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SUPERSEDING
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FEDERAL SPECIFICATION

CRANES, ROUGH TERRAIN, HYDRAULIC,
FULL REVOLVING, WHEEL MOUNTED, 4X4, DED

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers diesel-engine-driven, wheel mounted, 4X4 360 degree (o) full revolving superstructure with cab, hydraulically operated cranes.

1.2 Classification. Cranes shall be one of the following sizes, as specified (see 6.1):

- Size A - 15-ton capacity, minimum
- Size B - 30-ton capacity, minimum
- Size C - 60-ton capacity, minimum
- Size D - 90-ton capacity, minimum

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.1).

Beneficial comments (recommendations, additions, deletions) and any pertinent
 *data which may be of use in improving this document should be addressed to: *
 *Commanding Officer (Code 156), Naval Construction Battalion Center, Port *
 *Hueneme, CA 93043-5000, by using the self-addressed Standardization *
 *Document Improvement Proposal (DD Form 1426) appearing at the end of this *
 *document or by letter. *

FSC 3810

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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SPECIFICATIONS

FEDERAL

VV-F-800 - Fuel Oil, Diesel.

MILITARY

MIL-P-514 - Plates, Identification, Instruction and Marking, Blank.
MIL-C-3580 - Cranes and Crane-Shovels, Truck, Crawler, and Wheel
Mounted, Full-Revolving, and Their Attachments,
Packaging of.

STANDARD

MILITARY

MIL-STD-209 - Slinging and Tiedown Provisions for Lifting and Tying
Down Military Equipment.

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Control of Air Pollution from New Motor Vehicles and New Motor Vehicle
Engines: Certification and Test Procedures.

(Application for copies should be addressed to the Public Affairs Office, Environmental Protection Agency, Rockville, MD 20852; or CFR, Title 40 should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

DEPARTMENT OF LABOR (DoL)
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

Occupational Safety and Health Standards.

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Copies of specifications, standards, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

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AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

B30.5 - Mobile and Locomotive Cranes.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

POWER CRANE AND SHOVEL ASSOCIATION (PCSA)

Standard No. 4 - Mobile Power Crane and Excavator and Hydraulic Crane Standards

(Application for copies should be addressed to the Power Crane and Shovel Association, Marine Plaza, Suite 1700, 111 E. Wisconsin Avenue, Milwaukee, WI 53202.)

STATE OF CALIFORNIA

California Vehicle Code.

(Application for copies should be addressed to the Department of Motor Vehicles, 2570 24th Street, Sacramento, CA 95809.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE J159 - Load Moment System
SAE J375 - Radius-of-Load or Boom Angle Indicating Systems
SAE J376 - Load Indicating Devices in Lifting Crane Service
SAE J534 - Lubrication Fittings
SAE J931 - Hydraulic Power Circuit Filtration
SAE J1063 - Cantilevered Boom Crane Structures
SAE J1152 - Braking Performance - Rubber-Tired Construction Machines
SAE J1180 - Telescopic Boom Length Indicating System

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

TIRE AND RIM ASSOCIATION, INC. (TRA)

TRA Yearbook.

(Application for copies should be addressed to the Tire and Rim Association, Inc., 3200 West Market Street, Akron, OH 44313.)

(Nongovernment standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. REQUIREMENTS

3.1 First article. When specified (see 6.1), the contractor shall furnish a crane of the size specified for first article inspection and approval (see 4.2.1 and 6.3).

3.2 Standard commercial product. The crane shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the crane being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

3.3 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification.

3.4 Interchangeability. All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts.

3.5 Maintainability. The crane design, together with component and accessory location and installation, shall permit ready accessibility to all items requiring periodic maintenance service in the field, which will be accomplished with the use of conventional general-purpose tools associated with equipment of this nature. The replacement and adjustment of components and accessories shall be accomplished with minimum drainage requirements and minimum disturbance to other elements of the crane.

3.6 Safety. The crane shall comply with Federal OSHA regulations, Power Crane and Shovel Association Standard No. 4, and ANSI B30.5. All rotating or reciprocating parts and all parts subject to high operational temperatures, that are of such a nature or are so located as to be or become a hazard to the operating or attending personnel, shall be substantially guarded, or insulated, to the extent necessary to eliminate the hazard. The principal platform walking surfaces shall be of an anti-skid type. Ladders, steps, and handholds shall be provided in such quantity and of such size on the sides of the crane cab or superstructure that entrance thereto and exit therefrom may be unhampered and nonhazardous, and provide three (3) points of contact (two (2) feet and one (1) hand, or two (2) hands and one (1) foot) for persons entering

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and egressing equipment. Engine cooling fans shall have heavy grille or ring type guards.

3.7 Stress requirements. Design of the completely assembled crane shall be such that the maximum unit stress imposed will not exceed the minimum strength margins contained in SAE J1063. Tests, in accordance with SAE J1063, shall have been performed on the model crane being provided and test results shall be made available for government inspection at the time of first article tests.

3.8 Performance. The crane shall be capable of independently and simultaneously elevating the boom and rotating with a sweep of 360° continuous rotation, and shall have a maximum rotational speed of not less than 2 revolutions per minute (rpm) for sizes A and B, and not less than 1.5 rpm for size C and D. The crane, without load, shall be capable of attaining and maintaining a travel speed, on level paved roads, of not less than 18 miles per hour (mph) for sizes A and B, and not less than 16 mph for size C and D. The crane, without load, shall be capable of traveling on unimproved roads, rough terrain, and beach areas; shall travel up not less than 30 percent grade on paved roads or hard-packed surfaces without engine stall; and shall be capable of negotiating 15 percent side slopes.

3.8.1 Lifting capacities. The crane shall have lifting capacities of not less than the loads specified (see 6.1), at the radius specified (see 6.1), with the boom length or lengths specified (see 6.1), and with or without outriggers set as specified (see 6.1).

3.8.2 Stability. With lubricating and cooling systems full, fuel tank(s) half full, with crane resting on firm, level, and uniform supporting surface, with outriggers unsupported, with the boom fully retracted and in travel position, the crane shall conform to the following requirements:

- a. With the longitudinal axis of the rotating superstructure of the crane at 90° to the longitudinal axis of the carrier, the boom retracted and set at the minimum recommended radius, the total load on all wheels on the side of the carrier under the boom shall be not less than 15 percent of the total weight of the crane.
- b. With the longitudinal axis of the rotating superstructure of the crane in line with the longitudinal axis of the carrier, in either direction, the boom retracted and set at the minimum recommended radius, the total load on all wheels under the lighter load end of the carrier shall be not less than 15 percent of the total weight of the crane.

3.8.3 Power load lowering. Power load lowering by hydraulic control shall be provided for the winch(s) to facilitate controlled load lowering or lifting at any boom lengths or elevation. The power down for the main winch shall have sufficient capacity to raise, hold, and lower a load without slipping. The power load lowering means shall provide positive control.

3.8.4 Rotation. The power transmission system used to rotate the superstructure shall be hydraulic mechanical arrangement with a continuous rotation of 360°. Swing speed within this range shall be smooth and constant, and adequate control shall be provided to insure smooth starting and stopping. An automatic or manual type swing lock or brake, capable of locking the

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superstructure in any desired position shall be provided. The manual swing lock or brake controls shall be located within reach of the operator while seated.

3.8.5 Main winch capacity. The main winch shall have sufficient capacity to make maximum rated lifts with shortest boom length and with the length of rope installed on the winch as specified in 3.9.4.

3.8.6 Safe load capacities chart. A permanent chart indicating all the safe load capacities on each boom reach and radii at 360o rotation, with and without outriggers, shall be posted in the crane cab near the operator. The safe load capacity chart shall reflect the manufacturer's standard commercial rating for the size and model crane furnished, and not be limited to the minimum required capacities specified.

3.9 Crane. The crane assembly, designed for the carrier mount, shall consist of a fully revolving superstructure with hydraulically operated telescoping type boom, a main winch with wire rope, hook block, cab controls, and necessary accessories.

3.9.1 Superstructure. The superstructure shall be mounted on the carrier to insure full 360o working range and designed to withstand the forces caused by lifting, swinging, and traveling with the safe loads.

3.9.2 Boom. The boom shall be of alloy steel and of the hydraulically operated telescoping type, consisting of a base section and sliding section(s). All extensions, retraction, and elevations of the boom shall be accomplished by hydraulic controls from the operator's cab without manual assist. When specified (see 6.1), for longer boom lengths, boom shall be hydraulically extended and retracted, and may be automatically synchronized, and/or power pinned. When specified (see 6.1), an auxiliary point sheave shall be provided.

3.9.2.1 Boom drift. Boom drift, the vertical dropping of the boom due to inadvertent retraction of the boom hoist and/or boom extension cylinders, shall be kept to a minimum. Drift shall take place in gradual, imperceptible speeds or degrees. The crane load, under all operating conditions, shall not drop in a sharp or sudden manner at any time during crane operation.

3.9.3 Hook block. The rated capacity of the crane hook block shall be not less than the rated capacity of the crane for which it is furnished. The hook shall be of the forged steel, swivel type with an ultimate strength of four times the maximum safe-rated load and shall include a safety latch on the hook. The block and hook shall have adequate weight to insure payout of the cable without load on the hook in any position. Block assembly shall be provided for attachment to the hoist cable for not less than two-part line. Means shall be provided to secure hook block while traveling. The hook block furnished shall permit disassembly for visual and nondestructive testing. The hook shall not be painted. The swivel and hook overhaul weight shall be furnished.

3.9.4 Rope. Load hoist rope(s) shall be extra improved plow steel, IWRC with a safety factor not less than 3.5. The manufacturer's standard length of wire rope shall be furnished. The contractor shall provide a signed certification with each crane identifying the crane serial number, wire rope manufacturer, type of wire rope construction, type of wire rope material, and the minimum breaking strength of the wire rope provided.

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3.9.5 Sheaves. All sheaves and sheave sizes shall be in accordance with ANSI B30.5 recommendation. Non-metallic sheaves shall not be furnished.

3.9.6 Hydraulic system. The hydraulic system shall include a pump(s), hydraulic rams, rods, full flow filter, reservoir, pressure relief valve, and all necessary lines, lockouts, restrictor, and control valves to insure positive control of boom hoist and rope hoist in all operations or loss of hydraulic power due to ruptured hoses. Hydraulic line circuit and filtration shall be in accordance with SAE J931 with a 25 micron filter. The pump(s) shall be driven by the crane engine and shall have sufficient capacity to operate hydraulically powered components as specified herein. Means shall be provided in the hydraulic system for bleeding all air trapped in the system. All high pressure hydraulic hoses and fittings shall be capable of withstanding a bursting test pressure of four times the working pressure, and a minimum proof pressure of at least two times the operating pressure.

3.9.7 Boom length and boom angle indicators. A dial or digital display of boom length and load radius in feet shall be provided in the cab in view of the operator in his normal operating position. The system(s) shall comply with SAE J1180 and SAE J375.

3.9.8 Auxiliary winch. When specified (see 6.1), an auxiliary winch, of specified size, capacity and attachments shall be provided.

3.9.9 Piledriving system. When specified (see 6.1), the crane shall be fitted for operating a diesel hammer piledriving system. The crane boom point will be provided with a lead adapter to be used with commercial standard 20-inch series box type pile driver leads. The superstructure shall be fitted with catwalk pivot connections. The catwalk pivot connections shall allow the use of a standard catwalk of the same manufacturer as the pile driver leads.

3.9.10 Load Moment Device. When specified, a load indicating and warning device of the load moment type shall be provided to perform the following functions while on outriggers:

- a. Load indicating and warning device shall provide function kick-out when load moment exceeds 100 percent of rated capacity. Function kick-out shall block the operator's control of the boom down, boom extension, and boom hoist functions. When in the kick-out mode, the operator shall retain control of the boom up, boom retraction, and load lowering functions.
- b. Provide a dial or digital reading of hook load in pounds.
- c. Provide a dial or digital reading of radius in feet.
- d. Provide a dial reading of load moment as a percentage of rated capacity.
- e. Provide a visual warning (amber light) when load moment reaches 90 percent of rated capacity and visual and audible (red light and alarm) warning at 100 percent of rated capacity.

The device shall be capable of manually selecting parts of line and boom length. The device shall conform to SAE J159 and J376.

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3.9.11 Anti-two-block device. An anti-two-block device with audio/visual warning and function lockout shall be installed to prevent the hook block from contacting the boom tip.

3.10 Cab. The cab shall be mounted on the revolving superstructure and shall be fabricated from sheet steel or fiberglass, having sufficient windows and glazed doors to permit at least 270° vision for the driver or operator in normal position. All glass shall be not less than 3/16-inch nominal thickness, safety type, and held in place by rubber or metal channels for easy replacement. Windows shall be arranged for easy opening and removal when required. All cab doors, whether of the sliding or swinging type, shall be adequately restrained from accidentally opening or closing when the crane is traveling or operating. All doors shall be provided with means for securely locking in the closed position. An adjustable and comfortable seat shall be provided in the cab and located for maximum unobstructed visibility of the operator. The cab shall be equipped with a diesel operated (fired) heater, defroster, interior dome light, and air or electric operated windshield wiper. Electric or air horn, hand or foot operated, shall be provided. A positive swing lock for traveling shall be provided for the cab. The crane shall be provided with outside rearview mirrors on each side.

3.11 Controls. All carrier, crane controls, lockouts, and indicators shall be located within reach of the operator in the operator's cab, and shall be readily accessible under all conditions of operations. All controls shall be clearly marked as to their use and function.

3.12 Carrier. Carrier frame shall be of the heavy steel fabrication type, with necessary braces and reinforcements to provide rigid support for the revolving superstructure, hoisting drum rope, hook block, and cab, under maximum load, when the telescopic boom is extended at minimum through maximum radii at any position within the 360° rotation. The revolving superstructure shall be so positioned in a location on the carrier frame permitting maximum efficiency for all-purpose crane operations. The carrier frame shall be mounted on four wheels with all wheels steerable and four-wheel drive. All wheels shall be equipped with interchangeable pneumatic tires of compatible size for the load imposed. Full hydraulic steering shall be provided for front and rear wheels with 2-wheel, 4-wheel, and crab steering shall be provided. An indicator showing when the rear wheels are centered shall be provided.

3.12.1 Transmission. The crane carrier shall be equipped with a torque converter, a power shift transmission or automatic transmission with selective gear to provide not less than three forward and one reverse speeds in each range. Gearing shall allow a maximum speed in the lowest forward and reverse gear of not more than 3.5 mph, and in the highest gear forward of at least the travel speed specified in 3.8 with the engine operating at engine governed speed.

3.12.2 Brakes. The crane carrier shall be provided with the manufacturer's standard, foot controlled, service brakes applied to all four wheels. The service brakes shall be capable of bringing the crane to a complete safe stop in accordance with SAE J1152. A parking brake, capable of holding the crane on a longitudinal slope of not less than 15 percent without slippage, shall be provided.

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3.12.3 Tires. Tires shall be tubeless type with traction type tread. Tires shall have a rated capacity at least equal to the load imposed on each tire, measured at each wheel, at the ground, with the crane loaded with the maximum safe load. Tire ratings shall conform to TRA recommendations for the type and size of tires furnished. When specified (see 6.1), tires shall be high flotation type.

3.12.4 Lights and reflectors. The following lights and reflectors shall be furnished and installed and shall be powered by a 12 or 24-volt (V) electrical system:

- a. Two sealed beam headlights (mounted on carrier).
- b. Taillights.
- c. Stoplights.
- d. Clearance lights.
- e. Turn signal lights.
- f. Instrument panel light.
- g. A weatherproof automotive type of spotlight or floodlight mounted on top of crane cab.
- h. Emergency 4-way flashing lights.
- i. Two sealed beam floodlights (mounted on revolving cab) and when required, one worklight mounted on the boom.

3.12.5 Engine. The carrier engine shall be of the diesel type having horsepower, torque, and speed characteristics to meet satisfactorily all the crane performance requirements specified herein. The engine shall be capable of meeting the performance requirements using diesel fuel conforming to VV-F-800. The diesel engine shall start within 5 minutes and be ready for full load operation within 15 minutes in any ambient temperature from +125o Fahrenheit (F) to -20oF. When a fluid priming system is required, it shall be of the measure shot type with storage capacity of a minimum of 12 fluid ounces. The engine shall be furnished complete with a minimum of the following accessories:

- a. An instrument panel complete with lubricating oil pressure gage, a fuel gage, a cooling liquid-temperature gage, a battery charge and discharge rate indicator, or a battery condition indicator on a volt meter, and a tachometer.
- b. A fuel tank with sufficient capacity for 8 hours normal operation.
- c. A 12V or 24V electric cranking system.
- d. A charging alternator, with sufficient charge at idle to handle the entire electrical loads.
- e. A cooling-liquid high temperature visible and/or audible safety device of the warning type.
- f. A lubricating low oil pressure visible and/or audible safety device of the warning type.
- g. An engine housing so designed as to facilitate the maintenance of engine.
- h. A transmission temperature gage.
- i. An engine hour meter.

3.12.5.1 Air pollution control. The crane shall comply with the EPA Regulations governing Control of Air Pollution from New Motor Vehicles and New Motor Vehicle Engines in effect on the date of manufacture. In addition, cranes

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destined for California shall comply with State of California regulations governing air pollution control in effect on the date of manufacture.

3.12.6 Axle assembly. The front and rear axles shall be of sufficient capacity to sustain the imposed loads on both axles. The rear axle assembly shall be of the oscillating type, with a positive-type oscillation lockout incorporated for crane operation. With lockouts, the rear axle assembly shall not oscillate more than 2 inches measured at centerline of tires. The lockout controls shall be of the automatic type.

3.12.7 Outriggers. Four hydraulically operated outriggers, capable of extension to 6 inches below ground level, shall be provided, one outrigger on each corner of the chassis. The outriggers shall be operated separately or in any combination from the operator's cab, and shall not collapse due to loss of hydraulic power. The outriggers' legs and pads shall be of a size to support the intended working loads without loss of crane stability or cause excess ground bearing pressure. A device to accurately determine when the crane is level shall be installed in a position convenient to the outrigger controls.

3.12.8 Front winch. When specified (see 6.1), a hydraulic-operated winch of not less than 13,500 pounds (lb) line pull rating on base drum for size A and size B cranes and not less than 15,000 lb line pull rating on base drum for size C cranes, shall be mounted on a frame extension at the front of the crane and be fully protected against damage. The winch shall be of lightweight materials to the maximum practicable extent. The winch shall be equipped with an automatic brake. A device to prevent the winch from being inadvertently engaged shall be provided. The winch shall be wound with 150 feet of not less than 1/2-inch diameter wire rope, 6X19, Seale construction, improved plow steel with fiber center, and with thimble and hook attached. Operating controls shall be located in the operator's cab.

3.12.9 Pintle assembly. When specified (see 6.1), a pintle assembly shall be provided at the rear of the crane carrier. The pintle shall be installed on the carrier frame with reinforcements to transfer pintle loads directly to the carrier frame rails. The pintle type and pintle towing capacities shall be as specified by the procuring activity (see 6.1).

3.12.10 Fenders. The manufacturer's standard steel fenders shall be provided over each wheel.

3.12.11 Toolbox. The crane shall be provided with a metal toolbox, minimum 24-inch L x 12-inch W x 6-inch D. The toolbox shall have a hinged lid with a padlock closing device, less lock and key. The toolbox shall be securely fastened to the crane in a readily accessible and protected position.

3.13 Lifting and tiedown attachments. When specified (see 6.1), the crane shall be equipped with lifting and tiedown attachments. Lifting and tiedown attachments shall conform to type II or type III of MIL-STD-209. A nonferrous transportation plate conforming to MIL-P-514, shall be provided and mechanically attached to the crane. Transportation plates shall be inscribed with a diagram showing the lifting attachments and lifting slings, the capacity of each attachment, and the required length and size of each sling cable. A silhouette of the item furnished showing the center of gravity shall be provided on the

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transportation plate. Tiedown attachments may be identified by stenciling or other suitable marking.

3.14 Identification plate. An identification plate will be furnished by the contracting officer for each crane. The contractor shall stamp all necessary data in the blank spaces of the plate provided for that purpose, and securely affix a plate to each crane in a conspicuous place with nonferrous screws, rivets, or bolts not less than 1/8-inch in diameter. The applicable nomenclature contained in the contract item description shall be placed in the top blank. Nomenclature shall be "CRANE, ROUGH TERRAIN HYDRAULIC, 4X4 DED ---- TONS."

3.15 Instruction plates. The crane shall be equipped with instruction plates suitably located, describing any special or important procedures to be followed in operating and servicing the equipment. Plates shall be of a material which will last and remain legible for the life of the equipment. Plates shall be securely affixed to the equipment with nonferrous screws, bolts of not less than 1/8-inch diameter, or be self-adhesive.

3.16 Stenciling. The gross weight of each crane with equipment shall be stenciled on each side of the crane in such a manner as to be readily distinguished to dock and military personnel. The prescribed tire pressure shall be stenciled on the carrier fenders by block or stencil type letters not more than 1-inch high.

3.17 Lubrication. Means for lubrication shall be in accordance with the manufacturer's standard practice. The lubricating points shall be easily visible and accessible. Hydraulic lubrication fittings shall be in accordance with SAE J534. Where use of high pressure lubricating equipment, 1,000 pound-force per square inch or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location. A lube chart shall be furnished.

3.18 Cleaning, treatment, and painting. Surfaces normally painted in good commercial practice shall be cleaned, treated, and painted as specified herein. Surfaces to be painted shall be cleaned and dried to insure that they are free from contaminants, such as oil, grease, welding slag and spatter, loose mill scale, water, dirt, corrosion products, or any other contaminating substances. As soon as practicable, after cleaning, and before any corrosion product or other contamination can result, the surfaces shall be prepared or treated to insure the adhesion of the coating system. The painting shall consist of at least one coat of primer and one finish coat. The primer shall be applied to a clean, dry surface as soon as practicable after cleaning and treating. Painting shall be with manufacturer's current materials according to manufacturer's current processes and the total dry film thickness shall be not less than 2.5 mils over the entire surface. The paint shall be free from runs, sags, orange peel, or other defects. The color of the finish coat shall be as specified (see 6.1). Hazard stripes shall be applied to the rear of the carrier, boom point and hook block cheek plates. Stripes shall be manufacturer's standard Black, 2 inches wide, 2 inches apart, applied to a 45o angle, using the crane yellow paint as background.

3.19 Servicing and adjusting. Unless otherwise specified (see 6.1), prior to acceptance of the crane by the government inspector, contractor shall service

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and adjust each crane and its mounted equipment for operational use, including at least the following: Focusing of lights; adjustment of engine; adjustment of electrical and brake systems; alignment of front and rear wheels; inflation of all tires; complete lubrication of chassis, engine, running gear, and mounted equipment with grades of lubricants recommended; servicing of the cooling system with a solution of ethylene glycol type antifreeze and water in equal parts by volume.

3.20 Workmanship.

3.20.1 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to insure uniformity of size and shape.

3.20.2 Bolted connections. Bolt holes shall be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided in accordance with good commercial practice, and all bolts, nuts, and screws shall be tight.

3.20.3 Riveted connections. Rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads, when not countersunk or flattened, shall be of approved shape and of uniform size for the same diameter of rivet. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.

3.20.4 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the welds. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in this document shall not relieve the contractor of the responsibility of ensuring that all products or supplies

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submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements. However, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2.1).
- b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall be performed on one crane of the size specified when a first article is required (see 3.1 and 6.1). This inspection shall include the examination of 4.3, the tests of 4.4, and when specified, the preproduction pack inspection of 4.6 (see 4.6, 6.1, and 6.3). The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.3, the tests of 4.5, and the packaging inspection of 4.6.

4.3 Examination. Each crane shall be examined for compliance with the requirements specified in section 3 of this document. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.4 First article tests. When first article is required, the first article shall be subjected to the tests of 4.4.1 through 4.4.9, and when equipped with lifting and tying down attachments to 4.4.10. Failure to pass any phase of the test shall be cause for rejection.

4.4.1 Crane safe load capacity test. The crane shall be completely serviced and subjected to the manufacturer's recommended break-in. The safe load capacity test shall be performed on level, paved surface by connecting calibrated weights to the lifting hook. The crane shall then lift an assortment of loads selected by the government quality assurance representative. Test loads shall be 118 percent of the manufacturer's rated loads taken from the load chart of the crane being tested. The crane shall be rotated 360o with each test load. A minimum of three loads shall be selected from the load chart to test

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the structural integrity of the crane. Likewise, a minimum of three loads shall be selected from the load chart for testing the stability of the crane.

4.4.2 Speed tests. Speed tests shall be taken over a zero percent grade on a paved road. Time shall be recorded with a stopwatch accurate to 1 second. The average speed shall be recorded for the unit. Maximum average speed not less than that specified in 3.8 when calculated by the following formula shall be attained:

$$V = \frac{0.682 \times D}{T}$$

Where: V = Speed in mph.
D = Distance in feet.
T = Time in seconds.

A fifth wheel type recorder may be used.

4.4.3 Gradeability. The crane unit shall be tested for gradeability in compliance with 3.8. The crane unit, without load and with mounted attachments, shall negotiate a 30 percent grade on paved road without engine stall.

4.4.4 Power load lowering test. General inspection of the power-down system shall be made for adequate lubrication, ease of operation of controls, safety precautions, and for good manufacturing practices. The power load lowering system shall be tested as follows to determine conformance to 3.8.3:

- a. With the crane equipped with a boom of a length as specified in 3.8.1, and with outriggers set, position the revolving superstructure in the most stable craning position and assemble a single line load equal to the maximum rated load divided by the recommended number of parts of hoist line reeving.
- b. Position the boom angle for the minimum working radius.
- c. Hoist the load 20 feet or more above the ground level.
- d. Prepare the crane for power-down operation on the load line.
- e. Operate the power load lowering system in accordance with manufacturer's instructions, and lower the load under the power. Vary the speed of the load.
- f. When the load reaches the ground, immediately repeat operations (c), (d), and (e). These operations shall be repeated until 20 cycles have been completed.

4.4.4.1 Stability test. Stability of the crane shall be tested to determine conformance to 3.8.2.

4.4.5 Road test. The crane shall be given a road test for a distance of not less than 10 miles at a speed of 15 mph over paved roads; 4 miles over uneven roads with rough terrain at not less than 3 mph; and 1 mile over unpaved surface composed of sandy or loose soil or both.

4.4.6 Travel control test. To demonstrate workability of the travel controls (see 3.11), the crane shall be operated forward and backward in two figure-8 patterns with hard right and left turns.

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4.4.7 Service brake test. Service brakes of the crane shall be tested for compliance with 3.12.2. On a concrete roadway, the crane shall be accelerated at a maximum rate to a speed of not less than 18 mph. The service brakes shall be applied bringing the crane to a complete halt to determine conformance to 3.12.2. Immediately after the crane comes to a halt, this test cycle shall be repeated for four additional cycles.

4.4.8 Parking brake test. The parking brake shall be tested for compliance with 3.12.2.

4.4.9 Radius indicating device test. The radius indicating device shall be tested to determine conformance to 3.9.7.

4.4.10 Lifting and tying down attachment tests. When required, the lifting and tying down attachments shall be tested to conform to 3.13. Calculations may be accepted in lieu of testing.

4.4.11 Production sample. Upon acceptance of the first article, the first article shall remain at the manufacturing facilities as a production sample, and shall be the last crane delivered on the contract. The first article shall be reconditioned, including replacement of abnormally worn parts and paint touch-up or repainting prior to delivery to enable it to be accepted as a contract item. The contractor shall maintain the first article in a serviceable condition for the duration of the contract.

4.4.12 Boom drift test. The crane boom shall be tested as follows to determine conformance to 3.9.2.1:

- a. With outriggers set, assemble a safe load of at least 2,500 lb.
- b. Extend and retract the boom several times or until the crane hydraulic fluid is at least 130oF.
- c. Boom up to an angle of at least 70o.
- d. Extend boom to 3/4 of its fully extended length.
- e. Hoist the load four feet above the ground.
- f. For a period of not less than 20 minutes, observe crane for sudden, uncontrolled dropping of the load.
- g. After observing crane for 20 minutes, measure distance from the load to the ground.

Any perceptible sudden dropping of boom/load shall be cause for rejection.

4.5 Production unit operational test. Each production crane shall be completely assembled, adjusted, lubricated, or otherwise serviced for operation. The engine shall be started and subjected to a warm-up period as recommended by the manufacturer. The crane shall be given a run-in test and all controls operated a sufficient number of times to ascertain that the components and mechanisms actuated by the controls operated promptly, fully, and without restriction or malfunction. Test for capacity loads specified in 4.4.1 shall be conducted.

4.6 Packaging inspection. The inspection of the packaging requirements shall be in accordance with Paragraph 5.1.

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5. PACKAGING

5.1 Preservation, packing, and marking. Preservation, packing, and marking shall be in accordance with MIL-C-3580 unless otherwise specified (see 6.1).

6. NOTES

6.1 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Size of crane desired (see 1.2).
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. When a first article is required for inspection and approval (see 3.1, 4.2.1, and 6.3).
- e. Crane lifting capacities, with or without outriggers, of specified radii, and boom lengths required (see 3.8.1).
- f. When hydraulically extended and retracted boom lengths may be manually, automatically synchronized, and/or power pinned are required (see 3.9.2).
- g. When an auxiliary boom point sheave is required (see 3.9.2).
- h. When an auxiliary winch, size, capacity and attachments are required (see 3.9.8).
- i. When piledriving attachments are required (see 3.9.9).
- j. When high flotation type tires are required (see 3.12.3).
- k. When front mounted carrier winch is required (see 3.12.8).
- l. When pintle is required (see 3.12.9).
- m. Pintle type and pintle towing capacity required (see 3.12.9).
- n. When lifting and tiedown attachments are required (see 3.13).
- o. Color of finish coat required (see 3.18).
- p. When service and adjustment is not required (see 3.19).
- q. When a preproduction pack is required and the time frame required for submission of the preproduction pack (see 4.2.1 and 4.6).
- r. Level of preservation and level of packing required (see 5.1).

6.2 Subject Key Word Listing.

- | | |
|-------------------|------------------------|
| a. Rough Terrain | d. Compact |
| b. Extension Boom | e. Power Load Lowering |
| c. Multi Size | |

6.3 First article. When a first article inspection is required, the item will be tested and should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.2.1 and 6.1. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

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Custodian:
Navy - YD

Preparing Activity:
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(Project 3810-0110)

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.