types of equipment included in the scope of B30.

In 1982, the Committee was reorganized as an Accredited Organization Committee, operating under procedures developed by ASME and accredited by the American National Standards Institute.

This Standard presents a coordinated set of rules that may serve as a guide to government and other regulatory bodies and municipal authorities responsible for the guarding and inspection of the equipment falling within its scope. The suggestions leading to accident prevention are given both as mandatory and advisory provisions; compliance with both types may be required by employers of their employees.

In case of practical difficulties, new developments, or unnecessary hardship, the administrative or regulatory authority may grant variances from the literal requirements or permit the use of other devices or methods, but only when it is clearly evident that an equivalent degree of protection is thereby secured. To secure uniform application and interpretation of this Standard, administrative or regulatory authorities are urged to consult the B30

ASME B30 COMMITTEE (00)
Safety Standards for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

(The following is a roster of the Committee at the time of approval of this Standard.)

OFFICERS

P. S. Zorich, *Chair*
B. D. Closson, *Vice Chair*
J. Pang, *Secretary*

COMMITTEE PERSONNEL*

ALLIANCE OF AMERICAN INSURERS
T. A. Christensen, Liberty Mutual Insurance Co.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA
C. L. Huneycutt, J. A. Jones Construction
W. P. Rollins, *Alternate,* J. A. Jones Construction

ASSOCIATED WIRE ROPE FABRICATORS
D. Sayenga, Associated Wire Rope Fabricators
D. J. Bishop, *Alternate,* Bishop Lifting Products, Inc.

ASSOCIATION OF CONSTRUCTION EQUIPMENT MANAGERS
J. C. Ryan, Boh Bros. Construction Co.
H. E. Livermore, *Alternate,* Bechtel Leasing, Inc.

ASSOCIATION OF IRON AND STEEL ENGINEERS
J. W. Rowland, Bethlehem Steel

FORGING INDUSTRY ASSOCIATION
G. F. Hoffa, Columbus McKinnon Corp.
E. K. Marburg, *Alternate,* Columbus McKinnon Corp.

INTERNATIONAL UNION OF OPERATING ENGINEERS
W. J. Smith, Jr. International Union of Operating Engineers
S. C. Buck, *Alternate,* International Union of Operating Engineers

NATIONAL ERECTORS ASSOCIATION
B. E. Weir, Jr., Norris Brothers Co., Inc.
J. Conant, *Alternate,* Conant Crane Rental Co.

POWER, CRANE, AND SHOVEL ASSOCIATION BUREAU OF THE CONSTRUCTION INDUSTRY MANUFACTURERS ASSOCIATION (CIMA)
N. C. Hargreaves, Terex Corp.
D. G. Quinn, *Alternate,* FMC Construction Equipment Corp.

SPECIALIZED CARRIERS AND RIGGING ASSOCIATION
H. I. Shapiro, Howard I. Shapiro & Associates
R. M. Kohner, *Alternate,* Landmark Engineering Service

STEEL PLATE FABRICATORS ASSOCIATION
K. Miller, CBI NA-CON, Inc.

U.S. DEPARTMENT OF THE ARMY
E. E. Rudy, U.S. Army TARDEC

U.S. DEPARTMENT OF THE NAVY
J. E. Richardson, Naval Facilities Engineering Command

WIRE ROPE TECHNICAL BOARD

ASME B30.5-2000

SUMMARY OF CHANGES

The 2000 Edition of ASME B30.5 includes editorial changes, revisions, and corrections introduced in B30.5a-1995, B30.5b-1996, B30.5c-1998, and B30.5d-1999, as well as the following changes, identified by **(00)**:

Page	*Location*	*Change*
iii	Foreword	Updated to reflect edition
v	Committee Roster	Updated to reflect edition
ix	Contents	Updated to reflect edition
1, 2	General	(1) B30 volume listing updated
		(2) 9th para. revised
	Footnote 1	Revised
2	Section III	First para. revised
8	5-0.3	Editorially revised and ASME address updated
14	5-1.1.3(a)(2)	Editorially revised
	Footnote 3	Editorially revised
26	5-1.9.9	Revised

CONTENTS

(00)

SAFETY STANDARD FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

INTRODUCTION

(00) General

This Standard is one of a series of safety standards on various subjects that have been formulated under the general auspices of the American National Standards Institute. One purpose of the Standard is to serve as a guide to governmental authorities having jurisdiction over subjects within the scope of the Standard. It is expected, however, that the Standard will find a major application in industry, serving as a guide to manufacturers, purchasers, and users of the equipment.

For the convenience of the user, the Standard has been divided into separate volumes:

B30.1 Jacks
B30.2 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
B30.3 Construction Tower Cranes
B30.4 Portal, Tower, and Pedestal Cranes
B30.5 Mobile and Locomotive Cranes
B30.6 Derricks
B30.7 Base Mounted Drum Hoists
B30.8 Floating Cranes and Floating Derricks
B30.9 Slings
B30.10 Hooks
B30.11 Monorails and Underhung Cranes
B30.12 Handling Loads Suspended From Rotorcraft
B30.13 Storage/Retrieval (S/R) Machines and Associated Equipment
B30.14 Side Boom Tractors
B30.15 Mobile Hydraulic Cranes
Note: B30.15-1973 has been withdrawn. The revision of B30.15 is included in the latest edition of B30.5.
B30.16 Overhead Hoists (Underhung)
B30.17 Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
B30.18 Stacker Cranes (Top or Under Running Bridge, Multiple Girder With Top or Under Running Trolley Hoist)
B30.19 Cableways
B30.20 Below-the-Hook Lifting Devices
B30.21 Manually Lever Operated Hoists
B30.22 Articulating Boom Cranes
B30.23 Personnel Lifting Systems
B30.24 Container Cranes[1]
B30.25 Scrap and Material Handlers

If adopted for governmental use, the references to other national codes and standards in the specific volumes may be changed to refer to the corresponding regulations of the governmental authorities.

The use of cableways, cranes, derricks, hoists, hooks, jacks, and slings is subject to certain hazards that cannot be met by mechanical means but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are competent, careful, physically and mentally qualified, and trained in the safe operation of the equipment and the handling of the loads. Serious hazards are overloading, dropping or slipping of the load caused by improper hitching or slinging, obstructing the free passage of the load, and using equipment for a purpose for which it was not intended or designed.

The Standards Committee fully realizes the importance of proper design factors, minimum or maximum sizes, and other limiting dimensions of wire rope or chain and their fastenings, sheaves, sprockets, drums, and similar equipment covered by the Standard, all of which are closely connected with safety. Sizes, strengths, and similar criteria are dependent on many different factors, often varying with the installation and uses. These factors depend on the condition of the equipment or material; on the loads; on the acceleration or speed of the ropes, chains, sheaves, sprockets, or drums; on the type of attachments; on the number, size, and arrangement of sheaves or other parts; on environmental conditions causing corrosion or wear; and on many variables that must be considered in each individual

[1] B30.24 is in the developmental stage. (00)

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Section IV — New and Existing Installations

(a) Effective Date. The effective date of this volume for the purpose of defining new and existing installations shall be 1 year after its date of issuance.

(b) New Installations. Construction, installation, inspection, testing, maintenance, and operation of equipment manufactured and facilities constructed after the effective date of this volume shall conform with the mandatory requirements of this volume.

(c) Existing Installations. Inspection, testing, maintenance, and operation of equipment manufactured and facilities constructed prior to the effective date of this volume shall be done, as applicable, in accordance with the requirements of this volume.

It is not the intent of this volume to require retrofitting of existing equipment. However, when an item is being modified, its performance requirement shall be reviewed relative to the current volume. If the performance differs substantially, the need to meet the current requirement shall be evaluated by a qualified person selected by the owner (user). Recommended changes shall be made by the owner (user) within one year.

Section V — Mandatory and Advisory Rules

Mandatory rules of this volume are characterized by use of the word *shall*. If a provision is of an advisory nature, it is indicated by use of the word *should* and is a recommendation to be considered, the advisability of which depends on the facts in each situation.

Section VI — Metric Conversions

The values stated in U.S. customary units are to be regarded as the standard.

MOBILE AND LOCOMOTIVE CRANES

CHAPTER 5-0
Scope, Definitions, and References

Section 5-0.1 Scope of B30.5

Within the general scope defined in Section 1, American National Standard B30.5 applies to crawler cranes, locomotive cranes, wheel-mounted cranes, and any variations thereof which retain the same fundamental characteristics. The scope includes only cranes of the above types that are basically powered by internal combustion engines or electric motors. Side boom tractors and cranes designed for railway and automobile wreck clearance, digger derricks, cranes manufactured specifically for, or when used for, energized electrical line service, knuckle boom, trolley boom cranes, and cranes having a maximum rated capacity of one ton or less are excluded.

Special adaptions to the general types of machines covered by this volume, where applicable, fall under this scope.

Some basic machine types within this scope are convertible for excavating work and other uses not considered to be lifting service. The requirements of this volume are applicable only to such machines when used as lifting cranes.

Section 5-0.2 Definitions

'00) 5-0.2.1 Types of Mobile and Locomotive Cranes

commercial truck-mounted crane: a crane consisting of a rotating superstructure (center post or turntable), boom, operating machinery, and one or more operator's stations mounted on a frame attached to a commercial truck chassis, usually retaining a payload hauling capability whose power source usually powers the crane. Its function is to lift, lower, and swing loads at various radii (see Figs. 1 and 2).

crawler crane: a crane consisting of a rotating superstructure with a power plant, operating machinery, and boom, mounted on a base and equipped with crawler treads for travel. Its function is to lift, lower, and swing loads at various radii (see Figs. 3 and 4).

locomotive crane: a crane consisting of a rotating superstructure with a power plant, operating machinery, and boom, mounted on a base or car equipped for travel on a railroad track. It may be self-propelled or propelled by an outside source. Its function is to lift, lower, and swing loads at various radii (see Fig. 5).

wheel-mounted crane (multiple control stations): a crane consisting of a rotating superstructure, operating machinery, and operator's station and boom, mounted on a crane carrier equipped with axles and rubber-tired wheels for travel, a power source(s), and having separate stations for driving and operating. Its function is to lift, lower, and swing loads at various radii (see Figs. 6 and 7).

wheel-mounted crane (single control station): a crane consisting of a rotating superstructure, operating machinery, and boom, mounted on a crane carrier equipped with axles and rubber-tired wheels for travel, a power source, and having a single control station for driving and operating. Its function is to lift, lower, and swing loads at various radii (see Figs. 8, 9, and 10).

5-0.2.2 General

accessory: a secondary part or assembly of parts that contributes to the overall function and usefulness of a machine.

administrative or regulatory authority: a governmental agency, or the employer in the absence of governmental jurisdiction.

angle indicator (boom): an accessory that measures the angle of the boom to the horizontal.

anti two-block device: a device that, when activated, disengages all crane functions whose movement can cause two-blocking.

load indicator: a device that measures the weight of the load.

load ratings: crane ratings in pounds (kilograms) established by the manufacturer in accordance with para. 5-1.1.

mast (boom): a frame hinged at or near the boom hinge for use in connection with supporting a boom. The head of the mast is usually supported and raised or lowered by the boom hoist ropes.

mast (jib): a frame hinged at or near the boom point for use in connection with supporting a jib.

normal operating conditions

cab- or station-operated cranes: conditions during which a crane is performing functions within the manufacturer's operating recommendations. Under these conditions, the operator is at the operating control devices on the crane, and no other persons except those appointed are to be on the crane.

ground- or floor-operated cranes: conditions during which a crane is performing functions within the manufacturer's operating recommendations. Under these conditions, the operator is at the operating control devices that are mounted to the crane but operated with the operator off the crane, and no other persons except those appointed are to be on the crane.

remote-operated cranes: conditions during which a crane is performing functions within the manufacturer's operating recommendations. Under these conditions, the operator is at the operating control devices that are not mounted to any part of the crane, and no other persons except those appointed are to be on the crane.

outriggers: extendable or fixed members attached to the mounting base, which rest on supports at the outer ends used to support the crane.

pawl (dog): a device for positively holding a member against motion in one or more directions.

payload: that load or loads being transported by the commercial truck chassis from place to place.

pendant: a rope or strand of specified length with fixed end connections.

power-controlled lowering: a system or device in the power train, other than the load hoist brake, which can control the lowering rate of speed of the load hoist mechanism.

qualified operator: an operator who has met the requirements of paras. 5-3.1.2(a), (b), and (c).

qualified person: a person who, by possession of a recognized degree in an applicable field or certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

rail clamp: a tong-like metal device mounted on a locomotive crane car, which can be connected to the track.

reeving: a rope system in which the rope travels around drums and sheaves.

repetitive pickup point: 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.

rope: refers to wire rope unless otherwise specified

rotation resistant rope: a wire rope consisting of an inner layer of strand laid in one direction covered by a layer of strand laid in the opposite direction. This has the effect of counteracting torque by reducing the tendency of the finished rope to rotate.

running rope: a rope that travels around sheaves or drums.

shall: this word indicates that the rule is mandatory and must be followed.

should: this word indicates that the rule is a recommendation, the advisability of which depends on the facts in each situation.

side loading: a load applied to an angle to the vertical plane of the boom.

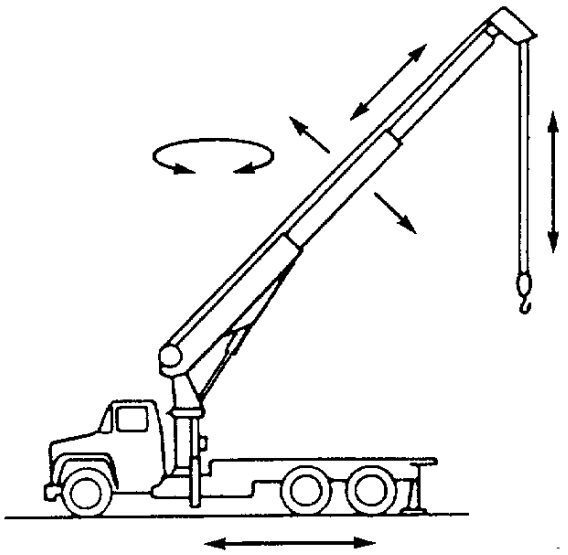
stabilizer: stabilizers are extendable or fixed members attached to the mounting base to increase the stability of the crane, but that may not have the capability of relieving all of the weight from wheels or tracks.

standby crane: a crane that is not in regular service but that is used occasionally or intermittently as required.

standing (guy) rope: a supporting rope that maintains a constant distance between the points of attachment to the two components connected by the rope.

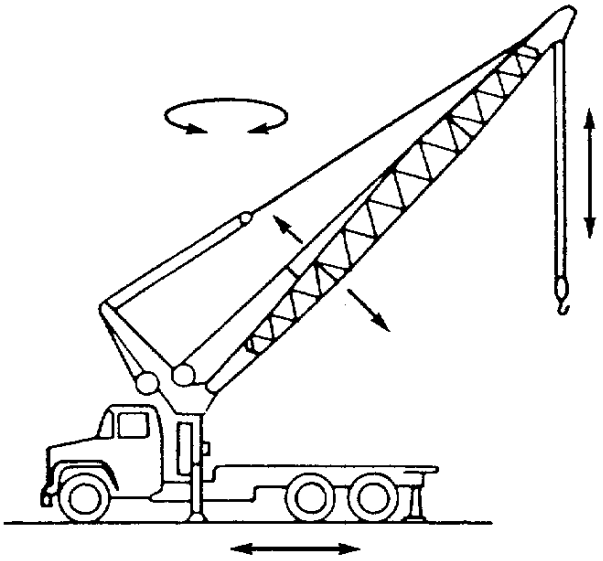
structural competence: the ability of the machine and its components to withstand the stresses imposed by applied loads.

superstructure: the rotating upper frame structure of the machine and the operating machinery mounted thereon.



GENERAL NOTE: The boom may have a base boom structure of sections (upper and lower) between or beyond which additional sections may be added to increase its length, or it may consist of a base boom from which one or more boom extensions are telescoped for additional length.

FIG. 1 COMMERCIAL TRUCK-MOUNTED CRANE — TELESCOPING BOOM



GENERAL NOTE: The boom may have a base boom structure of sections (upper and lower) between or beyond which additional sections may be added to increase its length, or it may consist of a base boom from which one or more boom extensions are telescoped for additional length.

FIG. 2 COMMERCIAL TRUCK-MOUNTED CRANE — NONTELESCOPING BOOM

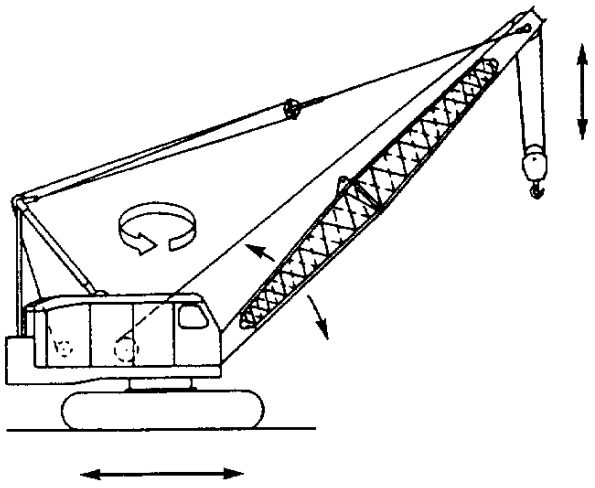
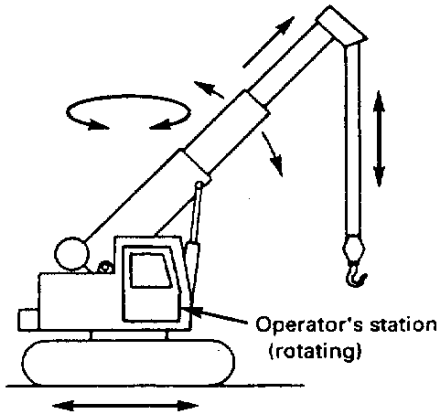
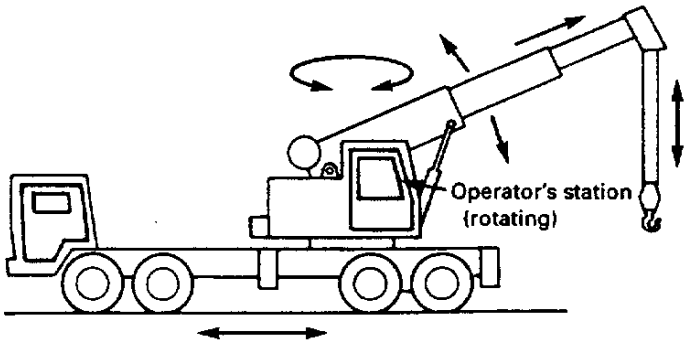


FIG. 3 CRAWLER CRANE



GENERAL NOTE: The boom may have a base boom structure of sections (upper and lower) between or beyond which additional sections may be added to increase its length, or it may consist of a base boom from which one or more boom extensions are telescoped for additional length.

FIG. 4 CRAWLER CRANE — TELESCOPING BOOM



GENERAL NOTE: The boom may have a base boom structure of sections (upper and lower) between or beyond which additional sections may be added to increase its length, or it may consist of a base boom from which one or more boom extensions are telescoped for additional length.

FIG. 7 WHEEL-MOUNTED CRANE — TELESCOPING BOOM (MULTIPLE CONTROL STATION)

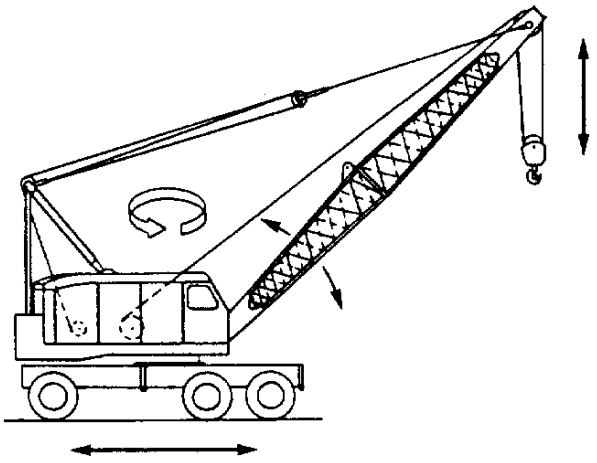
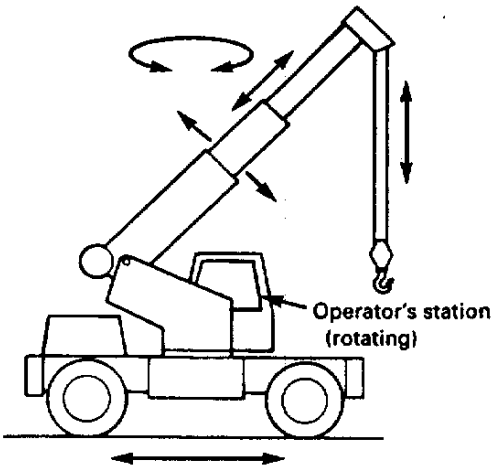


FIG. 8 WHEEL-MOUNTED CRANE (SINGLE CONTROL STATION)



GENERAL NOTE: The boom may have a base boom structure of sections (upper and lower) between or beyond which additional sections may be added to increase its length, or it may consist of a base boom from which one or more boom extensions are telescoped for additional length.

FIG. 9 WHEEL-MOUNTED CRANE — TELESCOPING BOOM (SINGLE CONTROL STATION)

CHAPTER 5-1
Construction and Characteristics

Section 5-1.1 Load Ratings

5-1.1.1 Load Ratings — Where Stability Governs Lifting Performance

(a) The margin of stability for determination of load ratings, with booms of stipulated lengths at stipulated working radii for the various types of crane mountings, is established by taking a percentage of the loads that will produce a condition of tipping or balance with the boom in the least stable direction relative to the mounting. The load ratings shall not exceed the following percentages for cranes, with the indicated types of mounting under conditions stipulated in (b) and (c) below.

Type of Crane Mounting	Maximum Load Ratings
Locomotive, without outrigger (stabilizer) support [Note (1)]	
Booms 60 ft (18m) or less	85
Booms over 60 ft (18 m)	85 [Note (2)]
Locomotive, using outriggers (stabilizers) fully extended and set	80
Crawler, without outrigger support	75
Crawler, using outriggers fully extended and set	85
Wheel mounted without outrigger support	75
Wheel mounted using outriggers fully extended and set, with tires off supporting surface	85
Commercial truck vehicle mounted crane with stabilizers extended and set	85

NOTES:

(1) As a precaution while testing for free ratings, outriggers should be loosely applied; rail clamps should not be used.

(2) The difference between the backward stability moment and the forward moment resulting from the load should not be less than 30,000 lb-ft (40 675 N · m) with the backward stability moment being the greater.

(b) The following stipulations shall govern the application of the values in (a) above for locomotive cranes:

(1) the crane shall be standing on a track that is level within 1% grade;

(2) the radius of the load is the horizontal distance from a projection of the axis of rotation to the rail support surface, before loading, to the center of the vertical hoist line or tackle with load applied;

(3) tipping loads from which ratings are determined shall be applied under static conditions only, i.e., without the dynamic effect of lifting, lowering, swinging, or booming; and

(4) the weight of all auxiliary handling devices such as lower load block, hooks, and slings shall be considered as part of the load.

(c) Stipulations governing the application of the values in (a) above shall be in accordance with ANSI/SAE J765.

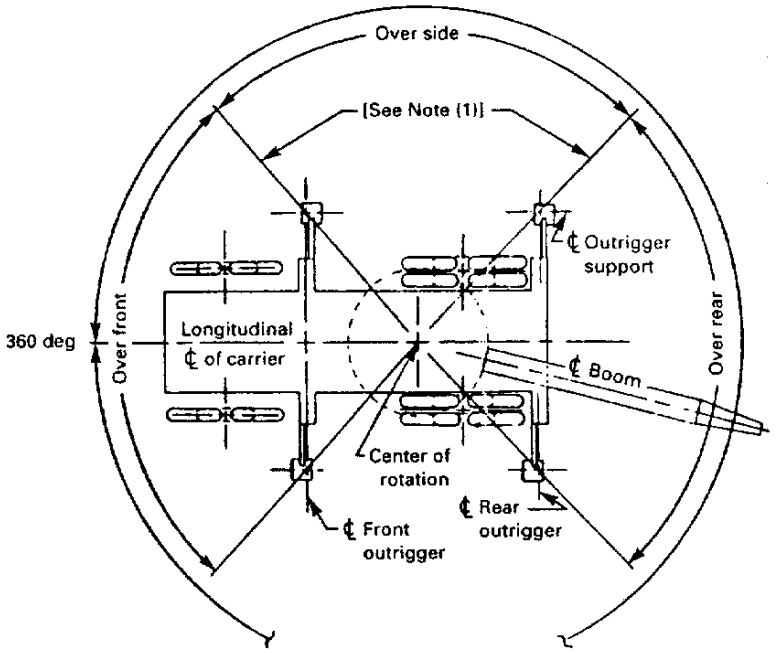
(d) The effectiveness of these preceding stability factors will be influenced by such additional factors as freely suspended loads, track, wind, or ground conditions, condition and inflation of rubber tires, boom lengths, proper operating speeds for existing conditions, and, in general, careful and competent operation. Any standard attachments to the boom such as jibs and auxiliary or whip lines shall be considered as affecting stability and a deduction shall be made from load ratings in accordance with the manufacturer's instructions. The effect of lights, pile lead adaptors, or other nonstandard attachments shall also be deducted from load ratings. All of these shall be taken into account.

(e) When cranes included in the scope of B30.5 are mounted on barges or pontoons, factors in addition to those stipulated in paras. 5-1.1.1 and 5-1.1.2 will influence the stability and structural competence. The load rating for a crane on a barge or pontoon shall be modified as recommended by the manufacturer or a qualified person (refer to ASME B30.8).

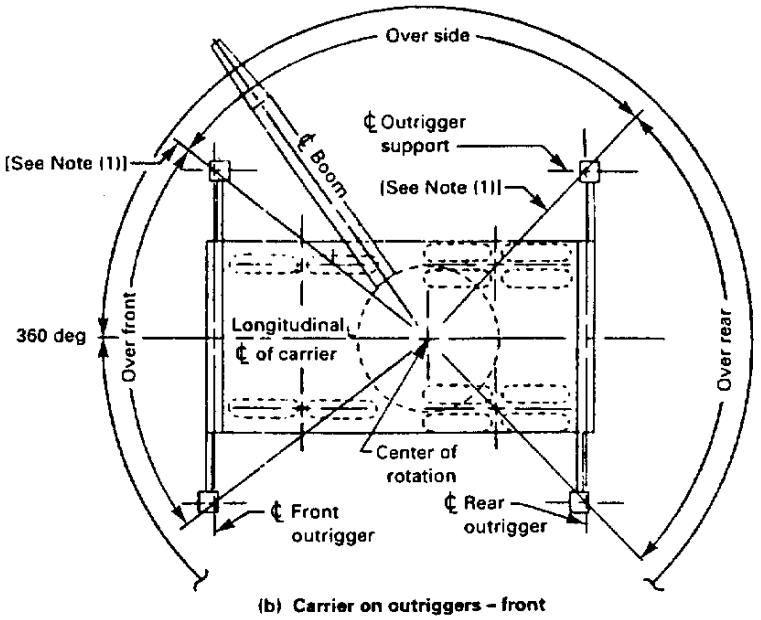
5-1.1.2 Load Ratings — Where Structural Competence Governs Lifting Performance

(a) Load ratings for some radii are limited by the stability of the crane. However, in some of the operating ranges the rating may be limited by factors other than stability, such as the conditions described below.

(1) The loads that will produce a condition of tipping increase rapidly and reach extreme values as the minimum operating radius and tipping fulcrum of the machine are approached. At some radii these loads are of such magnitude that they cannot be fully taken into account in the crane structure design without



(a) Carrier on outriggers – front outrigger behind of front wheels



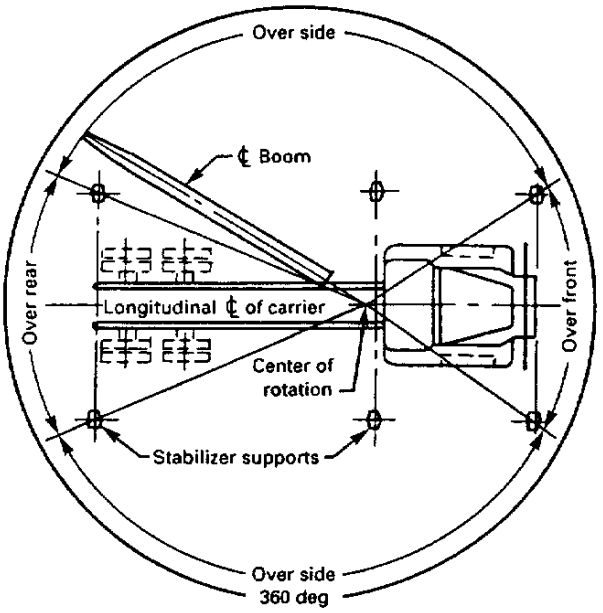
(b) Carrier on outriggers – front outrigger ahead of front wheels

GENERAL NOTE: Configurations that deviate sufficiently from the work areas shown in Fig. 11 shall have their working areas by appropriate sets of diagrams supplied by the manufacturer.

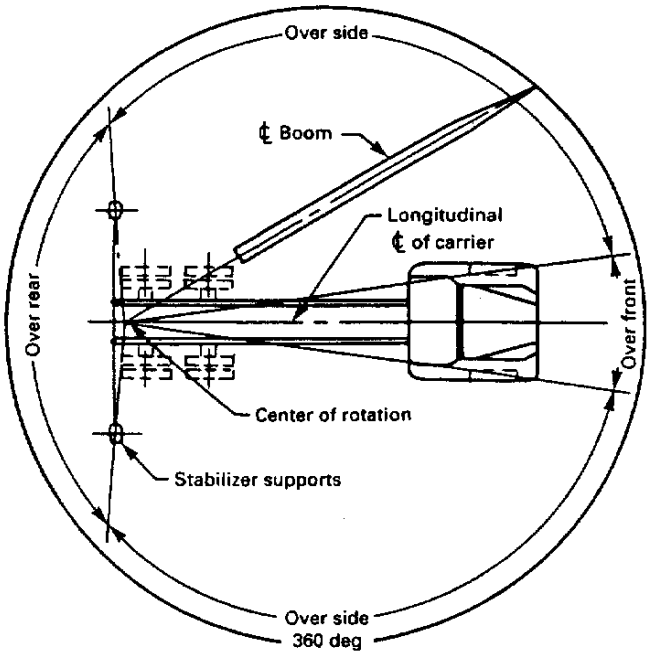
NOTE:

(1) These lines determine the limiting position of any load for operation within the working areas indicated.

FIG. 11 WORK AREAS



(e)



(f)

GENERAL NOTES:

(a) These lines determine the limiting position of any load for operation within the working areas indicated.

(b) Configurations that deviate sufficiently from the work areas shown in Fig. 11 shall have their working areas by appropriate sets of diagrams supplied by the manufacturer.

FIG. 11 WORK AREAS (CONT'D)

machine supported level on fully extended outriggers with all tires free of the supporting surface, the resistance to overturning in a backward direction shall be equivalent to those conditions specified in (c)(1) and (2) above.

5-1.2.4 Limitations in Boom Length or Boom Angle. Cranes may not have sufficient forward stability (in the direction of the boom) to handle some boom lengths. Information shall be provided on the load rating chart stating any limitations in boom length or boom angle for specified operating conditions of outriggers, direction of boom, or other requirements.

Section 5-1.3 Boom Hoist, Load Hoist, and Telescoping Boom Mechanisms

5-1.3.1 Boom Hoist Mechanism. The boom hoist may use a rope drum for its drive or hydraulic cylinder(s), and the supporting structure may be a gantry or the same hydraulic cylinder(s) used to elevate the boom.

(a) The boom hoist shall be capable of elevating and controlling the boom with its rated load (for rope boom hoists when reeved according to the manufacturer's specifications), and shall be capable of supporting the boom and rated load without action by the operator.

(b) In a rope supporting and elevating arrangement, boom lowering shall be done only under power control. Free-fall lowering of the boom shall not be permitted.

(1) The boom hoist drum shall have sufficient rope capacity to operate the boom in all positions, from the lowest permissible to the highest recommended, when using the manufacturer's recommended reeving and rope size. No less than two full wraps of rope shall remain on the drum with the boom point lowered to the level of the crane supporting surface. The drum end of the rope shall be anchored to the drum by an arrangement specified by the crane or rope manufacturer.

(2) The drum shall provide a first layer rope pitch diameter of not less than 15 times the nominal diameter of the rope used.

(c) On rope boom support machines, a braking mechanism and a ratchet and pawl or other locking device shall be provided to prevent inadvertent lowering of the boom.

(d) An integrally mounted holding device (such as a load hold check valve) shall be provided with boom support hydraulic cylinder(s) to prevent uncontrolled lowering of the boom in the event of a hydraulic system failure (e.g., supply hose rupture).

5-1.3.2 Load Hoist Mechanism. The hoist mechanism may consist of a drum or hydraulic cylinder(s) with necessary rope reeving.

(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.

(1) Where brakes and clutches are used to control the motion of the load hoist drums, they shall be of a size and thermal capacity sufficient to control all rated crane loads with minimum recommended reeving (where maximum rated loads are being lowered with near maximum boom length or operations involving long lowering distances, power controlled lowering is usually desirable to reduce demand on the load brake). Brakes and clutches shall be provided with adjustments where necessary to compensate for lining wear and to maintain force in springs, where used.

(2) Load hoist drums shall have rope capacity with the recommended rope size and reeving sufficient 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 ½ in. (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.

(5) Drum rotation indicators should be provided and located to afford sensing by the operator.

(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 auto-

steep grades are to be negotiated, a retarder or similar device should be provided. Means shall be provided to hold the machine stationary on the maximum grade for travel recommended by the manufacturer. Where travel brakes are operated by air pressure, means shall be provided for manually or automatically stopping the vehicle when the operating pressure falls below the specified minimum level.

(d) Commercial truck vehicle mounted cranes shall meet the requirements of the U.S. Department of Transportation Standards.

Section 5-1.6 Controls

5-1.6.1 General

(a) Basic controls (see Figs. 12 and 13) used during the crane operating cycle shall be located within reach of the operator while at the operator's station.

(b) Controls for load hoist, boom hoist, swing, and boom telescope (when applicable) shall be provided with means for holding in the neutral position, without the use of positive latches.

(c) On machines equipped with telescoping-type booms, the arrangements of controls should be as shown in Fig. 12. On machines not equipped with telescoping-type booms, the arrangements of controls should be in accordance with Fig. 13.

(d) Remote-operated cranes shall function so that if the control signal for any crane motion becomes ineffective, the crane motion shall stop.

(e) Provisions shall be made for emergency stop in the event of a device malfunction for remote-operated cranes.

5-1.6.2 Control Forces and Movements

(a) Forces shall not be greater than 35 lb (156 N) on hand levers and not greater than 50 lb (222 N) on foot pedals.

(b) Travel distance on hand levers shall not be greater than 14 in. (356 mm) from neutral position on two-way levers and not greater than 24 in. (610 mm) on one-way levers. Travel distance on foot pedals shall not be greater than 10 in. (254 mm).

5-1.6.3 Power Plant Controls. Controls for operating a superstructure mounted power plant shall be within reach of the operator and shall include the means to:

(a) start and stop;

(b) control the speed of internal combustion engines;

(c) stop two-cycle diesel engines under emergency conditions; and

(d) shift selective transmissions.

5-1.6.4 Engine Clutch. All cranes with a direct mechanical or hydrodynamic (such as torque converter or fluid coupling) drive to any crane function shall be provided with a clutch or other means for disengaging power. The controls shall be within reach of the operator's station.

Section 5-1.7 Ropes and Reeving Accessories

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; and

(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; and

(2) the design factor for boom pendants or standing ropes shall not be less than 2.5.

(c) Rotation resistant ropes shall have a design factor of 5 or greater [The design factor of 5 or greater for rotation resistant ropes may be modified by the crane user by complying with the provisions of para. 5-3.2.1.1(d)].

(d) The design factor specified in (a), (b), and (c) above shall be the total nominal breaking strength of all ropes in the system divided by the load imposed on the rope system when supporting the static weights of structure and crane rated load.

5-1.7.2 Ropes

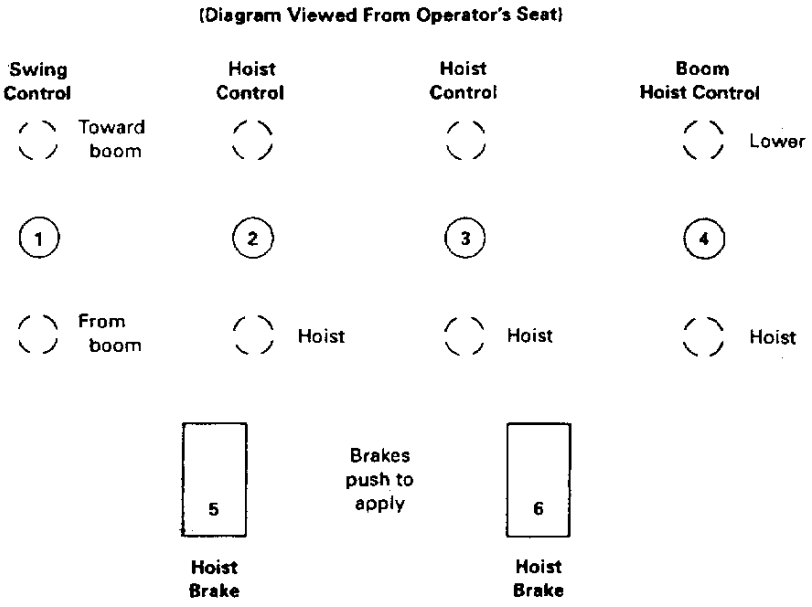
(a) The ropes shall be of a construction recommended by the rope or crane manufacturer, or a person qualified for that service.

(b) Rotation resistant rope and fiber core ropes shall not be used for boom hoist reeving.

(c) Rotation resistant rope shall be given special care during installation as it is easily damaged.

(d) Socketing shall be done in the manner specified by the manufacturer of the wire rope or fitting.

(e) If a load is supported by more than one part of rope, the tension in the parts shall be equalized.



Control	Operation
1 Swing Control	Push forward to swing toward boom, swining left for right side operator position or swinging right for lest side operator position. Pull back to reverse these actions.
2 Hoist Control	Pull back to hoist. Center (release) to lower by brake 5. Push forward to lower, if provided with powered load lowering on this drum.
3 Hoist Control	Pull back to hoist. Center (release) to lower by brake 6. Push forward to lower, if provided with powered load lowering on this drum.
4 Boom Hoist control	Pull back to raise boom. Push forward to lower boom. Center (released) position must hold boom stationary even with boom safety pawl released.
5 Hoist Brake	Push to hold or to stop lowering load. Release to lower load.
6 Hoist Brake	Push to hold or to stop lowering load. Release to lower load.

GENERAL NOTES:

(a) The control arrangement of Fig. 13 applies to mobile nontelescopic boom crane hand and foot controls.

(b) The arrangement of the basic controls should be shown in the control diagram. Controls 1, 2, 3, and 4 are levers for hand operation; controls 5 and 6 are pedals for foot operation, if applicable.

(c) Controls for auxiliary functions, such as telescope and hoist, should be located adjacent to the main controls. Controls for all other functions should be positioned to avoid operator confusion and physical interference. Nothing in this recommended practice precludes the use of additional controls subject to the recommendations herein.

(d) All basic controls should operate as specified in the control diagram. It is not the intent to limit the use thereof, or to apply to combination, automatic, or other special operating control requirements.

FIG. 13 NONTELESCOPIC BOOM CRANE CONTROL DIAGRAM
Suggested Mobile Nontelescopic Boom Crane
Basic Operating Control Arrangement for New Cranes

ery, brakes, clutches, and operator's station from the weather.

(b) All cab glazing shall be safety glazing material as defined in ANSI Z26.1. Windows shall be provided in the front and on both sides of the cab or operator's compartment with visibility forward and to either side. Visibility forward shall include a vertical range adequate to cover the boom point at all times. The front window may have a section that can be readily removed or held open, if desired. If the section is of the type held in the open position, it shall be secured to prevent inadvertent closure. A windshield wiper should be provided on the front window.

(c) All cab doors, whether of the sliding or swinging type, shall be restrained from inadvertent opening or closing while traveling or operating the machine. The door adjacent to the operator, if of the swinging type, should open outward and, if of the sliding type, should slide rearward to open.

(d) A clear passageway shall be provided from the operator's station to an exit door on the operator's side.

(e) A seat belt shall be provided in all single control station wheel mounted cranes for use during transit and travel.

5-1.8.2 Platforms to Cab

(a) Principal walking surfaces shall be of a skid-resistant type.

(b) Outside platforms, if furnished, shall be provided with guardrails in accordance with ANSI/SAE J185. Where platforms are too narrow to use guardrails, handholds shall be provided at convenient points above the platform.

5-1.8.3 Access to Cab

(a) On locomotive cranes, handholds and steps shall be provided for access to the car and cab. Their construction shall conform to the requirements of the Safety Appliance Standards and Power Brakes Requirements of the Federal Railroad Administration.

(b) On all crawler and wheel-mounted cranes, handholds, steps, or both shall be provided, as needed, to facilitate entrance to and exit from the operator's cab and the carrier cab.

(c) Principal walking surfaces shall be of a skid-resistant type.

5-1.8.4 Cab Roof. Where necessary for rigging or service requirements, a ladder or steps shall be provided to give access to the cab roof. The ladder or steps shall conform to the requirements of ANSI/SAE J185. Where necessary, areas of the cab roof shall be capable of supporting, without permanent distortion, the weight of a 200 lb (90 kg) person.

Section 5-1.9 General Requirements

5-1.9.1 Booms

(a) Boom Stops. Stops shall be provided to resist the boom falling backwards. Boom stops should be of one of the following types:

(1) a fixed or telescoping bumper;

(2) a shock absorbing bumper; or

(3) hydraulic boom elevation cylinder(s).

(b) Jibs shall be restrained from backward overturning.

(c) A boom angle or radius indicator readable from the operator's station shall be provided.

(d) A boom hoist disconnect, shutoff, or hydraulic relief shall be provided to automatically stop the boom hoist when the boom reaches a predetermined high angle.

(e) A boom length indicator readable from the operator's station shall be provided for telescoping booms unless the load rating is independent of the boom length.

(f) Booms, boom sections, and jibs shall be identified and shall be used only for the purposes recommended by the manufacturer.

5-1.9.2 Exhaust Gases. Engine exhaust gases shall be piped to the outside of the cab and discharged in a direction away from the operator. All exhaust pipes shall be guarded or insulated to prevent contact with personnel when performing normal duties.

5-1.9.3 Outriggers

(a) Means shall be provided to hold all outriggers in the retracted position while traveling, and in the extended position when set for operating.

(b) Power-actuated jacks, where used, shall be provided with the means (such as integral load hold check valves on hydraulic cylinders, mechanical locks, etc.) to prevent loss of support under load.

(c) Means shall be provided for fastening outrigger floats to outriggers when in use.

5-1.9.4 Locomotive Crane Equipment

(a) Truck Wedges or Jacks. Locomotive crane cars shall be provided with removable wedges or jacks for transmitting loads from the crane body directly to the wheels without permitting the truck springs to function when handling heavy loads. These wedges shall be

CHAPTER 5-2
Inspection, Testing, and Maintenance

Section 5-2.1 Inspection — General

The manufacturer shall furnish required field assembly, operation, and maintenance information.

5-2.1.1 Inspection Classification

(a) Initial Inspection. Prior to initial use, all new and altered cranes shall be inspected by a qualified person to verify compliance with the provisions of this volume.

(b) Regular Inspection. Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals are dependent in turn upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as *frequent* and *periodic*, with respective intervals between inspections as defined below:

(1) Frequent Inspection. Daily to monthly intervals, by a designated person;

(2) Periodic Inspection. One to twelve month intervals, or as specifically recommended by the manufacturer or by a qualified person.

5-2.1.2 Frequent Inspection. Items such as the following shall be inspected by a designated person for defects at intervals as defined in para. 5-2.1.1(b)(1) or as specifically indicated by the manufacturer, including observation during operation for any deficiencies that might appear between regular inspections. Any deficiencies, such as those listed, shall be carefully examined and a determination made as to whether they constitute a hazard:

(a) all control mechanisms for maladjustment interfering with proper operation — daily, when used;

(b) all control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter;

(c) all safety devices for malfunction;

(d) all hydraulic hoses, and particularly those that flex in normal operation of crane functions, should be visually inspected once every working day, when used;

(e) hooks and latches for deformation, chemical damage, cracks, and wear (refer to ASME B30.10);

(f) rope reeving for compliance with crane manufacturer's specifications;

(g) electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation;

(h) hydraulic system for proper oil level — daily, when used; and

(i) tires for recommended inflation pressure.

5-2.1.3 Periodic Inspection. Complete inspections of the crane shall be performed by a qualified person at intervals as generally defined in para. 5-2.1.1(b)(2), depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of para. 5-2.1.2 and, in addition, items such as the following. Any deficiencies, such as those listed, shall be examined and determination made as to whether they constitute a hazard:

(a) deformed, cracked, or corroded members in the crane structure and entire boom;

(b) loose bolts or rivets;

(c) cracked or worn sheaves and drums;

(d) worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and locking devices;

(e) excessive wear on brake and clutch system parts, linings, pawls, and rachets;

(f) load, boom angle, and other indicators over their full range, for any significant inaccuracies;

(g) gasoline, diesel, electric, or other power plants for performance and compliance with safety requirements;

(h) excessive wear of chain drive sprockets and excessive chain stretch;

(i) crane hooks inspected for cracks;

(j) travel steering, braking, and locking devices, for malfunction;

(k) excessively worn or damaged tires;

(l) hydraulic and pneumatic hose, fittings, and tubing inspection:

(1) evidence of leakage at the surface of the flexible hose or its junction with the metal and couplings;

qualified person. The replacement of the rope is specifically excluded from this requirement. However, a functional test of the crane under a normal operating load should be made prior to putting the crane back in service.

(1) Test loads shall not exceed 110% of the manufacturer's load rating.

(2) Written reports shall be furnished by an appointed or authorized person, showing test procedures and confirming the adequacy of repairs or alterations.

(b) Where rerating is necessary:

(1) Crawler and wheel-mounted cranes shall be tested in accordance with paras. 5-1.1.1(a) and 5-1.1.1(c) for load ratings where stability governs. Ratings governed by structural competence shall be established by the manufacturer or a qualified person and tested to 110% of the rating.

(2) Locomotive cranes shall be tested in accordance with paras. 5-1.1.1(a) and 5-1.1.1(b) of this Standard.

(3) The rerating test report shall be made available.

(c) No cranes shall be rerated in excess of the original load ratings unless such rating changes are approved by the crane manufacturer or a qualified person.

Section 5-2.3 Maintenance

5-2.3.1 Preventive Maintenance

(a) A preventive maintenance program based on the crane manufacturer's recommendations should be established. Dated records should be made available.

(b) It is recommended that replacement parts be obtained from the original equipment manufacturer.

5-2.3.2 Maintenance Procedure

(a) Before adjustments and repairs are started on a crane, the following precautions shall be taken as applicable:

(1) crane placed where it will cause the least interference with other equipment or operations in the area;

(2) all controls in the off position and all operating features secured from inadvertent motion by brakes, pawls, or other means;

(3) starting means rendered inoperative;

(4) power plant stopped or disconnected at power takeoff;

(5) boom lowered to the ground, if possible, or otherwise secured against dropping;

(6) lower load block lowered to the ground or otherwise secured against dropping; and

(7) relieve hydraulic oil pressure from all hydraulic circuits before loosening or removing hydraulic components.

(b) "Warning" or "Out of Order" signs shall be placed on the crane controls. For locomotive cranes, blue flag protection shall be employed. Signs or flags shall be removed only by authorized personnel.

(c) After adjustments and repairs have been made, the crane shall not be returned to service until all guards have been reinstalled, trapped air removed from the hydraulic system, safety devices reactivated, and maintenance equipment removed.

5-2.3.3 Adjustments and Repairs

(a) Any hazardous conditions disclosed by the inspection requirements of Section 5-2.1 shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by designated personnel.

(b) Adjustments shall be maintained to ensure correct functioning of components. The following are examples:

(1) functional operating mechanisms;

(2) safety devices;

(3) control systems;

(4) power plants; and

(5) braking systems.

(c) Repairs or replacements shall be provided as needed for operation. The following are examples:

(1) critical parts of functional operating mechanisms that are cracked, broken, corroded, bent, or excessively worn;

(2) critical parts of the crane structure that are cracked, bent, broken, or excessively corroded; and

(3) damaged or worn hooks as described under Maintenance in ASME B30.10. Repairs by welding or reshaping are not recommended.

(d) Replacement parts or repairs shall have at least the original design factor.

(e) Instructions shall be provided by the manufacturer for the removal of air from hydraulic circuits.

5-2.3.4 Lubrication

(a) All moving parts of the crane for which lubrication is specified should be regularly lubricated. Lubricating systems should be checked for proper delivery of lubricant. Care should be taken to follow the manufacturer's recommendations as to the points and frequency of lubrication, maintenance of lubricant levels, and types of lubricant to be used.

(b) Machinery shall be stationary while lubricants are being applied and protection provided as called for in paras. 5-2.3.2(a)(2) through 5-2.3.2(a)(5), unless equipped for automatic or remote lubrication.

to operate to the end of the work shift, based on the judgment of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift.

(b) Removal criteria for rope replacement shall be as follows:

(1) Broken Wires

(a) in running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay; and

(b) in rotation resistant ropes, two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in thirty rope diameters. For special conditions relating to rotation resistant rope, refer to para. 5-3.2.1.1(d)(1)(b);

(2) one outer wire broken at the point of contact with the core of the rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required.

(3) wear of one-third the original diameter of outside individual wires;

(4) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure;

(5) evidence of any heat damage from any cause;

(6) reductions from nominal diameter of more than:

(a) $\frac{1}{64}$ in. (0.4 mm) for diameters up to and including $\frac{5}{16}$ in. (8.0 mm);

(b) $\frac{1}{32}$ in. (0.8 mm) for diameters $\frac{3}{8}$ in. (9.5 mm), to and including $\frac{1}{2}$ in. (13.0 mm);

(c) $\frac{3}{64}$ in. (1.2 mm) for diameters $\frac{9}{16}$ in. (14.5 mm), to and including $\frac{3}{4}$ in. (19.0 mm);

(d) $\frac{1}{16}$ in. (1.6 mm) for diameters $\frac{7}{8}$ in. (22.0 mm), to and including $1\frac{1}{8}$ in. (29.0 mm);

(e) $\frac{3}{32}$ in. (2.4 mm) for diameters $1\frac{1}{4}$ in. (32.0 mm) to and including $1\frac{1}{2}$ in. (38.0 mm).

(7) in standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

(c) Broken wire removal criteria cited in this volume apply to wire rope operating on steel sheaves and drums. The user shall contact the sheave, drum, or crane manufacturer, or a qualified person, for broken wire removal criteria for wire ropes operating on sheaves and drums made of material other than steel.

(d) Replacement rope shall have a strength rating at least as great as the original rope furnished or recommended by the crane manufacturer. Any deviation from the original size, grade, or construction shall be specified by a rope manufacturer, the crane manufacturer, or a qualified person.

(e) Ropes Not in Regular Use. All rope that has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed shall be given an inspection in accordance with para. 5-2.4.2(b) before it is placed in service. This inspection shall be for all types of deterioration and shall be performed by an appointed or authorized person.

(f) Inspection Records

(1) Frequent Inspection. No records required.

(2) Periodic Inspection. In order to establish data as a basis for judging the proper time for replacement, a dated report of rope condition at each periodic inspection shall be kept on file. This report shall cover points of deterioration listed in para. 5-2.4.2(b)(2). If the rope is replaced, only that part need be recorded.

(g) A long-range inspection program should be established and should include records on the examination of ropes removed from service so that a relationship can be established between visual observation and actual condition of the internal structure.

5-2.4.4 Rope Maintenance

(a) Rope should be stored to prevent damage or deterioration.

(b) Unreeling or uncoiling of rope shall be done as recommended by the rope manufacturer and with care to avoid kinking or inducing a twist.

(c) Before cutting a rope, seizings shall be placed on each side of the place where the rope is to be cut to prevent unlaying of the strands. On preformed rope, one seizing on each side of the cut is required. On nonpreformed ropes of $\frac{7}{8}$ in. (22 mm) diameter or smaller, two seizings on each side of the cut are required, and for nonpreformed rope of 1 in. (26 mm) diameter or larger, three seizings on each side of the cut are required.

(d) During installation, care should be exercised to avoid dragging of the rope in dirt or around objects that will scrape, nick, crush, or induce sharp bends in it.

(e) Rope should be maintained in a well-lubricated condition. It is important that lubricant applied as part of a maintenance program shall be compatible with the original lubricant, and to this end, the rope manufacturer should be consulted; lubricant applied shall be of the type that does not hinder visual inspection. Those sections of rope that are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating rope. The object of rope lubrication is to reduce internal friction and to prevent corrosion.

CHAPTER 5-3
Operation

Section 5-3.1 Qualifications for and Conduct of Operators and Operating Practices

5-3.1.1 Operators

(a) Cranes shall be operated only by the following personnel:

(1) persons who have met the requirements of paras. 5-3.1.2(a), (b), and (c);

(2) persons who have met the requirements of para. 5-3.1.2(d) and who are training for the type of crane being operated. While operating, the trainee must be under the direct supervision of a designated, qualified operator;

(3) maintenance personnel who have completed all operator trainee qualification requirements. Operation by these persons shall be limited to those crane functions necessary to perform maintenance on the crane or to verify the performance of the crane after maintenance has been performed; and

(4) inspectors who have completed all operator trainee qualification requirements. Operation by these persons shall be limited to those crane functions necessary to accomplish the inspection.

(b) Only the personnel specified in (a) above, oilers, supervisors, and those specific persons authorized by supervisors, shall enter a crane cab. Persons shall only enter the cab when their duties require them to do so, and then, only with the knowledge of the operator or other appointed persons.

5-3.1.2 Qualifications for Operators. Operators shall be required to successfully meet the qualifications for the specific type crane (see Figs. 1 through 10) that they are operating.

(a) Operator and operator trainees shall meet the following physical qualifications unless it can be shown that failure to meet the qualifications will not affect the operation of the crane. In such cases, specialized clinical or medical judgments and tests may be required.

(1) vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses;

(2) ability to distinguish colors, regardless of position, if color differentiation is required;

(3) adequate hearing, to meet operational demands, with or without hearing aid;

(4) sufficient strength, endurance, agility, coordination, and speed of reaction to meet the operation demands;

(5) operators and operator trainees shall have normal depth perception, field of vision, reaction time, manual dexterity, coordination, and no tendencies to dizziness or similar undesirable characteristics;

(6) each operator or operator trainee shall successfully pass with a negative result a substance abuse test. The level of testing will be determined by the standard practice for the industry where the crane is employed and this test shall be confirmed by a recognized laboratory service;

(7) no evidence of physical defects or emotional instability that could render a hazard to the operator or others, or that in the opinion of the examiner could interfere with the operator's performance. If evidence of this nature is found, it may be sufficient cause for disqualification; and

(8) evidence that an operator is subject to seizures or loss of physical control shall be sufficient reason for disqualification. Specialized medical tests may be required to determine these conditions.

(b) Operator requirements shall include, but not be limited to, the following:

(1) evidence of successfully passing a physical examination as defined in para. 5-3.1.2(a);

(2) satisfactory completion of a written examination covering operational characteristics, controls, and emergency control skills such as response to: fire, power line contact, loss of stability, or control malfunction, as well as characteristic and performance questions appropriate to the crane type for which qualification is sought;

(3) operators shall demonstrate their ability to read, write, comprehend, and exhibit arithmetic skills and load/capacity chart usage, in the language of the crane manufacturer's operation and maintenance instruction materials;

(b) the crane shall be located within an area protected from unauthorized entry.

(8) When a local weather storm warning exists, consideration shall be given to the recommendations of the manufacturer for securing the crane.

(f) 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 an appointed person.

(g) Before closing the switch or starting the engine, the operator shall see that all controls are in the off or neutral position and that all personnel are in the clear.

(h) If power fails during operations, the operator shall:

(1) set all brakes and locking devices;

(2) move all clutches or other power controls to the off or neutral position; and

(3) if practical, land the suspended load under brake control.

(i) The operator shall be familiar with the equipment and its proper care. If adjustments or repairs are necessary, the operator shall promptly report this to the appointed person, and shall also notify the next operator.

(j) All controls shall be tested by the operator at the start of a new shift. If any controls fail to operate properly, they shall be adjusted or repaired before operations are begun.

(k) The manufacturer's boom assembly and disassembly procedures should be followed. Any deviation from the manufacturer's procedure shall require blocking of the boom or boom sections to prevent inadvertent dropping of the boom.

(l) When removing pins or bolts from a boom, workers should stay out from under the boom.

(m) Each outrigger shall be visible to the operator or to a signal person during extension or setting.

Section 5-3.2 Operating Practices

5-3.2.1 Handling the Load

5-3.2.1.1 Size of Load

(a) No crane shall be loaded beyond the specifications of the load rating chart, except for test purposes as provided in Section 5-2.2.

(b) The load to be lifted shall be within the rated capacity of the crane in its existing configuration [refer to 5-1.1.1(d)].

(c) When loads that are not accurately known are to be lifted, the designated person responsible for the job lift shall ascertain that the weight of the load does not exceed the crane ratings at the maximum radius at which the load is to be handled.

(d) When rotation resistant ropes are used with an operating design factor less than 5, but in no case less than 3.5, the special provisions that follow shall apply:

(1) For each such lifting assignment:

(a) An appointed person shall direct each lift.

(b) A qualified person shall ascertain that the rope is in satisfactory condition [paras. 5-2.4.2(a)(1)(a) through (e)] both before and after lifting; but more than one broken wire in any one lay shall be sufficient reason to consider not using the rope for such lifts.

(c) Operations shall be conducted in such a manner and at such speeds as to minimize dynamic effects.

(2) Each lift under these provisions shall be recorded in the crane inspection record and such prior uses shall be considered before permitting another such lift.

(3) These provisions are not intended to permit duty cycle or repetitive lifts to be made with operating design factors less than 5.

5-3.2.1.2 Attaching the Load

(a) The hoist rope shall not be wrapped around the load.

(b) The load shall be attached to the hook by means of slings or other devices of sufficient capacity.

5-3.2.1.3 Holding the Load

(a) The operator shall not leave the controls while the load is suspended.

(b) No person should be permitted to stand or pass under a suspended load.

(c) If the load hoist mechanism is not equipped with an automatic brake and the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the device specified in para. 5-1.3.2(a)(4). The boom hoist brakes shall be set and the device specified in para. 5-1.3.1(c) shall be engaged.

(d) As an exception to (a) above, under those circumstances where a load is to be held suspended for a period of time exceeding normal lifting operations, the operator may leave the controls provided that, prior to that time, the appointed individual and operator shall establish the requirements for restraining the boom hoist, telescoping, load, swing, and outrigger functions, and provide notices, barricades, or whatever other precautions may be necessary.

the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.

(p) When a crane is to be operated with the boom at a fixed angle, the boom-hoist pawl or other positive holding device shall be engaged.

(q) Use of Winch Heads

(1) Fiber and wire rope 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 convenient reach of the power unit control lever.

(r) Personnel shall not be permitted to ride the bare hook or a load of material suspended from the hook.

5-3.2.2 Personnel Lifting. This Standard recognizes that mobile and locomotive cranes are designed and intended for handling materials and not personnel. Personnel are only permitted to ride in a personnel platform, prescribed in para. 5-3.2.2(b), supported by the crane load line attachment. This does not preclude the use of boom mounted baskets when used in accordance with the crane manufacturer's instructions. The crane shall not be used for other purposes while handling personnel.

(a) The following special procedures shall be followed when personnel are to be lifted.

(1) The person specifically responsible for the overall work function to be performed shall determine that there is no practical alternate way to perform the needed work or gain access to the area, and he shall authorize its usage.

(2) For each personnel lifting procedure, the person responsible for the task shall attest to the need for the operation by issuing a statement describing the procedure and its time frame. The statement, after being approved by the authorizer, shall be retained at the jobsite.

(3) When used for lifting personnel, the crane shall be inspected daily in accordance with the requirements of paras. 5-2.1.2 and 5-2.4.2(a).

(4) The lifting and supporting shall be made under controlled conditions and under the direction of an appointed signalperson.

(5) A meeting attended by the crane operator, signalperson, and the person responsible for the task to be performed shall be held daily to plan and review procedures to be followed. The person responsible for the task shall also instruct all personnel who will occupy the personnel platform of the proper procedures to be followed, including procedures for entering and leaving the personnel platform and the points at which persons will enter and leave the personnel platform.

(6) The operator and signalperson shall conduct a test lift with the empty personnel platform or basket and verify adequacy of footing in accordance with para. 5-3.4.6.

(7) Communication between the crane operator, signalperson, and person(s) being lifted shall be maintained.

(8) When hook supported personnel platforms are lifted, a two-block damage prevention feature shall be provided on telescopic boom cranes and a warning device shall be provided on lattice boom cranes.

(9) The crane shall be operated so that lowering motion will be power-controlled lowering (no free-fall).

(10) When welding is done by personnel from the platform or basket, the electrode holders shall be protected from contact with metal components of the personnel platform or basket.

(11) Personnel being lifted or supported shall wear safety belts with lanyards attached to designated anchor point(s).

(12) The operator shall remain at the controls when the personnel platform is occupied.

(13) Movement of the personnel platform shall be done in a slow, controlled, cautious manner with no sudden movements of the crane or personnel platform. The lifting or lowering speed shall not exceed 100 ft/min (0.51 m/s).

(14) Cranes shall not travel while personnel are on a personnel platform or in the basket.

(15) The personnel being lifted or positioned shall remain in continuous sight or in communication with the operator or signalperson.

(16) Cranes used for lifting personnel shall be supported by a firm surface. To support and maintain the crane in a level position, it may be necessary to use blocking or other means so that the support medium does not exceed its load bearing capabilities. When provided, outriggers shall be fully extended and properly set. Lifting of personnel is not permitted when the crane is supported on tires.

(17) The total weight of the lifted load (including personnel) shall not exceed 50% of the crane rating under the planned conditions of use.

(18) Suspended personnel platforms shall be used only for personnel, their tools, and sufficient materials to do their work. They shall not be used for transporting bulk materials.

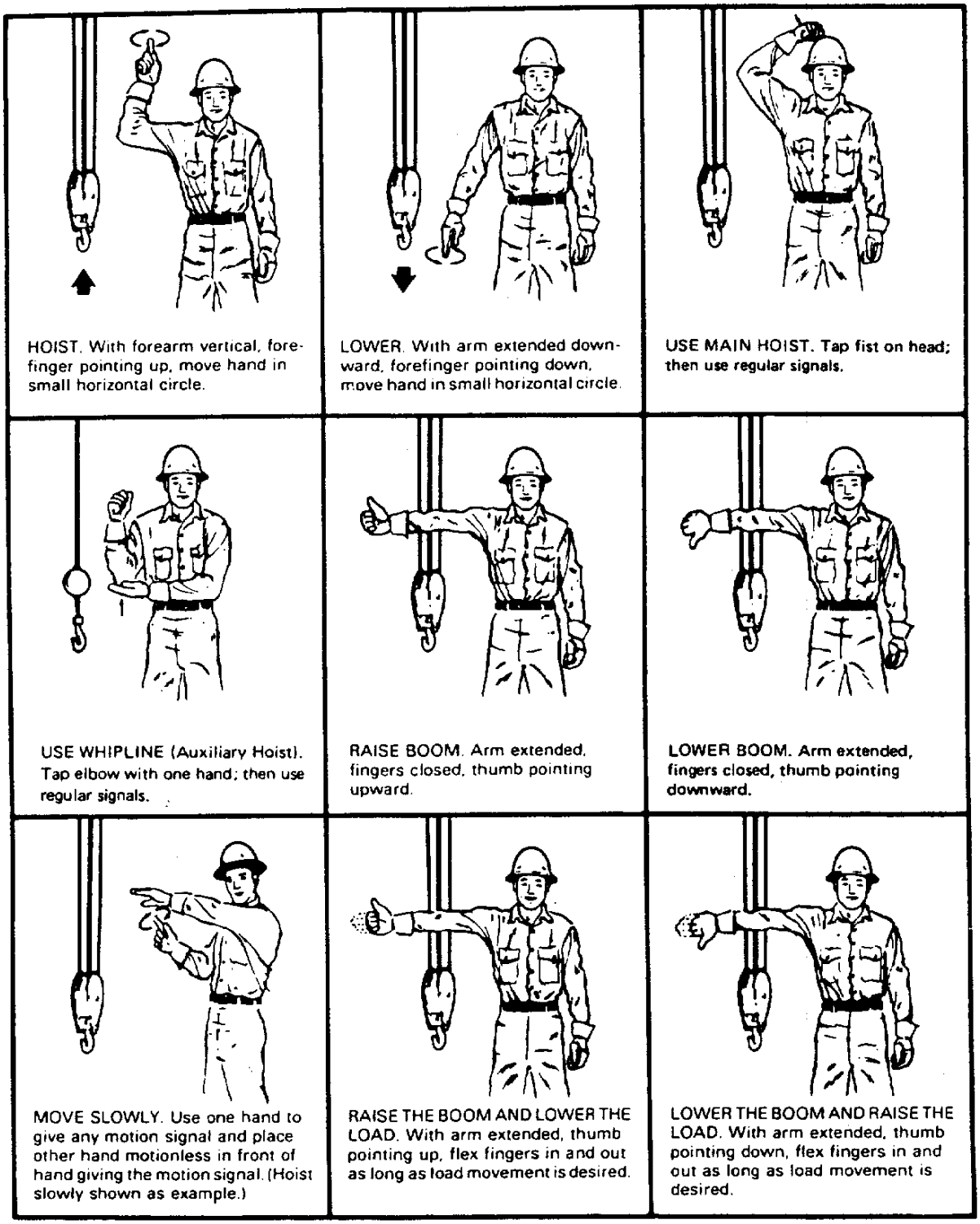


FIG. 16 STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS

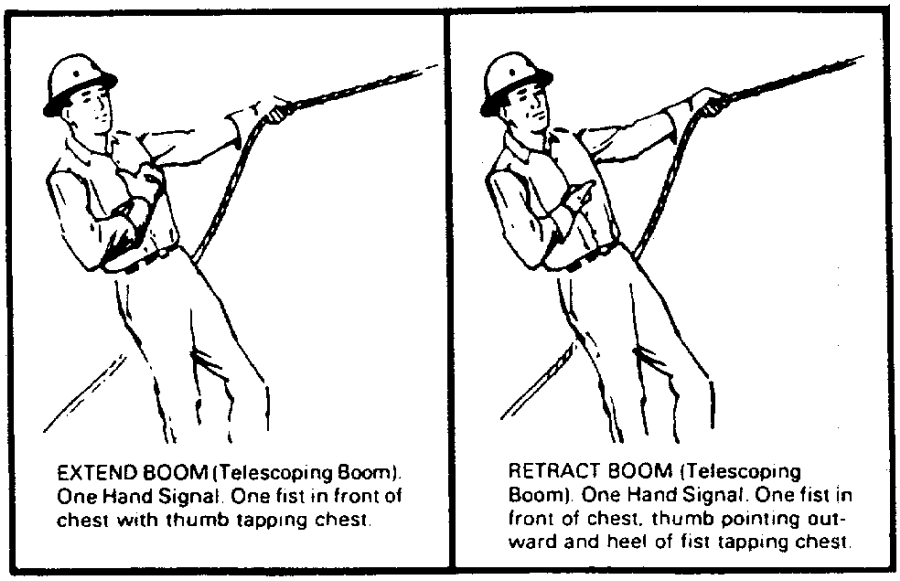


FIG. 16 STANDARD HAND SIGNALS FOR CONTROLLING CRANE OPERATIONS (CONT'D)

(b) GO AHEAD — two audible signals
(c) BACK UP — three audible signals

5-3.3.5 Instructions. If it is desired to give instructions to the operator, other than those provided by the established signal system, the crane motions shall be stopped.

Section 5-3.4 Miscellaneous

5-3.4.1 Rail Clamps. Rail clamps, if used, should have some slack between the point of attachment to the rail and the end fastened to the crane. Rail clamps shall not be used as a means of restraining tipping of a locomotive crane.

5-3.4.2 Ballast or Counterweight. Cranes shall not be operated without the ballast or counterweight being in place as specified by the crane manufacturer. Under specific conditions, such as during crane assembly, unusual boom configurations, etc., the crane manufacturer's recommendations for the amount of ballast or counterweight shall be adhered to. The maximum ballast or counterweight approved by the manufacturer for use on a given machine shall not be exceeded. Unauthorized addition of ballast or counterweight constitutes a hazard in two ways:

(a) the structural competence of the various parts of the machine may be exceeded, causing failure;

(b) the manufacturer's margin of backward stability may be exceeded and the crane may turn over backwards or damage various parts of the machine.

5-3.4.3 Rerailing Locomotive Cranes. If a locomotive crane has been derailed, a wrecking frog or car replacer (or its equivalent) should be used and the crane should be hauled back onto the track by external power.

5-3.4.4 Swinging Locomotive Cranes. A locomotive crane shall not be swung into a position where railway cars on an adjacent track might strike it, until it has been ascertained that cars are not being moved on the adjacent track and that proper flag protection has been established.

5-3.4.5 Operating Near Electric Power Lines

5-3.4.5.1 General. This volume recognizes that operating mobile cranes where they can become electrified from electric power lines is an extremely hazardous practice. It is advisable to perform the work so there is no possibility of the crane, load line, or load becoming a conductive path. [See Fig. 17, sketches (a) and (b).] Cranes shall not be used to handle materials stored under electric power lines unless any combination of boom, load, load line, or machine component cannot

enter the prohibited zone. Operating mobile cranes where they can become electrified with electric power lines is not recommended unless there is no less hazardous way to perform the job.

Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line. Crane operators shall not rely on the coverings of wires for their protection. Four conditions to consider when operating a mobile crane near electric power lines are:

(a) power lines de-energized and grounded as in para. 5-3.4.5.2;

(b) power lines energized, crane operating less than the erected/fully extended boom length away as in para. 5-3.4.5.3 [see Fig. 17, sketch (c)];

(c) power lines energized, crane within prohibited zone as in para. 5-3.4.5.4; and

(d) crane in transit, no load and boom lowered as in para. 5-3.4.5.5.

5-3.4.5.2 Crane Operation Near De-energized and Grounded Electric Power Lines. This is the preferred condition under which the operation can be performed. The hazard of injury or death due to electrocution has been removed.

The following steps shall be taken to assure de-energization of the power lines.

(a) The power company or owner of the power lines shall de-energize the lines.

(b) The lines shall be visibly grounded to avoid electrical feedback and appropriately marked at jobsite location.

(c) A qualified representative of the owner of the lines or a designated representative of the electrical utility shall be on the site to verify that steps (a) and (b) of this Section have been completed and that the lines are not energized.

(d) Durable signs shall be installed at the operator's station and on the outside of the crane warning that electrocution or serious bodily injury may occur unless minimum clearances, as specified in Table 1 [see Table 1 and Fig. 17, sketch (d)], are maintained between the crane or the load being handled and energized power lines.

(e) If cage-type boom guards, insulating links, or proximity warning devices are used on cranes, such devices shall not be a substitute for the requirements of Section 5-3.4.5, even if such devices are required by law or regulation. In view of the complex, invisible, and lethal nature of the electrical hazard involved and to lessen the potential of false security, instructions on the electrical hazard involved, operating conditions for the devices, limitations of such devices, and testing requirements prescribed by the device manufacturer, if used, shall be understood by the crane operator, crew, and load handling personnel. Compliance with Section 5-3.4.5 is the recommended practice of this volume in determining permissible proximity of the crane and its protuberances, including load, to electrical power lines.

5-3.4.5.3 Crane Operation Within the Erected/Fully-Extended Boom Length of the Prohibited Zone, With the Power Lines Energized. The following steps shall be taken to minimize the hazard of electrocution or serious injury as a result of contact between the energized power lines and the crane, load line, or load [see Fig. 17, sketch (c)].

(a) An on-site meeting between project management and a qualified representative of the owner of the lines or a designated representative of the electrical utility shall take place to establish the procedures to safely complete the operations.

(b) The specified clearance between the power lines and the crane, load line, and load shall be maintained at all times [see Table 1 and Fig. 17, sketch (d)].

(c) Load control, when required, shall utilize tag lines of a non-conductive type.

(d) A qualified signal person(s), whose sole responsibility is to verify that the required clearance is maintained, shall be in constant contact with the crane operator.

(e) No one shall be permitted to touch the crane or the load unless the signal person indicates it is safe to do so.

(f) Operation of boom and load over electric power lines is extremely dangerous, due to perception of distance and multiple contact points as viewed from the position of the operator and/or position of the signal person. The operator should avoid operating the crane, with or without a load, in this area.

(g) The horizontal and vertical distance of movement of long span lines due to the wind shall be added to the minimum clearance distance as specified in Table 1 [see Table 1 and Fig. 17, sketch (d)]. A qualified representative of the owner of the lines or a designated representative of the electrical utility shall be consulted for specific distances.

(h) Devices such as ribbons, balls, etc., should be attached by a qualified person to the power lines to improve visibility, or equivalent means employed to aid in location of the prohibited zone.

TABLE 1 REQUIRED CLEARANCE FOR NORMAL VOLTAGE IN OPERATION NEAR HIGH VOLTAGE POWER LINES AND OPERATION IN TRANSIT WITH NO LOAD AND BOOM OR MAST LOWERED

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance, ft (m) [Note (1)]
Operation Near High Voltage Power Lines	
to 50	10 (3.05)
Over 50 to 200	15 (4.60)
Over 200 to 350	20 (6.10)
Over 350 to 500	25 (7.62)
Over 500 to 750	35 (10.67)
Over 750 to 1000	45 (13.72)
Operation in Transit With No Load and Boom or Mast Lowered	
to 0.75	4 (1.22)
Over 0.75 to 50	6 (1.83)
Over 50 to 345	10 (3.05)
Over 345 to 750	16 (4.87)
Over 750 to 1000	20 (6.10)

NOTE:
(1) Environmental conditions such as fog, smoke, or precipitation may require increased clearances.

(i) Durable signs shall be installed at the operator's station and on the outside of the crane warning that electrocution or serious bodily injury may occur unless minimum clearances, as specified in Table 1 [see Table 1 and Fig. 17, sketch (d)], are maintained between the crane or the load being handled and energized power lines.

(j) If cage-type boom guards, insulating links, or proximity warning devices are used on cranes, such devices shall not be a substitute for the requirements of Section 5-3.4.5, even if such devices are required by law or regulation. In view of the complex, invisible, and lethal nature of the electrical hazard involved and to lessen the potential of false security, instructions on the electrical hazard involved, operating conditions for the devices, limitations of such devices, and testing requirements prescribed by the device manufacturer, if used, shall be understood by crane operator, crew, and load handling personnel. Compliance with Section 5-3.4.5 is the recommended practice of this volume in determining permissible proximity of the crane and its protuberances, including load, to electrical power lines.

5-3.4.5.4 Crane Operation Within the Prohibited Zone With the Electric Power Lines Energized. The following steps shall be taken to minimize the hazard of electrocution or serious injury as a result of contact between the energized power lines and the crane, load line, or load.

(a) Before such operations take place, a qualified person together with a qualified representative of the utility or an engineer qualified in power line transmission shall, after visiting the site, determine if this is the most feasible way to complete the operation, and set minimum required clearances and procedures for such operations. These operations shall be under their supervision. The following may be required:

(1) crane/load grounded to line neutral by the utility;

(2) electrical system protective devices that automatically reenergize the circuit after a power line contact occurrence should be blocked or disengaged to inhibit this function;

(3) insulated barriers, which are not a part of nor an attachment to the crane and which will not allow contact between the energized electric power lines and the crane, load lines, or load; and/or

(4) non-conductive barricades to restrict access to the crane work area.

(b) Load control, when required, shall utilize tag lines of a non-conductive type.

(c) A qualified signal person(s), whose sole responsibility is to verify that the clearances established in para. 5-3.4.5.4(a) are maintained, shall be in constant contact with the crane operator.

(d) The person(s) responsible for the operation shall alert and warn the crane operator and all persons working around or near the crane about the hazard of electrocution or serious injury and instruct them on how to avoid the hazard.