ASME B30.27-2005

Material Placement Systems

Safety Standard for Cableways, Cranes, Derricks Hoists, Hooks, Jacks, and Slings

AN AMERICAN NATIONAL STANDARD



The American Society of Mechanical Engineers

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The next edition of this Standard is scheduled for publication in 2010. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Interpretations are published on the ASME Web site under the Committee Pages at http://www.asme.org/codes/ as they are issued, and will also be published within the next edition of the Standard.

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FOREWORD

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 standards (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 the 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 Committee, in accordance with the format described in Section III, before rendering decisions on disputed points.

This volume of the Standard, which was approved by the B30 Committee and by ASME, was approved by ANSI and designated as an American National Standard on August 29, 2005.

Safety codes and standards are intended to enhance public safety. Revisions result from committee consideration of factors such as technological advances, new data, and changing environmental and industry needs. Revisions do not imply that previous editions were inadequate.

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Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

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

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

B30 STANDARD INTRODUCTION

GENERAL

This Standard is one of a series of safety standards on various subjects, which 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
B30.26 Rigging Hardware
B30.27 Material Placement Systems
B30.28 Balance-Lifting Units[1]

If these standards are 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 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; the loads; the acceleration or speed of the ropes, chains, sheaves, sprockets, or drums; the type of attachments; the number, size, and arrangement of sheaves or other parts; environmental conditions causing corrosion or wear; and many variables that must be considered in each individual case. The rules given in the Standard must be interpreted accordingly, and judgment must be used in determining their application.

[1] B30.24 and B30.28 are in the developmental stage.

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The Standards Committee will be glad to receive criticisms of this Standard's requirements and suggestions for its improvement, especially those based on actual experience in application of the rules.

Suggestions for changes to the Standard should be submitted to the Secretary of the B30 Committee, ASME, Three Park Avenue, New York, NY 10016-5990, and should be in accordance with the following format:

(a) Cite the specific paragraph designation of the pertinent volume.

(b) Indicate the suggested change (addition, deletion, revision, etc.).

(c) Briefly state the reason and/or evidence for the suggested change.

(d) Submit suggested changes to more than one paragraph in the order that the paragraphs appear in the volume.

The B30 Committee will consider each suggested change in a timely manner in accordance with its procedures.

SECTION I: SCOPE OF B30 STANDARD

This Standard applies to the construction, installation, operation, inspection, maintenance, and safe use of jacks; power-operated cranes, monorails, and crane runways; power-operated and manually operated derricks and hoists; lifting devices, hooks, and slings; and cableways.

This Standard does not apply to track and automotive jacks, railway or automobile wrecking cranes, shipboard cranes, shipboard cargo-handling equipment, well drilling derricks, skip hoists, mine hoists, truck body hoists, car or barge pullers, conveyors, excavating equipment, or equipment coming within the scope of the following Committees: A10, A17, A90, A92, A120, B20, B56, and B77.

SECTION II: PURPOSE

This Standard is designed to

(a) guard against and minimize injury to workers and otherwise provide for the protection of life, limb, and property by prescribing safety requirements

(b) provide direction to owners, employers, supervisors, and others concerned with, or responsible for, its application

(c) guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives

SECTION III: INTERPRETATIONS

Upon request, the B30 Committee will render an interpretation of any requirement of the Standard. Interpretations can only he rendered in response to a written request sent to the Secretary of the B30 Committee, ASME, Three Park Avenue, New York, NY 10016-5990.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his request utilizing the following format:

Subject:	Cite the applicable paragraph number(s) and provide a concise description.
Edition:	Cite the applicable edition of the pertinent volume for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain any proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which could change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information, which 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 per-

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formance 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 within 1 year.

SECTION V: MANDATORY AND ADVISORY RULES

Mandatory rules of this Standard 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

This Standard contains SI (metric) units as well as U.S. Customary units. The values stated in U.S. Customary units are to be regarded as the standard. The SI units are a direct (soft) conversion from the customary units.

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MATERIAL PLACEMENT SYSTEMS

Chapter 27-0
Scope, Definitions, and References

SECTION 27-0.1: SCOPE

Volume B30.27 includes provisions that apply to the construction, installation, operation, inspection, and maintenance of mobile material placing booms, mobile telescoping boom conveyors, separate placing booms, and material placement accessories (see Figs. 1 through 3).

This Volume does not apply to the pumping elements of a concrete pump, conveyors, mortar conveying or spraying machines, or dry mix shotcreting machines.

The concrete pump portion of these machines is covered by CPMA 27-2000.

The conveyor section of these machines is covered by ASME B20.1.

SECTION 27-0.2: DEFINITIONS

concrete delivery hose: a flexible delivery hose having a coupling on each end.

control panel: controls mounted on the material placement system.

delivery systems: delivery lines, pipes, hoses, attachment components, and transfer valves, through which material is transported (see Fig. 4).

designated person: a person selected or assigned by the employer or the employer's representative as being competent to perform specific duties.

end hose: a flexible concrete delivery hose that only has one coupling.

manual valve override: a mechanical valve actuator used to operate an electrically controlled valve in emergency or breakdown situations.

manual valves: a valve whose manual actuator is the only means of valve actuation.

maximum support force: the maximum force exerted on the supporting surface at any one outrigger.

normal operating conditions: conditions during which a material placement system is performing functions within the scope of the original design. Under these conditions, no one other than the operator is on the material placement system.

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

placing booms: manual or power driven, slewable working devices, consisting of one or more extendable or foldable parts supporting the material delivery system, and directing the discharge into the desired location.

priority switching: transferring control of one or more functions from a control location to a different control location.

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.

rated load: maximum allowable working load designated by the manufacturer.

remote control: a portable control device connected to the machine by a wire cable or linked by radio or other means.

safety device: a means placed in use for the specific purpose of preventing an unsafe condition.

sheave: a grooved wheel or pulley used with a rope to change the direction and point of application of a pulling force.

shortrigging: one or more outriggers not fully extended on the side away from the boom operational area.

signal person: see *spotter*.

specific type (of material placement system): a model, style, or size classification of material placement system (e.g., three section boom, four section boom, 50 meter class, conveyor).

spotter: a signal person/spotter is a person positioned at a vantage point where both the point of discharge and the operator of the material placement system can be seen and relays information to the operator.

SECTION 27-0.3: REFERENCE TO OTHER CODES AND STANDARDS

The following is a list of publications referenced in this Volume:

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ANSI Z-244.1, Lock-out, Tag-out of Energy Sources — Minimum Safety Requirements
ANSI Z-535, Product Safety Signs and Labels
Publisher: American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036

ASME B30.22, Articulating Boom Cranes
ASME B30.5, Mobile and Locomotive Cranes
Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

CPMA 27-2000, Safety Standard for Concrete Pumps, Placing Booms, and Delivery System
Publisher: Concrete Pump Manufacturers Association (CPMA), 2310 S. Green Bay Road, PMB #174, Racine, WI 53406

ISO 13850, Safety of Machinery — Emergency Stop — Principles for Design
Publisher: International Organization for Standardization (ISO), 1 rue de Varembé, Case Postale 56, CH-1211, Genève 20, Switzerland/Suisse

SAE J185, Access Systems for Off-Road Machines
SAE J833, Human Physical Dimensions
Publisher: Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001

SECTION 27-0.4: ILLUSTRATIVE FIGURES

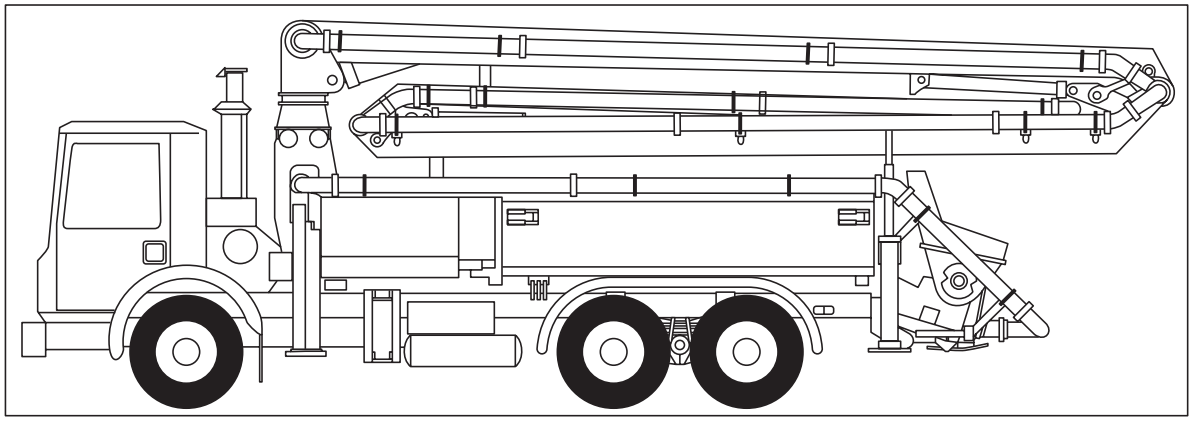


Fig. 1 Material Placement System: Truck-Mounted Concrete Pump With Integrated Placing Boom

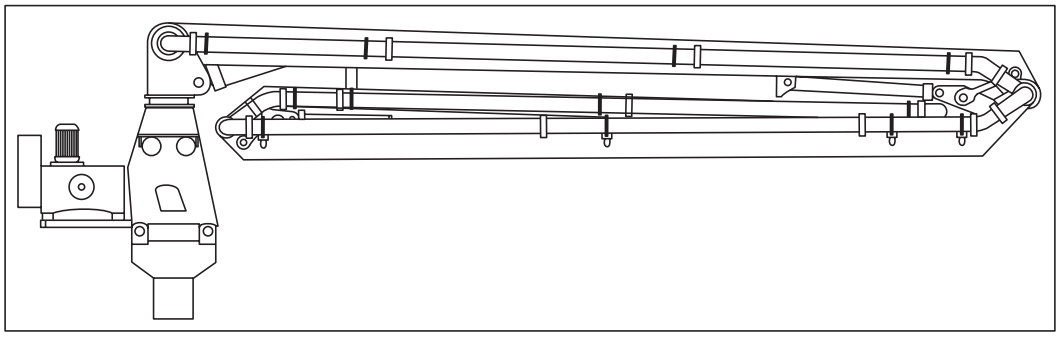


Fig. 2 Material Placement System: Separate Placing Boom

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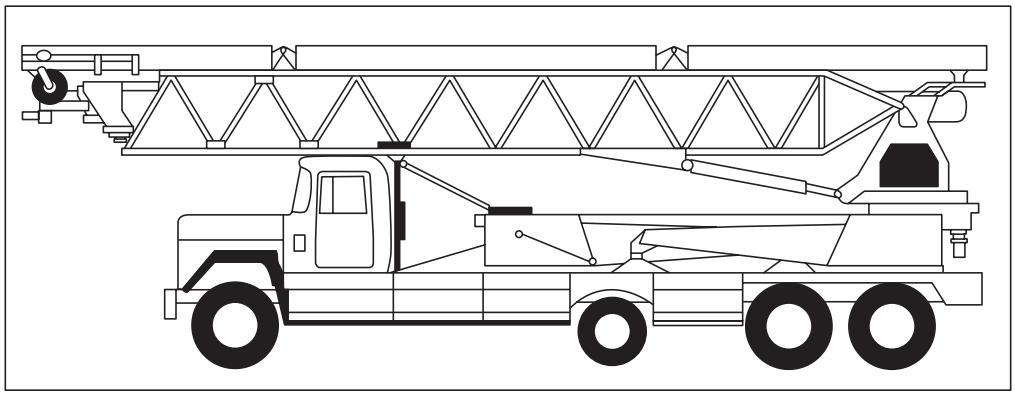


Fig. 3 Material Placement System: Truck-Mounted Telescopic Conveyor System

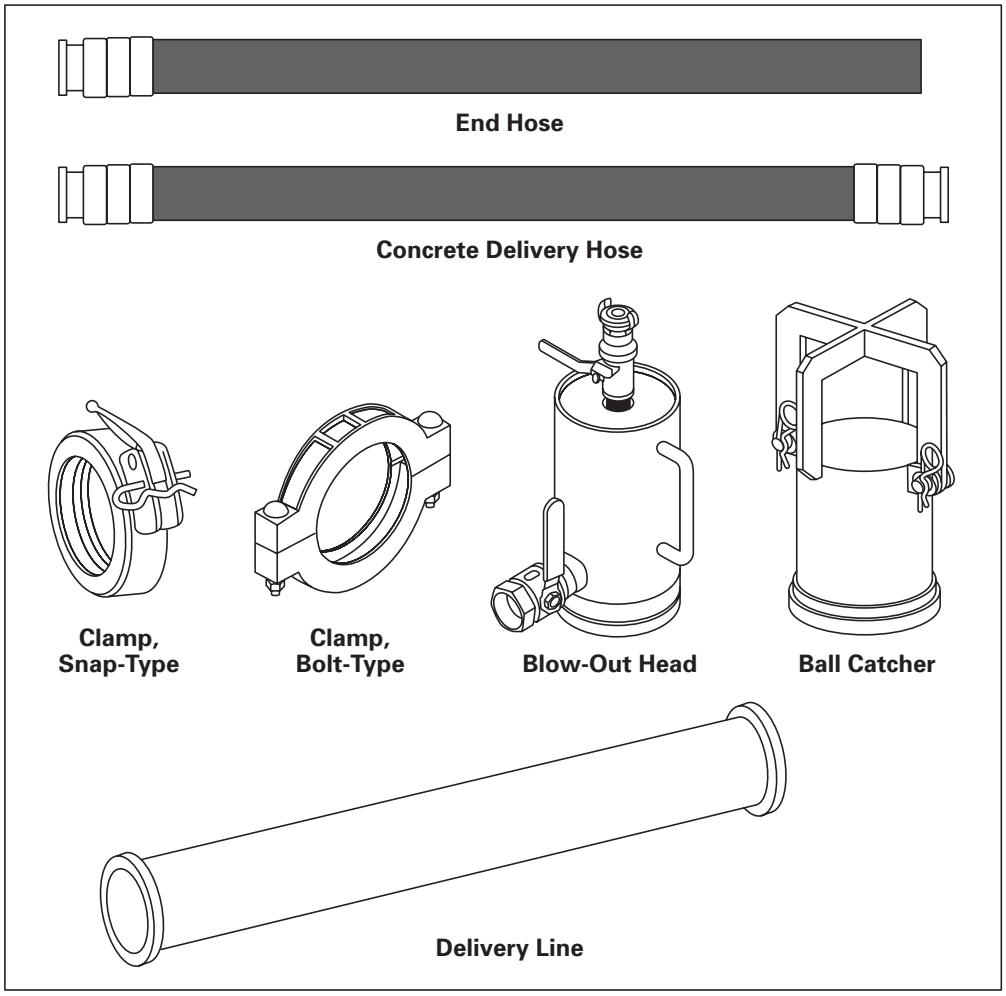


Fig. 4 Material Placement System: Examples of Delivery System Components

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Chapter 27-1
Construction and Installation

SECTION 27-1.1: MARKINGS

27-1.1.1 Placing Boom Rating and Identification Markings

(a) The following information shall be legibly marked on a durable identification plate on the placing boom:

(1) manufacturer, supplier, or importer

(2) year of manufacture

(3) fabrication (serial) number

(4) type or model

(5) maximum design working pressure in the hydraulic system

(6) rated load

(a) for placing booms, maximum weight per foot of delivery system when filled with material based on 150 lb/ft^3

(b) for conveyor, maximum weight of material per foot of belt

(b) Power rating for electrical equipment above 24 V (voltage, frequency, power, amperage draw).

(c) Placing booms shall be clearly marked with a label affixed near the tip elbow warning about the use of improper diameter delivery system.

(d) A durable plate showing the maximum weight of the hanging system components shall be attached to the boom tip.

(e) Placing booms shall not be used to move freely suspended loads. A safety sign shall be placed on the machine to this effect.

27-1.1.2 Material Placement System Rating and Identification Markings

The following information shall be legibly marked on a durable identification plate on the lower support structure of the material placement system:

(a) maximum working pressure of material placement system hydraulic circuit(s)

(b) maximum material pressure, if applicable

(c) maximum working pressure supplied to the boom hydraulic system

27-1.1.3 Straight Delivery Pipes Rating and Identification Markings

The following information shall be legibly and durably marked on straight delivery pipes longer than 12 in.:

(a) manufacturer or supplier (name or code)

(b) nominal diameter

(c) maximum working pressure, when new

(d) weight of pipe per foot when filled with material based on 150 lb/ft^3

27-1.1.4 Delivery System Elbow Rating and Identification Marking

The following information shall be legibly and durably marked on delivery system elbows:

(a) manufacturer or supplier (name or code)

(b) nominal diameter

(c) maximum working pressure, when new

(d) weight of elbow when filled with material based on 150 lb/ft^3

27-1.1.5 Delivery System Hose Rating and Identification Marking

The following information shall be legibly marked on the delivery hose:

(a) manufacturer

(b) nominal diameter

(c) working pressure when new

(d) weight

(1) for delivery hose, pounds per foot when filled with material based on 150 lb/ft^3

(2) for end hose, total weight (when filled with material based on 150 lb/ft^3) of component

27-1.1.6 Safety Signs

(a) Safety signs shall meet the requirements of ANSI Z-535, parts 1, 3, and 4.

(b) Safety signs shall be placed on the material placement system according to the requirements of CPMA 27-2000.

27-1.1.7 Hand Signals

Hand signals in accordance with para. 27-3.3.2 shall be posted conspicuously on the material placement system or placing boom.

SECTION 27-1.2: MOBILE MATERIAL PLACING BOOM CONSTRUCTION

27-1.2.1 Structural

The material placement system shall be designed and constructed so when operated in accordance with manufacturer's intended use, stresses in load-bearing components shall not exceed structural limits.

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27-1.2.2 Stability

The material placement system shall be designed and constructed so three outriggers of the machine support structure remain in contact with the support surface under the following conditions:

(a) The unit is set up within 3 deg of level.

(b) 125% of the rated static load is applied to the boom.

Stability of a representative model of the truck-mounted material placement system with integral placing boom shall be verified by performing the test described in para. 27-2.2.2.

27-1.2.3 Lifting Attachment Points

(a) Machines or their parts designed to be lifted by cranes or other lifting devices shall be equipped with suitable attachment points.

(b) Attachment points shall be clearly marked for identification purposes.

SECTION 27-1.3: WORK PLATFORMS, ACCESS WALKWAYS, AND GANGWAYS

(a) Work platforms, access walkways, and gangways shall be a skid-resistant type.

(b) Access for maintenance, assembly, dismantling, and testing should be provided.

(c) The machine designer should consider weather conditions in the design phase to minimize adverse effects, such as pooling of water and accumulation of ice and mud.

(d) Access provisions for getting on and off the material placement system shall be in accordance with SAE J185.

SECTION 27-1.4: ELECTRICAL INSTALLATIONS

(a) Each electrically powered placing boom shall have a power disconnect switch mounted at or near the base of the placing boom. This switch shall have provisions to apply lockout/tagout procedures in accordance with ANSI Z244.1.

(b) Electrical equipment shall be located or guarded so that live parts are not exposed to inadvertent contact under normal operating conditions.

(c) Electrical equipment shall be protected from concrete, dirt, grease, oil, and moisture infiltration. Fixtures, wiring, and connections exposed to the weather shall be of weather-resistant type.

(d) Overload protection shall be provided for each individual motor.

SECTION 27-1.5: ERGONOMICS

Control panels, manual override levers, access doors, and covers shall be located to provide access to accommodate human physical dimensions as outlined in SAE J833.

SECTION 27-1.6: OUTRIGGERS

(a) The machine shall be constructed so that the operator can see the area of outrigger movement from the outrigger control station.

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

(c) If equipped with detachable outrigger floats (feet), they shall be securable to the outrigger jack.

(d) The maximum downward force imposed by the outrigger shall be marked at each outrigger.

(e) 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.

SECTION 27-1.7: CONTROLS AND INDICATORS

27-1.7.1 Emergency Stops

(a) Each machine shall be equipped with an emergency stop system.

(b) The emergency stop system actuator(s) shall be visible, accessible, and easy to operate.

(c) The machine shall be equipped with an emergency stop actuator at control panel(s) and at the remote control device(s). The machine may be fitted with additional emergency stop actuators.

(d) Emergency stops shall

(1) cause the machinery to stop instantaneously, taking into account stored energy.

(2) prevent the automatic restart of the machine. The machine will have to be started intentionally.

(3) be constructed according to ISO 13850.

27-1.7.2 Outriggers

(a) Control devices for slewable, telescopic, or adjustable outriggers shall return to the neutral position when released.

(b) Control devices for outriggers shall be situated outside of the area of outrigger movement, or access to the area of outrigger movement shall be otherwise restricted.

(c) Control circuits for the outriggers shall be independent of each other.

(d) Outrigger control systems shall be designed so they are nonfunctional when the machine is locked-out in accordance with ANSI Z244.1.

27-1.7.3 General Control Requirements

(a) If there are multiple control locations, the same operation (e.g., start, close, open) shall only be possible from one location at a time. Priority switching (either manual or automatic) shall be used to transfer the control between the control locations.

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(b) Control devices shall be designed to prevent unintentional operation.

(c) Control systems shall be designed so that they are nonfunctional when the equipment is locked out in accordance with ANSI Z244.1.

(d) All control devices shall be constructed, arranged, and marked so their function is indicated.

(e) Control devices that activate boom movements shall return to the neutral position when released.

27-1.7.4 Hour Meters

Hour meters shall be installed on any material placement system requiring maintenance based on hours.

SECTION 27-1.8: GUARDS

(a) Any hazard that is inaccessible is considered guarded by location.

(b) A fixed guard shall be installed for rotating shafts. The underside of a mobile truck chassis-mounted material placement system is considered guarded by location.

(c) A fixed guard shall be installed over V-belts, drive pulleys, chains, sprockets, gears, and other moving parts.

(d) All exhaust pipes shall be guarded or insulated to prevent contact with personnel when performing routine duties.

(e) Whenever guarding is impractical, prominent means such as safety signs or lights shall be provided at the point of hazard in lieu of guarding.

SECTION 27-1.9: MOBILE AND STATIONARY PLACING BOOMS

27-1.9.1 Placing Booms

(a) Mobile placing booms shall be equipped with a remote control with sufficient range to operate the material placement system from a distance equivalent to the boom length.

(b) The lifting and lowering speed at the end of the boom shall not exceed 3 ft/sec when activating any one section.

(c) The lifting and lowering speed at the end of the boom shall not exceed 10 ft/sec when activating any combination of boom functions.

(d) The horizontal slewing speed at the end of the boom shall not exceed 5 ft/sec.

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

27-1.9.2 Boom Tip Attachments

Provisions shall be made so that attachments suspended from the boom tip can be restrained.

SECTION 27-1.10: DELIVERY SYSTEMS

27-1.10.1 Delivery Line

Delivery system components supplied with a machine shall have a working pressure rating at least equal to the maximum pressure of the machine, as delivered.

27-1.10.2 Delivery System Components

Delivery system components shall meet the requirements of CPMA 27-2000.

SECTION 27-1.11: LOSS OF POWER

Interruption of power to the material placement system shall not cause a hazardous situation.

SECTION 27-1.12: REMOTE STARTING

A material placement system powered by the vehicle engine shall be designed so the engine cannot be started from a remote location unless the drive axles are disengaged.

SECTION 27-1.13: MANUALS

The manufacturer, supplier, or importer shall furnish with each material placement system information applicable to the following:

(a) installation
(b) hazards
(c) lock-out/tag-out procedures
(d) operation
(e) inspection
(f) testing
(g) lubrication
(h) maintenance
(i) parts
(j) wiring diagram (may be supplied separately)
(k) hydraulic diagram (may be supplied separately)
(l) safety sign ordering information and location guide (may be supplied separately)
(m) spare parts list containing relevant safety-related spare parts, such as relief valves, check valves, and guards, with part location

SECTION 27-1.14: FUEL AND EXHAUST SYSTEMS

(a) The material placement system's fuel system components shall be compatible with the fuel used.

(b) The fuel system filling area shall be located away from potential fuel ignition sources on the machine.

(c) Engine exhaust gases shall be piped to the outside of the cab and discharged in a direction away from the operator and other locations where personnel would be performing routine duties.

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Chapter 27-2
Inspection, Testing, and Maintenance

SECTION 27-2.1: INSPECTION

27-2.1.1 Inspection Classifications

(a) Initial Inspection. Prior to initial use, all new, repaired, or altered material placement systems shall be inspected by a qualified person to verify compliance with the provisions of this Volume.

(b) Frequent and Periodic Inspections. The inspection procedure for material placement systems in regular service is divided into two general classifications based upon the intervals at which the inspections are to be performed. The inspection intervals are dependent upon the nature of the components and degree of safety, exposure to wear, malfunction, or deterioration. The two general classifications of regular inspection are designated as "frequent" and "periodic."

27-2.1.2 Frequent Inspection

27-2.1.2.1 Frequent inspection shall be performed by a designated person at daily to monthly intervals and shall include observations prior to and during operation.

27-2.1.2.2 A designated person shall determine whether conditions found during the inspection constitute a hazard and whether a more detailed inspection is required.

27-2.1.2.3 Frequent inspection of the material placing boom and structural support system shall include, as applicable

(a) safety devices, such as holding valves, guards, and interlocks, for proper operation

(b) boom controls for proper operation and engagement

(c) boom and outrigger hooks, straps, and latches for proper operation and engagement

(d) hydraulic hoses for wear, rubbing, and cracking

(e) hydraulic oil level

(f) hydraulic oil leaks

(g) remote control boxes and cables for proper operation, exposed wires, broken controls, missing control guards, or broken plugs

(h) boom and outrigger structures for visible deformations, cracks, and damage

(i) boom and outrigger pins for visible wear, damage, and missing hardware

(j) tires for sufficient tread, proper inflation, cuts, and loose lug nuts

(k) proper loading of accessories to prevent loss while traveling

(l) proper lubrication of moving parts

27-2.1.2.4 Frequent inspection of the delivery system components shall include

(a) boom delivery system for

(1) minimum wall thickness to withstand the maximum material pressure, according to the manufacturer's instructions

(2) dents or cracks

(3) missing locking pins

(4) leaking gaskets

(b) delivery system hoses for

(1) internal wear, according to the manufacturer's instructions

(2) separation of the ferrule from the hose

(3) bulges, kinks, soft spots, cuts, or abraded areas, which may indicate broken or misplaced reinforcement

(4) presence of hardened concrete

(c) couplings for

(1) cracked, broken, distorted, or missing components

(2) proper operation of the adjusting nut, if so equipped

(3) concrete preventing proper operation

(4) system compatibility

(d) separately laid pipeline components for

(1) sufficient wall thickness to withstand the maximum material pressure of the material placement system, according to the manufacturer's instructions

(2) dents, holes, or deformed ends

(3) the presence of old concrete inside the pipeline

(e) cables or slings used to secure hanging system components

(f) missing or damaged safety signs and operational labels

27-2.1.2.5 Frequent inspection of conveyor system components shall include

(a) conveyor belts for proper tension, proper alignment (i.e., in center of pulleys and rollers), and unusual wear (e.g., grooves or holes in belt)

(b) telescope drive cable or chain for excessive wear, damage, and proper tension

(c) sheaves for excessive wear or damage

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(d) chains for excessive wear or damage
(e) chain sprockets for excessive wear or damage
(f) rollers, pulleys for proper adjustment, concrete buildup, excessive wear, or damage
(g) tie rods for proper adjustment or damage
(h) scraper blade assemblies for excessive wear, damage, concrete buildup, or improper adjustment
(i) hydraulic cylinder pins or anchors for excessive wear or damage
(j) missing or loose mounting bolts, guards, or hardware
(k) missing or damaged safety signs and operational labels
(l) proper lubrication of moving parts

27-2.1.3 Periodic Inspections

27-2.1.3.1 Complete inspections of the material placing boom and structural support system shall be performed by a qualified person at the intervals listed below
(a) first 5 years — every 2,000 working hours, or at least once per year, whichever occurs first
(b) 5 to 10 years — every 1,000 working hours, or at least once per year, whichever occurs first
(c) 10 years and older — every 500 working hours, or at least once per year, whichever occurs first

27-2.1.3.2 A qualified person shall inspect
(a) the placing boom for corrosion, cracking, deformation, or damage
(b) the structural support system for corrosion, cracking, deformation, or damage
(c) measured boom pin wear

27-2.1.3.3 If the inspection of para. 27-2.1.3.2 reveals a condition determined as hazardous, the machine shall be taken out of service until repairs are made.

27-2.1.3.4 The periodic inspection shall include the requirements of frequent inspections (paras. 27-2.1.2.3 and 27-2.1.2.4) and in addition, the following items, as applicable, which can be inspected by a designated person:
(a) measured gear lash and bearing clearances
(b) loose or missing fasteners, including pins or pin retainers
(c) slewing and telescope bearings, gear drives, and gears for mounting and wear
(d) hydraulic component mounting(s)
(e) missing or loose mounting bolts to the carrier chassis
(f) truck mounting for cracks, deformation, or damage
(g) hydraulic and pneumatic pumps and motors
(1) loose bolts or fasteners
(2) leaks at joints between sections
(3) shaft seal leaks
(4) unusual noises or vibration
(5) loss of operating speed
(6) excessive heating of the fluid
(7) loss of pressure
(h) hydraulic and pneumatic valves
(1) cracks in valve housing
(2) improper return of spool to neutral position
(3) leaks at spools or joints
(4) sticking spools
(5) failure of relief valves to attain correct pressure setting
(6) relief valve pressures shall be checked as specified by the manufacturer
(i) hydraulic and pneumatic cylinders
(1) drifting caused by fluid leaking across the piston
(2) rod seals leakage
(3) leaks at welded joints
(4) scored, nicked, or dented cylinder rods
(5) dented case (barrel)
(6) loose or deformed rod eyes or connecting joints
(j) operational labels and safety signs are present, attached in the appropriate place, and legible

27-2.1.3.5 A designated person shall determine whether conditions found during the inspection of para. 27-2.1.3.4 constitute a hazard and whether a more detailed inspection is required.

27-2.1.4 Material Placement Systems Not in Regular Use

A material placement system that has been idle for a period of 1 month or more shall be given a frequent inspection before being placed in service.

27-2.1.5 Inspection Records

Dated periodic inspection records shall be maintained by a designated person.

SECTION 27-2.2: TESTING

27-2.2.1 Operational Testing

All new production material placement systems shall be tested by the manufacturer after final assembly to verify
(a) proper operation of all safety devices
(b) proper operation of all controls
(c) proper positioning of all boom sections in all intended operational positions
(d) proper positioning of outriggers in all intended operational positions
(e) proper setting of hydraulic pressures and relief settings
(f) no unusual vibrations or noise
(g) the boom will support the intended load without seeping down in excess of the manufacturer's specification
(h) proper operation and engaging of latching and locking devices
(i) compliance with the requirements of this Volume

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27-2.2.2 Manufacturer's Stability Test

A representative unit of each model and chassis in each intended operation configuration shall be tested for stability. A written test report shall be kept on file. The stability test shall comply with the following minimum guidelines:

(a) The margin of stability shall be determined by calculation of the static load imposed by the boom and its systems and mountings, plus the maximum allowable load imposed on the boom by the material in the delivery system, including end hose, and the boom rotated to the least stable position. The calculation of the material load shall be based on material with a bulk density of 150 lb/ft^3.

(b) If having the outriggers, extendable axles, or other means in use are part of the normal configuration to meet the stability requirements, they shall be set per manufacturer's instructions.

(c) The test load equivalent to 125% of the rated load (1.25 times) shall be applied to the boom to verify its stability. The manufacturer shall determine the most critical configuration(s) of the unit for this test. Ballast may be applied to the unit that is equivalent to the weight of material in the hopper (filled to the top of delivery cylinder opening), one delivery cylinder (filled 75%), and the deck delivery line.

(d) None of the stability testing shall cause permanent deformation to any component. While being tested, three outriggers shall remain in contact with the support surface. During the stability test, the lifting of one outrigger on the opposite side of the load does not necessarily indicate a condition of instability.

27-2.2.3 Postmaintenance Test

Before being returned to service after maintenance is performed, any altered, replaced, or repaired components shall be tested for proper operation per the manufacturer's recommendations.

SECTION 27-2.3: MAINTENANCE

(a) The manufacturer shall provide a recommended preventative maintenance schedule to minimize the possibility of mechanical failures and excessive and unnecessary wear.

(b) A preventive maintenance program based on the machine and truck manufacturer's recommendations should be established for material placement systems. Dated records of maintenance performed should be maintained.

(c) Under severe conditions, or if excessive wear is noted, scheduled intervals should be adjusted to prevent breakdowns and excessive wear.

(d) Maintenance shall be performed by a designated person.

(e) Maintenance should be performed in accordance with the manufacturer's recommended procedures.

(f) All guards shall be reinstalled, all safety devices reactivated, and maintenance equipment removed after maintenance is completed.

(g) Welding on the boom, outrigger, or structural member shall be performed in accordance with the recommendations of the manufacturer. In the absence of a manufacturer's recommendation, the welding can be performed per the recommendations of a qualified person.

(h) Replacement parts shall meet or exceed the manufacturer's specifications.

(i) Missing or illegible operational labels and safety signs shall be replaced.

(j) Lubrication should be performed according to the manufacturer's recommendations and procedures.

(k) Delivery of lubricant to intended points should be verified.

(l) Machinery shall not be in operation while lubricants are being applied, unless equipped for automatic or remote lubrication or the lubrication point specifically requires movement for the lubricating procedure.

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Chapter 27-3
Operation

SECTION 27-3.1: QUALIFICATIONS FOR AND CONDUCT OF OPERATORS AND OPERATING PRACTICES

27-3.1.1 Operators

(a) Material placement systems shall be operated only by the following personnel:

(1) persons who have met the requirements of paras. 27-3.1.2(a), (b), and (c).

(2) persons who have met the requirements of para. 27-3.1.2(d) and are training for the type of material placement system being operated. While operating, the trainee shall be under the direct supervision of a designated, qualified operator.

(3) maintenance personnel who have completed all operator trainee qualification requirements and demonstrated operational ability as defined in para. 27-3.1.2 (b)(4). Operation by these persons shall be limited to those material placement system functions necessary to perform maintenance on the machine or verify the performance of the material placement system after maintenance has been performed.

(4) inspectors who have completed all operator trainee qualification requirements and demonstrated operational ability as defined in para. 27-3.1.2(b)(4). Operation by these persons shall be limited to those material placement system functions necessary to accomplish the inspection.

(b) During material placement system operations, no one other than the personnel specified in para. 27-3.1.1(a) shall be within 5 ft of the material placement system or climb up on the machine, with the exception of supervisors, those specified persons authorized by supervisors whose duties require them to do so in the performance of their duties, or concrete truck drivers having the knowledge and permission of the material placement system operator.

27-3.1.2 Qualifications for Operators

Operators shall be required to successfully meet the qualifications for the specific type of material placement system 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 material placement system. In such cases, specialized clinical or medical judgements and tests may be required.

(1) vision of at least 20/30 Snellen in one eye, 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 a hearing aid.

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

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

(6) should 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 material placement system 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.

(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. 27-3.1.2(a).

(2) satisfactory completion of a written examination covering operational characteristics, controls, power line avoidance, stability requirements, 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 material placement system type for which qualification is sought.

(3) operators shall demonstrate their ability to read and comprehend the material placement system manufacturer's operation and maintenance instruction materials.

(4) completing an operation test demonstrating proficiency in handling the specific type material place-

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ment system, including both prestart and poststart inspection, setup procedures, maneuvering skills, shutdown, and securing procedures.

(5) operators shall demonstrate understanding of the applicable sections of the B30 Standard and federal, state, and local requirements.

(c) Operators who have successfully qualified for a specific type material placement system shall be required to be requalified if supervision deems it necessary. Requalification shall include, but not be limited to, the following:

(1) evidence of successfully passing a current physical examination as defined in para. 27-3.1.2(a).

(2) satisfactory completion of a written examination covering operational characteristics, controls, power line avoidance, stability requirements, and emergency control skills, such as response to fire, power line contact, loss of stability, or control malfunctions appropriate to the material placement system for which they are being qualified.

(3) operators shall demonstrate their ability to read and comprehend the material placement system manufacturer's operation and maintenance instruction materials.

(4) completing an operations test demonstrating proficiency in handling the specific type material placement system on which they are being requalified, including both prestart and post-start inspections, setup procedures, maneuvering skills, shutdown, and securing procedures.

(5) operators shall demonstrate understanding of the applicable sections of the B30 Standard and federal, state, and local requirements.

(d) Trainee qualification requirements shall include, but not be limited to, the following:

(1) evidence of successfully passing a current physical examination as defined in para. 27-3.1.2(a).

(2) satisfactory completion of a written examination covering operational characteristics, controls, power line avoidance, stability requirements, and emergency control skills, such as response to fire, power line contact, loss of stability, or control malfunctions appropriate to the material placement system for which they are being qualified.

(3) operator trainees shall demonstrate their ability to read and comprehend the material placement system manufacturer's operation and maintenance instruction materials.

(e) Trainee qualification, operator qualification, and operator requalification shall be performed by a qualified person.

(f) Operator physical examinations shall be required every 3 years or more frequently if supervision deems it necessary.

27-3.1.3 Conduct of Operators

(a) Operators shall operate the material placement system in accordance with the manufacturer's recommendations or, lacking such recommendations, as directed by a qualified person.

(b) The operator shall not divert his attention from the operation of the material placement system while operating the material placement system.

(c) When physically or mentally unfit, an operator shall not engage in the operation of equipment.

(d) The operator shall respond to signals from the spotter. However, the operator shall obey a stop signal at all times, no matter who gives it.

(e) Each operator shall be held responsible for those operations under the operator's direct control. If there is any doubt as to the safety of the situation, the operator shall consult with a qualified person before proceeding.

(f) The operator shall not leave the machine controls unattended when the material placement system is operating.

(g) The operator shall disable the material placement system according to the manufacturer's recommendations before leaving the material placement system controls unattended.

(h) When site weather conditions exceed the manufacturer's operating parameters, the manufacturer's recommendations for securing the material placement system shall be followed.

(i) The operator shall be familiar with the equipment and its proper care. The operator shall promptly report the need for adjustments or repairs or potentially hazardous conditions to a designated person and 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, which could create a hazardous condition, they shall be adjusted or repaired before operations are begun.

(k) The manufacturer's boom assembly and disassembly procedures shall be followed. In the absence of such procedures, the directions of a qualified person shall be followed.

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

(m) Each outrigger shall be visible to the operator or a spotter during extension, slewing, or jacking.

(n) The operator shall not set up or operate the material placement system when it results in a hazardous condition.

27-3.1.4 Operating Practices

27-3.1.4.1 Material placement systems shall

(a) not be used as cranes or hoists to lift objects or other loads

(b) not be overloaded by

(1) hanging system pipe or hose beyond the specification of the manufacturer

(2) installing boom pipe, elbows, or clamps heavier than manufacturer's specifications

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(3) attaching pipeline directly to the boom tip elbow without a flexible delivery hose that allows boom movement

(4) securing the boom to any fixed object

(c) be set up level according to the manufacturer's specification

(d) be operated with all outriggers fully slewed, extended, and jacked level in accordance with the manufacturer's procedures. Shortrigging is permitted only if all the following conditions are met:

(1) documented by a qualified person that shortrigging is unavoidable.

(2) the boom is not operated beyond the area of fully extended outriggers (see Fig. 5).

(3) any outriggers left retracted are jacked and the unit leveled.

(4) the manufacturer's or a qualified person's documented procedures are followed.

(e) not be used to drag hose or separately laid delivery system

(f) not be operated without a sling or cable attaching each piece of hanging delivery system to the boom

(g) not be moved to different locations unless both the boom and outriggers are stowed in the transport position or as directed by the manufacturer's specification

(h) not be operated when lightning is present

(i) not be operated when wind force exceeds the manufacturer's recommendation for safe operation

27-3.1.5 Operating Near Electric Power Lines

27-3.1.5.1 Material placement systems shall not be operated near energized electrical power lines unless no combination of boom, delivery system, or machine components could enter the danger zone as shown in Fig. 6.

27-3.1.5.2 In the event operating within the danger zone is unavoidable, the following steps shall first be taken to ensure de-energization of the power lines.

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

(b) The lines shall be visibly grounded and appropriately marked at the job site location.

(c) A qualified representative of the owner of the power line or a designated representative of the electrical utility shall verify that steps (a) and (b) of this paragraph have been completed and the lines are not energized.

27-3.1.5.3 If a material placement system is positioned so the placing boom is capable of entering the danger zone, a designated person shall be appointed whose sole responsibility is to verify the clearances established in Table 1 are maintained and shall have the ability to alert the operator.

27-3.1.5.4 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 it is not an energized line. Caution shall be exercised when working near overhead lines, because they can move horizontally or vertically due to wind, moving the danger zone to new positions. Operators shall not rely on the coverings of wires for their protection.

When operating near energized electric power lines, the following clearances shall be met:

(a) For lines rated 200 kV or below, minimum clearance between the lines and any part of the material placement system shall be 17 ft (5 m) (Fig. 6). For higher voltages, see Table 1.

(b) In transit with the boom lowered, the clearance shall be as specified in Table 1 and illustrated in Fig. 6.

27-3.1.6 Cleaning Pipeline

27-3.1.6.1 Cleaning the boom pipeline should be accomplished by sucking a sponge ball backwards through the delivery pipeline per the manufacturer's specifications.

Unless specified by the manufacturer, material delivery systems shall not be cleaned out with compressed air and then only when all of the following conditions have been met:

(a) The operation is planned and supervised by a qualified person.

(b) The system to be cleaned has been secured against movement.

(c) All hoses at the discharge end have been removed, except when a short hose is part of a planned discharge into a ready mix truck.

(d) The discharge is controlled.

27-3.1.6.2 Compressed air shall not be used to remove a blockage in a material delivery system.

27-3.1.7 Knowledge of Manual Content

Personnel responsible for the supervision, installation, operation, inspection, or maintenance of the material placement system shall be familiar with the applicable contents of the manual(s) supplied by the manufacturer.

SECTION 27-3.2: MATERIAL PLACEMENT SYSTEM LOCKOUT/TAG OUT

(a) A lockout/tag-out policy and procedure shall be developed, documented, and implemented by the owner or user of the material placement system.

(b) The lockout/tag-out policy and procedure shall comply with the requirements of ANSI Z244.1.

(c) The policy shall give consideration to the following areas:

(1) material placement system power disconnection means

(2) work to be done on the material placement system

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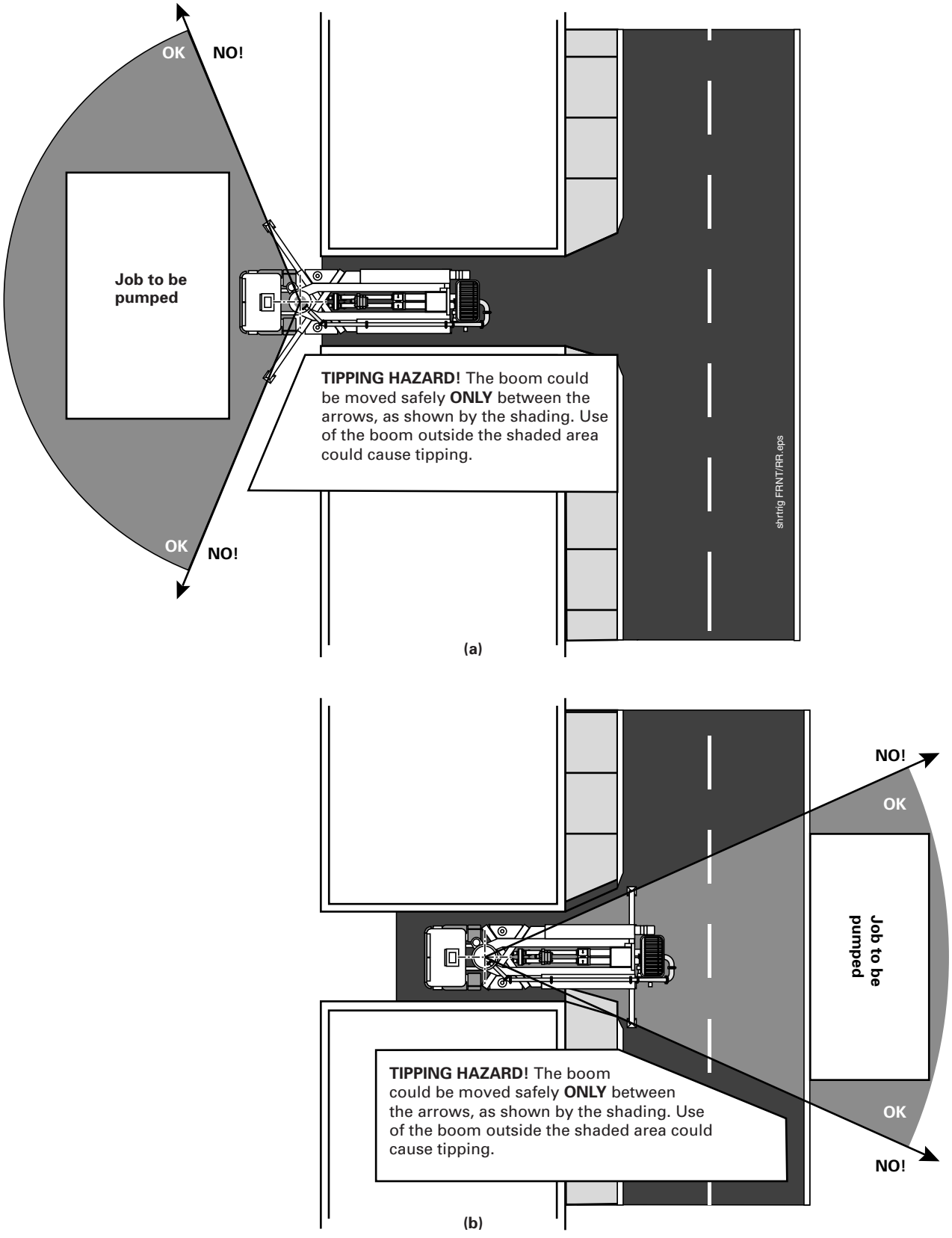


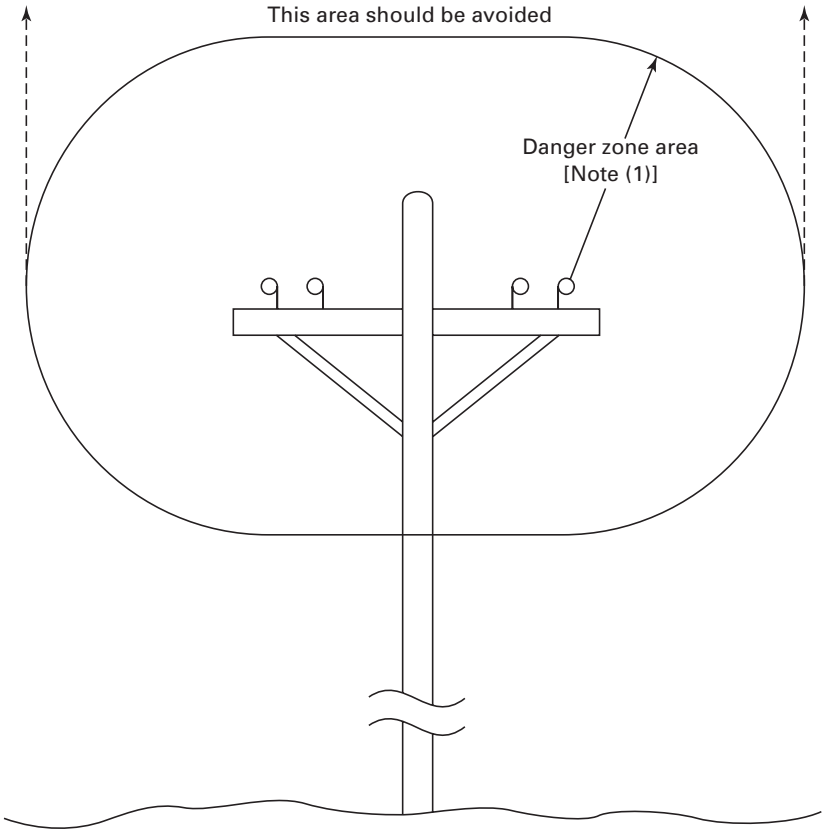
Fig. 5 Area of Extended Outriggers

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Table 1 Minimum Required Clearances

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance, ft (m) [Note (1)]	
Operation near high voltage power lines		
to 200	17	(5)
Over 200 to 350	20	(6.10)
Over 350 to 500	25	(7.62)
Over 500 to 750	35	(10.67)
Over 750 to 1 000	45	(13.72)
Operation in transit with boom or conveyor lowered		
to 0.75	4	(1.22)
Over 0.75 to 50	6	(1.83)
Over 50 to 345	10	(3.05)
Over 345 to 750	16	(4.87)
Over 750 to 1 000	20	(6.10)

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



NOTE:
(1) For minimum radial distance of danger zone, see Table 1.

Fig. 6 Danger Zone for Material Placement Systems and Delivery System Operating Near Electrical Transmission Lines

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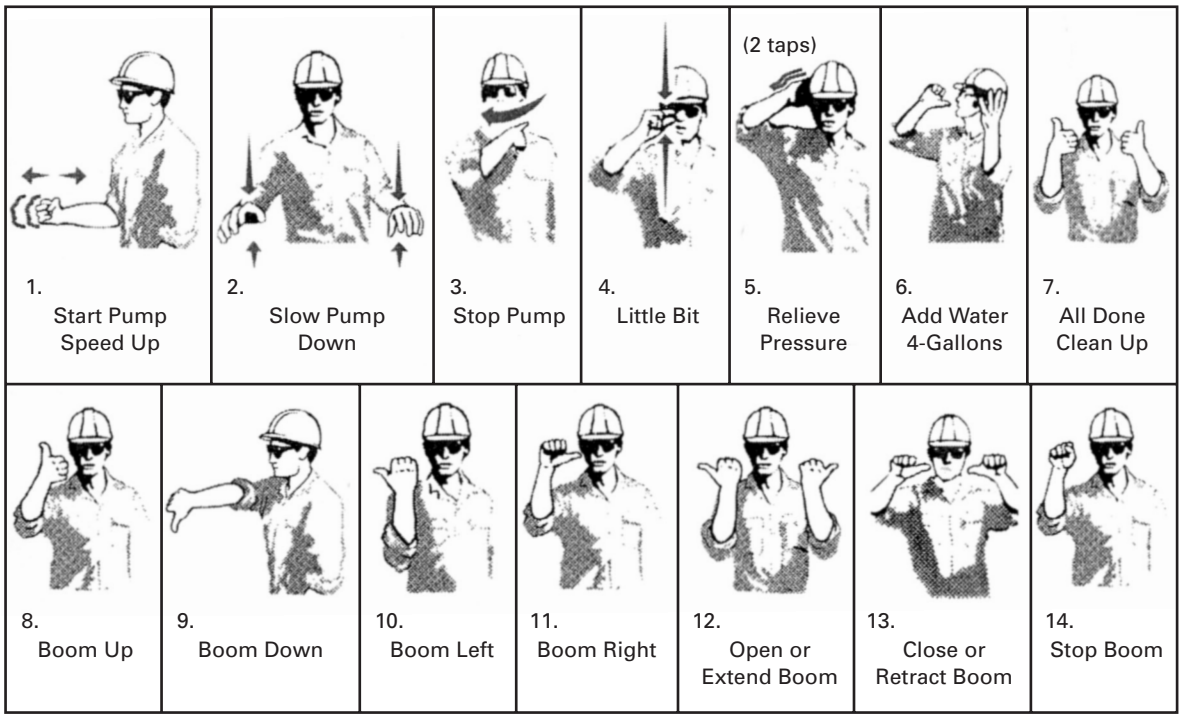


Fig. 7 Material Placement System Hand Signals

SECTION 27-3.3: SIGNALS

27-3.3.1 Standard Signals

Standard signals to the operator shall be in accordance with para. 27-3.3.2 unless voice communication equipment (telephone, radio, or equivalent) is utilized. Signals shall be discernible or audible at all times. No response shall be made unless signals are clearly understood.

27-3.3.2 Hand Signals

Hand signals shall be in accordance with Fig. 7.

27-3.3.3 Special Signals

For operations not covered by para. 27-3.3.2, or for special conditions that occur from time to time, additions to or modifications of the standard signals or hand signals may be required. In all such cases, these special signals shall be agreed upon in advance by both the operator and designated spotter and should not be in conflict with standard signals.

27-3.3.4 Instructions

If it is necessary to give instructions to the operator other than those provided by established signal system, the material placement systems movements shall be stopped.

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