

U.S. Department of Commerce  
National Institute of Standards and Technology  
(formerly National Bureau of Standards-NBS)  
Office of Standards Services

## COMMERCIAL STANDARD CS90-58 POWER CRANES AND SHOVELS

Commercial Standard CS90-58, Power Cranes and Shovels, was withdrawn by the U.S. Department of Commerce in 1972.

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The following organizations may provide guidance and assistance for additional information on the subject, contact:

### **Association of Equipment Manufacturers (AEM)**

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Milwaukee, WI 53202-4879  
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### **Crane Manufacturers Association of America-CMMA**

c/or Materials Handling Institute  
8720 Red Oak Boulevard, Suite 201  
Charlotte, NC 28217-3992  
Telephone: (800) 345-1815 or (704) 676-1190  
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**CMAA's Specification No.78** -- also known as "Standards and Guidelines for Professional Services Performed on Overhead Travelling Cranes and Associated Hoisting Equipment" -- has been produced by the association's Crane Manufacturers Service Committee (CMSC).

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**Note:** The Association of Equipment Manufacturers (AEM) was formed from the consolidation of the Construction Industry Manufacturers Association (CIMA) and Equipment Manufacturers Institute on January 1, 2002. The Power Crane and Shovel Association (PCSA) was a subsidiary of CIMA.

The following organization may also be helpful: **Crane Certification Association of America**, P. O. Box 87907, Vancouver, WA 98687-7907, Telephone: (800) 447-3402 or (360) 834-3805, Fax: (360) 834-3507, E-mail: [admin@ccaaweb.net](mailto:admin@ccaaweb.net).

**DEPARTMENT OF COMMERCE**  
**National Bureau of Standards**  
**VOLUNTARY PRODUCT STANDARDS**  
**Notice of Intent To Withdraw Certain Standards**

In accordance with § 10.12 of the Department of Commerce Procedures for the Development of Voluntary Product Standards (15 CFR Part 10, as revised, 35 F.R. 8349 dated May 28, 1970), notice is hereby given of the Department's intent to withdraw the 62 standards identified below. It has been tentatively determined that each of these Commercial Standards (CS) and Simplified Practice Recommendations (SPR) are obsolete, no longer technically adequate, no longer generally acceptable to and used by the industry, inconsistent with established policy, or otherwise inappropriate, and revision is not feasible or would serve no useful purpose.

- CS 14-51 Boys' Sport and Dress Shirt (Woven Fabrics) Size Measurements.
- CS 33-43 Knit Underwear (Exclusive of Rayon).
- CS 56-60 Strip Oak Flooring.
- CS 70-41 Phenolic Disinfectant (Emulsifying Type).
- CS 71-41 Phenolic Disinfectant (Soluble Type).
- X**CS 90-58 Power Cranes and Shovels.
- X**CS 101-63 Flue-Connected Oil-Burning Space Heaters and Recessed Heaters with Vaporizing Pot-Type Burners.
- CS 104-63 Warm-Air Furnaces Equipped with Vaporizing-Type Oil Burners.
- CS 106-67 Boys' Pajama Sizes (Woven Fabrics).
- CS 109-44 Solid-Fuel-Burning Forced-Air Furnaces.
- CS 111-43 Earthenware (Vitreous-Glazed) Plumbing Fixtures.
- CS 113-63 Oil-Burning Floor Furnaces Equipped with Vaporizing Pot-Type Burners.
- CS 128-52 Men's Sport Shirt Sizes-Woven Fabrics (Other than Those Marked with Regular Neckband Sizes).
- CS 129-47 Materials for Safety Wearing Apparel.
- CS 131-46 Industrial Mineral Wool Products, All Types—Testing and Reporting.
- CS 134-46 Cast Aluminum Cooking Utensils (Metal Composition).
- CS 135-46 Men's Shirt Sizes (Exclusive of Work Shirts).
- CS 145-47 Testing and Rating Hand-Fired Hot Water Supply Boilers.
- CS 152-48 Copper Naphthenate Wood Preservative (Spray, Brush, Dip Applications).
- CS 158-49 Model Forms for Girls' Apparel.
- CS 165-50 Zinc Naphthenate Wood Preservative (Spray, Brush, Dip Applications).
- OS 174-41 140-F Drycleaning Solvent.
- CS 177-62 Bituminous-Coated Metal Septic Tanks (Residential).
- CS 178-51 Testing and Rating Ventilating Fans (Axial and Propeller Types).
- CS 180-52 Model Forms for Boys' Apparel.
- CS 183-51 Boys' Trouser Size Measurements.
- CS 185-52 Wool Felt.
- CS 186-52 Boys' Sport Outerwear Size Measurements.

- CS 195-60 Warm-Air Furnace Burner Units Equipped with Pressure-Atomizing or Rotary Type Oil Burners.
- CS 196-55 Model Forms for Toddlers' and Children's Apparel.
- CS 198-55 Infants', Children's, Girls' and Boys' Knit Underwear (Exclusive of Rayon, Acetate, and Nylon).
- CS 216-58 Asphalt Insulating Siding.
- CS 235-61 Pressure Treated Wood Fence Posts (With Oil-Type Preservatives).
- CS 249-62 Pressure-Treated Douglas Fir Marine Piles.
- CS 250-62 Pressure-Treated Southern Pine Marine Piles.
- CS 271-65 Grading of Abrasive Grain for Grinding Wheels.
- SPR 17-47 Heavy Forged Hand Tools.
- SPR 44-49 Boxboard Thicknesses.
- SPR 60-55 Machine, Carriage and Lag Bolts, and Nuts (Case Quantity and Gross Weight).
- SPR 72-27 Solid Section Steel Windows.
- SPR 77-45 Hickory Handles.
- SPR 100-47 Welded Chain.
- SPR 125-31 Waxed Tissue Paper.
- SPR 136-32 Flax and Hemp Twine.
- SPR 147-42 Wire Diameters for Mineral Aggregate Production Screens.
- SPR 157-50 Steel Firebox Boilers and Steel Heating Boilers (Commercial and Residential).
- SPR 163-48 Coarse Aggregates (Crushed Stone, Gravel, and Slag).
- SPR 168-37 Braided Shoe Laces.
- SPR 180-41 Copper Conductors for Building Purposes.
- SPR 183-46 Brass or Bronze Valves (Gate, Globe, Angle, and Check).
- SPR 184-47 Iron Valves (Gate, Globe, Angle, and Check).
- SPR 185-47 Pipe Fittings (Gray Cast-Iron, Malleable Iron, and Brass or Bronze).
- SPR 190-42 Stove Pipe and Accessories.
- SPR 198-50 Wire Rope.
- SPR 207-60 Pipes, Ducts, and Fittings for Warm Air Heating and Air-Conditioning Systems.
- SPR 214-55 Metal-Cutting Band Saws (Hard Edge Flexible Back).
- SPR 220-46 Open-End and Box Wrenches.
- SPR 227-47 Plumbing Fixture Fittings and Trim for Housing.
- SPR 229-63 Vises (Machinists' and Other Bench-Mounted Vises).
- SPR 238-50 Convectors.
- SPR 245-51 Weldless Chain and Chain Products.
- SPR 259-56 Hexagon-Head Cap Screws (Case Quantity and Gross Weight).

Any comments or objections concerning the intended withdrawal of any of these standards should be made in writing and directed to the Office of Engineering Standards Services, National Bureau of Standards, Washington, D.C. 20234, within 45 days of the publication of this notice. The effective date of withdrawal, where appropriate, will be not less than 60 days after the final notice of withdrawal. Withdrawal action terminates the authority to refer to a published standard as a voluntary standard developed under the Department of Commerce procedures, from the effective date of the withdrawal.

Dated: June 16, 1972.

LAWRENCE M. KUSHNER,  
*Acting Director.*

[FR Doc.72-9362 Filed 6-20-72; 8:51 am]

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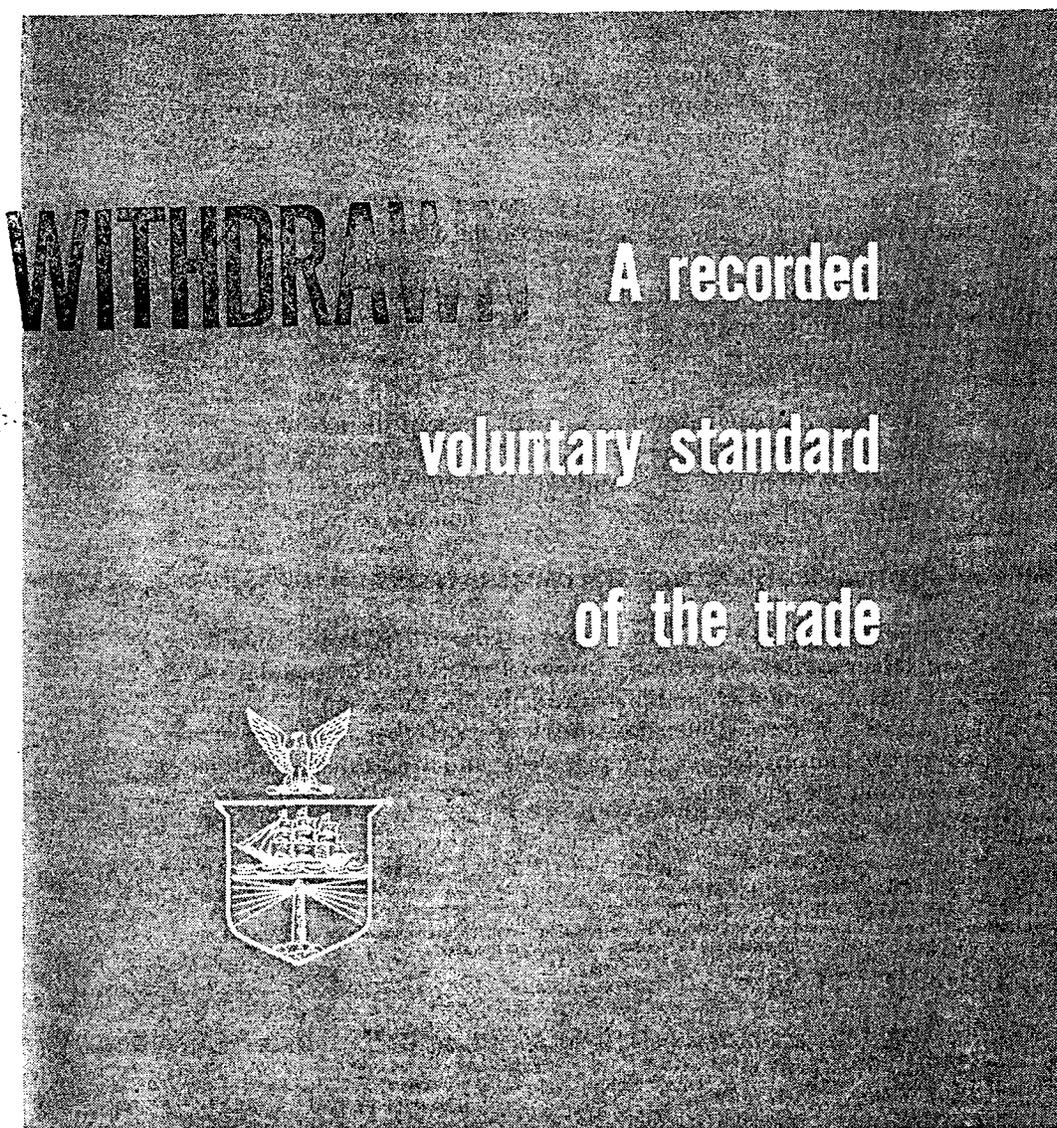
**WITHDRAWN**

COMMERCIAL STANDARD CS90-58  
Supersedes CS90-49 and CS90E-47

DO NOT REMOVE

*Withdrawn 8/24/72*

# POWER CRANES AND SHOVELS



UNITED STATES DEPARTMENT OF COMMERCE

OFFICE OF TECHNICAL SERVICES

## COMMERCIAL STANDARDS

Commercial Standards are developed by manufacturers, distributors, and users in cooperation with the Commodity Standards Division of the Office of Technical Services, and with the National Bureau of Standards. Their purpose is to establish quality criteria, standard methods of test, rating, certification, and labeling of manufactured commodities, and to provide uniform bases for fair competition.

The adoption and use of a Commercial Standard is voluntary. However, when reference to a Commercial Standard is made in contracts, labels, invoices, or advertising literature, the provisions of the standard are enforceable through usual legal channels as a part of the sales contract.

Commercial Standards originate with the proponent industry. The sponsors may be manufacturers, distributors, or users of the specific product. One of these three elements of industry submits to the Commodity Standards Division the necessary data to be used as the basis for developing a standard of practice. The division by means of assembled conferences or letter referenda, or both, assists the sponsor group in arriving at a tentative standard of practice and thereafter refers it to the other elements of the same industry for approval or for constructive criticism that will be helpful in making any necessary adjustments. The regular procedure of the division assures continuous servicing of each Commercial Standard through review and revision whenever, in the opinion of the industry, changing conditions warrant such action.

### SIMPLIFIED PRACTICE RECOMMENDATIONS

Under a similar procedure the Commodity Standards Division cooperates with industries in the establishment of Simplified Practice Recommendations. Their purpose is to eliminate avoidable waste through the establishment of standards of practice for sizes, dimensions, varieties, or other characteristics of specific products; to simplify packaging practices; and to establish simplified methods of performing specific tasks.

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The initial printing of Commercial Standard CS90-58 was made possible through the cooperation of the Power Crane and Shovel Association in securing copies for its members.

A M E N D M E N T No. 1  
COMMERCIAL STANDARD CS90-58  
POWER CRANES AND SHOVELS

Effective July 1, 1961

This amendment forms part of Commercial Standard CS90-58. All copies of the standard should include the following changes:

Page 7. Par. 6.08. After line 6, insert line "Crane rating classification" and after last line insert pars. 6.08.1 and 6.08.2. The revised and inserted paragraphs will read as follows:

6.08 Crane Rating Data. - (See fig. 4 for dimensions A through C.)  
The manufacturer shall furnish the data listed below:

- A. Length of boom.
- B. Minimum practical operating radius.
- C. Boom head clearance height.
- D. Crane rating classification. (See 6.08.1 and 6.08.2.)
- E. Crane ratings at various radii.

6.08.1 Crane rating classification. - The ratings for crawler-mounted, truck-mounted, and wheel-mounted cranes rated in accordance with par. 6.06 shall be supplemented by a crane rating classification symbol. The symbol shall consist of a group of two numbers, based on crane ratings in the direction of least stability with outriggers set, if the machine is so equipped, as follows:

- (1) The first number of the group shall be the crane rating radius, in feet, for the maximum rated load, with base boom length.
- (2) The second number of the group shall be the rated load (expressed in pounds divided by 100, and rounded off to the nearest whole number) at 40-ft. radius, with 50-ft. boom length.

6.08.2 Example. - To illustrate the above method of classification, assume a truck crane rated 40 tons at 12-ft. radius with base boom length, and 19,600 pounds at 40-ft. radius with 50-ft. boom length. The classification of this crane would be:

"40-ton truck crane (Class 12-196)"

The number 12 represents the radius, in feet, for the 40-ton rated load, and the number 196 represents the rated load in pounds, at 40-ft. radius, divided by 100. This method is illustrated in Fig. 4.1.

COMMODITY STANDARDS DIVISION  
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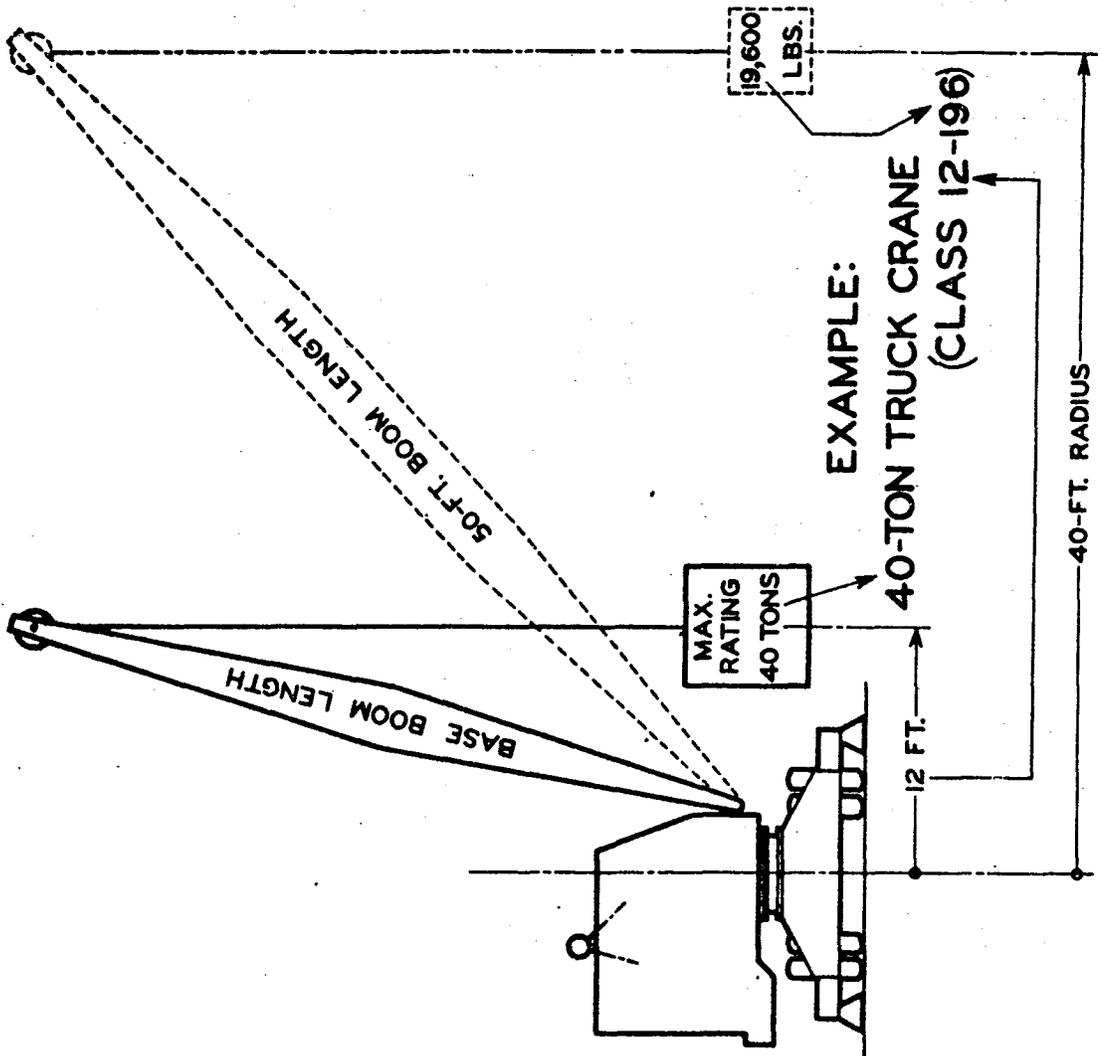


Figure 4.1. - Method of Determining Crane Rating Classification.

**Commercial Standard CS90-58**

Supersedes CS90-49 and CS90E-47

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# Power Cranes and Shovels

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**U. S. DEPARTMENT OF COMMERCE**  
**SINCLAIR WEEKS, Secretary**

Issued by  
**OFFICE OF TECHNICAL SERVICES**  
Commodity Standards Division

With the cooperation of  
**NATIONAL BUREAU OF STANDARDS**

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## POWER CRANES AND SHOVELS

[Effective May 15, 1958]

### 1. PURPOSE

1.01 The purpose of this Commercial Standard is to establish uniform methods for the guidance of manufacturers, distributors, and users in specifying power cranes and shovels, and in presenting data concerning them. The standard is designed to serve as a basis for common understanding between buyers and sellers in determining the capabilities of the machines and in conducting trade negotiations. Its purpose is also to promote fair competition and to provide for the use of identifying labels on products that conform with the standard.

### 2. SCOPE

2.01 TYPES AND SIZES.—This standard applies to power cranes and shovels of the convertible full-revolving type that are crawler mounted, truck mounted, and wheel mounted, as herein defined, including front end operating equipment for clamshell, dragline, lifting crane, pile driver, shovel, and hoe operation. It includes so-called "commercial" sizes nominally rated from  $\frac{1}{4}$  to  $2\frac{1}{2}$  cubic yards (0.19 to 1.91 cubic meters) as shovels, and from  $2\frac{1}{2}$  to 60 tons (2,268 to 54,432 kilograms) as cranes.

2.02 UNIFORM SPECIFICATION DATA.—The standard provides illustrations, tables, and lists of items which establish the scope and arrangement of important specification requirements and dimensions. The uniform presentation in manufacturers' literature of data on the major operating components makes possible convenient and comprehensive comparisons of the characteristics of the machines. Nomenclature and definitions are included, together with a glossary, to aid in the interpretation of terms used in the trade.

2.03 REQUIREMENTS.—The requirements cover features of construction, operation, control, stability, capacity, and safety. Certain general requirements for export are also given. The following requirements which need particular atten-

tion in complying with this standard are printed in **boldface** type where they occur:

- (1) Requirements which apply to design, construction, performance, and safety of the equipment.
- (2) Requirements which apply to information that the manufacturer shall furnish on request, if it is not included with his current printed specifications and sales literature.

2.04 COMPLIANCE.—Methods of certification and labeling are provided for giving evidence of full compliance with the provisions of this standard. A label widely used in the industry is illustrated. However, the employment of labels and other means for showing compliance is voluntary and is applicable only to products which conform with the standard in all respects. The provisions of this standard on compliance, certification, and labeling are not applicable to products which deviate from the standard in any particular. However, when deviations are clearly stipulated, as in specifications or contracts, the Commercial Standard may be made to apply in other respects.

### 3. BASIC COMPONENTS OF MACHINES

3.01 BASIC OPERATING COMPONENTS.—The machines covered in this Commercial Standard, when equipped for work, consist of three main operating components, (1) revolving superstructure, (2) base mounting, and (3) front end operating equipment, as follows:

3.01.1 *Revolving superstructure*.—The revolving superstructure includes the rotating frame, gantry, and machinery common to all functional operations, as described in paragraphs 4.01 through 4.11.

3.01.2 *Mounting*.—The mounting is the base of the revolving superstructure. It provides the mobility for the machine while in operation, and

while moving from job to job. Three types are covered herein, (1) crawler mounting (pars. 5.01 through 5.11), (2) truck mounting, and (3) wheel mounting (pars. 5.12 through 5.20). (See also par. 7.01.)

3.01.3 *Front end operating equipment (convertible)*.—Several types of front end attachments may be applied to the basic machine for performing various types of excavating and crane functions; such as, clamshell, dragline, lifting crane, pile driver, shovel, and hoe operations. These attachments are described in paragraphs 6.01 through 6.36. Manufacturers are usually in a position to provide convertible and interchangeable boom equipment and other accessories for these different operations.

#### 4. REVOLVING SUPERSTRUCTURE

4.01 REVOLVING SUPERSTRUCTURE.—The revolving superstructure is defined as the rotating frame and machinery located thereon for operating the machine.

4.02 INTERNAL COMBUSTION ENGINE DRIVE.—Machines covered by this standard may be powered by internal combustion engines of various types. The following information shall be supplied:

- (1) **Manufacturer's name, model number, and type.**
- (2) **Number of cylinders, bore and stroke, displacement in cubic inches.**
- (3) **Rated horsepower. (See par. 4.04.)**
- (4) **Full-load governed speed in revolutions per minute. (See par. 4.03.)**
- (5) **Type of starting equipment.**

4.03 INTERNAL COMBUSTION ENGINE SPEED, DEFINITIONS.

- (1) **High Idle Speed.**—The top engine speed at which the engine will run at no load, governor controlled.
- (2) **Full-load Governed Speed.**—The highest speed, under load, at which governor has fully opened the throttle or fuel pump.
- (3) **Maximum Torque Engine Speed.**—The speed at which the engine develops its maximum torque.

4.04 RATED HORSEPOWER, INTERNAL COMBUSTION ENGINES.—The rated horsepower shall be the net brake horsepower at the flywheel under the following conditions: (1) At sea level or at specified altitude (see par. 4.04.1); (2) at full-load governed speed with engine fully equipped with generator, fan, air cleaner, and other regular equipment.

4.04.1 *Internal combustion engine power at high altitude.*—Since internal combustion engines tend to lose power as altitude increases, the purchaser should specify the altitude at which the machine

is to be used if this exceeds 3,000 feet above sea level.

4.05 ELECTRIC MOTOR DRIVE.—Electric drives under this standard are of the single-motor type, either alternating current or direct current, with the current supplied from an outside source. **The continuous horsepower rating of electric motors shall be specified.** This is usually substantially less than that of corresponding internal combustion engines due to the high overload torque characteristics of electric motors.

4.06 POWER TAKEOFF.—Power takeoff is defined as the method of transmitting power from the engine to the operating mechanism of the revolving superstructure. It may be transmitted through a disconnecting mechanical clutch, a hydraulic coupling, or a torque converter, and through a speed reduction of gears or chain drive.

4.07 HOIST.—Hoist is defined as the function of lifting and lowering loads. Standard machines are usually provided with two main hoist drums and operating mechanisms. Some manufacturers offer a third hoist drum for special purposes. When torque converters are used, the rated line speeds and line pulls are based on a single point on the converter speed-torque curve selected by the manufacturer.

4.07.1 *Line pull.*—Line pull is defined as the maximum pull in pounds at the drum, at full-load governed speed, with the specified pitch diameter of drum or lagging, for the first layer of rope or cable.

4.07.2 *Line speed.*—Line speed is defined as the speed in feet per minute at the drum, at full-load governed speed, with the specified pitch diameter of drum or lagging, for the first layer of rope or cable.

4.08. BOOM HOIST.—Boom hoist is defined as the hoist drum for controlling the angle of the boom. When a boom hoist is completely independent of all other functions, it is usually designated as the independent type. The boom may be lowered by gravity alone or controlled by engaging with the power train. **Braking mechanism is required regardless of the type of drive.**

4.09 SWING.—Swing is defined as the function of revolving the superstructure of the machine, usually through reversing clutches.

4.09.1 *Swing speed.*—Swing speed is defined as the speed, in revolutions per minute, at which the revolving superstructure rotates with engine operating at full-load governed speed.

4.09.2 *Swing lock and swing brake.*—A swing lock is a mechanical device to lock the revolving superstructure rigidly to the mounting in selected positions. A swing brake is a control device to retard the swing of the revolving superstructure and/or to hold it from swinging.

4.09.3 *Swing data.*—Manufacturer shall specify swing speed and state whether or not swing lock, swing brake, or both are furnished.

4.10 GANTRY OR A-FRAME.—A gantry or A-frame is defined as a structure mounted on the revolving superstructure of the machine to which the boom supporting cables are attached. Gantries may be available in different heights and types for various conditions. **Manufacturers shall specify conditions of use, and state whether fixed or foldable.**

4.11 REVOLVING SUPERSTRUCTURE AND CAB DIMENSIONS.—(See figs. 1, 2, and 3 for dimensions A through H.)

- A. Width of cab.
- B. Clearance height of cab from grade.
- C. Clearance radius of rear end.
- D. Location of boom hinge pin ahead of center of rotation.
- E. Height of boom hinge pin above grade.
- F. Gantry heights above grade when in operation and when folded. (See par. 4.10.)
- G. Counterweight clearance from grade.
- H. Overall width when running boards are used.

## 5. MOUNTINGS

### Crawler Mounting

5.01 CRAWLER MOUNTING.—A crawler mounting is defined as two continuous, parallel crawler belts, consisting of a series of tread shoes or links encompassing rollers and drive tumblers, supporting a base frame which houses the propelling mechanism driven and controlled from revolving superstructure. Final drive to crawler tread belts may be by chain or gears.

5.02 BEARING LENGTH AND AREA.—The length of each crawler bearing on the ground is computed as not more than the normal distance from center to center of the crawler end sprockets or tumbler wheels at midpoint of adjustment range, plus 35 percent of the overall crawler height at center of end sprocket or tumbler wheels. The crawler bearing area is computed by multiplying the total crawler bearing length (as above defined) of all crawler belts by the width of tread shoes.

5.03 GROUND PRESSURE.—Ground pressure is the average pressure in pounds per square inch derived by dividing the total working weight of the machine with complete front end equipment by the crawler bearing area.

5.04 LEAST STABLE POSITION.—The least stable position is with the longitudinal axis of the revolving superstructure at right angles to the crawler tipping fulcrum nearest the center of rotation.

5.05 TIPPING CONDITION.—When the least stable position is with the boom over the side of crawlers, tipping is considered to occur when any crawler roller is lifted 2 inches away from those treads remaining on supporting surface. When

least stable position is with the boom over the end of crawlers, tipping occurs when one-third of bearing portion of properly adjusted crawler belt is lifted from the supporting surface. For test purposes, machine shall be on firm, level, and uniform supporting surface.

5.06 BACKWARD STABILITY.—To avoid excessive or unsafe counterweighting of the machine on crawler mounting and to insure proper backward stability when used as a lifting crane, dragline, clamshell, or pile driver, the center of gravity of any crawler mounted type of machine, in working order without load, resting on firm, level, and uniform supporting surface, with base rating length of boom at its minimum working radius, shall not be farther to the rear of the axis of rotation than 70 percent of the radial distance from the axis of rotation to the tipping fulcrum in the least stable direction.

5.07 TRAVEL OR PROPULSION.—Machine shall be capable of propelling itself in either direction of travel. The travel speed (or speeds if more than one are available) shall be given at full-load governed speed.

5.08 CLIMB.—Each crawler machine shall have sufficient propelling power to climb a 30 percent grade (30 feet rise in 100 feet horizontal) on smooth, firm, dry ground.

5.09 STEERING.—Each machine shall be capable of being steered either right or left in either direction of travel. Control shall be from the operator's position on revolving superstructure.

5.10 TRACTION LOCK OR BRAKE.—A traction lock or brake shall be standard equipment.

5.11 CRAWLER MOUNTING DIMENSIONS AND SPECIFICATIONS.—(See fig. 1 for dimensions S through U, W, and Y.)

- S. Overall length of crawler.
- T. Overall width of crawler.
- U. Width of tread shoes.
- V. Crawler bearing area.
- W. Overall height of tread belt at centerline of end tumblers.
- Y. Minimum ground clearance under crawler base.

### Truck and Wheel Mountings

#### 5.12 DEFINITIONS.

(1) Truck Mounting.—A heavy-framed, rubber-tired carrier supported by two or more axles and having the general characteristics of a heavy-duty truck, upon which is mounted a revolving superstructure with appropriate front end equipment, and which is controlled for over-the-road travel from a cab mounted on the carrier. It generally has separate engines for carrier and superstructure, but

the superstructure may be driven from the carrier engine.

- (2) **Wheel Mounting.**—A heavy-framed, rubber-tired carrier supported by two or more axles, upon which is mounted a revolving superstructure with appropriate front end equipment, and which is controlled for travel from the cab on the revolving superstructure. The carrier generally is driven by the engine on the superstructure, but may have a separate engine.
- (3) **Wheel and Axle Arrangement.**—Arrangements are designated by standard automotive practice, and refer to both truck and wheel mountings. Any one wheel may have one or more tires. The designations and their significance are as follows:

Designation	Wheels		Axles	
	Total	Driven	Total	Driven
4 x 2-----	4	2	2	1
4 x 4-----	4	4	2	2
6 x 4-----	6	4	3	2
6 x 6-----	6	6	3	3
8 x 4-----	8	4	4	2
8 x 6-----	8	6	4	3
8 x 8-----	8	8	4	4

5.13 **OUTRIGGERS.**—Outriggers are members attached to the carrier frame which may be blocked up to increase stability; when extendible they can further increase stability by increasing the size of the supporting base. **Manufacturer shall specify whether outriggers are fixed or extendible, whether telescoping or hinged, whether front or rear outriggers or both are supplied, and if jacks and supporting floats are available.**

5.14 **TIPPING CONDITION, WITHOUT OR WITH OUTRIGGERS.**—With the machine in working order and on firm, level, and uniform supporting surface, a tipping condition shall be considered to exist when all tires on one or more wheels leave the supporting surface.

5.15 **BACKWARD STABILITY.**—The weight distribution shall be as given in (1) and (2) of this paragraph in order to avoid excessive or unsafe counterweighting of the machine on pneumatic tires, and to insure proper backward stability when the machine is used as a lifting crane, clamshell, or dragline. Weight distribution shall be determined with the machine in working order on a firm, level, and uniform supporting surface, with outriggers unsupported, and with crane boom of basic length placed at its minimum radius without load.

- (1) With axis of the revolving superstructure at 90° to the axis of the carrier, the total load on all wheels on the side under the boom shall be at least 15 percent of the total weight of crane and carrier.
- (2) With axis of the revolving superstructure on the axis of the carrier, the total load on all wheels on the end under the boom shall be at least 5 percent of the total weight of crane and carrier.

5.16 **POWER EQUIPMENT.**—Carriers covered by this standard may be powered by internal combustion engines of various types. The following information shall be supplied:

- (1) Manufacturer's name, model number, and type.
- (2) Number of cylinders, bore and stroke, displacement in cubic inches.
- (3) Rated horsepower. (See par. 4.04.)
- (4) Manufacturer's recommended maximum speed in revolutions per minute.
- (5) Type of starting equipment.

5.17 **TRAVEL SPEEDS.**—Manufacturer shall specify the number of gear speeds in forward and reverse, and the vehicle speeds in lowest and highest gears for full-load engine speed when traveling on firm, smooth, level surface.

5.18 **GRADABILITY.**—Gradability is defined as the maximum grade in percentage which the machine can climb safely on a smooth, dry surface, free from loose material.

5.19 **REMOTE CONTROL.**—When supplied, remote control provides control of the carrier functions from the revolving superstructure of a truck mounted machine. **Carrier functions controlled from the revolving superstructure shall be specified.**

5.20 **TRUCK MOUNTING AND WHEEL MOUNTING DIMENSIONS AND SPECIFICATIONS.**—(See figs. 2 and 3 for dimensions P through U, W and Z.)

- P. Distance from center of rear axle or bogie to center of rotation.
- Q. Distance between centers of axles of tandem axle bogie.
- R. Wheelbase.
- S. Distance from center of rear axle or bogie to rear end of frame.
- T. Overall length.
- U. Overall width, greatest dimensions over tires, fenders, or retracted outriggers.
- V. Minimum diameter of clearance circle, neglecting overhang of front end equipment, in which machine can be turned completely.
- W. Distance from back of carrier cab to center of rear axle or bogie.
- X. Size and ply of tires.
- Y. Size and type of service brakes and parking brakes.
- Z. Overall width of extended outriggers.

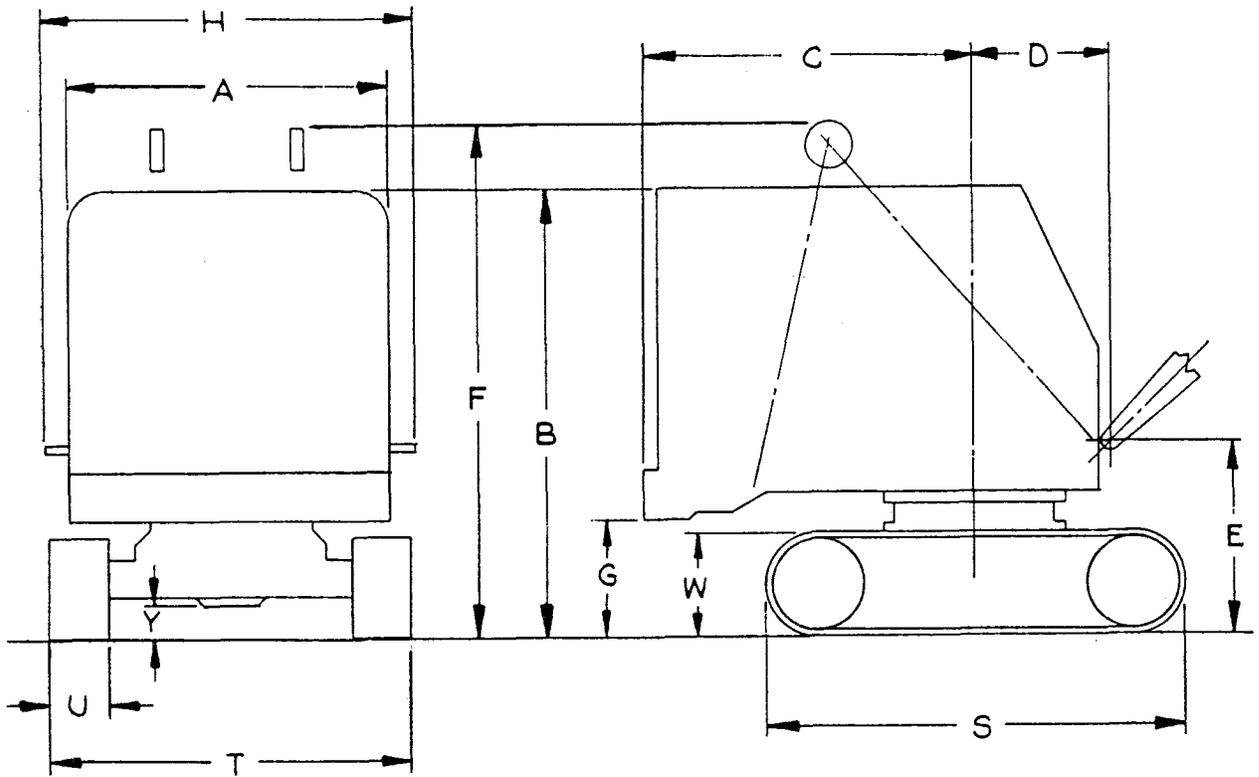


FIGURE 1.—Crawler mounting.

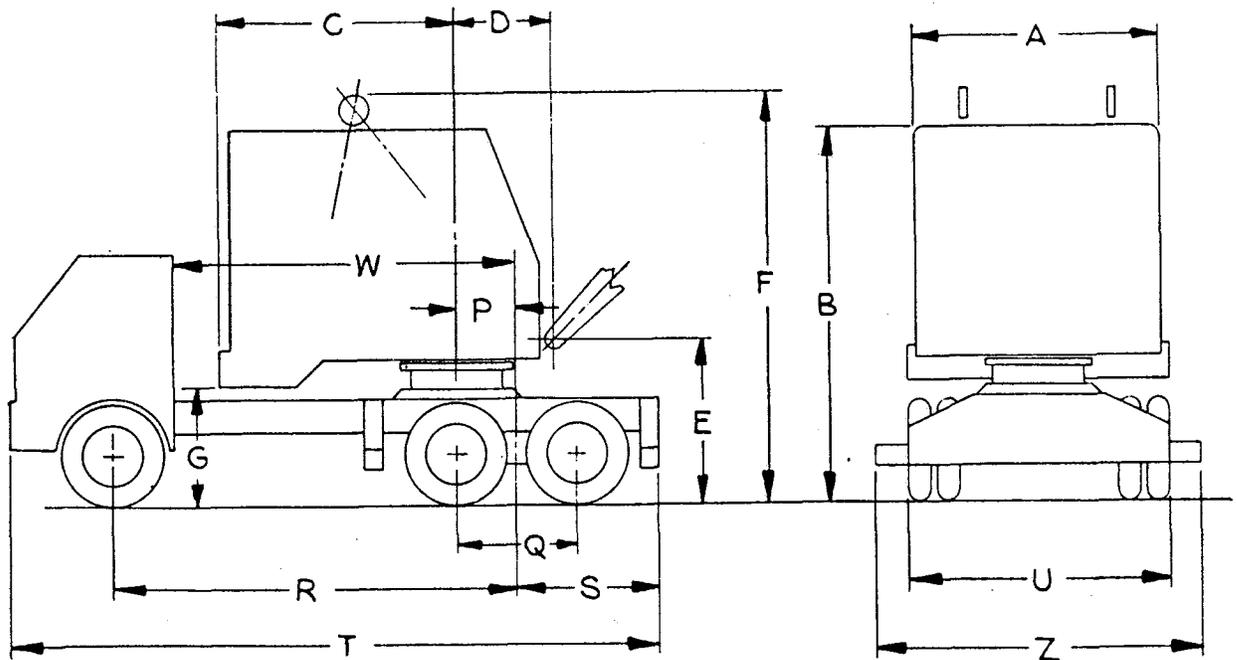


FIGURE 2.—Truck mounting, three axles.

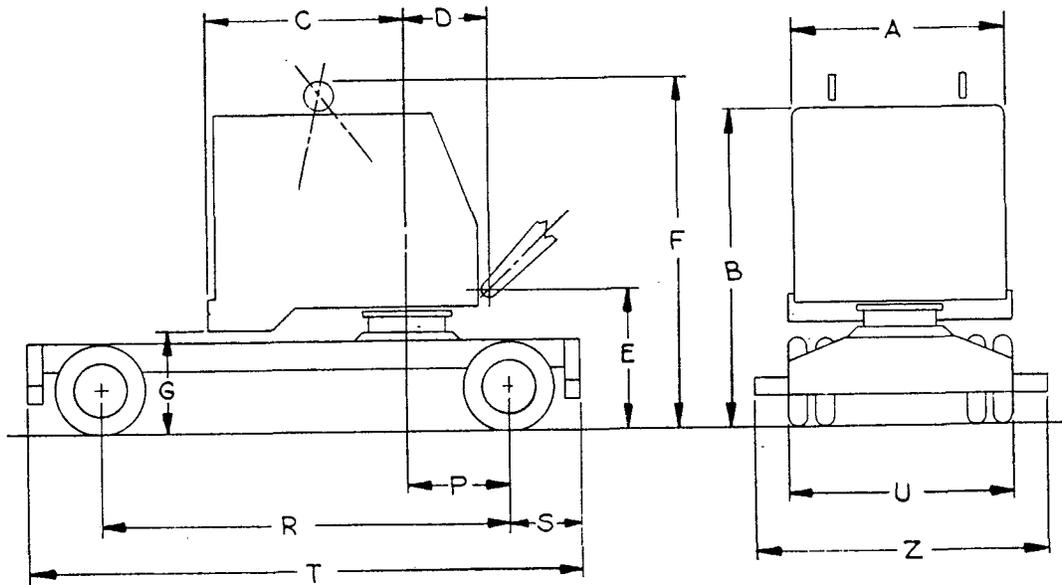


FIGURE 3.—Wheel mounting, two axles.

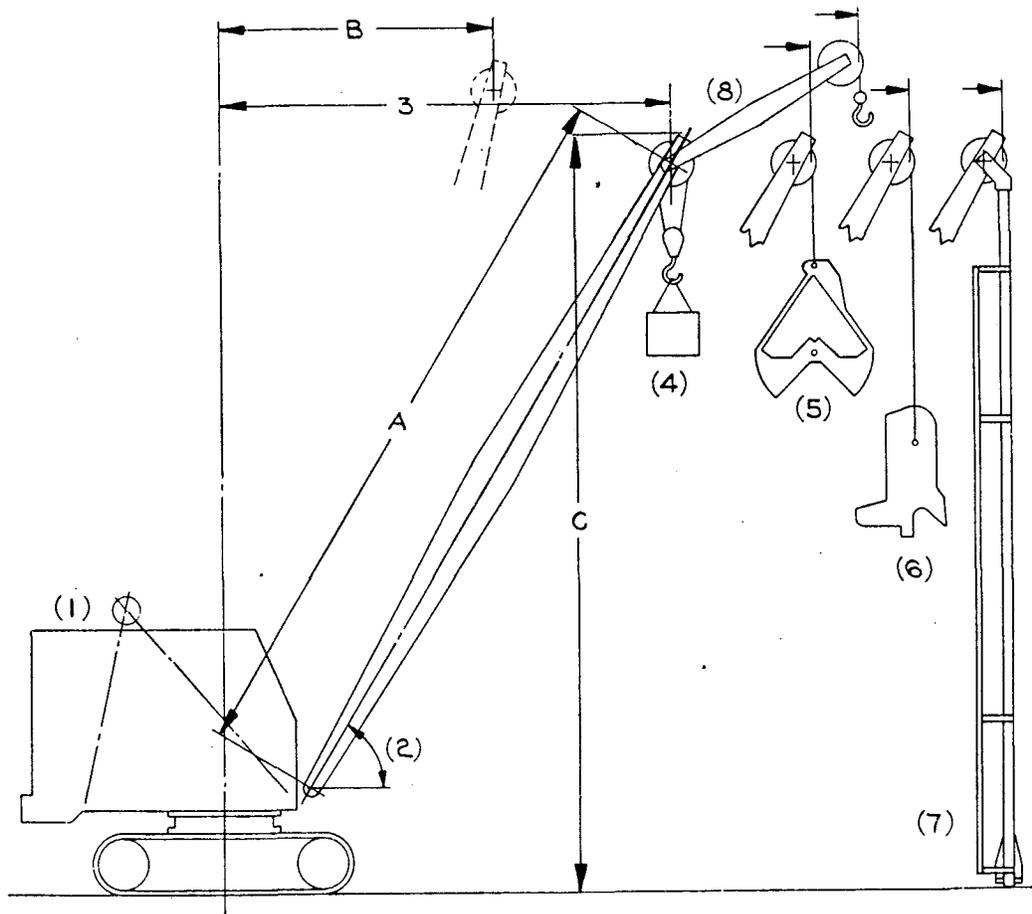


FIGURE 4.—Common crane boom equipment.

6. FRONT END OPERATING EQUIPMENT

The types of front end operating equipment included in this standard are clamshell, dragline, lifting crane, pile driver (all of which use common crane boom equipment), shovel, and hoe.

Common Crane Boom

6.01 COMMON CRANE BOOM EQUIPMENT.—(See fig. 4.) The crane is equipped with a boom structure having head shaft, sheaves, and other functional parts as required. The basic boom structure usually consists of two sections, upper and lower, between which additional sections may be inserted to lengthen the boom. The crane boom is pivotally mounted at the front end of the rotating frame and is adjustable as to angle. The boom is raised and held suspended by boom hoist or derricking cables.

6.02 BOOM LENGTH.—(See "A" in fig. 4.) The boom length is the straight line distance from centerline of boom foot pins to centerline of boom head main sheave pin. For the purpose of comparison, crane boom lengths for machines having various nominal shovel dipper capacity ratings are shown in Table 1.

TABLE 1.—Crane boom lengths

Shovel dipper capacity		Base rating length of crane boom	
<i>Cubic yards</i>	<i>Cubic meters</i>	<i>Feet</i>	<i>Meters</i>
¼ (0.250)	0.191	20	6.10
⅜ (0.375)	0.287	25	7.62
½ (0.500)	0.382	30	9.14
⅝ (0.625)	0.478	30	9.14
¾ (0.750)	0.573	35	10.67
1 (1.000)	0.765	40	12.20
1¼ (1.250)	0.956	45	13.72
1½ (1.500)	1.147	50	15.24
1¾ (1.750)	1.338	50	15.24
2 (2.000)	1.529	50	15.24
2½ (2.500)	1.911	60	18.29

6.03 BOOM ANGLE.—(See "2" in fig. 4.) Boom angle is defined as the angle between the horizontal and a straight line joining the center of the boom foot pin and the boom head main sheave pin.

6.04 JIB OR BOOM TIP EXTENSIONS.—(See "8" in fig. 4.) These extensions are attached to the boom head for further lengthening the boom beyond the boom head main sheaves. The jib may be straight or offset. **The manufacturer shall specify the load rating of the jib.**

6.05 BOOM HOIST CABLES (ALSO CALLED DERRICKING CABLES).

(1) Continuous Boom Hoist Cables.—Those cables which lead without interruption from the gantry to the boom head. If the boom is lengthened or shortened by a considerable amount, it may be necessary

to supply a longer or shorter boom hoist cable.

(2) Floating Boom Harness (Sometimes Called Bridle).—A floating frame or spreader equipped with sheaves and connected to the boom head by stationary cables usually called pendants. The boom hoist cable or cables then lead from the gantry to the floating frame. To change the boom length, it is necessary only to change the pendants.

6.06 CRANE RATINGS.—Rated loads at specified radii shall be furnished by the manufacturer. The ratings shall be the maximum loads covered by the manufacturer's warranty with the crane in working order standing on a firm, level, and uniform supporting surface. They shall be as follows:

(1) Crawler Mounted Machines.—Crane shall be rated at not more than 75 percent of the load which produces a tipping condition at any specified radius with the boom in the least stable position. (See pars. 5.04 and 5.05.)

(2) Truck and Wheel Mounted Machines.—Crane shall be rated at not more than 85 percent of the load which produces a tipping condition at any specified radius. (See par. 5.14.)

6.07 RADIUS OF LOAD.—(See "3" in fig. 4.) Radius of load is defined as the horizontal distance from the axis of rotation of the machine to a vertical line through the center of gravity of the suspended load.

6.08 CRANE RATING DATA.—(See fig. 4 for dimensions A through C.) The manufacturer shall furnish the data listed below:

- A. Length of boom.
- B. Minimum practical operating radius.
- C. Boom head clearance height.
- D. Crane ratings at various radii.

6.09 NET LOAD.—All auxiliary load-handling devices, such as buckets, magnets, load falls, slings, load blocks and hooks, pile driver leads, shall be considered part of the load and their weight shall be subtracted from the crane rating to determine the net load capacity.

6.10 SAFE WORKING LOAD.—The user is expected to make due allowance for his particular job conditions in determining the safe working load. These include factors affecting stability, hazardous conditions, experience of personnel, etc.

Clamshell

6.11 CLAMSHELL EQUIPMENT.—The clamshell is equipped with common crane boom, a clamshell bucket, closing line, holding line, and tagline mechanism. This classification includes orange

peel buckets, grapples, and other similar attachments.

6.12 CLAMSHELL BUCKET.—(See "5" in fig. 4.) The clamshell bucket usually consists of two similar scoops hinged so as to close with each other when the hinge is lifted, together with a head assembly and with corner bars connecting the head to the outer corners of the scoops. It is operated by cables reeved over the boom head sheaves. Because the weight of the bucket largely determines its digging ability, these buckets are supplied in various weight classes for use in materials ranging from solid to very loose.

6.13 TAGLINE.—A tagline is a cable attached to the bucket and kept under tension to retard any spinning and drifting of the bucket.

6.14 CLAMSHELL RATINGS.—For normal operation, it is recommended that the combined weight of bucket and contents should not exceed 90 percent of the crane ratings for any given radius of operation for crawler cranes, or 80 percent of crane ratings for any given radius of operation for truck cranes. Furthermore, for either type of crane, the combined weight of bucket and contents should not exceed 70 percent of the closing line pull. The manufacturer should state any other limitations of bucket size that should apply to any particular machine and, when requested, to any particular operation.

6.15 CLAMSHELL DATA.—For each machine equipped for clamshell operation, the manufacturer shall furnish the following data:

- (1) Closing line pull. (See par. 4.07.1.)
- (2) Holding line pull. (See par. 4.07.1.)
- (3) Closing line speed. (See par. 4.07.2.)
- (4) Holding line speed. (See par. 4.07.2.)
- (5) Recommended maximum combined weight of bucket and contents.

#### Dragline

6.16 DRAGLINE EQUIPMENT.—(See "6" in fig. 4.) The dragline is equipped with the common crane boom, dragline fairlead, hoist cable, drag cable, and a dragline bucket. The bucket is hoisted by a cable reeved over the boom head sheave and, for filling, is pulled toward the machine by the drag cable which passes directly through the fairlead located near the boom foot. Because the weight of the bucket largely determines its digging ability, these buckets are supplied in various weight classes for use in materials ranging from solid to very loose. (See par. 6.17 for dragline ratings.)

6.17 DRAGLINE RATING.—For normal operation, it is recommended that the combined weight of bucket and contents should not exceed 60 percent of the hoist line pull. The manufacturer should state any other limitation of bucket size that should apply to any particular machine and, when requested, to any particular operation.

6.18 DRAGLINE DATA.—For each machine equipped for dragline operation, the manufacturer shall furnish the following data:

- (1) Drag line pull. (See par. 4.07.1.)
- (2) Hoist line pull. (See par. 4.07.1.)
- (3) Drag line speed. (See par. 4.07.2.)
- (4) Hoist line speed. (See par. 4.07.2.)

#### Lifting Crane

6.19 LIFTING CRANE EQUIPMENT.—(See "4" in fig. 4.) The lifting crane is equipped with common crane boom, frequently with the addition of a jib, and is usually equipped with load block and hook. Where a crane is to be used exclusively as a lifting crane, alternate boom head arrangements may be furnished.

6.20 LIFTING CRANE DATA.—For each machine equipped for lifting crane operation, the manufacturer shall furnish the following data:

- (1) Line pull for each hoisting drum. (See par. 4.07.1.)
- (2) Line speed for each hoisting drum. (See par. 4.07.2.)

#### Pile Driver

6.21 PILE DRIVER EQUIPMENT.—(See "7" in fig. 4.) The pile driver is equipped with common crane boom, pile leads, pile driving hammer, and pile cap.

6.22 PILE HAMMER.—Two basic types of hammers are used:

- (1) Drop Hammer.—A simple weight sliding in leads which is raised and dropped on the pile.
- (2) Power Hammer.—A machine that rests on the pile and contains within itself a reciprocating hammer that drives the pile.

6.23 PILE LEADS.—Pile leads are two parallel properly shaped members suitably tied together and hung from the crane boom point to act as a guide for pile hammer and cap.

6.24 PILE CAP.—A pile cap is a protecting cap for fitting on top of the pile to center the pile and reduce battering or splintering.

6.24.1 Pile driver data.—For each machine equipped for pile driver operation, the manufacturer shall furnish the following data:

- (1) Drop hammer weights available.
- (2) Lengths and weights of available leads.
- (3) Cable pull for extra drums if offered.
- (4) Cable speed for extra drums if offered.

#### Shovel

6.25 SHOVEL EQUIPMENT.—A shovel is equipped with a shovel boom, dipper, dipper stick, dipper trip mechanism, padlock, crowding mechanism on superstructure, and cables. Dipper is attached

to the end of the dipper stick which slides relative to the shovel boom. In the digging motion, the dipper is crowded into the bank and is hoisted simultaneously. After the dipper is loaded, the unit is swung to the dumping position where the dipper is dumped by means of the dipper trip control located where it is convenient to the operator.

6.26 CROWDING AND RETRACTING.—Crowding and retracting are defined as the outward and inward thrusts of the dipper and the dipper stick.

6.27 CROWD TYPES.—There are three general types of crowd used on shovels. **Manufacturer shall specify which one of the following is used:**

- (1) Combination Cable Crowd.—A type having hoist drums and brakes, and requiring no special reversing mechanism.
- (2) Independent or Positive Crowd.—A type driven by either a cable or a chain, or a combination of both, from reversing mechanism on revolving superstructure.
- (3) Dual Crowd.—A type in which the reaction from dead end of hoist hitch is used to assist crowding of the dipper and where independent crowding mechanism is also provided.

6.28 DIPPER CAPACITY RATING.—The rated capacity of the shovel dipper shall be not more than the number of cubic yards, or fraction thereof, obtained by multiplying the mean height of the dipper by the inside cross-sectional area of the dipper at one-half the minimum height. A variation of 2 percent shall be allowed. The mean height shall be determined by taking one-half of the sum of the maximum and minimum heights of the dipper body including its minimum lip projection without teeth. If the dipper is of special shape, proper allowance shall be made for the increased or decreased volume.

6.29 DIPPER STICK DRIVE.—Two methods of driving the dipper stick at the shipper shaft for the crowd and retract actions are provided as follows:

- (1) Rack and Pinion Drive.—A geared pinion on shipper shaft meshing with a rack on the dipper stick.
- (2) Chain or Cable Drive.—Power is applied through cables or chain to the ends of the dipper stick moving it through a guide in either direction.

6.30 DIPPER TRIP MECHANISM.—**Manufacturer shall state type of dipper trip mechanism used.**

6.31 HIGH LIFT.—High lift is a term applied to shovel front end equipment when boom and/or dipper stick longer than standard is installed to give greater dumping range and height.

6.32 SHOVEL DIMENSIONS AND SPECIFICATIONS.—(See fig. 5 for dimensions B through M.)

- A. Shovel dipper capacity in cubic yards.
- B. Length of boom from boom hinge pin center to boom point sheave shaft center.
- C. Effective length of dipper stick.
- D. Maximum dumping height.
- E. Dumping radius at maximum height.
- F. Maximum dumping radius.
- G. Maximum cutting height.
- H. Maximum cleanup radius at floor level.
  - I. Maximum digging depth below floor level.
  - J. Maximum cutting radius.
  - K. Boom head clearance height.
  - L. Boom head clearance radius.
  - M. Dumping height at maximum dumping radius.
  - N. Dipper bail speed (with number of parts of line stated) at full-load governed speed.
  - O. Dipper bail pull (with number of parts of line stated) at full-load governed speed.

Hoe

6.33 HOE EQUIPMENT.—A hoe is equipped with a boom, dipper, dipper arm, bail, and gantry or A-frame connected at or near boom hinge to provide proper cable leads. The hoe is a positive digging tool best suited for excavating below ground level. Dipper arm is pivoted at end of boom and dipper is fastened to arm. One hoist drum controls angle or position of boom which is live. One hoist drum controls angle of dipper arm and position of dipper, drags in dipper to load and releases it for dumping. The hoe is also called trench hoe, back hoe, backdigger, drag shovel, and pull shovel. Hoe dippers are usually rated in terms of width of cut. Nominal size is same as that of shovel.

6.34 DIGGING DEPTH RATING.—The rating shall not exceed the distance below grade a machine will excavate, as measured to the lowest point on an arc described by the dipper teeth when a straight line through the centers of the boom foot pin and dipper arm hinge is 45° below horizontal.

6.35 DUMPING POSITION.

- (1) Beginning of Dump.—(See "H" and "T" in fig. 6.) Position of dipper when pulled in toward boom as far as possible and with boom raised until bottom of dipper is horizontal.
- (2) End of Dump.—(See "J" and "K" in fig. 6.) Position of dipper with boom in same position as (1) but with dipper raised until bottom of dipper is vertical.

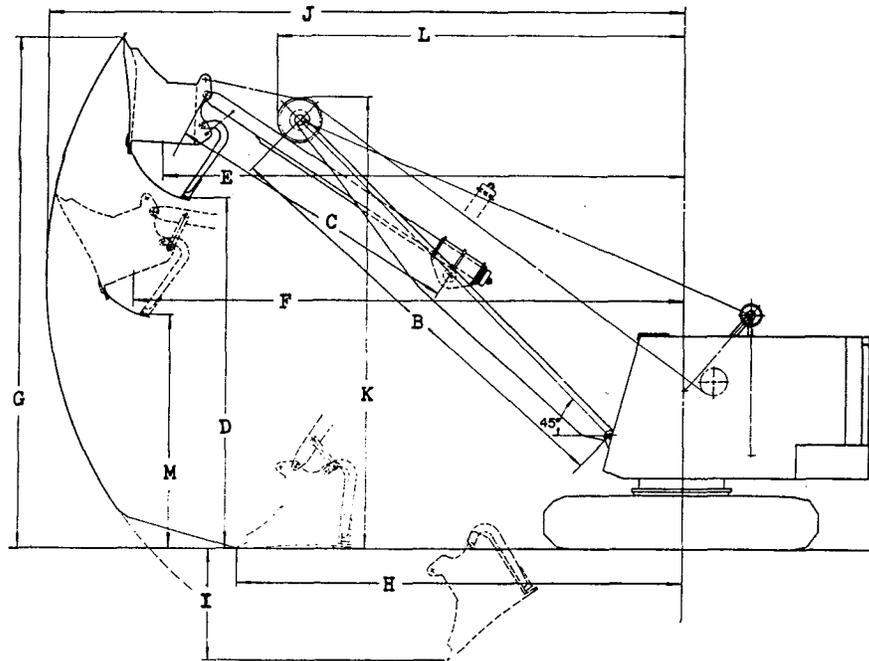


FIGURE 5.—Shovel.

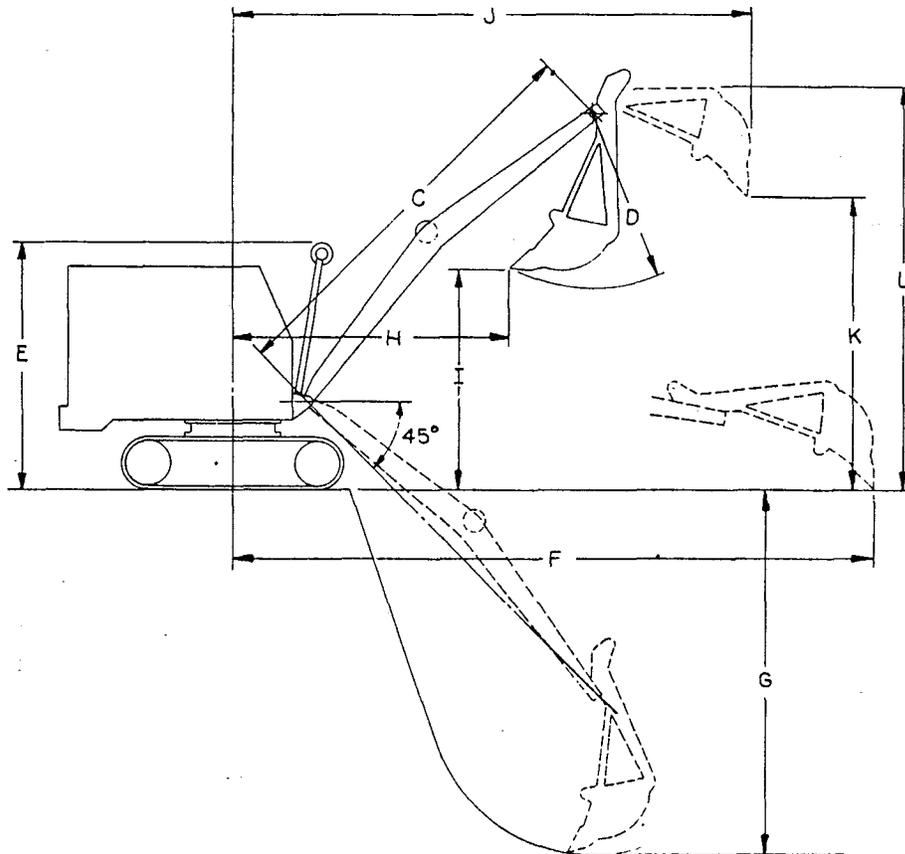


FIGURE 6.—Hoe.

6.36 HOE DIMENSIONS AND SPECIFICATIONS.—  
(See fig. 6 for dimensions C through L.)

- A. Hoe dipper nominal capacity in cubic yards.
- B. Hoe dipper width over side cutters.
- C. Length of boom from hinge pin center to dipper arm hinge pin.
- D. Sweep radius from boom point pivot pin to dipper tooth point.
- E. Height of hoe gantry in working position.
- F. Maximum reach at grade level.
- G. Digging depth rating.
- H. Radius of dipper teeth at beginning of dump.
- I. Clearance of dipper from ground at beginning of dump.
- J. Clearance radius at end of dump.
- K. Clearance from ground at end of dump.
- L. Overall height at end of dump.

**Special Front End Equipment**

6.37 In addition to the front end equipment covered by this standard, many manufacturers supply special attachments for specialized work such as, tunneling, log loading, and coal loading.

**7. COMPLETE MACHINES**

7.01 MOUNTINGS.—The three different types of mountings described herein (see par. 3.01.2) may be applied to any one specific size of revolving superstructure, but are seldom capable of being economically interchanged after the complete machine has been shipped from the factory. Hence the machines are not usually considered convertible with respect to their mountings. Therefore, it is necessary for the buyer to choose, at the time of his initial purchase, the type of mounting best suited for his conditions.

7.02 OPERATING FUNCTIONS.—Front end operating attachments (see par. 3.01.3) which are readily interchangeable, are available from most manufacturers for their equipment. The change-over from one type of attachment to another is a comparatively simple operation. A buyer's initial purchase may cover any or all of the attachments available. Most manufacturers are in a position to supply front end attachments for their earlier as well as current models.

**7.03 COMPLETE MACHINE SPECIFICATIONS.**

(1) Required Data.—The manufacturer shall furnish all data specified in the following paragraphs as applicable:

Revolving superstructure.....	4.11
Mounting.....	5.11 or 5.20
Clamshell front end..	6.08 and 6.15
Dragline front end....	6.08 and 6.18
Lifting crane.....	6.08 and 6.20
Pile driver.....	6.08 and 6.24.1
Shovel front end.....	6.32
Hoe.....	6.36

(2) Working Weight.—Weight of machine in working order with complete front end equipment shall be given.

7.04 SAFETY REQUIREMENTS.—Each machine shall conform to the following safety requirements, as applicable:

- (1) Revolving Superstructure.
  - (a) Principal platform walking surface shall be of an antiskid type.
  - (b) Grease fittings shall be located in as easily accessible positions as possible.
  - (c) All gear teeth, where exposed to contact, shall be either entirely enclosed, or equipped with a guard covering the gear face and having side flanges extending radially inward beyond the root of the teeth.
  - (d) Load brakes shall be capable, when properly adjusted, of holding or lowering rated loads on recommended reeving. These brakes shall be capable of being locked in a set position.
  - (e) The boom hoist shall be capable of safe suspension of the boom with recommended reeving, without attention from the operator, and allow lowering only when under operator's control.
  - (f) A swing lock or swing brake capable of preventing rotation under normal working conditions shall be provided.
  - (g) Hand holds and/or steps shall be provided on the revolving superstructure to facilitate entrance to and exit from the operator's station.
  - (h) Engine fans shall be adequately guarded.
  - (i) Engine clutch shall be provided with a device requiring positive manual effort to engage so that it cannot be inadvertently engaged. Where a transmission having neutral position is used in combination with an engine clutch, the clutch may be of the spring loaded type.
  - (j) The control levers, usually called hoist clutch control, swing clutch control, and crowd clutch control, shall be free of all latches which may seriously delay emergency operation.
  - (k) All cab doors, whether of the sliding or swinging type, shall be adequately restrained from accidentally opening or closing while traveling or operating the machine.

- (1) A means of securely locking the cab doors in the closed position when desired shall be provided.
- (2) Mounting—Crawler.
- (a) Wherever possible, grease fittings shall be located so as to be easily accessible from outside of the crawlers and lower base.
  - (b) Brakes or other locking means shall be provided to hold the machine stationary during the working cycle and while the machine is on level grade or any grade at which it will operate satisfactorily.
- (3) Mounting—Truck.
- (a) Safety glass shall be provided in truck cab.
  - (b) Hand holds and steps shall be provided to facilitate entrance to the truck cab.
  - (c) Brakes shall be provided to safely bring the machine to a stop. In addition, locking means on the brakes to adequately hold the machine stationary shall be provided.
  - (d) A suitable number of hand holds and/or steps shall be provided to facilitate operator's ascent to or descent from operator's station in revolving superstructure.
  - (e) Where truck mountings will be used on the highway, stop lights, tail lights, clearance lights, and reflectors shall be furnished.
- (4) Mounting—Wheel.
- (a) Brakes shall be provided to bring the machine safely to a stop. In addition, locking means on the brakes to adequately hold the machine stationary shall be provided.
  - (b) A suitable number of hand holds and/or steps shall be provided to facilitate ascent to or descent from operator's station in the revolving superstructure.
- (5) Crane.
- (a) A permanent load rating chart shall be provided and be securely fixed to the interior of the cab or other suitable location in the machine where clearly visible to the operator. It shall include:
    - (i) Basis of crane rating (see par. 6.06).
    - (ii) Indication that rated loads are gross loads and that buckets, hooks, chains, or any other external auxiliary lifting means are to be included as a part of such rated loads.
    - (iii) Statement that rated loads are on basis of machine standing on a firm, level, and uniform supporting surface.
  - (iv) Statement of deductions to be made from rated loads for component parts of crane attachment such as jibs.
  - (v) Truck-mounted and wheel-mounted crane rated loads shall be given for operation with and without the use of outriggers.
  - (b) Wire rope sheaves shall be adequately guarded to prevent the wire rope from leaving the sheave groove during operation.
  - (c) Cable safety factors for crane and clamshell attachments. Safety factors shall be not less than 3.5 for all live or running cable reevings, (this applies to any cable arranged for running over sheaves, including boom hoist cable), and not less than 3 for all standing part or guy cables. These factors shall be determined as follows:
    - (i) Published crane or clamshell rated loads only shall be used in determining the total tensile load in the particular cable system being considered.
    - (ii) All loadings shall be considered static, i. e., as produced by the suspended rated load when not moving or swinging.
    - (iii) Factors in all cables of the boom hoist system shall be determined with any recommended boom length and at the angle between 15° above horizontal and highest position which produces the greatest load in these cables.
    - (iv) The numerical value of the cable safety factor in any given system shall be determined by dividing the total rated breaking strength of all the cables in the system, as recommended by the crane manufacturer, by the total load in the system as defined above.
  - (d) All cranes for operation in a clamshell or magnet service shall be equipped with a suitable tagline mechanism.
- (6) General.
- (a) Backward stability. (See pars. 5.06 and 5.15.)
  - (b) Crane ratings. (See pars. 5.05, 5.14, and 6.06.)
  - (c) Proper allowance should be made by the user for other conditions, such as, soft or uneven ground and excessive pendulum action when

swinging heavy loads, such as encountered in clamshell, dragline, and magnet work.

- (d) Rules for safe operation of equipment should be adhered to at all times. See paragraph 7.05 on references for development of safety requirements and paragraph 7.05(2) on the recommended standard hand signals for the operation of shovel and crane equipment, as adopted by the Power Crane and Shovel Association, March 15, 1956.

7.05 REFERENCE.—The following publications are recommended as references for safety requirements:

- (1) Operation of Power Shovels, Dragline and Similar Equipment, Data Sheet D-271, Stock No. 12304; Wire Rope, Safe Loads for Slings, Data Sheet D-380, Stock No. 12304; and Safe Use of Heavy Duty Equipment on Construction Jobs, Industrial Safety Reprint No. 130, Stock No. 12913. These publications are available from the National Safety Council, 425 North Michigan Ave., Chicago 11, Illinois.
- (2) "125 Ways to Better Power Shovel-Crane Operation." This publication is available from the Power Crane and Shovel Association, 75 West St., New York 6, N. Y., includes standard hand signals.
- (3) American Standard Safety Code for Cranes, Derricks and Hoists, B30.2-1943 (R 1952). This publication is available from the American Standards Association, 70 East Forty-fifth St., New York 17, New York.

## 8. GENERAL RECOMMENDATIONS FOR EXPORT

8.01 EXPORT PREPARATION.—A number of factors influence the manner in which machines, as covered by this standard, may or should be prepared for export shipment overseas, namely:

- (1) Design and construction of basic superstructure and mounting.
- (2) Transportation and handling facilities to and at port of entry, or ultimate destination, or conditions of transshipment.
- (3) Ocean freight charges for excess weight or cubic content, as compared to the cost of export packing to eliminate excess charges.
- (4) Type of skilled labor or facilities available for erecting machines at ultimate destination.

8.01.1 Two general methods of export preparation are employed as described in paragraphs 8.02

and 8.03. Detailed specifications should be negotiated between manufacturer and buyer when order is placed.

8.02 SKIDDING.—The machine is prepared for skidding by first removing the front end attachment from the revolving superstructure, and also removing the revolving superstructure from its mounting. The superstructure is then placed on skids. The mounting is either shipped loose or placed on skids, and parts that may be easily damaged are covered and adequately protected. Front end attachments and other heavy parts are either shipped loose or crated. Small parts are enclosed in complete boxes. Attention should be given to keeping overall cubic measurements to a minimum because such shipments usually are of large size, and charges are based on measurement instead of weight. Slings for handling large pieces may be provided. The manufacturer shall furnish a complete description and specifications of his "skidding" method of shipment, together with a pro forma packing list showing weight and measurements of each piece.

8.03 PACKING.—The machine is prepared for boxing by dismantling or "knocking down" sufficiently to meet conditions specified either by buyer or manufacturer, or after negotiation between them, as such conditions determine the degree to which the machine is to be dismantled. Various segments of component parts are boxed or crated according to negotiated specifications. The manufacturer shall furnish a pro forma packing list showing weights and dimensions of each piece and shall furnish detailed packing lists upon shipment.

8.04 MARKING.—Complete marking instructions shall be furnished by the buyer. Such markings shall be legibly transferred to each package of the shipment and placed where they are easily read.

8.05 SPARE PARTS.—When the manufacturer submits quotation bids or tenders direct to a buyer who is the ultimate user, it is suggested that he recommend a spare parts kit of sufficient quantity for maintaining and servicing the machine for a period of 1 year.

## 9. LABELING AND CERTIFICATION

9.01 IDENTIFICATION.—The name and address of the manufacturer, model number, and serial number shall be shown in a conspicuous place in or on the machine.

9.02 CERTIFICATION.—In order to assure the purchaser that he is receiving a machine that complies with the requirements of this standard, it is recommended that the manufacturer attach in a conspicuous place in or on each machine a plate or label bearing the following wording:

The manufacturer declares that this machine complies with all requirements of Commercial

Standard CS90-58, as developed by the trade, under the procedure of the Commodity Standards Division, and issued by the United States Department of Commerce.

9.03 LABELING.—Figure 7 illustrates the label adopted by the members of the Power Crane and Shovel Association to certify compliance of any particular machine with the applicable parts of this standard.

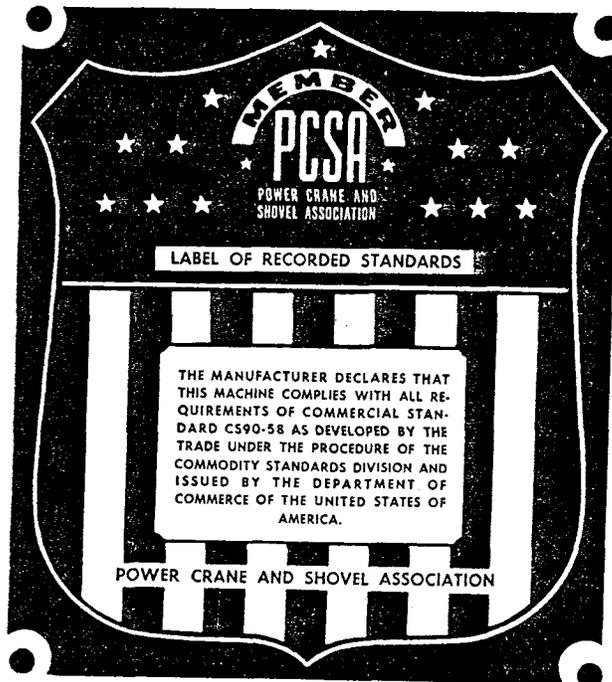


FIGURE 7.—Label adopted by the Power Crane and Shovel Association.

## 10. NOMENCLATURE

10.01 GLOSSARY AND INDEX.—The following is an index and glossary of technical terms and definitions peculiar to the power crane and shovel industry. No terms of a general mechanical engineering or design nature are listed.

*Accessory.*—Any device, mechanical or otherwise, that assists or increases the usefulness of the machine.

*A-frame.*—See paragraph 4.10.

*Air brake.*—Brake operated by compressed air developed from air compressor. Most important use is for service brakes on truck-mounted or wheel-mounted machines.

*Air hammer.*—Compressed-air-driven hammer.

*Arm (dipper).*—See *Dipper stick*.

*Assembly.*—Any minor or major group of mechanical parts designed to perform a given function.

*Attachment.*—An alternate designation for a front end component. Also any other device that may be added to a complete unit or assembly.

*Axle.*—The shaft or spindle on which a wheel or gear revolves. On truck-mounted and wheel-mounted machines, it refers to the automotive type of axle assembly, including gearing and differential.

*Axle (bogie).*—Two automotive-type axles mounted in tandem in a frame so as to permit oscillation in vertical direction.

*Axle (truck).*—See paragraph 5.12 (3).

*Backdigger.*—Another term for hoe. See paragraph 6.33.

*Backfiller.*—Machine used for refilling a trench or excavation. The term is applied to various machines equipped as shovel, hoe, clamshell, or dragline, and also to a small dragline with a backfiller board having chains or bridles for connection to hoist and dragline cables.

*Back hoe.*—Another term for hoe. See paragraph 6.33.

*Backward stability.*—See paragraphs 5.06 and 5.15.

*Bail (bucket or dipper).*—A large yoke or spreader hinged to sides of shovel dipper, hoe dipper, or dragline bucket to which is attached connecting sheave or chain for hoisting and dragging operations.

*Bail block.*—See *Block (bail)*.

*Bail pull.*—Total pull developed at point of attachment of hoisting line to dipper or bucket. This is about twice the line pull when hoist cable is reeved in two parts.

*Ballast.*—See *Counterweight*.

*Band brake.*—Circular type of brake either of external contracting type or internal expanding type, having a steel strap lined with heat-resistant and wear-resistant friction material.

*Band clutch.*—Circular type of clutch either of external contracting type or internal expanding type, having a steel strap lined with heat-resistant and wear-resistant friction material.

*Bank (lever).*—Group of operating levers used for controlling the machine.

*Barrel.*—Cast or structural sleeve through which single-dipper stick slides in certain types of shipper shaft construction. Also the lagging or body portion of a cable drum.

*Base (crawler).*—See *Crawler base*.

*Base (rotating).*—Cast or structural member on which all revolving superstructure mechanism is mounted.

*Base (travel).*—Sometimes used to describe complete mounting—crawler, truck or wheel.

*Base (turntable).*—See *Base (rotating)*.

*Belt (tread).*—Assembled crawler treads and connecting pins around rollers and drive sprockets; that part of crawler which contacts the ground.

*Block.*—Sheaves or grooved pulleys in a frame provided with hook, eye and strap.

## Power Cranes and Shovels

**Block (bail).**—Block attached to shovel dipper or dragline bucket bail through which hoist line is reeved. Also referred to as padlock.

**Block (hook).**—Block with hook attached used in lifting service. It may have a single sheave for double or triple line or multiple sheave for four or more parts of line.

**Block (pull).**—See *Block (bail)*.

**Bogie axle.**—See *Axle (bogie)*.

**Boom.**—Structural member attached to revolving superstructure used for guiding and acting as support for front end operating mechanism.

**Boom angle.**—The angle from horizontal at which the boom is inclined. This angle is measured between the horizontal and a straight line drawn between the boom foot pin and boom point sheave pin. Boom angle is adjustable by means of the boom hoist (also called derricking) device. See paragraph 6.03.

**Boom chord.**—The corner member of a structural boom.

**Boom head fairlead.**—A swiveling sheave or sheaves at head of boom used to reduce hoist cable wear by compensating for operation not in line with the boom.

**Boom hoist.**—See paragraph 4.08.

**Boom lacing.**—Structural truss members at angles to and supporting the corner members of a structural boom.

**Boom length.**—See paragraph 6.02.

**Boom sections.**—Crane booms are usually in two sections, upper and lower. Such booms may be lengthened by insertion of one or more intermediate sections.

**Boom splices.**—Splicing connections for sections of basic crane boom and intermediate sections may be of the splice plate type, pin type or butt type.

**Booster.**—An auxiliary device attached to main functional clutch or brake to activate it for greater ease of operation. Also separate auxiliary device used to assist in other functions such as steering.

**Brake (air).**—See *Air brake*.

**Brake (band).**—See *Band brake*.

**Brake shoe.**—That part of a shoe-type brake or clutch which makes contact with brake wheel, brake drum or clutch drum.

**Bridle.**—Another term for guy rope and pendant. See paragraph 6.05.

**Bucket.**—See *Clamshell*, paragraph 6.12; *Dragline*, paragraph 6.16; *Shovel*, paragraph 6.25; *Hoe*, paragraph 6.33.

**Bucket (concrete).**—Bucket for handling wet concrete, fitted with bail or bridle, usually handled on lifting crane and hoisted to dumping location.

**Bull gear.**—See *Swing gear*.

**Cab.**—Housing that covers revolving superstructure, usually of sheet metal, on structural frame. Also, on truck carriers, the driver's enclosure.

**Cable.**—Steel wire cables or ropes used in various front end equipment operating functions.

**Car body.**—See *Crawler base*.

**Center gudgeon.**—See *Gudgeon*.

**Center pin.**—Large pin or vertical shaft which acts as rotation centering device and connects revolving superstructure and travel base.

**Center pintle.**—See *Center pin*.

**Center post.**—See *Center pin*.

**Chain (crawler).**—See *Crawler chain*.

**Chain crowd.**—See paragraph 6.27.

**Clean-up radius.**—Maximum digging distance from revolving center at same grade on which machine mounting rests and operates.

**Climb.**—See paragraph 5.08.

**Closing line.**—The cable reeved from hoist drum to control closing of clamshell bucket.

**Clutch (band).**—See *Band clutch*.

**Combination crowd.**—See paragraph 6.27 (1).

**Common crane boom.**—See paragraph 6.01.

**Component.**—An assembly or group of mechanisms which, when attached to or installed on a machine, permits the performance of distinct functions.

**Continuous boom hoist cables.**—See paragraph 6.05.

**Convertibility.**—Ability of machine to be equipped for different types of work through interchangeability of front end equipment. See paragraph 7.01.

**Counterweight.**—Weights used for balancing operating loads and usually attached to rear of revolving superstructure. Also called ballast.

**Crawler.**—See paragraph 5.01.

**Crawler base.**—Cast or structural lower member to which are attached frames for carrying crawler mechanism including tread belt, and on which are mounted roller path and ring gear.

**Crawler bearing length.**—See paragraph 5.02.

**Crawler chain.**—Chain used as final drive from crawler frame to large sprocket to which is attached driving roller of tread belt.

**Crawler frame.**—Substructure on which is mounted crawler base, and which carries tread belt, rollers, and final crawler drive.

**Crawler shoes.**—See *Treads*.

**Crowd.**—See paragraph 6.27.

**Cutting lip.**—The edge of a bucket or dipper which penetrates material to be excavated. Teeth may or may not be attached.

**Cutting width.**—Actual width of opening cut by a bucket or dipper measured by overall width of outside teeth or cutters.

- Deck*.—Revolving superstructure turntable bed.
- Derricking*.—Operation of changing boom angle or of hoisting or lowering boom. Also called luffing.
- Derricking cables*.—See paragraph 6.05.
- Digging radius*.—Horizontal distance from center of rotation to dipper teeth at maximum reach of dipper, or bucket, at any given boom angle.
- Dipper arm*.—See *Dipper stick*.
- Dipper back*.—The top surface or top side of dipper when teeth are in horizontal digging position.
- Dipper capacity*.—See paragraph 6.28.
- Dipper front*.—The bottom surface or bottom side when teeth are in horizontal digging position.
- Dipper handle*.—See *Dipper stick*.
- Dipper latch*.—A mechanism which holds dipper door shut and can be tripped for dumping.
- Dipper latch bar*.—Bar attached to dipper door, fitting into latch plate on dipper, actuated by dipper trip mechanism, for opening and closing door for dumping.
- Dipper stick*.—Rigid member to which the shovel dipper is attached and through which the crowding and retracting are effected. Also called dipper arm and dipper handle.
- Dipper trip*.—Mechanism used in opening dipper door in dumping operation.
- Double reduction*.—Automotive term applying to type of drive from drive shaft to differential in driving axles.
- Drag cable*.—Cable for pulling in bucket in dragline or hoe operations.
- Dragline*.—See paragraph 6.16.
- Dragline bucket*.—See paragraph 6.16.
- Dragline fairlead*.—A swiveling, rotating or hinged frame carrying sheaves, and mounted on front of revolving superstructure or at base of boom, for guiding the drag cable to or from drag drum (one of the main hoist drums).
- Drag shovel*.—Another term for hoe. See paragraph 6.33.
- Drive tumbler*.—Roller with teeth or lugs which contact matching recesses or lugs or pins in tread belt of crawler mechanism.
- Drop hammer*.—See paragraph 6.22.
- Drum*.—Any spool on which cable used in machine operation is wrapped.
- Dual crowd*.—See paragraph 6.27 (3).
- Dumping height*.—Maximum clearance height from operating grade of any dipper or bucket in dumping position at given boom angle. For shovel dipper with doors, this distance is measured from lowest point of arc of swing of the door.
- Dumping radius*.—Maximum distance from center of rotation of machine to centerline of dipper or bucket in dumping position with boom at any given angle.
- Excavator*.—A term used for any machine which digs material.
- Fairlead*.—See *Boom head fairlead* and *Dragline fairlead*.
- Floating harness*.—See paragraph 6.05.
- Fuel pump (diesel)*.—Pump on diesel engine which takes fuel from supply line and distributes it to nozzles on injectors.
- Fuel pump (gasoline)*.—Pump on gasoline engine which forces fuel in supply line to carburetor.
- Fuel pump (hand)*.—Hand-operated pump used for filling fuel tank by pumping fuel from another receptacle.
- Full-load speed*.—See paragraph 4.03.
- Gantry*.—See paragraph 4.10.
- Gantry crane (revolving)*.—A term applied to a crane mounted on a high structural base capable of traveling on rails.
- Gooseneck boom*.—A boom which has a rigid upper section projecting at an angle from longitudinal axis of boom, usually a curved section.
- Governed speed*.—See paragraph 4.03.
- Ground pressure*.—See paragraph 5.03.
- Grouser*.—Projecting lugs attached to, or integral with, crawler tread shoes to provide additional traction.
- Gudgeon*.—A centering housing between revolving superstructure and travel base or center pin.
- Guy rope*.—Cables with both ends dead-ended. Usually used in connection with boom hoist system when floating harness is installed. Also called bridle or pendant. See paragraph 6.05.
- Hammer (pile)*.—See paragraph 6.22.
- Handle (dipper)*.—See *Dipper stick*.
- Heads, high-altitude*.—High compression cylinder heads installed on gasoline or gas engines to partially compensate for low air pressure at high altitude. See paragraph 4.04.1.
- High lift*.—See paragraph 6.31.
- Hoe*.—See paragraph 6.33.
- Hoe mast*.—Another term for hoe gantry. See paragraph 6.33.
- Hog rods*.—Stationary boom supports used instead of derricking cables.
- Hoist*.—See paragraphs 4.07 and 4.08.
- Holding line*.—The cable reeved from second hoist drum for holding clamshell bucket suspended during dumping and lowering operations.
- Hook block*.—See *Block (hook)*.
- Hook rollers*.—Rollers which prevent the lifting of the turntable from the base.
- Identification plate*.—See paragraphs 9.02 and 9.03.
- Idler roller*.—Rollers of tread belt mechanism which are not power driven.
- Idler tumbler*.—Large end roller of crawler tread belt mechanism at opposite end from drive tumbler, and which is not power driven.
- Independent crowd*.—See paragraph 6.27 (2).
- Independent boom hoist*.—See paragraph 4.08.

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*Jack shaft.*—Term applied to any intermediate shaft.

*Jib.*—See paragraph 6.04.

*King pin.*—See *Center pin*.

*Laggings.*—Removable and interchangeable drum spool shells for changing hoist drum diameter to provide variation in rope speeds and line pulls. This construction is optional with manufacturer.

*Latticed boom.*—Boom of open construction with angular lacing between four main corner members in form of truss.

*Lifting capacity.*—See paragraphs 6.06 and 6.14.

*Line pull.*—See paragraph 4.07.1.

*Line speed.*—See paragraph 4.07.2.

*Live roller circle.*—An assembly of multiple swing rollers free to roll between revolving superstructure and mounting.

*Load line.*—Another term for hoist line. In lifting crane service, it refers to the main hoist. The secondary hoist is referred to as a whip line.

*Luffing.*—See *Derricking*.

*Magnet.*—Electric lifting magnet used for picking up loose ferrous metal. Machine must be equipped with electric power either by (1) independently driven generator, (2) generator driven from machine power unit, or (3) power from outside source through plug-in arrangement.

*Magnet controller.*—Electric controller for governing flow of current to magnet. Part of magnet equipment.

*Main hoist.*—See paragraph 4.07.

*Mast.*—An adjustable frame hinged to the turntable at or near the boom hinge and extending above the cab for use in connection with supporting a boom. Head of mast is usually supported and raised or lowered by the boom hoist cables. When used with crane type boom, it serves the purpose of a high A-frame or gantry.

*Mats.*—Supports or floats used for supporting machine on extremely soft ground. Usually of timber construction.

*Monkey line.*—Another term for tagline. See paragraph 6.13.

*Mounting.*—See paragraph 3.01.2.

*Outriggers.*—See paragraph 5.13.

*Overhaul.*—Ability of a weight on end of hoist line to unwind cable from drum when brake is released.

*Padlock.*—Sometimes referred to as bail block, dipper sheave block, or pull block. It consists of a sheave and its housing by which the hoist line is connected to the dipper either directly or through a bail.

*Pay load.*—The net load or volume handled exclusive of weight of bucket, dipper, hook or other handling mechanism.

*Pendant.*—Another term for bridle or guy rope. See paragraph 6.05.

*Pile.*—See paragraph 6.21.

*Pile cap.*—See paragraph 6.24.

*Pile lead.*—See paragraph 6.23.

*Pitch diameter.*—Diameter of drum, lagging or sheave plus the diameter of the cable.

*Points (dipper teeth).*—Removable and replaceable points for dipper or bucket teeth.

*Power equipment.*—See paragraphs 4.02 and 5.16.

*Power lowering.*—Hoist mechanism with reversing drive that permits lowering the load under power, for more precise control, rather than by gravity with brake control.

*Power-lowering boom.*—Boom hoist which has reversible mechanism permitting lowering under power rather than by gravity with brake control.

*Power takeoff.*—See paragraph 4.06.

*Pull block.*—See *Block (pull)*.

*Pull shovel.*—Another term for hoe. See paragraph 6.33.

*Rack.*—A gear-toothed surface on dipper stick which meshes with shipper shaft pinion; a flat gear.

*Racking.*—Operation of crowding or retracting dipper.

*Radius (of load).*—See paragraph 6.07.

*Rated load.*—See paragraphs 6.06 and 6.14.

*Rear end radius.*—Clearance distance from center of rotation to maximum rear extension of revolving superstructure. Also called tail swing radius.

*Reeving.*—The passing of cables or ropes over drums, sheaves or pulleys.

*Revolving superstructure.*—See paragraph 3.01.1.

*Ring gear.*—See *Swing gear*.

*Roller (idler).*—See *Idler roller*.

*Roller path.*—The surface upon which run the rollers that support revolving superstructure. It may accommodate either cone rollers or cylindrical rollers or live roller circle.

*Rope.*—See *Cable*.

*Rope crowd.*—See paragraph 6.27.

*Rotating base.*—See *Base (rotating)*.

*Saddle block.*—Mechanism and bearings which carry shipper shaft drive and acts as guide for dipper stick.

*Scoop (skimmer).*—Usually not standard equipment. Consists of flat box-type boom with flanges on each side in which a flat-bottomed bucket is hung and driven on trolley mechanism and is thrust forward or crowded for digging by one hoist cable. The bucket is retracted by gravity when boom is raised or by a retracting clutch. The "live" boom is

operated by second hoist cable to control its angle and dumping position of bucket. Bucket has a hinged bottom controlled by a trip cable actuated from operator's station. Boom hoist is not used. Skimmer bucket capacity is usually stated in terms of width of cut, but nominal capacity is same as shovel dipper capacity for any given machine.

Most manufacturers offer the skimmer scoop only on special order because of its limited demand and few uses. It has a positive action and may be used for hard digging where a thin cut parallels the boom. It is best adapted to machines of  $\frac{1}{2}$  to  $\frac{3}{4}$  cubic yard capacity. It is effective under some conditions such as (1) ripping up old pavement, (2) carrying an accurate grade on highway paving, (3) excavating top soil, or (4) carrying an accurate slope in firm materials.

*Shipper shaft.*—Shaft at center (or near center) of shovel boom, which acts as pivot point of dipper stick as its angle and thrust positions are changed, and on which is mounted the dipper stick crowding and retracting mechanism of the boom.

*Shoes.*—See *Treads*.

*Skidding.*—Method of export shipping preparation. See paragraph 8.02.

*Skimmer.*—See *Scoop (skimmer)*.

*Slewing.*—Another term for swinging function.

*Stability.*—The ability of machine to resist tipping.

*Steam hammer.*—Steam-driven pile hammer. See paragraph 6.22.

*Stripper.*—Machine used for excavating overburden in open cut mining. The term is usually applied to a shovel or dragline capable of greater reaches than the manufacturers' standard ratings for the particular size of machine. A stripping shovel may be equipped with extra long boom and dipper stick and with a dipper slightly smaller than the nominal rated capacity (a high-lift shovel). A stripping dragline usually has an extra long boom with a correspondingly smaller bucket than one of nominal rated capacity as furnished with a boom of base rating length.

*Superstructure (revolving).*—See paragraph 3.01.1.

*Sway braces.*—Stiffening cables or rods with or without turnbuckles, sometimes used on each side of boom.

*Swing.*—See paragraph 4.09.

*Swing gear.*—External or internal gear attached to the lower base with which swing pinion on revolving superstructure meshes to provide swinging motion.

*Tagline.*—See paragraph 6.13.

*Tail swing.*—See *Rear end radius*.

*Third drum.*—A third hoist drum, in addition to two standard hoist drums, often used in pile driving.

*Tipping load condition.*—See paragraphs 5.05 and 5.14.

*Tire sizes.*—These are specified by diameter of casing, diameter of wheel and ply rating, i. e., 9.00 x 20-10 ply is a 9 inch diameter casing on a 20 inch diameter wheel or rim, and is of 10-ply construction.

*Tooth base.*—Main part of dipper tooth to which removable points are fastened.

*Torque converter.*—Auxiliary hydraulic device usually direct-connected to main engine or prime mover which multiplies engine torque as load increases with a corresponding decrease in speed.

*Track.*—See *Belt (tread)*.

*Trailer.*—Rubber-tired vehicle on which machine is loaded for long moves; also one pulled by machine, particularly a truck-mounted machine, when hauling auxiliary equipment.

*Travel.*—See paragraphs 5.07 and 5.17.

*Travel base.*—See *Crawler base*.

*Tread belt.*—See *Belt (tread)*.

*Treads.*—Hinged steel pads joined to form a continuous crawler belt which supports the machine.

*Trench hoe.*—Another term for hoe. See paragraph 6.33.

*Truck crane.*—Crane mounted on independent engine-driven rubber-mounted carrier. See paragraph 5.12.

*Tumbler.*—One of the large rollers for a crawler tread belt. Also see *Idler tumbler*.

*Turning circle.*—Minimum diameter of circle in which machine can turn completely.

*Turntable.*—Another term for revolving superstructure of machine.

*Wagon.*—See *Wheel Mounting*, paragraph 5.12(2).

*Wheel base.*—Distance to center of front and rear axles. On three-axle trucks, rear center is center of bogie axle.

*Whip line.*—Secondary hoist line. Also see *Load line*, and paragraph 4.07.

*Working weight.*—Weight of machine in working order with complete front end equipment.

## 11. EFFECTIVE DATE

11.1 Having met all procedural requirements of the Commodity Standards Division, including approval by the acceptors hereinafter listed, this Commercial Standard was issued by the United States Department of Commerce, effective May 15, 1958.

EDWIN W. ELY,  
Chief, Commodity Standards Division.

## Power Cranes and Shovels

### HISTORY OF PROJECT

**EXPORT STANDARD.**—The establishment of a Commercial Standard for power cranes and shovels was considered at a conference of manufacturers in Chicago, Illinois, on December 14, 1939, and certain general features were outlined. A standard covering export classifications, to bring about better understanding between buyers and sellers, was requested and drafts were subsequently considered by the manufacturers in the United States and by cooperating organizations in Canada and in Latin American countries. Their composite suggestions were embodied in a recommended standard that was circulated for endorsement. Signed statements of acceptance were received, giving satisfactory evidence of general approval, and the printed edition of Commercial Standard CS90E-41, effective January 9, 1941, was promulgated.

**REVISION OF EXPORT STANDARD.**—Upon recommendation by the Power Crane and Shovel Association, and with the approval of the Standing Committee, a recommended revision was circulated to the trade on September 4, 1946. General acceptance was subsequently recorded, and Commercial Standard CS90E-47, effective February 15, 1947, was promulgated.

**DOMESTIC STANDARD.**—The Power Crane and Shovel Association on May 13, 1946, requested the establishment of a Commercial Standard for power cranes and shovels for domestic application. Proposed requirements were referred to manufacturers, distributors, purchasers, and related interests for comment, and usable suggestions were embodied in a recommended standard that was circulated on November 30, 1948. General concurrence in all branches of the industry was shown by the acceptances recorded, and Commercial Standard CS90-49, effective August 1, 1949, was promulgated.

**REVISION OF DOMESTIC AND EXPORT STANDARDS.**—Experience with the domestic and export standards in their respective fields showed possibilities for further improvement by combining the

two standards. A revision covering the desired modifications was submitted by the Power Crane and Shovel Association on July 24, 1956. It was approved by the Standing Committee with minor changes, and was circulated on November 6, 1957, as a Recommended Revision of Commercial Standards for Power Cranes and Shovels, TS-5371. Acceptances from manufacturers, distributors, users, and other interests were recorded showing general industry concurrence. On April 11, 1958, the Commodity Standards Division announced that Commercial Standard CS90-58, Power Cranes and Shovels, would be considered effective from May 15, 1958.

Project Manager: Alfred S. Best, Commodity Standards Division, Office of Technical Services.  
 Technical Adviser: L. R. Sweetman, Engineering Mechanics Section, Mechanics Division, National Bureau of Standards.

### STANDING COMMITTEE

The following individuals comprise the membership of the Standing Committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Comments concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Commodity Standards Division, Office of Technical Services, United States Department of Commerce, which acts as secretary for the committee.

- A. F. BUSICK, JR. (Chairman), Marion Power Shovel Co., Marion, Ohio.
- C. S. DAVIS, Utah Construction Co., San Francisco, Calif.
- E. A. FRETZ, Fretz Construction Co., Houston, Tex.
- M. B. GARBER, The Thew Shovel Co., Lorain, Ohio.
- B. H. HARDAWAY, III, Hardaway Contracting Co., Columbus, Ga.
- R. L. JOHNSON, H. O. Penn Machinery Co., Bronx, N. Y.
- H. D. LITTLEJOHN, The Highway Equipment Co., Cincinnati, Ohio.
- E. B. NICKLES, Manitowoc Engineering Corp., Manitowoc, Wis.
- W. J. ROHAN, Winston Bros. Co., Minneapolis, Minn.
- H. E. SHAW, Service Supply Corp., Philadelphia, Pa.
- JULIEN R. STEELMAN, Koehring Co., Milwaukee, Wis.
- G. K. WOODLING, Harnischfeger Corp., Milwaukee, Wis.

**WITHDRAWN**

CS90-58

**ACCEPTANCE OF COMMERCIAL STANDARD**

If an acceptance has not previously been filed, this sheet properly filled in, signed, and returned, will provide for the recording of your organization as an acceptor of this Commercial Standard.

Date .....

Commodity Standards Division  
Office of Technical Services  
U. S. Department of Commerce  
Washington 25, D. C.

**WITHDRAWN**

Gentlemen:

We believe that Commercial Standard CS90-58 constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the

production <sup>1</sup>                      distribution <sup>1</sup>                      purchase <sup>1</sup>                      use <sup>1</sup>

of power cranes and shovels. We reserve the right to depart from it as we deem advisable.

We understand, of course, that only those products which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer .....

(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer .....

Organization .....

(Fill in exactly as it should be listed)

Street address .....

City, zone, and State .....

<sup>1</sup> Underscore the one that applies. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade associations, trade papers, etc., desiring to record their general support, the words "General support" should be added after the signature.

(C) (this line)