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MIL-T-40629B
3 Ocotber 1985
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MIL-T-40629A
17 March 1976

MILITARY SPECIFICATION

TRUCK, FORK, REACHING AND TIERING,

CONTINUOUS DUTY, NARROW AISLE, ELECTRIC, NON PALLET STRADDLING

SHIPBOARD

GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense

1. SCOPE

1.1 Scope. This specification covers heavy duty, standup rider, end control, non pallet straddling, battery powered, telescopic mast, shipboard, reach type trucks, the load capacity of which is rated at 24 inches from the front face of the forks. Trucks are for shipboard applications. Capacities and dimensions shall be as shown on the military specification slash sheet.

2. APPLICABLE DOCUMENTS.

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Navy Ships Parts Control Center, Post Office Box 2020, Attention: Code 0302, Mechanicsburg, PA 17055 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 3930

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SPECIFICATIONS

Federal

O-E-915 - Extinguisher, Fire, Dry-Chemical, Portable.

W-B-133 - Batteries, Storage (Lead-Acid, Industrial for Cycle Service).

GG-P-455 - Plates and Foils, Photographic (Photosensitive Anodized Aluminum).

TT-E-489 - Enamel, Alkyd, Gloss (for Exterior or Interior Surfaces).

Military

MIL-V-173 - Varnish, Moisture-and-Fungus-Resistant (for the Treatment of Communication, Electronic, and Associated Electrical Equipment).

MIL-P-514 - Plates, Identification, Instruction, and Marking, Blank.

MIL-S-901 - Shock Tests, H.I. (High Impact); Shipboard Machinery, Equipment, and Systems, Requirements For.

MIL-C-1283 - Can, Gasoline, Military, 5-Gallon.

MIL-L-2104 - Lubricating Oil, Internal Combustion Engine, Heavy Duty.

MIL-G-3859 - Grease Guns, Hand-Operated, Lever, Push and Screw Type.

MIL-M-3971 - Meter, Time Totalizing, Non-Hermetically Sealed, Electric, AC and DC.

MIL-W-5044 - Walkway, Coating and Matting, Nonslip, Aircraft.

MIL-F-22191 - Films, Transparent, Flexible, Heat Sealed, For Packaging Applications.

MIL-L-46167 - Lubricating Oil, Internal Combustion Engine, Arctic.

MIL-F-52723 - Filter Element, Hydraulic, Disposable.

MILITARY HANDBOOK-267 (SH) - Guide for Selection of Lubricants and Hydraulic Fluids for use in Shipboard Equipment.

STANDARDS

Federal

FED. STD. No. 595 - Colors

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Military

MIL-STD-129 - Marking for Shipment and Storage.

MIL-STD-130 - Identification Marking of U.S. Military Property.

MIL-STD-162 - Preparation for Delivery of Warehouse Materials Handling Equipment for Domestic and Overseas Shipment and Storage.

MIL-STD-209 - Slinging Eyes and Attachments for Lifting and Tying Down Military Equipment.

MIL-STD-461 - Electromagnetic Interference Characteristics Requirements for Equipment.

MIL-STD-810 - Environmental Test Methods.

MIL-STD-889 - Dissimilar Metals.

MIL-STD-1472 - Human Engineering Design Criteria For Military Systems, Equipment and Facilities.

MS-15367 - Battery, Storage, for Electric Powered Industrial Trucks and Tractors.

MS-16966 - Tire, Cushion, Permissible Sizes and Loading.

MS-16967 - Tire, Solid, Permissible Sizes and Loading.

NAVSEA Drawing D-80064-610-2253346
NAVSEA Drawing 53711-804-5184188

(Copies of specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitations for bids or request for proposals shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE

Safety Standard For Powered Industrial Trucks (ANSI B56.1) and (ANSI B56.2)

Load Handling Symbols for Powered Industrial Trucks (MH 11.3).
Forks and Fork Carriers for Powered Industrial Trucks (MH 11.4).
Methods for Calibration of Liquid Automatic Particle Counters (ANSI B93.28).

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

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DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION 29 CFR, Chapter XVII, Part 1910.

Occupational Safety and Health Standards

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS

Standard B633

(Application for copies should be addressed to: American Society for Testing and Materials, 1961 Race Street, Philadelplhia, PA 19103).

NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NEMA Standards

(Application for copies should be addressed to the National Electrical Manufacturers Association, 155 East 44th Street, New York, New York 10017).

SOCIETY OF AUTOMOTIVE ENGINEERS, INC.
SAE Handbook

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

UNDERWRITERS LABORATORIES, INC.
Standard for Electric-Battery-Powered Industrial Trucks (UL 583).

(Application for copies should be addressed to: Underwriters' Laboratories, Inc. 1285 Walt Whitman Road, Melville, Long Island, New York 11746; 207 East Ohio Street, Chicago. Illinois 60611; or 1655 Scott Boulevard, Santa Clara, California 95050).

3. REQUIREMENTS

3.1 Description. The truck shall be an electric motor driven, two wheel drive, rear wheel steer, stand-up narrow aisle, reach and tier fork lift truck. Truck requirements shall be as specified herein and in accordance with the specification sheet.

3.1.1 First article (first produced truck). The supplier shall furnish one or more trucks as specified (see 6.2) for examination and testing within the time frame specified (see 6.2) to prove that his production methods and choice of design detail will produce trucks that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4, shall

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be contractor responsibility and shall be subject to surveillance and approval by the Government. The approved first produced truck may be presented as the last unit for delivery under the contract after being rehabilitated to new condition. (see 6.3)

3.1.1.1 Minimum Quality Assurance Requirements. The Supplier shall furnish one truck for minimum inspection and testing requirements at the suppliers facility within the time frame specified (see 6.2) when a First Article (First Produced Truck) is not specified (see 6.2) to prove that essential shipboard requirements have been met. Inspection and tests shall be as specified in section 4 and shall be subject to surveillance and approval by the Government. Supporting test data and Inspection documentation shall be subject to approval by Navy Ships Parts Control Center, Code 0302.

3.1.2 Material. Material shall be as specified herein. Materials not specified shall be selected by the supplier and shall be subject to all provisions of this specification. All piston rods, shafts, axles, chains, keys, pins, and other components which must be movable or subject to relative movement during any use of the truck, or which must be removed for service or repair of the truck or its components, shall exhibit no evidence of malfunction or damage due to stress, component/metal fatigue, overcurrent or heat and normal wear including damage or malfunction due to corrosion when tested in accordance with Section 4. Minor corrosion affecting only appearance shall not be sufficient cause for rejection.

3.1.2.1 Dissimilar metals. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals and methods of protecting them are defined and described in MIL-STD-889.

3.1.2.2 Plating. All threaded fasteners required to fabricate the truck, except those in contact with oils in reservoirs and those inside components which are corrosion resisting, shall be zinc plated or made of an appropriate type of corrosion resisting material. Washers and cotter pins shall be zinc plated in accordance with American Society of Testing Materials Standard B633, except those in contact with oils in reservoirs and those inside components which are corrosion resisting.

3.1.3 Design. The trucks shall be designed for the specified rated load at the specified load center with the forks at the specified maximum fork height and fork extension. Design of truck covered by this specification and all components therein shall insure safe operation when operated as specified herein. There shall be no evidence of accelerated wear, failures or permanent deformation when operated as specified herein. There shall be no exposed bolts, clamps, gages, fittings, lifting parts, or appendages that can be caught or hooked while the truck is working in a confined space. Maximum weight of truck shall be as specified on the applicable specification sheet.

3.1.3.1 Operating temperature. Trucks shall be designed to operate in a nominal ambient temperature of 0°F-115° range.

3.1.3.2 Safety. The truck shall conform to the requirements of ANSI B56.1 and UL583, with OSHA Standards 29CFR Chapter XVII, Part 1910 and as specified herein.

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3.1.3.2.1 Certification. Trucks shall bear U. L. or an independent testing laboratory stamp of approval for Type EE. In addition, the contractor shall submit to the contracting officer or his authorized representative satisfactory evidence that the trucks furnished under this specification meet other requirements of 3.1.3.2. Acceptable evidence of meeting these other requirements shall be certified test reports from recognized independent testing laboratories acceptable to the Government, indicating that the trucks conform to the requirements of 3.1.3.2.

3.1.3.3 Bearings. Unless otherwise specified herein, rotating parts shall be mounted on sealed ball, roller or tapered bearings.

3.1.3.4 Lubrication. All surfaces requiring lubrication shall be provided with a suitable means for lubricating except where sealed bearings are used.

3.1.3.4.1 Lubricants. The truck shall operate as specified herein when lubricated with lubricants listed in MIL-HDBK-267(SH).

3.1.3.4.2 Lubrication fittings. Lubrication fittings shall conform to SAE J534. Fittings shall be located in a protected position and shall be accessible to a hand-operated grease gun conforming to MIL-G-3859 with a 10-inch flexible extension. Accessibility to fittings shall be provided without the removal or adjustment of accessories or parts.

3.1.3.4.3 Lubrication seals. All lubrication seals shall be properly sized and seated to prevent leakage of lubricant through or around positioned seals.

3.1.3.5 Screw threads. Screw threads shall be in accordance with National Bureau of Standards Handbook H28.

3.1.3.6 Maintainability. Use of hand tools shall not be required to check reservoir levels. Provision shall be made for ready adjustment, servicing, and replacement of all electrical assemblies and components, battery, wearing parts of lift and tilt mechanism, brakes and components, wearing parts of steering assembly, tires, wheels, lights, and horn, without the removal of any major parts other than covers. If hand access openings are used on the exterior of the truck, the edges of each opening shall be smooth and shall be provided with a removable or hinged cover, whenever it is required. Dimensions of access openings shall be in accordance with SAE J925 for bare hand or normally clothed man. There shall be no interference with the servicing or draining of oils and lubricants to or from any assembly or components by frame members or other obstructions, and without requiring the use of flexible connections, except as specified in 3.1.3.4.2, or other special devices. Drain holes with removable drain plugs shall provide for complete drainage without disconnection of hoses. Compliance with specific maintenance requirement for the equipment shall be timed in accordance with Section 4. Unless otherwise specified all special hand tools required for maintenance of the truck shall be provided and shipped with each truck procured. The truck shall be designed so as not to require preventive maintenance or repair services at intervals shorter than 2000 laps when tested as specified herein except for servicing truck batteries and removing foreign matter from tire threads. Reservoir level checks are not considered scheduled maintenance. The ratio of man hours of scheduled and unscheduled maintenance required to the hours of operation performed shall not exceed .08.

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3.1.3.6.1 Maintenance operations. Unless otherwise specified herein, each operation in the following maintenance operations list shall be accomplished by one man in not more than the time specified, using common tools and special tools, if any, furnished with the truck.

Maintenance Operation (Time in Minutes)	Time
a. Remove and Replace Drive Motor Brushes	90
b. Remove and Replace Hydraulic Pump Motor Brushes	90
c. Remove and Replace Steer Motor Brushes	90
d. Remove and Replace all Contactor Tips	90
e. Remove and Replace all Filters, Screens and Strainers in Hydraulic System	105
f. Bleed and Adjust Brakes and Refill Master Cylinder (2 men)	45

3.1.3.7 Lubrication system. A lubrication system described as follows shall be provided. It shall include:

(a) A system for lubrication of all points that require service at intervals of not less than 2000 laps when tested as specified herein.

(b) A system not requiring pumping, metering device, or electrical controls. The system shall be limited to the extension of individual lubrication points; the design of joints, bearings and seals to withstand the prolonged lubrication cycle; and accessibility to lubrication points. Neither shall it be necessary to remove the battery for access to lubrication points.

(c) All necessary lubrication points capable of being serviced with the truck at rest in normal mode on a level, shipboard level deck/suface exceptions: procedure may incorporate operation of the mast or carriage assembly and movement of steering mechanism.

(d) It shall not be necessary to remove components or assemblies to accomplish lubrication or addition of or checking fluids.

(e) Each point requiring lubrication shall be lubricated separately. Non-accessible lubrication points may be extended by flexible or rigid metal lines or hoses as necessary to points of access. However, all lubrication system parts, separately and in aggregate, shall be constructed and located so that operational capability of the end item will not be degraded.

(f) The location of hoses, lines and lubrication points to the outline of the truck shall provide for protection of hoses and lines from sagging, dragging, or entanglement with foreign objects during operation or to prevent chafing, stretching and crimping during opening of covers or doors.

3.1.4 Certificates of compliance. Upon request, a certificate of compliance with the requirements of this specification shall be furnished. Back-up data to support the certificate of compliance may be requested by the

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contracting officer for review. The certificate of compliance shall read as follows:

This certifies that the _____(component, part or assembly) complies with all provisions and requirements of Specification _____ Paragraph _____. The certificates shall be signed by a duly authorized agent of the contractor.

3.1.5 Electrical equipment.

3.1.5.1 Resistors. Resistors shall not be used in series with the motor armature for speed control. Speed control shall be effected by the application of a system as specified in 3.2.1.3. Low resistance shunts across field coils may be used to increase top speed of the motor. Such resistors as are necessary in the control circuit network shall be continuous-duty types of a power rating value sufficient to withstand all tests required by this specification.

3.1.5.2 Enclosure and shields. Trucks shall comply with the requirements of UL 583 except motor enclosures in minimum 115°F ambient shall not exceed 250°F when subjected to any test specified herein. All electrical components except motors shall be located in sealed waterproof panels. All cables, wiring and controls passing through panels shall be provided with grommets which exclude water. Gaskets shall be heat and weather resistant and shall extend around entire periphery of the enclosure.

3.1.5.3 Overcurrent devices. In addition to the requirements of 3.1.3.2, overcurrent devices shall be provided on each power and each control circuit. Power circuits shall be fused in both positive and negative circuits.

3.1.5.4 Heat-producing devices. The outside surface temperature of heat-producing devices shall stabilize at temperatures allowed by UL 583 when truck is operating with rated capacity continuously in the speed which creates the most heat, except that temperatures shall not exceed 250°F.

3.1.5.5 Static tires. Truck shall be equipped with static tires on the steer wheels to discharge static electricity through contact with the deck surface. The electrical resistance between truck chassis and the deck through the static discharge device shall not exceed 250,000 ohms when tested in accordance with 4.3.2.18 or the tires shall be Underwriters' Laboratories approved. Where UL approval is granted, test of 4.3.2.18 shall be waived.

3.1.5.6 Panels. All electrical components shall be located in panels except motors. The control panel shall be designed for easy removal as a unit or front removal of electrical assemblies mounted thereon. Mounting studs, bolts, or nuts, shall be so secured that they will not turn or become loose when an assembly is removed from the panel. Panel covers shall be unobstructed to permit removal of the covers for inspection and servicing without removal of any major part or interference from truck structure. Panels shall be provided with 1/2 inch wide rubber gasketing and shall be sealed water tight. Panels shall be equipped with well fitted covers and quick disconnect fasteners providing adequate secureness. Temperature of any component in the panel shall not exceed 250°F when truck is operated in 115°F ambient.

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3.1.5.7 Conductors. Conductors and enclosures shall comply with all requirements of UL 583. All wiring shall be color or number coded (printed on the wire insulation) and the identification scheme shall be included on the electric diagram. Conductors shall be located within the truck frame and body, in conjunction with suitable designed noncombustible shielding, to provide mechanical protection from damage. All wiring which is subject to damage by moving components of the truck or when maneuvering the truck shall be in rigid metal conduit, except that flexible metal conduit may be used at flexure areas; similar protection shall be provided for exposed wiring runs in operator's platform area.. Wherever flexible metal conduit contacts metallic edges, such as the truck frame, metallic edges shall be rounded to prevent chafing of the conduit. Conductors passing through compartment walls or other metal barriers shall have rubber, plastic or insulated metalic type bushings, or other protective material, and shall be securely anchored to prevent movement, exclude moisture and protect conductors relative to the opening. All terminal connectors shall be fastened with spring lock washers, lock nuts, or provided with other means of preventing accidental loosening as a result of vibration or unintentional movement of wire terminal ends. Terminal connections to motors shall be provided with rubber boots.

3.2 Propulsion and hydraulic systems.

3.2.1 Motor and motor accessories.

3.2.1.1 Motors. Traction motors shall be industrial type, with a high starting torque, designed for efficient operation on 24 direct current voltage. Motors shall be capable of withstanding the stresses and current loads induced by test as required by this specification. The resultant strains and temperature rise shall not cause failure of any component part or excessive pitting other than normal discoloration of the commutators. The hydraulic pump motor and steering pump motor, shall successfully withstand the stresses and current loads induced by tests required by this specification. Trucks shall be provided with one or more thermal relay switches which shall cause disconnection of battery power to the affected circuit before the outside surface temperature of the motor(s) exceed limits as specified in 3.1.5.4. Thermal relays shall be located in critical heat areas and shall interrupt the current only to the over-heated circuit.

3.2.1.2 Insulation. Insulation for motors shall be Class B, F or H as defined in NEMA Standards except the insulation shall not contain silicone materials. Silicone material in any form shall not be used in the motor. The electrical and mechanical properties of the insulated windings shall not be impaired by the application of the temperature permitted for the class insulation used (the word "impaired" is here used in the same sense of causing any change which could disqualify the insulating material for continuous service).

3.2.1.3 Speed controller. Attention is directed to paragraph 3.15.2 requiring waterproof sealing of this component. Speed control shall be solid state type. The control shall be of heavy duty design for continuous truck use and shall not incur failure or damage when the truck is tested in accordance with section 4. The controllers shall provide means to permit precision maneuvering in restricted areas. It shall provide stepless acceleration over 85% of the travel speed range in both the forward and reverse directions, shall

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have automatic electrical interlocks to prevent starting except in low speed and a neutral position. It shall provide automatic means of dynamic braking to limit the plugging when the controller is reversed with the truck in motion. A fail safe equalizing contactor shall be provided for the dual drive motor circuit. All contactors on the truck shall be designed for operation on 24 volts direct current and shall have easily replaceable tips of copper or silver alloy composition. Replacement of contactor tips shall be accomplished by use of hand tools only. There shall be no evidence of failure in any part of the controller when the truck undergoes tests specified herein. Controllers shall automatically return to neutral position under any of the following conditions: (a) upon release of control; (b) upon release of deadman brake pedal. Resistors shall not be used in the speed control circuit. (Refer to 3.1.5.1).

3.2.1.4 Safety cutout system. Release of deadman brake shall interrupt all power to the traction motors when the operator leaves the truck. In order to insure that no current is flowing when the connector is being disconnected on the truck, a magnetic contactor shall be installed in one of the two main power lines from the battery switches in series, either of which shall cause the contactor to open and disconnect all power. The first switch shall be the deadman switch.

3.2.2 Battery and battery accessories. Battery size and capacity for truck shall be governed by MS-15367. Battery shall conform to WB 133c, the specification sheet and ordering data. Battery shall have hinged cover, battery leads shall be equipped with a two-contact, type EC locking half connector that is used to connect with electric motor through mounting half or to connect to battery charger with charging half. The length of leads shall be 18 inches. The battery, battery leads, and connectors shall be shielded or modified as necessary to assure that the battery as a component of the truck when drawing maximum current (lifting and traveling simultaneously) shall comply with 3.9 as applicable. Where the battery leads penetrate the battery compartment a rubber or plastic grommet with retainer shall be installed to prevent abrasion of chaffing of the battery leads. The battery for the first produced truck used for testing by the contractor shall be shipped in a wet and charged condition after the exterior of the battery has been rehabilitated to a "like new" appearance. Battery shall be installed in truck for shipment. Battery lift points shall be compatible with strong back NAVSEA Drawing D-80064-610-22533446.

3.2.3 Battery connector. Truck shall be equipped with Standard EC mounting half connectors, suitably located to fit the locking half as specified in 3.2.2. A locking disconnect device shall be provided to disconnect all power from the battery. The device shall be conveniently located so that it can be readily actuated by the operator without leaving the compartment. Battery connectors shall be fastened to truck with bolts and not welded. Charging connectors shall be so arranged that the truck cannot be operated while truck is connected to the charging source. Battery leads shall be no smaller than No. 00 AWG.

3.2.3.1 Battery installation. Battery well dimensions shall be determined from batteries specified in 3.2.2. Battery clearance shall comply with the requirements of UL 583. The well shall be constructed to permit quick inspection and servicing of battery using simple hand tools as well as easy battery removal. Effective means shall be provided to secure battery in place

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and prevent lateral movement of more than one-half inch. The securing device shall be attached so that it can be easily removed with the use of hand tools. The battery well shall permit removal or installation of the battery from either side or top of the truck. The underside of the battery cover shall be lined with a sheet of 1/4 inch plywood finished with not less than three coats of asphalt paint, or equivalent insulating material. The inside of the battery well shall be finished with an acid resistant paint to resist deterioration through normal contact with electrolyte. Easy access to the top of the battery shall be provided by a hinged cover with latch capable of being opened and latched open at least 90 degrees from the closed position.

3.2.4 Drive unit. Truck shall have totally enclosed all gear dual drive units (two wheel drive) operating in a constant oil bath. The motor reduction units and drive wheel assemblies shall be of integral design and shall revolve on hardened and ground antifriction bearings. Drive gear housings shall be equipped with filler and magnetic drain plugs, readily accessible for servicing without removing other components. Except for worm gears, each gear, shaft and axle shall be heat-treated alloy steel. The drive shall be a gear reduction unit directly connected to the driving motor(s).

3.2.5 Hydraulic system. The hydraulic system shall consist of all hydraulic components necessary for operation of the forks and mast and does not include brake and steering system components. The system shall have a maximum working pressure (relief valve setting) not in excess of 2500 psi. Oil for the system shall conform to MIL-L-2104, Grade 10 or MIL-L-46167. All hydraulic component materials shall be compatible with these oils. Unless otherwise specified herein, all system components which are subject to full system pressure shall withstand a proof pressure that is equal to or greater than 1-1/2 times the maximum working pressure (1-1/2 times relief valve setting) without external leakage, damage, or permanent deformation. Unless otherwise specified herein, all hydraulic system components which are subject to full system pressure shall have a minimum burst pressure that is equal to or greater than two times the system relief valve setting. Hydraulic fittings on pumps, valves, and cylinders shall be the O-ring straight thread type as specified in SAE J514 for ports 3/4 inch and smaller, and 4-bolt flanged type as specified in SAE J518 for ports larger than 3/4 inch. The hydraulic system shall be cleaned free of foreign matter including weld slag and spatter. Hydraulic connection ports of the hydraulic system components shall be sealed by the component manufacturer. The system shall provide for lowering of rated load at the rate specified in 3.6.1 in the event of failure of or damage to hydraulic hose supplying the lift cylinder. A pipe tap or straight thread O-ring boss test point shall be located at the outlet of each steering pump or pressure inlet of each control valve for measuring pressure.

3.2.5.1 Hydraulic lines. Hydraulic lines shall consist of stainless steel tubing, or hose as listed below and fittings. All lines shall be routed to provide the shortest line, minimum number of bends, ease of maintenance and maximum protection. Provision shall be made to prevent damage of lines due to chafing. The hose installation, such as angle of fittings and location, shall cause no stress concentration on the hose at the fitting, and the hose shall be supported, when necessary, to eliminate sagging at the fitting. All lines other than suction lines, return lines, and cylinder bleeder lines shall be considered pressure lines.

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3.2.5.1.1 Pressure hose assemblies. Pressure hose shall be as specified in SAE J517, except 100R7 type hose is not acceptable, and worm gear and spring clamps are unacceptable. Permanently attached type pressure hose couplings are acceptable as original equipment hose assemblies. Field attachable reusable fittings shall be compatible with the truck design such that they will replace each permanently attached coupling, and the replacement hose assembly shall fit in place of the original hose. All fittings shall be either 37-degree flare, female swivel or 4-bolt split flange as specified in SAE J516. Hose I. D. shall be limited to 1/4, 5/16, 3/8, 1/2, 3/4, 1, 1-1/4, 1-1/2, and 2 inches. The hose selected shall have a working pressure which is equal to or greater than the hydraulic system maximum relief valve setting. The hose installation shall not cause the hose to be bent beyond the minimum bend radius specified in SAE J517.

3.2.5.1.2 Pressure tubing. Pressure tubing shall be in accordance with SAE J524 or SAE J525 and shall meet the requirements specified herein. Pressure tube sizes shall be limited to 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 1, 1-1/4, 1-1/2, and 2 inches. Tubing shall have a minimum burst pressure that is equal to or greater than 3.5 times the system maximum working pressure. Tubing shall be clamped by cushioned, threaded fasteners spaced at intervals of not more than 24 inches and within 6 inches on each side of structure which it penetrates. All bends shall be smooth without flattening, kinking, or wrinkling of the tube. The term "without flattening" is defined as follows:

"Throughout the bend, the tube maximum diameter shall be equal to or greater than the tube nominal diameter, and the tube maximum diameter minus the tube minimum diameter shall be not greater than 15 percent of the tube nominal diameter."

3.2.5.1.3 Pressure tube fittings. Unless otherwise specified herein, pressure tube fittings shall be 37-degree flare or "O" ring boss conforming to SAE J514 or 4-bolt split flange conforming to SAE J518. Jump size tees may be used. Four-bolt split flange connections may terminate in either a flange head that incorporates a SAE J518 mating face or a flange head that integrally incorporates 4-bolt holes and an "O" ring groove for mating to a SAE J518 port face. Pressure tube fittings that incorporate the SAE J518 connection shall contain a boss into which the tube shall be brazed or welded. Pressure tube fitting sizes shall be limited to 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 1, 1-1/4, 1-1/2, and 2 inches. Pressure tube fittings shall have a minimum burst pressure that is equal to or greater than 3.5 times the maximum system working pressure.

3.2.5.1.4 Suction return and cylinder bleed lines. The pump suction line (pump inlet line) shall include provision for flexibility when there is vibration or movement between the reservoir and the pump. The suction line shall be sized so that the minimum pump inlet pressure does not fall below atmosphere by more than 5 inches of mercury at 150 degrees F, plus or minus 10 degrees F, oil temperature. The suction line installation shall include no stress concentration at the end fittings and no kinks. Suction return and cylinder bleed lines shall conform to SAE J517, 100R4 or shall be oil resistant hose. The suction line assembly shall be capable of withstanding a minimum of 25 inches of mercury vacuum without evidence of leakage or collapse. Suction hose clamps shall be of the double wrap stainless steel type in accordance with SAE J536, Type F, Style 1, 2, or 4.

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3.2.5.2 Hydraulic pump(s). The hydraulic pump(s) shall be directly driven by an electric motor independent of the drive motor. The hydraulic pump(s) shall withstand a minimum proof pressure of 1-1/2 times the maximum system working pressure without permanent deformation, damage, or external leakage.

3.2.5.3 System filtration. A system filter shall be furnished in the return line as specified in 3.2.5.3.1.

3.2.5.3.1 Return line filter. The system filter element shall conform to MIL-F-52723. The filter shall maintain a full flow condition for the duration of reliability testing as specified in 4.3.2.33. The filter bypass may open for system oil at a temperature less than 70 degrees F. The filter element shall have been tested to the requirements of MIL-F-52723 at a flow rate equal to or greater than the truck's maximum system oil flow. All return oil shall pass through the filter except relief oil which may return directly to the reservoir. The filter shall be located so that the element may be removed for examination or replacement without spilling or draining oil from the reservoir. At the maximum system oil flow through the filter, including lowering rated load on the forks and an oil temperature of 150 degrees F, plus or minus 5 degrees F, the pressure drop across a new filter assembly shall not exceed 10 psi. An automatic bypass shall be provided in the filter and shall open at not less than 10 psi greater than pressure drop measured across new filter assembly and shall permit full flow at a pressure not greater than 35 psi. The filter housing shall have a minimum proof pressure of 100 psi without permanent deformation, damage, or leakage. The filter shall be equipped with a contamination indicator which may be remotely mounted. The indicator shall be clearly readable without the removal of any components. As a minimum, the indicator shall show when the element is clean and when the filter is beginning to bypass, requiring a change of the element.

3.2.5.4 Reservoir. A reservoir shall be furnished to contain the hydraulic system oil. The reservoir shall include a filler opening, screen, cap, dip stick and other items required to function as specified herein. The dip stick shall be accessible without the use of hand tools. The reservoir shall be rigidly mounted to prevent vibrations that could result in leaks, loosening of fasteners, brinelling of material, or cracks. The location shall not impair operator's visibility or access to either side of the operator's compartment or or operation of foot controls. The reservoir shall have sufficient capacity to prevent air entering the system with all hydraulic pistons fully extended and sufficient free air capacity to prevent oil being discharged through the reservoir air vent when maximum return flow of oil is surged into the reservoir from the system. The "Add" and "Full" marks on the dipstick shall indicate the correct oil level when the truck is on level deck, the mast is vertical, and the forks are at deck level. The filler cap and tube shall be located to provide for filling from a standard 5-gallon container conforming to MIL-C-1283 and to prevent entrance of contaminants throughout filling and checking operations. The filler tube shall be not less than 1 inch inside diameter. The reservoir pump suction openings shall be located a minimum of 3/8 inch above the bottom of the reservoir to prevent entrance of settled contaminants. Except for sealed reservoirs, a breather with a maximum rating of 15 micron nominal shall be provided and shall filter incoming air. The breather shall preclude the entrance of water induced by rain. All return line flow except vent line shall discharge into the reservoir at a level which is below the oil level in the reservoir when the lift cylinder is at maximum extension. The

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reservoir filler neck shall contain a removable 50 mesh strainer retained in place unless all oil added to the reservoir is filtered by an equal or finer filter prior to passing through the pump. The reservoir shall have one or more accesses for manual cleaning of the entire inside or be removable for cleaning. A removable strainer, 50 mesh minimum, shall be installed in the suction line between the reservoir and the pump. Two or more thermal switches shall be installed in different critical heat areas on the same hydraulic reservoir and each one, separately, shall cause disconnection of the pump motor(s) before the temperature rises above that specified in 3.1.5.4.

3.2.5.5 Hydraulic control valves. Mounting of the valves shall be rigid and shall permit no vibration that may cause instability of the controls. All control-valve spools shall be spring centered with sufficient force to return the levers to the center position and retain them there throughout all operations. Valve spools exposed to dirt and moisture shall be provided with wipers and seals. Spools shall not bind under any operating conditions specified herein.

3.2.5.6 Cylinders. All hydraulic system and steering cylinders shall be fabricated from either seamless steel tubing or welded and redrawn tubing. All welding and brazing to the cylinder within the zone of piston operation shall be done prior to final machine honing or rolling of the cylinder. Cylinders shall be so located as to provide for ease of maintenance and replacement. All internal cylinder ports shall be located beyond the area of piston travel. Each cylinder shall have wiper-rings to prevent foreign material and fluids from entering around the piston rod and damaging the seal and other cylinder components. The rod shall be hard chrome plated to prevent corrosion. After plating, maximum rod surface roughness shall not exceed 32 micro-inches. All hydraulic system and steering cylinders shall withstand a pressure that is equal to 1.5 times the system relief valve setting without evidence of rupture, permanent deformation, damage, or external leakage. The bearing surface shall be of a material that will not scar, score, or gall the inside surface of the cylinder or the cylinder rod.

3.2.5.7 Hose reels. Sheave wheels, guide rollers, guide blocks, or other means shall be provided to prevent the hose from becoming entangled around and riding over the reels or reel flanges. Hose reels shall be mounted such that they are within the plan outline of the truck for all positions of the forks and shall be provided with lubrication fittings.

3.2.5.8 Contamination levels for hydraulic system. When the hydraulic system is tested as specified in 4.3.2.35, particle counts shall not exceed 1000 particles per milliliter greater than 10 micrometers, and particle counts shall not exceed 10 particles per milliliter greater than 20 micrometers.

3.3 Structure.

3.3.1 Chassis and frame. Uprights shall be provided with mast rollers with anti-friction canted bearings to ensure minimum friction between telescopic sections and main frame supports. The frame and related structure shall be fabricated from steel and steel castings at least equal to the size and design of manufacturer's normal commercial frame members and shall be capable of withstanding 300 percent of rated load without permanent deformation. Frame members, bracings, and all their joints shall provide a rigid unit structure.

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The frame and related structure shall have sufficient depth to afford protection for working parts and shall be capable of withstanding, without permanent deformation, stresses induced by capacity loads and tests in Section 4. Unless otherwise specified (see 6.2), the complete frame structure shall be tested as outlined in 4.3.2.29. The width of the truck shall not exceed the dimension specified on the applicable specification sheet. Refer to paragraph 3.6.11 for underclearance requirements.

3.3.1.1 Uprights and carriage assembly. Uprights shall be of the telescopic roller bearing type. Rollers shall be of the permanently lubricated for life type. Uprights shall be positioned in such a manner that the back surface of the lower fork mounting plate or cross bars in the vicinity of the tires are located forward of the vertical plane tangent with the front face of the drive tires. The lift cylinder shall be mounted and positioned so that it does not protrude forward of the plan outline of the uprights. Chains shall be installed in such a manner that they can not be displaced from the roller until they have been raised a minimum of 3/8 inch. Cross members of the mast structure, when in a lowered position, shall not interfere with the operator's horizontal line of sight plus or minus 10 degrees to the front of the truck. The operator shall be able to see the tip of at least one fork at any lift height without leaving the operating position and when there is no load on the forks. The lift shall be hydraulically actuated, with the upper portion automatically lifting as the load is raised above the "free lift" position. Adequate means shall be provided in the uprights to compensate by replacement or adjustment for wear which may develop between lateral rolling contacts without disassembly of the mast. Positive means shall be provided to prevent overtravel of the carriage or channel in both upper and lower positions. Chains used in the lifting mechanism shall be a listed ANSI Standard and shall have a factor of safety of not less than 4.6 to 1 based on average ultimate strength. The upright lift arrangement shall be designed to control premature elevation of an intermediate section during raising or "hanging up" of these sections during lowering. If multiple chains are used to support the load, an equalizer shall be provided to distribute the load.

3.3.1.2 Forks. The forks and fork carrier shall conform to ANSI MH 11.4 and the applicable specification sheet. A cutout shall be provided in the fork carrier so that the lower hook of the fork will fit through the slot and each fork shall be removable without removing the load backrest. Fork thickness shall not exceed 1/2 inch at the tips and the end taper shall be not less than 14 inches long. Taper shall be on the underside of the forks. The dimensions and spacing adjustment shall be measured between outer edges of the forks. The top of the fork tips shall be chamfered or rounded to break corners and provide smooth edges. The fork carrier shall be free of obstruction to allow the forks to slide over the entire width of the carrier. Forks shall be adjustable laterally without the use of hand tools. Each fork arm shall be stamped with its rated capacity in a location clearily discernible and not subject to wear. Forks for trucks shall show no evidence of cracks or failure when inspected in accordance with Test Method No. 11. Except the forks on first produced truck, certification from fork vendor will be acceptable. The lifting surfaces of the forks shall not exceed 2 1/4 inches from the deck in the lowest position.

3.3.1.3 Outriggers. Outriggers shall be fabricated from steel plate or bar steel formed to shape as an integral part of the frame to provide a rigid structure, and shall be capable of withstanding without permanent deformation,

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all stresses induced by tests outlined in section 4. Overall height of outrigger shall not exceed 6 inches when truck is empty, and overall width of the outriggers shall not exceed 42 1/2 inches maximum. Each outrigger shall be provided with two (2) tandem load wheels, and the load wheels shall be of the articulating type in order to assure equal load distribution of each of the load wheels with and without rated load on the truck. Outrigger plates shall protect the top, sides, and front of the load wheels.

3.3.1.4 Reach mechanism. A reach mechanism shall be provided which will permit extension of the forks or fork assembly to a point where the front vertical face of the forks is at least 1/2 inch in front of the forward edge of the load wheels or outrigger to permit handling of loads at deck level that are off center laterally or would otherwise conflict with the outriggers or load wheels. The reach mechanism structure shall be capable of meeting the performance requirements specified herein and shall be sufficiently strong and well braced to prevent racking or twisting that might result in permanent distortion or exceed the elastic limit of any component part. The design shall be particularly well suited to withstand stresses which result from bumping of one fork or one corner of the load against an obstruction. Antifriction bearings or bronze or steel bushings shall be provided for the rollers on the pantograph type extension and the extensible mast reach mechanism. Maximum bearing loading, including safety factors, shall not exceed that recommended by the bearing manufacturer. A mechanical means shall be provided to fully adjust the clearance of the fork tines and reach mechanism (pantograph) assembly from 0 inches to 1 inch plus/minus 1/4 inch (or 0 inches to 3 inches plus/minus 1/4 inch as measured from the deck to top of fork tines). (Minimum lift requirement). This clearance adjustment is required to prevent the base of the reach mechanism from contacting and bending shipboard elevator ramps during unloading/loading operations.

3.3.1.5 Load backrest extension. A metal load backrest extension, (when specified, see 6.2), removable without disturbing any other component, shall be provided. There shall be no protruding bolts or appendages beyond the side plane of the load backrest. The load backrest extension in conjunction with fork and hanger design shall provide a vertical rear guard at least 48 inches high measured from load carrying surfaces of the forks. It shall have width and capacity and strength sufficient to prevent a rated load 48 inches high or less from forcing backrest against the uprights when the mast is at maximum rearward tilt. The rack shall be firmly attached to the lift carriage. Rack design shall not unduly obstruct operator's visibility. The spacing of vertical members shall be no more than 6 inches between members. The backrest shall be capable of withstanding without permanent deformation a horizontal static test load equal to the rated load uniformly distributed over the area, from the top carrying surface of the forks to the top of the backrest for not less than 3 minutes.

3.3.2 Wheels. The truck shall be mounted on flat-faced steel, malleable iron or cast iron wheels, equipped with tapered roller bearings. There shall be two single steer/drive wheels and four load wheels. Wheels, when equipped with new tires, shall clear any part of the truck structure and mast structure by at least 1/4 inch under all conditions of operation. Load wheels shall be protected completely by the outrigger side and top plates. Drive wheels shall not extend beyond maximum truck width.

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3.3.2.1 Tires. The tires shall be conform to sizes with loadings less than permitted on MS-16966 or MS-16967. Drive tires shall be static discharge type conforming to UL583 type "EX". Grounding straps shall not be used. The drive wheel tires shall be of the industrial type with non-directional tread, molded onto a steel band for pressing onto flat faced wheels or shall be molded onto a steel band which is integral with an internal flange for direct bolting onto a driving hub. The drive tires shall be siped, minimum thickness shall be not less than 2 1/8 inches. Tire size for drive wheels shall be not less than 10 1/2 inches outside diameter by 6 inches face. Each drive tire shall provide a minimum of 18 square inches of tire to deck contact area. The load wheels shall be of the polyurethane type not less than 5 inches diameter by 3 1/2 inches face, pressed-on or molded-on.

3.3.3 Steering. Steering shall be accomplished by a horizontal hand steering safety wheel equipped with recessed steering knob for convenient left hand operation. It shall be located to make it unnecessary for any part of the driver's body to project over the plan outline of the truck. Steering wheel shall measure 10 X 15 inches. The steering mechanism shall turn the drive wheel through spur gear reduction, or accepted commercially equivalent reduction device, which shall permit ease of operation. Chains shall not be used in the steering mechanism. A hydraulic steering booster or other power steering shall be provided. The handwheel shall be mounted 40 inches above the upper operator's platform and shall permit the operator to steer with his left hand when facing the load, or with his right hand when facing away from the load. Clockwise turning of the steering wheel shall provide for right turning of the truck in the forward direction (operator facing load). Provision shall be made for precision adjustment to compensate for wear of all major steering parts where required and for lubrication of all friction points by accessible grease fittings or a lubricant reservoir. The reservoir shall be readily accessible for filling and checking lubricant level. Means shall be provided to prevent wheels or tires or steering linkage from contacting any part of truck structure, other than stops, irrespective of obstacle magnitude or cramped steer angle. Spindles and kingpins, if used, shall be of heat treated alloy steel.

3.3.4 Brakes.

3.3.4.1 Service brakes. The service brakes shall be of the hydraulic activated disc type, mounted on the traction motor shafts, countershafts, or drive wheels. The brakes shall be retard, smoothly control, and stop the truck, both with and without load, under all operating conditions specified herein without fade, noise, uneven braking, or malfunction. All brake system components shall be protected from damage or malfunction from deck hazards and shall provide maximum safety, efficiency, and ease of maintenance. Brake cables shall not bind or chafe during operation, the service brake system shall include driver's pedal or treadle, one master cylinder, two (drive) rear-wheel brakes, and all other components required for a complete, matched-brake system based on the gross weight of the truck. Brake foot control shall be covered with a replaceable rubber cover and shall be located for convenient right foot operation. Foot pedal shall be at least 4 inches wide and 6 inches long, installed 4 inches above upper platform floor. Operator shall be able to control the applied braking force within any desired range up to the maximum available braking force. The brake system shall withstand an operator's brake application force of at least 350 pounds at the pedal or treadle without

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yielding. The wheel brake assembly rated torque capacity heat rejection characteristics, and installation shall be in accordance with the recommendations of the wheel brake assembly manufacturer. The fixed assemblies shall be positively indexed to the axle assembly. The orientation of hydraulic wheel cylinders shall permit bleeding of all air in the system through the bleeders. Brake lining for pads shall be of the molded asbestos type intended for heavy duty service and shall be securely bonded or fastened to the brake components. Brake lining shall have at least 80 percent of the total lining rubbing surface in contact with the wearing surface during the service life of the lining. Automatic and manual brake adjustment shall be provided. Automatic adjustment shall maintain correct lining to disc adjustment without looseness or lockup. The automatic adjusters shall be of the guarded or enclosed type, protected from environmental damage or malfunction. Manual brake adjustment mechanisms shall be accessible and shall be adjustable using common handtools. The brake system shall conform to the requirements of ANSI B56.1.

3.3.4.2 Deadman brake. A deadman brake shall be furnished and shall provide for separate actuation by a pedal conveniently located for left foot operation and shall be spring applied when the brake pedal is released. The braking system shall be interlocked with a switch which shall interrupt the electrical current to the traction motors when the deadman brake is actuated and speed control returns to neutral. The control system shall be so designed that when the circuit is broken, it cannot be re-established until speed controller is moved to forward or reverse. The brake pedal, when depressed to fully release the brake, shall be in a horizontal position and flush with the top of the operator's platforms. Brake pedals shall be provided with rubber covering and shall be at least 4 1/2 inches wide and 11 inches long. Deadman brake shall be installed on both operator's platforms. Force required to hold the pedal fully depressed shall not exceed 20 pounds.

3.3.4.3 Parking brake. A hand operated parking brake with locking device shall be provided. The parking brake shall be independent mechanical friction brakes mounted on both drive motors. This control shall be located within easy reach of the operator and in a position permitting easy and safe movement on and off the vehicle from either side. If hand lever is of the ratchet type, the ratchet and pawl shall be of heat treated steel. Adjustment of parking brake shoes or band shall be accomplished without the removal of any major assembly other than tires and wheels. This adjustment shall provide positive means to prevent loss of adjustment through inadvertent disengagement of adjusting device. Cables shall be corrosion resisting.

3.3.5 Body. The truck body shall be constructed of steel sheet or plate. The truck body shall completely cover the drive unit assembly, steering mechanism, and speed controller when these components are not contained inindividual housings. Provision shall be made for immediate and easy access to all working parts requiring inspection and maintenance. If hand openings are provided, the edge of the opening shall be smooth and shall be provided with a removable or hinged cover whenever it is required. Covers shall be secured with quick opening hand operated fasteners. Covers shall have continuous rubber gasketing. Overall width of the truck body, including tiedown fittings and/or lifting eyes, shall be as specified on the specification sheet. Truck width shall allow the performance of all applicable tests specified herein.

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3.3.5.1 Operator's compartment. The operator's compartment shall provide two platform levels. Distance from deck of ship to lowest platform shall be seven inches. Distance from lowest platform to upper platform shall be ten inches and height of operator's compartment shall be fifty inches from deck of ship. Upper platform shall provide a minimum twenty inches wide by forteen inches clear area at all heights. Lower platform shall provide a minimum depth of eleven inches. Tolerance for the preceding dimensions shall be plus or minus one inch. Platform floors shall be steel plate with one quarter inch cemented rubber tread. Design of compartment shall permit operator to stand within plan outline of truck. Means shall be provided for operator to maintain balance when stopping suddenly while backing up, such as a rubber pad or vertical steel plate. Compartment shall have three enclosed sides with unobstructed entrance from the rear. Sharp edges shall be removed from all pedals and plates which can cause injury to the operator. Operator platforms shall conform to MIL-STD-1472 using 5th percentile body dimensions for ground troops, regarding location, design, function, construction, visibility and operator safety.

3.3.5.2 Wheel guards. If drive/steer wheels, when in a straight-ahead position protrude beyond the body of the truck in excess of 1-1/2 inches, suitable wheel guards shall be provided to prevent wheel damage should truck be driven next to bulkheads and other shipboard obstructions.

3.3.5.3 Slinging and tiedown provisions. Permanently affixed slinging and tiedown provisions that enable the truck to be lifted in its normal travel position and to be fastened to the floor or deck of a transportation medium shall be provided. Provisions shall conform to MIL-STD-209, Classes 1 and 2 or Class 3 for type II or III equipment, excluding air transport requirements.

3.3.5.4 Tiedown attachments for HI Shock. Truck shall conform to the requirements of Grade A item in Type A HI (High-Impact) Shock as specified in MIL-S-901 (see 6.2), the truck shall be furnished with tiedown attachments designed in accordance with the instructions of the truck supplier for securing the unloaded truck in stowed position using chain tiedowns according to Naval Sea Systems Command Drawing 53711-804-5184188.

3.3.5.5 Sideshift attachment. The truck shall be equipped with a sideshift attachment. Sideshifter shall be hydraulically controlled and shall provide for a minimum movement of 4 inches on each side of center with rated load. Fork hanger shall permit the side adjustment of forks. Controls for the sideshift mechanism shall be in accordance with 3.4.5.

3.3.5.6 Weighing device. The truck shall be equipped with a weighing device such as digital readout of a pressure transducer or the indication of a Bourdon tube dial indicator; it shall be connected to and operate from the system for raising and lowering the forks. The entire instrument and connections shall be shock and corrosion resistant, and the transparent cover shall be resistant to damage by shock or heat. If a dial indicator is furnished, the dial shall be not less than 6 inches in diameter and shall be marked in 50-pound increments. The dial shall be capable of being rotated 360 degrees by means of an external tare adjusting knob. Bearing points or locking device(s) shall prevent dial rotation owing to shock loads or vibration that occur during test of first article truck or production truck. The indicating pointer shall be capable of 360 degree rotation for full scale reading. The

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entire indicator case shall be filled with oil to provide movement lubrication and dampening of vibration-caused tube and pointer oscillation. There shall be sufficient air space left to allow for oil expansion owing to temperature changes. The indicator case shall be appropriately sealed to prevent leakage. The indicator shall be fitted with a fully adjustable pulsation damper in an easily accessible position on the case. The weighing device shall be certified by its manufacturer to an accuracy of 1/2 of 1% and shall read to an accuracy of 5% of full scale reading as demonstrated when tested in accordance with 4.3.2.26. Accuracy of weighing device within required tolerances shall be verified by supporting data. Weighing device shall be capable of withstanding the pressure caused by placing 150-percent of truck rated load on the forks without sustaining damage when tested in accordance with 4.3.2.26. The readout shall be within the view of the operator when he is in the operating position. The truck shall meet all requirements of this specification with weighing device installed.

3.4 Hand and foot controls and instrumentation. All hand controls shall be self cenetering and provided with position markings (decals are not acceptable) either on a diagram visible to the operator or embossed or depressed on or near the control. Markings for hand controls shall conform to ANSI MH 11.3. Letter height for control markings shall be equal to or greater than that specified for general dial and panel design for the applicable viewing distance of the 5th percentile man as specified in MIL-STD-1472. Unless otherwise specified herein, the distance from the near edge of one control to the near edge of an adjacent control or other surface shall be a minimum of 1-1/2 inches. Electric controls and instrumentation shall be moisture resistant and shock mounted. Mechanical push-pull remote controls when furnished shall be of the waterproof antifriction type, conforming to requirements for marine cables in SAE J917, except as specified herein. As a minimum, all exposed parts of the control cable shall be fabricated of corrosion resistant steel. The cables shall be covered with a polyethylene or vinyl jacket. Cable ends shall be tailored to actuate all levers through their respective arcs without binding. Bend radii shall be as recommended by the cable manufacturer plus an increase in radii of 20 percent. The as-installed mechanical efficiency of each installation shall be not less than 71 percent, and the no-load friction shall not exceed 5 ounces per foot. Forces necessary to actuate directional and hydraulic controls shall be 10 pounds maximum. All hand-control levers and linkages shall withstand a minimum force of 50 pounds applied at the handgrip in the normal directions of operation and shall have sufficient strength to withstand, without permanent deformation or damage, all vibration forces generated during all operations specified herein. The travel of the controls shall not exceed 6 inches from the center position when measured at the end of the grip. All controls and instrumentation including battery discharge indicator shall conform to MIL-STD-1472 using 5th percentile body dimensions for ground troops regarding location, design, function, construction and visibility. All controls shall have a directional motion insofaras possible, the motion of the hand control shall be similar to the resulting motion of the truck operation to be performed. Controls passing through compartment and panels shall be provided with rubber boots for weather seals.

3.4.1 Light switch. A switch shall be installed in a location convenient to the operator.

3.4.2 Brakes. Service, deadman and parking brakes shall be as specified in

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3.3.4. Grease fittings or permanent lubrication shall be provided for lubricating moving parts.

3.4.3 Speed and directional control. A right hand operated control shall be provided. Control shall have a neutral position, forward movement of the control shall cause truck to move forward. Backward movement of the control shall cause truck to move backward. Speeds shall be proportional to the control movement. Control shall be located for safe, convenient and efficient operation with operator facing load or away from load. (Refer to 3.2.1.3).

3.4.4 Lift, reach, shift and tilt controls. The lift, reach, shift and tilt controls shall be located for right-hand operation. The lift control shall provide for positioning the load when truck is in motion without requiring the operator to release the steering control or actuate the directional control by any part of his body other than hands. Reach control shall be at the right of the tilt control. Rearward and upward motion of lift, reach, and tilt control levers shall elevate, retract, and tilt load rearward respectively. Modulation of the speed of lift, reach, tilt, or lower shall be readily controllable. Lift, reach and tilt controls may be incorporated in a self centering, multi-functional control handle located for right hand operation in lieu of individual control levers. The forks shall be extended by movement of the extension-retraction lever from the centered position to the forward position. Retraction of the forks shall be accomplished by movement of the lever from the centered position to the rearward position. Means shall be provided to prevent jerky stopping or starting of forks and prevent waste of electrical power at the end of the extension and retraction movement. Controlsshall return to neutral on release of the control.

3.4.5 Sideshift control. The sideshift control shall be conveniently located to the left of the tilt control for right-hand operation. Rearward movement of the sideshifter control shall shift the forks to the right and forward motion of the lever shall shift the forks to the left. The attachment and its components shall show no evidence of deformation when tested as specified in 4.3.2.23.

3.4.6 Master switch. A master switch shall be furnished that has provision for a key. When key is removed, control circuits shall be opened or be interrupted making it impossible for any electrical control circuit to be activated. The key shall be removeable only when the switch is in the "off" position. All trucks under each contract shall be keyed identically. Two (2) keys shall be supplied with each truck. All keys shall be identical for every truck under each contract.

3.4.7 Instruments. All gages, indicator lights, and meters shall be products of manufacturers regularly engaged in producing these types of instruments. They shall be flush mounted on the instrument panel in view of the operator when he is in operating position. All instruments shall be shock mounted and spark-enclosed construction or mounted in spark proof enclosures. All instruments and exposed electrical components shall be moisture proof.

3.4.7.1 Hour meter. An electrically operated hour meter which registers the total number of hours of operation of the traction and pump motors shall be provided. Hour meters shall be in accordance with MIL-M-2971, Type 1.

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3.4.8 Alignment marks for side shift mechanism. Provide two alignment marks on frame and two matching marks on the mast, each mark shall be six inches from edge. Marks to be welded 1/8 thick bar steel, (See 3.11.1), approximately 1/2 inch wide painted black. Purpose is to assist operator in aligning side shift mechanism to center position. (See 3.10.3).

3.5 Accessories. The provisions of UL-583 shall apply. Electric accessories and instrumentation shall be moisture and weather resistant in accordance with Section 4.

3.5.1 Flood light. The truck shall be equipped with one red sealed beam, 25 watt minimum, floodlamp, shock mounted in an elastometer ring housing on the left side of the mast. Directional adjustment range of this light shall be a minimum of 45 degrees above and below the horizontal plane. Horizontal adjustment range shall be a minimum of 300 degrees to illuminate front and rear areas. Adjustments shall not require use of hard tools. Adequate protection against damage, by means of position or guard, shall be provided.

3.5.2 Horn. Truck shall be equipped with an electric horn with push button mounted and located for convenient operation. Horn button and electrical wiring for the horn shall be constructed to be moisture and weather resistant. The horn shall be operable without requiring the operator to release the steering or directinal controls.

3.5.3 Driver's overhead guard. When specified (see 6.2) trucks shall be equipped with a high strength overhead guard capable of withstanding the tests specified in 4.3.2.11. Where the upright in the collapsed position is lower than the overhead guard height, the guard shall be removable with hand tools and no component shall be mounted on the overhead guard. A minimum of 78 inches from operators top platform to underside of guard shall be provided at all tilt positions of the mast. Guard height, with the mast tilted rearward, measured from the ground level to the top side of guard shall not exceed the height on the appropriate specification sheet. Guard design shall not interfere with operation of the truck, nor with normal movements of the operator when entering, leaving, or operating the truck. Guard shall not interfere with servicing of the battery and shall permit removal of the battery, if from the top, in one continuous lift and swing operation. Overhead guard shall remain firmly secured to its support brackets under normal and test course operation.

3.5.4 Fire extinguisher. When specified (see 6.2), each truck shall be equipped with a stored pressure type, potassium bicarbonate fire extinguisher as specified in O-E-915, type I, class 2, size 2-1/2. Mounting shall be on a positive locking quick release bracket, in an accessible position, with the extinguisher nozzle protected against damage.

3.5.5 Battery protector. A battery discharge indicator shall be provided. The indicator shall be a solid state device requiring no adjustment except a periodic light bulb check or replacement. It shall be tamper proof and carry UL approval. It shall be designed to protect the battery from approaching a dangerously low state of discharge by first warning the operator by means of a signal light, or electrical meter and signal light. After a short interval of time or after the consumption of an additional amount of electrical energy, it shall interrupt the lift control circuit making the lift mechanism inoperative

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until the battery has been replaced or recharged. The circuit shall be such that the operator cannot activate the lift control circuit by unplugging and replugging the battery after it has been 80% discharged, (typically 1150 specified gravity). Unplugging and replugging the battery prior to reaching 80% discharge shall not reactivate the lift control circuit. The discharge indicator shall reset when a battery charged to 56% of full capacity (typically 1200 specific gravity) is put on the truck. The discharge indicator may have controls to adjust the discharge setting and the reset level to values other than 80% and 56%, provided such settings can be made without electrical test equipment and the positions of the settings are indicated by indelible markings on the controls. When a electrical meter is used, it shall be mounted on the driver panel, and it shall display energy in the method of empty to full type display used in gasoline vehicles. There shall be a defined point on the meter where the warning light goes on and a defined point where the truck lift mechanism becomes inoperative. Location and method of mounting shall provide plain visibility of the indicator to the driver without creating interference with truck operation, maintenance, and entry and egress movements of the operator.

3.5.6 Wheel Position Indicator. Truck shall be furnished with an indicator showing the position of at least one of the steerable drive wheels and visible to the operator in operating position. Pointer shall be embossed or depressed into the indicator.

3.6 Performance.

3.6.1 Lifting and lowering speed. Minimum lifting speed over the entire distance from ground level to maximum fork height with rated load (ambient temperature between 65 degrees F and 85 degrees F) shall be as specified in the specification sheet, when tested in accordance with 4.3.2.2. Minimum speed of lowering of unloaded forks (ambient temperature between 65 degrees F and 85 degrees F) shall be as specified in the specification sheet, over the entire distance from maximum fork height to deck level when tested in accordance with 4.3.2.2. Speed of lowering forks with rated load shall be not more than 80 feet per minute over the entire distance from maximum fork height to deck level. The hydraulic control system shall be damped, metered, or easily manually regulated to reduce shock and prevent the truck from overturning when a rated load is lowered at maximum speed and then stopped quickly.

3.6.2 Extension and retraction. Trucks shall be capable of extending and retracting rated load on forks not less than the distance from the forward face of the forks (retracted) to the heel of the outriggers or load wheels (extended) in not less than 3 nor more than 5 seconds maximum, when tested in accordance with 4.3.2.2. Minimum reach shall be as specified on the specification sheet.

3.6.3 Right-angle turn. Trucks, when carrying rated load, shall be capable of backing through a turn in either direction and returning to the same or a parallel position within dimension "A", as measured by 4.3.2.3. Dimension "A" shall be as specified on the specification sheet.

3.6.4 Steering. The steer wheels shall be capable of being turned from extreme right to extreme left or vice versa in not more than 3 complete turns of the hand steering wheel. The maximum steering effort through the entire

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turn shall be not less than 2 pounds nor more than 5 pounds in either direction when the truck is stationary on a smooth dry deck when tested in accordance with 4.3.2.10. The steering gear assembly shall be capable of withstanding unbalanced tangential force of 150 pounds without distortion or deformation.

3.6.5 Speed. While carrying rated capacity on a level deck, trucks shall be capable of attaining specified speed listed on the specification sheet in forward and reverse directions. Speed shall be as measured in accordance with 4.3.2.4.

3.6.6 Slope ascension, forward direction. Trucks with and without rated load shall be capable of ascending the grade specified on the specification sheet. Test shall be conducted on a dry concrete surface. Truck shall be able to accelerate from a dead stop on this slope, when carrying a load. Trucks shall ascend grade in forward direction only when loaded. Conformance to these requirements shall be tested as specified in 4.3.2.5.

3.6.7 Upright tilt. When loaded, truck masts shall have 2 degrees, plus or minus 1/2 degrees forward tilt and 4 degrees, minimum rearward tilt. Positive means shall be furnished to prevent cavitation of the tilt cylinders when tilting rated load to fullforward tilt with oil temperature not less than 120 degrees F. Tilt shall be measured from a true vertical when tested in accordance with 4.3.2.6.

3.6.8 Collapsed mast and overall truck height. Maximum collapsed mast height of unloaded truck measured from the ground to the top of mast of the fixed uprights in a vertical position shall be as specified on the specification sheet when measured in accordance with 4.3.2.1. No truck projection is permitted above this height.

3.6.9 Minimum fork height. Minimum fork height of truck with rated load and uprights extended vertically shall be not less than shown on the specification sheet when maximum allowed overall height is attained. Test in accordance with 4.3.2.1.

3.6.10 Free lift height. Lift of forks without increase in the specified collapsed mast height shall be not less than that specified in the appropriate specification sheet. Free lift height shall be measured in accordance with 4.3.2.1.

3.6.11 Underclearance. The truck with rated load shall have sufficient underclearance to safe operation from one horizontal plane to another without scraping or dragging, using the slope specified by 3.6.6. Underclearance beneath the mast assembly, when in a true vertical position with rated load in retracted position shall be not less than 2-3/4 inches. Underclearance shall be not less than 2 inches under entire truck. Hydraulic fittings, hoses, tubing, and linkages shall not be the lowest portion of the truck and shall be protected by structural members from striking obstacles.

3.6.12 Lift assembly drift. The lift assembly shall be capable of holding the rated load at maximum height and extension not less than 10 minutes with not more than 1-3/4 inch of vertical and extension drift and not more than 1 degree of rotational drift from the vertical when tested in accordance with 4.3.2.7. Specified drift rates shall be measured when hydraulic oil

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temperature at the inlet to each cylinder is not less than 120 degrees F.

3.6.13 Forks and mast assembly. Forks, mast assembly, and related structures shall show no permanent deformation or failure when subjected to test of 300 percent of rated load as specified in 4.3.2.13.

3.6.14 Hydraulic system. The hydraulic system shall show no leaks or breakage when the truck is subjected to the test prescribed in 3.6.13 with the pressure relief valve inoperative. This requirement does not include the pump. The pressure relief valve shall open when pressure equals no more than 150 percent of the maximum pressure needed to lift rated load to the maximum fork height.

3.6.15 Brakes.

3.6.15.1 Service brakes. Brake pedal pressure of not more than 150 pounds and not less than 50 pounds shall develop a drawbar pull equal to 30 percent of the gross weight of the truck (with rated load) while the truck is being towed over a non-skid having a coefficient of friction not less than 0.50. The brake system shall be capable of withstanding brake pedal pressure of 350 pounds without failure of any component. These requirements shall be tested according to 4.3.2.16. Brake parts designed to be rigid shall not loosen as a result of these tests. Brake pedal action shall not be spongy.

3.6.15.2 Deadman brake. Current to traction motors shall be interruped by deadman brake action and speed control return to neutral. Force required to hold the deadman pedal fully depressed shall not exceed 20 pounds. Nonconformance to 4.3.2.15 shall constitute failure of the test.

3.6.16 Stability. Truck shall not overturn when tested in accordance with Test Method No. 16.

3.6.17 Overhead guard strength. The guard (when required) shall be capable of withstanding an 8-foot drop of a 500-pound high density cube 10 without failure or permanent deformation exceeding 3 inches when tested according to 4.3.2.11.

3.6.18 Acceleration. From a standing start the truck, when carrying the specified rated load, shall have an average acceleration rate in the forward direction such as to negotiate a distance of 22 feet in 7 seconds when tested according to 4.3.2.8. There shall be not more than one second delay in the movement of the truck when the truck is accelerated.

3.6.19 Stopping distance. Truck, with rated load, shall be capable of stopping from a forward and rearward maximum speed in five feet when tested as specified in 4.3.2.14. Brake parts designed to be rigid shall not loosen as a result of this test.

3.6.20 Mechanical parking brake. The parking brake shall be capable of retaining the truck with rated load on a slope equal to the specified slope ascension in both forward and reverse direction. Test of parking brake shall be accomplished only with the truck ascending specified slope in forward direction. Tests shall be in accordance with 4.3.2.15.

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3.6.21 Resistance to saline atmosphere. All components shall be designed and installed to withstand the corrosive effect of the salt fog test specified in 4.3.2.22 without any loss of performance and without sustaining harmful corrosion.

3.6.22 Power consumption. The truck with battery shall meet the power consumption requirements of 4.3.2.25.

3.6.23 HI (High-Impact) shock requirement. The truck and the battery as a component of the truck shall be designed to withstand Type A HI Shock as a grade A Item in accordance with MIL-S-901 when tested in accordance with 4.3.2.27. See paragraph 6.4 for reporting requirement.

3.6.24 Water. The truck shall be capable of performing all its normal operations after being subjected to the water exposure test specified in 4.3.2.28.

3.6.25 Truck weight. The truck shall not exceed the weight listed on the specification sheet when tested in accordance with 4.3.2.24.

3.6.26 Reliability. Truck shall complete 2000 laps without failure when tested as specified in 4.3.2.38. Failure shall be as defined in 4.3.2.38. If failure occurs before lap 2000, the cause of failure shall be corrected and the test restarted at the first lap.

3.7 Workmanship. The truck shall withstand any operation specified herein without permanent deformation, breakage of connections, malfunction, or component interference caused by incorrect workmanship. All parts of the truck before and after painting shall be clean and free from sand, rust, dirt, fins, pits, spurs, scale, flux, and other harmful extraneous material. Edges and surfaces exposed to operating and maintenance personnel shall be smooth and rounded to the extent that a hazardous surface does not exist.

3.7.1 Riveted connections. Rivets shall fill the holes completely. The upset rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member, and shall be in accordance with SAE J492 or Industrial Fastener Institute Standard No. 114 for Break Mandrel Blind Rivets.

3.7.2 Welding. The surfaces of parts to be welded shall be free from rust, scale, paint, grease, mill scale that can be removed by chipping and wire brushing, and other foreign matter. Welds shall transmit stress without permanent deformation or failure when the parts connected by the welds are subject to proof and service loading. Parent materials, weld filler metals, and fabrication techniques shall be as required to enable the forklift to conform to the examination and test requirements specified in Section 4. Parts to be joined by filler welds shall be brought into as close contact as possible and in no event shall be separated by more than 3/16 inch unless appropriate bridging techniques are used. The welding process used in fabrication of the forklift shall be at the option of the supplier.

3.7.3 Bolted connections. Bolt holes shall be accurately formed and shall have the burrs removed. Washers, lockwashers or other positive locking devices shall be provided where necessary. Matching thread areas securing bolts

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conforming to SAE J429 or capscrews shall be of sufficient strength to withstand the tensile strength of the bolt. All fasteners shall be correctly torqued and shall have full thread engagement.

3.7.4 Steel and other metal fabrication. Metals used in the fabrication of the truck shall provide original quality surface finish and shall be free from kinks and sharp bends. Metals having corroded or pitted surfaces are not acceptable. The straightening of materials shall be done by methods that will not cause weakening or injury to the material. Burrs and sharp edges in holes and on sheets, plates, and members shall be removed sufficiently to assure correct fits and to prevent loosening of fasteners and damage to components. from re-entrant cuts. Heated metals shall be allowed to cool slowly, except for designed heat treatment, and over-heating shall be avoided in accordance with the recommendations of the metal manufacturer. All modular assembly fabrication shall provide for interchangeability of components.

3.7.5 Machine work. Tolerances and gauges for metal fits shall conform to the limits specified herein, and to the standards of the Materials Handling Equipment Industry.

3.7.6 Castings and forgings. All parts, components, and assemblies of the forklift which include castings and forgings shall be clean of harmful extraneous material such as sand, dirt, sprues, scale and flux. Rework shall be limited to procedures which do not reduce mechanical properties or affect function. Castings with fastener holes shall provide for correct seating of fasteners such as bolt, lockwasher and nut assemblies and capscrews.

3.8 Treatment and painting. All exterior surfaces of the truck shall be thoroughly cleaned and shall be dry and free from mill scale, oil, grease, dirt and rust and shall be painted as soon as practicable after cleaning with not less than one coat of metallic base primer and two coats of synthetic enamel. Primer and finish coats shall be applied in accordance with normal commercial practices to assure complete coverage and durability of the finish. The finish color shall be 13538 of FED-STD-No. 595. When a first produced truck is required for test and evaluation, it shall be painted with one primer coat only. The finish coat, when dry, shall be a smooth even surface, free from runs, sags, peels, chips, blisters, areas of thin film or no film overspray will not be permitted. Surfaces of components and assemblies of the truck not normally painted with a finish coat shall be cleaned and prepared in accordance with good commercial practice. Lift chains, sprockets, rollers, plastics, fabric hoses, hydraulic hoses, and drive belts shall not be painted. Paint must be kept off working surfaces where interference with working of parts would result.

3.8.1 Walkway coating. Floor plates and step surfaces not covered shall be painted with type II or III, color number 39038, black, or MIL-W-5044 and FED-STD-No. 595.

3.9 Electromagnetic interference control. Trucks shall be equipped for control of electromagnetic interference in accordance with Part 8, Class C1, Group II of MIL-STD-461.

3.10 Identification and other marking. Each individual forklift and each separable attachment removable for transportable purposes (e.g., cab, ROPS,

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fork carriage or counterweights) except forks shall be identified in acordance with MIL-STD-130 on identification plates conforming to MIL-P-514, type I, style 1, composition C (GG-P-455, type I, grade A, class 1) material. Additional or specified information to be indented or embossed on the plate(s) shall be as specified. All other plates shall conform to MIL-P-514, type III, composition C (GG-P-455, type I, grade A, class 1) material. All plates shall be attached by screws, drive screws, bolts, or rivets in conspicuous protected locations.

3.10.1 Instruction plates. The forklift shall be equipped with instruction, warning, caution and diagram plates describing any special or important procedures to be followed in assembling operating or servicing the truck.

3.10.2 Loading plates. Forklift shall be equipped with a wheel loading plate having the following information:

Wheel loading (no load on forks)
Drive wheels (each side) pounds

Wheel loading (rated load on forks)
Drive wheels (each side) pounds

Center of gravity (distance from rear of forklift)

3.10.3 Side shift centering warning plate. Forklift shall be equipped with a plate in center of cross assembly facing operator at eye level having having the following information:

WARNING
CENTER ALIGNMENT MARKS
BEFORE LOWERING FORKS

3.11 Registration data and vehicle marking. The manufacturer shall execute registration data cards, as required by the contracting officer.

3.11.1 Vehicle marking. Trucks shall be marked in black color number 17038 in accordance with Federal Standard No. 595. Marking paint shall be in accordance with TT-E-489. Characters shall be block-type capitals and Arabic numerals. Marking location and information and character size shall be as follows:

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Information	Example	Location	Character Size
Capacity	4,000 Lbs.	On each side of mast	2 inch height
Type Designation	EE	On each side and rear	4 inch height
Rider warning	NO RIDERS	On rear of mast	2 inch height
Service designation	U.S. NAVY	On each side and rear	1-1/2 inch height
Registration Number	13-15675	On each side	3 inch height
Gross Weight with rated load	6,600 Lbs.	On each side	2 inch height
Warning	Not to be used in Hypergolic Magazines/Spaces	On each side	2 inch height

3.12 Technical manuals. Technical manuals conforming to Contract Data Requirements DD 1423 shall be furnished by the contractor with each truck at time of shipment. The manual shall be placed in a protected place in the equipment. Each manual shall be preserved and packaged in a bag of the transparent material conforming to Type II of MIL-F-22191 by Method IC-1 of MIL-P-116 and the bag heat sealed. Additional copies of the manual shall be furnished as specified.

3.13 Fungus and moisture resistance. The electrical circuitry, including all components and connections except as specified below, shall be protected from the effects of fungus growth and moisture by an overall treatment with a varnish conforming to MIL-V-173, Composition I or II as applicable (see 3.13.1), with 1 percent copper 8-quinolinolate (by weight) based on the nonvolatile content of the varnish:

(a) Components or circuit elements that are inherently fungus and moisture resistant or which are hermetically sealed need not be treated.

(b) Components or circuit elements whose functions will be adversely affected by the varnish coating shall not be treated.

When used, the varnish shall be applied by spray, brush or a combination of both to give a minimum dry-film thickness of 1 mil to component or element surfaces previously cleaned and prepared so that the surfaces are free from all foreign matter which would interfere with the adherence or function of the varnish.

3.13.1 Composition. Composition II shall be used only in the case when local air pollution regulations for the application of the varnish precludes the use of Composition I. When Composition II is used, the supplier shall provide evidence to the Government that the use of Composition II is required and shall certify that the Composition II material complies with Rule 66, Air Pollution Control District, County of Los Angeles, CA.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. The contractor is responsible for the performance of all inspection requirements specified herein. 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 Component and material inspection. The contractor is responsible for assuring that components and materials used are manufactured, examined, and tested in accordance with the requirements of referenced specifications and standards.

4.2 Classification of inspections and tests. Inspections and tests shall be classified as follows:

(a) First produced truck inspection and tests (see 4.3).

(b) Quality conformance inspection (see 4.4).

(c) Inspection comparison (see 4.5).

(d) Inspection of preparation for delivery (see 4.6).

4.3 First produced truck inspection and tests. Prior to inspection and test of the truck specified in 3.1.1 the following shall be performed:

(a) Furnish a schedule of maintenance to be followed during all testing of the first produced truck. A list of special tools required to perform this maintenance shall be provided.

(b) Service the truck with oils and greases specified herein and designated for use in the ambient temperature at which the tests will be conducted.

(c) Break in the truck as prescribed by the contractor.

4.3.1 Inspections.

4.3.1.1 Pretest inspection. Prior to testing according to 4.3.2, one or more of the first produced trucks as specified in 3.1.1 shall be inspected for the defects marked "X" in Column 1 of Table I.

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4.3.1.2 Post-test disassembly and inspection (see 4.3.2.40).

4.3.2 Tests. Upon successful completion of the inspection specified in the truck shall be subjected to the tests marked "X" in Column 1 of Table II. Acceptance of a first produced truck shall not exclude the remaining trucks from the quality conformance inspection and acceptance provisions specified in Section 4. Test conditions and schedule shall be as follows:

(a) Unless otherwise specified herein, tests shall be conducted at the ambient temperature and climatic conditions existing at the place of test. The test surface, unless otherwise specified or specific tests, shall be level within +/- 1 degree. The surface of the test shall produce a coefficient of .5 or greater. (If the specified coefficient is not available, it is permissible to cover the travel surface with a friction increasing material). Only that maintenance established by the supplier and submitted as a maintenance schedule prior to commencement of tests shall be performed during the tests.

(b) Tests shall be in accordance with Table II and may be conducted in any order desired except that reliability and post test shall be the last tests conducted. An "X" in the applicable column indicates the tests that shall be conducted.

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Table I. Inspection Schedule

First Produced Inspection	Quality Conformance	Defect		Requirement Paragraph
1	2		3	4
x		101.	Material not as specified	3.1.2
x		102.	Dissimilar metals not protected	3.1.2.1
x		103.	Plating not as specified	3.1.2.2
x	x	104.	Design not as specified	3.1.3
x		105.	Safety not as specified	3.1.3.2
x		106.	Bearings not as specified	3.1.3.3
x	x	107.	Lubrication and fittings not as specified	3.1.3.4
x		108.	Screw threads not as specified	3.1.3.5
x	x	109.	Maintainability not as specified	3.1.3.6
x	x	110.	Lubrication system not as specified	3.1.3.7
x		111.	Resistors not as specified	3.1.5.1
x	x	112.	Enclosures and shields not as specified	3.1.5.2
x	x	113.	Overcurrent devices not as specified	3.1.5.3
x		114.	Heat producing devices not as specified	3.1.5.4
x	x	115.	Static discharge devices not as specified	3.1.5.5
x		116.	Panels not as specified	3.1.5.6
x		117.	Conductors not as specified	3.1.5.7
x	x	118.	Motors not as specified	3.2.1.1
x		119.	Insulation not as specified	3.2.1.2
x		120.	Speed controller not as specified	3.2.1.3
x		121.	Safety cutout system not as specified	3.2.1.4
x	x	122.	Battery not as specified	3.2.2
x		123.	Battery connector mounting not as specified	3.2.3
x	x	124.	Battery installation not as specified	3.2.3.1
x		125.	Drive unit not as specified	3.2.4
x		126.	Hydraulic system not as specified	3.2.5
x	x	127.	Chassis and frame not as specified	3.3.1
x		128.	Uprights and carriage not as specified	3.3.1.1
x		129.	Fork and fork carrier not as specified	3.3.1.2
x	x	130.	Outriggers not as specified	3.3.1.3
x	x	131.	Reach mechanism not as specified	3.3.1.4
x	x	132.	Load rest not as specified	3.3.1.5

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Table 1. Inspection Schedule

First Produced Inspection	Quality Conformance		Defect	Requirement Paragraph
1	2		3	4
x		133.	Wheels not as specified	3.3.2
x		134.	Tires not as specified	3.3.2.1
x	x	135.	Steering not as specified	3.3.3
x	x	136.	Service brakes not as specified	3.3.4.1
x	x	137.	Deadman brake not as specified	3.3.4.2
x		138.	Parking brake not as specified	3.3.4.3
x		139.	Truck body not as specified	3.3.5
x	x	140.	Operating platform not as specified	3.3.5.1
x		141.	Wheel guards not as specified	3.3.5.2
x		142.	Slinging and tiedown attachments not as specified	3.3.5.3 & 3.3.5.4
x	x	143.	Sideshift attachment not as specified	3.3.5.5
x	x	144.	Weighing device not as specified	3.3.5.6
x	x	145.	Controls and instrumentation not as specified	3.4
x	x	146.	Floodlight not as specified	3.5.1
x	x	147.	Horn not as specified	3.5.2
x	x	148.	Overhead guard not as specified	3.5.3
x	x	149.	Fire extinguisher not as specified	3.5.4
x	x	150.	Battery protector not as specified	3.5.5
x	x	151.	Wheel position indicator not as specified	3.5.6
x	x	152.	Riveted connections not as specified	3.7.1
x	x	153.	Welding not as specified	3.7.2
x	x	154.	Bolt connections not as specified	3.7.3
x	x	155.	Metal fabrication not as specified	3.7.4
x	x	156.	Machine work not as specified	3.7.5
x	x	157.	Casting and forgings not as specified	3.7.6
x	x	158.	Treatment and painting not as specified	3.8
x	x	159.	Walkway coating not as specified	3.8.1
x	x	160.	Identification marking not as specified	3.10
x	x	161.	Instruction plates not as specified	3.10.1
x	x	162.	Wheel loading plate not as specified	3.10.2
x	x	163.	Side shift warning plate not as specified	3.10.3
x	x	164.	Vehicle marking not as specified	3.11
x	x	165.	Technical manuals not as specified	3.12
x	x	166.	Fungus and moisture resistance not as specified	3.13

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Table II. Test Schedule

First Produced	Quality Conformance	Post Test	Test	Test Para.	Requir. Para.	Test Method No.
1	2	3	4	5	6	7
x		x	Collapsed mast height, maximum fork height, free lift height	4.3.2.1	3.6.8 3.6.9 3.6.10	1
x	x	x	Lift speed, and lowering speed	4.3.2.2	3.6.1	2
x	x	x	Extension & retraction speed	4.3.2.2	3.6.2	2
x			Right angle turn	4.3.2.3	3.6.3	3
x	x	x	Travel speed	4.3.2.4	3.6.5	5
x	x	x	Slope ascension, parking brake, underclearance	4.3.2.5	3.6.6 3.6.20 3.6.11	6
x		x	Tilt	4.3.2.6	3.6.7	7
x		x	Drift	4.3.2.7	3.6.12	8
x		x	Acceleration	4.3.2.8	3.6.18	9
x			Stability	4.3.2.9	3.6.16	16
x		x	Steering	4.3.2.10	3.6.4	4
x			Overhead guard	4.3.2.11	3.6.17	14
x			Lifting & tiedown provisions	4.3.2.12	3.3.5.3 & 3.3.5.4	10
x			Forks and mast assy overload	4.3.2.13	3.6.13 & 3.6.14	11
x	x	x	Stopping distance	4.3.2.14	3.6.19	17
x	x	x	Auxiliary brakes	4.3.2.15	3.6.15.2 & 3.6.20	6
x	x	x	Service brakes	4.3.2.16	3.6.15.1	15
x			Maintainability	4.3.2.17	3.1.3.6.1	13
x	x		Static discharge	4.3.2.18	3.1.5.5	12
x			Fork load backrest	4.3.2.19	3.3.1.5	23
x			Tire loading	4.3.2.20	3.3.2.1	18
x			Electromagnetic Interference characteristics	4.3.2.21	3.9	—
x			Saline atmosphere	4.3.2.22	3.6.21	—
x			Sideshift attachment	4.3.2.23	3.4.6	30
x			Truck weight	4.3.2.24	3.6.25	—
x			Power consumption	4.3.2.25	3.6.22	19
x	x		Weighing device	4.3.2.26	3.3.5.6	29
x			Hi-shock test	4.3.2.27	3.6.23	--
x			Water protection	4.3.2.28	3.6.24	20
x			Frame racking	4.3.2.29	3.3.1	21
x			Operating temp.	4.3.2.30	3.1.5.4	25
x			Hydraulic pump vac.	4.3.2.31	3.2.5.1.4	--

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Table II. Test Schedule

First Produced	Quality Conformance	Post Test	Test	Test Para.	Requir. Para.	Test Method No.
1	2	3	4	5	6	7
x			Suction line	4.3.2.31.1	3.2.5.1.4	—
x			Hydraulic pump pressure test	4.3.2.32	3.2.5.2	—
x			Hydraulic filter	4.3.2.33	3.2.5.3.1	26
x		x	Hydraulic filter life	4.3.2.33.1	3.2.5.3.1	—
x			Hydraulic cylinder	4.3.2.34	3.2.5.6	27
x	x		Hydraulic system Cleanliness	4.3.2.35	3.2.5.8	24
x			Hydraulic fittings	4.3.2.36	3.2.5.1.1	28
x			Uprights and sideshift	4.3.2.37	———	30
x			Reliability	4.3.2.38	3.6.26	22
x	x		Battery protector	4.3.2.39	3.5.5	31
x		x	Post tests	4.3.2.40	———	—

4.3.2.1 Overall truck height, Maximum fork height, collapsed mast height, free lift height.
Test the truck in accordance with Test Method No. 1. Failure to conform with the requirements of 3.6.8, 3.6.9 and 3.6.10 shall constitute failure of this test.

4.3.2.2 Lift, lowering, extension and retraction speeds. Test truck in accordance with Test Method No. 2. Failure to conform with the requirements of 3.6.1 and 3.6.2 shall constitute failure of this test.

4.3.2.3 Right angle turn. Test the truck in accordance with Test Method No. 3. Failure to conform with the requirements of 3.6.3 and the individual specification sheet shall constitute failure of this test.

4.3.2.4 Speed. Test the truck in accordance with Test Method No. 5. Nonconformance to 3.6.5 and the individual specification sheet shall constitute failure of this test.

4.3.2.5 Slope ascension, underclearance. Test the truck in accordance with Test Method No. 6. Nonconformance to 3.6.6, 3.6.20 and 3.6.11 shall constitute failure of this test.

4.3.2.6 Tilt. Test the truck in accordance with Test Method No. 7. Nonconformance to 3.6.7 shall constitute failure of this test.

4.3.2.7 Drift. Test the truck in accordance with Test Method No. 8. Nonconformance to 3.6.12 shall constitute failure of this test.

4.3.2.8 Acceleration. Test the truck in accordance with Test Method No. 9. Nonconformance to 3.6.18 shall constitute failure of this test.

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4.3.2.9 Stability. Test the truck in accordance with Test Method No. 16. Nonconformance with the requirements of 3.6.16 shall constitute failure of this test.

4.3.2.10 Steering. Test the truck in accordance with Test Method No. 4. Nonconformance with the requirements of 3.6.4 shall constitute failure of this test. Other maneuverability features shall meet the endurance test requirements.

4.3.2.11 Overhead guard strength. Test the truck in accordance with Test Method No. 14. Nonconformance with the requirements of 3.6.17 shall constitute failure of this test.

4.3.2.12 Lifting and tiedown attachments. Test the truck in accordance with Test Method No. 10. Nonconformance to 3.3.5.3 and 3.3.5.4 and requirements of Test Method shall constitute failure of test.

4.3.2.13 Mast assembly overload. Test the truck in accordance with Test Method No. 11. Nonconformance with the requirements of 3.6.13 and 3.6.14 shall constitute failure of this test.

4.3.2.14 Stopping distance. Test the truck in accordance with Test Method No. 17. Nonconformance with the requirements of 3.6.19 shall constitute failure ot test.

4.3.2.15 Parking brake and deadman brake. Test the parking brake in accordance with the application part of Test Method No. 6. Nonconformance with the requirements of 3.6.20 shall constitute failure of this test. Test the deadman brake by measuring force to fully depress the pedal. With on-off switch "on", depress deadman brake pedal and determine whether current to traction motors is cut-off and cannot be established until speed controller is moved to first position. Nonconformance with the requirements of 3.6.15.2 shall constitute failure of this test.

4.3.2.16 Service brake drag and pressure. Test the truck in accordance with Test Method No. 15. Nonconformance with the requirements of 3.16.5.1 shall constitute failure of this test.

4.3.2.17 Maintainability. Test the truck in accordance with Test Method No. 13. Failure to perform the operations in the allotted time as specified in 3.1.3.6.1 shall constitute failure of this test.

4.3.2.18 Static discharge. Test the truck in accordance with Test Method No. 12. Nonconformance with the requirements of 3.1.5.5 shall constitute failure of this test.

4.3.2.19 Fork load backrest. Test the backrest in accordance with Test Method No. 23. Nonconformance to 3.3.1.5 shall constitute failure of this test.

4.3.2.20 Tire loading. Test the truck in accordance with Test Method No. 18. Nonconformance with requirements of 3.3.2.1 shall constitute failure of this test.

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4.3.2.21 Electromagnetic interference characteristics. The first produced truck equipped for electromagnetic compatibility in accordance with 3.9 shall be tested as specified in MIL-STD-461. The supplier shall furnish the contracting officer the report of the test required by MIL-STD-461. Upon approval of the report by the contracting officer and provided all other requirements of the specification are met, the approved truck shall be used as a model for all production trucks.

4.3.2.22 Saline atmosphere test. The truck shall be tested in accordance with MIL-STD-810, Test Method 509, Salt Fog. At the option of the supplier, the truck may be tested as a completely assembled unit or by components and subassemblies. If the truck is tested in the form of components and subassemblies, the following parts may be omitted: chassis, frame, body, counterweight, and battery furnished without cover. All other parts, including components, fasteners, subassemblies, battery furnished with cover, and the electric system shall be tested. Whether in assembled or in disassembled condition, the truck shall not be washed or operated in accordance with 3.1.6 of Method 509 until the exposure and drying periods have been completed. Nonconformance to 3.6.21 shall constitute failure of this test.

4.3.2.22.1 Assembled truck. Preparation of the assembled truck prior to exposure to salt fog shall be in accordance with 3.1.5 of Method 509. All exterior surfaces of the truck, including the exposed surface of each piston rod and excluding only surfaces such as those of lift chains which are lubricated in service use, shall be cleaned and exposed to salt fog and the drying. The rod(s) of the tilt and of the sideshift cylinder(s), if provided, shall be at full extension. The lift cylinder rod which is exposed when the lift assembly is lowered in accordance with 4.3.2.22.3(c) herein shall be so cleaned and exposed. Components such as bearings which are lubricated in service use shall be lubricated in accordance with instructions of supplier prior to test.

4.3.2.22.2 Unassembled truck. Preparation of the truck tested as subassemblies and components shall be in accordance with 3.1.5 of Method 509. Exterior surfaces of all of the parts shall be so cleaned, except those specifically omitted above and those which are lubricated in service use. Those surfaces, components, and subassemblies which are lubricated in service use shall be lubricated in accordance with instructions of the supplier prior to test. Surfaces to be cleaned and exposed to salt fog and for drying shall include the exposed surface of each piston rod. The rod(s) of the tilt and of the sideshift cylinder(s) if provided shall be at full extension for the cleaning and exposure. The lift cylinder rod surface which is exposed when the lift assembly is lowered in accordance with 4.3.2.22.3(c) shall be so cleaned and exposed.

4.3.2.22.3 Details. Pursuant to paragraph 4 of Method 509, the following details are designated:

a. Pretest data shall be that required by 4.4.2 of this specification. In addition, evidence of harmful corrosion, loss of mobility of parts, or inability to disassemble parts for service or repair shall be cause for rejection. Note that disassembled truck will have first been assembled for production testing, disassembled for Salt Fog, and finally reassembled for repeat of the production testing following (f) below.

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b. 5 percent.

c. Mounting.

(1) Assembled truck resting on load tires with trail axle elevated to place truck at required plane of traveling longitudinal stability, with mast at full forward tilt and carriage at maximum sideshift to expose rod of shift cylinder if provided, and with mast lowered to where tips of forks rest on 4-inch x 4-inch wood blocks.

(2) Unassembled truck parts supported as convenient with large pieces in positions similar to assembled positions described in (1) and resting on 4-inch x 4-inch wood blocks. Small pieces supported as nearly as possible to 30 degrees from vertical by cords, hooks, or racks.

d. 72 hours.

e. 168 hours.

f. Visual inspection after 24 hours and 72 hours exposure, but no washing or operation until examination following exposure and drying periods. Truck shall be dried at room temperature while loosely covered with sheet of clear plastic to retard drying and allow visual inspection.

4.3.2.23 Sideshift attachment. Truck shall be tested in accordance with Test Method No. 30. Failure to function or noncompliance with 3.4.6 after testing shall constitute failure of this test.

4.3.2.24 Truck weight. Truck with no load shall be weighed to comply with 3.6.25. Any evidence of noncompliance shall be cause for rejection of the truck.

4.3.2.25 Power consumption. Test the truck in accordance with Test Method No. 19 prior to Test Method No. 22. Failure to conform with requirements of test method shall constitute failure of this test.

4.3.2.26 Weighing device. Weighing device shall be tested according to Test Method No. 29 for conformance to the requirements of 3.3.5.6.

4.3.2.26.1 First produced truck. Weighing device shall be adjusted to zero and marked in accordance with 4.3.2.26. By use of a load equal to the rated truck capacity plus zero, minus 1-percent, the accuracy of the weighing device to weigh the calibrated load shall be demonstrated. Failure to comply with this required accuracy shall be cause for rejection.

4.3.2.26.2 Production Truck. The weighing device on each production truck shall be tested according to paragraphs 1 through 3.f of Test Method No. 29.

4.3.2.27 HI Shock test. When truck is specified to be tested in HI Shock (see 6.2), first produced truck with battery shall be tested in accordance with MIL-S-901. The contractor shall locate a non-government shock test facility, arrange the test, and pay for the test. Prior to actual test, contractor shall submit a formal procedure to be used during the high shock test for approval. procedure shall indicate applicable documents, test requirements, description

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of test, hardware configuration, preparation for testing, visual inspections, initial operational tests, evaluation of damage, shock test report, definition of failure, cause for rejection, completion of shock testing/post shock examination and post operational tests including lifting/lowering speeds, acceleration vehicle speed, slope ascension and stopping distance. Pursuant to 6.1 of MIL-S-901 the following ordering data shall apply to the first article truck and battery which shall be mounted on the Floating Shock Platform during test and to the trucks furnished by the supplier:

(a) "Shock tests: HI (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements For", MIL-S-901.

(b) Grade A shock-proofness required.

(c) Deck-mounted principal unit.

(d) The truck is class I, modified. The modification is that the truck rests on solid rubber or polyurethane tires which are similar in action to some resilient mountings.

(e) Heavyweight.

(f) Type A test in which the truck is the principal unit and the battery is a subsidiary component.

(g) Following the explosion of the depth charge at 20-foot standoff, the truck and battery shall comply with (i) and then with (j). Minor permanent deformation of battery components and minor loss of electrolyte from splashing are permitted. Cracked or leaking cells, fractured intercell connectors, major loss of electrolyte, or failure to power the truck in accordance with (i) or to reach rated capacity in accordance with (j) shall constitute failure of the battery to meet the High Impact Shock requirement. Failure of the truck to comply with (i) and (j) or failure or permanent deformation of any component preventing operation of truck shall be regarded as failure of the truck to meet the H. I. Shock requirement.

(h) The truck with battery installed shall be secured to the deck simulator of the floating shock platform in accordance with the instructions of the contract.

(i) The truck shall not be operated during the shocks, but it shall be operated briefly after each shock, to show lifting, lowering, drive wheels jacked up and rotating forward and reverse, sideshift operation if applicable, and steering.

(j) After successful test of the truck and after successful demonstration of battery's reaching rated capacity in accordance with 4.5.1 of W-B-133 except that not more than 2 cycles of charge shall be allowed after the HI Shock testing, and provided neither truck nor battery sustained damage beyond that permitted in accordance with (g), the shock-tested first produced truck with battery may be submitted as the final production item under the contract after being refurbished to appear new.

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(k) See (d).

(l) Only first-produced truck with battery required to be tested.

4.3.2.28 Water protection. Test the truck in accordance with Test Method No. 20. Evidence of moisture in instruments or controls or inability to perform any normal function shall constitute failure of this test. Nonconformance with the requirements of 3.6.24 shall constitute failure of this test.

4.3.2.29 Frame racking. Test the truck in accordance with Test Method No. 21. Nonconformance with the requirements of 3.3.1 shall constitute failure of this test.

4.3.2.30 Operating temperature test. Test the truck in accordance with Test Method No. 25. Nonconformance with the requirements of 3.1.5.4 shall constitute failure of this test.

4.3.2.31 Hydraulic pump vacuum. Install a vacuum gage into the pump suction line immediately adjacent to the pump or at the pump. Install a thermocouple in the hydraulic reservoir. Run the pump at RPM encountered in truck operation and governed rpm. Measure the pump inlet pressure in inches of mercury vacuum at the specified temperature and speed. Nonconformance to 3.2.5.1.4 shall constitute failure of this test.

4.3.2.31.1 Suction line. The suction line(s) consisting of all fittings and hoses between the pump(s) and reservoir shall be tested by capping one end of the line and applying a minimum of 25 inches of mercury vacuum to the other end of the line and holding the vacuum for a minimum of 1 minute. Coat all suction line junctures with detergent foam. Evidence of leakage or a reduction of outside circumference of more than 15 percent shall constitute failure of this test.

4.3.2.32 Hydraulic pump(s). Operate the pump(s) at maximum RPM encountered in truck operation and at 1-1/2 times maximum system working pressure for not less than 2 minutes. Check for external leaks at assembled surfaces and the shaft seal. Nonconformance to 3.2.5.2 shall constitute failure of this test.

4.3.2.33 Hydraulic filter. Test the hydraulic filter in accordance with Test Method No. 26. Nonconformance to 3.2.5.3.1 shall constitute failure of this test.

4.3.2.33.1 Hydraulic filter life. The hydraulic filter life test shall be conducted on the truck during the reliability test. At conclusion of reliability test, establish maximum system oil flow through the filter at an oil temperature of 150 degrees F plus or minus 5 degrees F, and note if element is bypassing. Nonconformance to 3.2.5.3.1 as evidenced by indicator reading bypass shall constitute failure of this test.

4.3.2.34 Hydraulic cylinders. Test each hydraulic cylinder in accordance with Test Method No. 27. Nonconformance to 3.2.5.6 shall constitute failure of this test.

4.3.2.35 Hydraulic system cleanliness. Test each truck in accordance with

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Test Method No. 24. Nonconformance to 3.2.5.8 shall constitute failure of this test.

4.3.2.36 Hydraulic fittings. Test each truck in accordance with Test Method No. 28. Nonconformance to 3.2.5.1.1 shall constitute failure of this test.

4.3.2.37 Uprights and sideshift. Test the truck in accordance with Test Method No. 30. Any evidence of permanent deformation, damage, fracture or inability to complete the required cycles shall constitute failure of this test. Test upright may be other than the upright furnished for reliability test of the first-produced truck.

4.3.2.38 Reliability. The first-produced truck(s) shall be tested in accordance with Test Method No. 22 after completion of Test Method No.19. Failure for the purpose of this test is defined as any malfunction which cannot be remedied by adjustment, repair, or replacement action by organizational maintenance using the organization tools and parts within 60 minutes and which may cause:

(a) Failure to commence operation, cessation of operation, or degradation of performance capabilities of the truck below designated levels.

(b) Serious damage to the truck by continued operation.

(c) Serious personnel safety hazard.

Simultaneous related malfunctions are considered as one failure.

4.3.2.39 Battery protector. Test the truck in accordance with Test Method No. 31. Nonconformance to 3.5.5 shall constitute failure of the test.

4.3.2.40 Post test disassembly and inspection. Upon completion of tests in 4.3.2.39 the truck shall be subjected to the tests marked "X" in column 3 of Table II. Nonconformance with applicable requirements shall constitute a failure. Upon completion of all tests dismantle the truck sufficiently to permit detailed disassembly and visual inspection of the following components.

(a) Motors.

(b) Drive units.

(c) Complete brake system components.

(d) Steering system cylinders, valves and pump (if used).

Additional disassembly and inspection shall be made at the option of the contracting officer. The disassembly and inspection area shall consist of a paved shop area of sufficient size to permit the disassembly and detailed examination of all truck components. The area should be well lighted, clean, and have provisions for prohibiting all but required personnel. Available equipment shall include tables and benches to permit parts grouping, flashlights, and photographic equipment. Record complete descriptions of the condition of all parts and assemblies examined and take pictures of any deficiency. Each evidence of corrosion which affects the functions of the

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truck, each evidence of permanent deformation, breakage, or excessive wear of any component shall constitute a defect. Manufacturing tolerances listed in the supplier's qualify control program shall be made available upon request and shall be used as the basis for determining excessive wear.

4.3.3 Inspection and test failure. Failure of a first-produced truck to meet any requirement specified herein, during and as a result of the inspection and tests specified in 4.3.1 and 4.3.2 shall be cause for refusal by the Government to accept any production truck until evidence has been provided by the supplier that corrective action has been taken to eliminate deficiencies. Correction of such deficiencies shall be accomplished by the supplier at no cost to the Government on trucks produced under the contract. Any deficiencies found as a result of the first inspection and tests will be considered prima facie evidence that all trucks accepted prior to the completion of first inspection and tests are similarly deficient unless evidence to the contrary is furnished by the supplier and such evidence is acceptable to the contracting officer.

4.4 Quality conformance inspection and tests.

4.4.1 Tests. Each truck shall be tested carrying a rated load as specified in Column 2 of Table II. Failure of any test shall be cause for rejection. Overheating, failure of any components, malfunction of any control, or evidence of leakage of fluids shall be cause for rejection of the truck. All tests shall be conducted utilizing a contractor furnished battery equal to the battery specified in 3.2.2.

4.4.2 Inspection. After successful completion of all tests specified in 4.3.2, each truck shall be inspected for the defects marked "X" in Column 2 of Table I. Presence of one or more defects shall be cause for rejection.

4.5 Inspection comparison. The Government may select trucks at any time during the contract production period and subject the trucks to the inspections specified in Column 1 of Table I and to the tests specified in Column 1 of Table II to determine conformance to the requirements of this specification. The inspection will be performed by the Government, at a site selected by the Government, on units selected at random from those which have been accepted by the Government and will not include the previously inspected first produced truck(s). In addition to any test specified as part of the inspection comparison, the Government reserves the right to conduct any and all other tests contained in this specification as part of the inspection comparison, and failure of such additional tests shall have the same effect as failure of those tests specified as inspection comparison.

4.5.1 Inspection failure. Failure of an inspection comparison truck to meet any requirement specified herein during and as a result of the inspection and tests specified in 4.5 shall be cause for rejection of the inspection comparison truck(s) and shall be cause for refusal by the Government to continue acceptance of production trucks until evidence has been provided by the supplier that corrective action has been taken to eliminate the deficiencies. Correction of such deficiencies shall be accomplished by the supplier at no cost the the Government on trucks previously accepted and produced under the contract. Any deficiencies found as a result of the

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inspection comparison will be considered prima facie evidence that all trucks accepted prior to the completion of inspection comparison are similarly deficient unless evidence to the contrary is furnished by the supplier and such evidence is acceptable to the contracting officer.

4.6 Inspection of preparation for delivery. The preservation, packaging, packing, and marking shall be examined to determine compliance with MIL-STD-162.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing. Shall be in accordance with MIL-STD-162.

5.2 Marking. Marking for shipping and storage shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. These trucks are intended for stacking, unstacking, moving general supplies, cargo and handling of propellants, ammunition, and other ordnance applications in and around warehouses, loading platforms, ordnance depots, ammunition depots, docks, and aboard ships. Trucks are intended for operation over paved and unpaved surfaces for short distances. These trucks are for use where continuous operation is required in slow speeds such as inching with minimum temperature rise of electrical components. Users are cautioned to use proper type of truck as prescribed by current safety regulations.

6.2 Ordering data. Procurement documents shall specify the following:

(a) Title, number and date of this specification.

(b) Type and size required, applicable individual specification sheet.

(c) Number of trucks to be furnished for first article testing. Time frame required for submission of first produced truck(s) (see 3.1.1).

(d) When frame racking test is required (see 3.1.1).

(e) When Hi-Shock test is not required (if required, see 3.3.5.4, 3.6.23 and 4.3.2.27).

(f) When backrest is required (see 3.3.1.5).

(g) Detailed battery specifications (see 3.2).

(h) When fire extinguisher is required.

(i) When overhead guard is required (see 3.5.3 and 3.6.17).

(j) Level of preservation, packaging and packing required (see 5.1).

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6.3 First produced truck(s). Any changes or deviations of production trucks from the approved first produced model during production will be subject to the approval of the contracting officer. Approval of the first produced model will not relieve the supplier of his obligation to furnish trucks conforming to this specification (see 3.1.1).

6.3.1 Incident report. When the supplier conducts the tests specified herein, a verbal or teletype notification within 24 hours and a written report within 48 hours shall be furnished the contracting officer of any incident of equipment malfunction or failure during the conduct of the test. As a minimum, the report shall describe components and parts affected, test and operating conditions, date of incident, hour meter reading, how detected, and description of incident.

6.4 High-impact Shock reports and test results. Reports and test results of High-Impact Shock shall be forwarded to the contracting officer for approval. One copy shall be furnished to Ships Parts Control Center Code 0302, Mechanicsburg, Pa 17055 and one copy to NAVSEASYSCOM Code 55X11 Washington, DC 20362.

6.5 Lubricants. The contracting officer shall furnish a list of military lubricants applicable to the truck covered by this specification as listed in MIL-HDBK-267(SH).

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APPENDIX

FOR

TRUCK, LIFT, FORK, ELECTRIC

7. SCOPE

The test methods contained within this appendix are to determine whether trucks procured under this specification conform to the requirements set forth.

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TEST METHOD NO. 1

MINIMUM AND MAXIMUM FORK HEIGHT - FREE LIFT HEIGHT

MAXIMUM AND COLLAPSED MAST HEIGHT

OVERALL TRUCK HEIGHT

1. Test Course:

   (a) Level, flat surface.

2. Test Apparatus:

   (a) Tape measure.
   (b) Plumb bob.
   (c) Liquid level or clinometer.

3. Test Procedure:

   (a) Measure the true vertical distrance from deck to uppermost projection of the truck and of the upright assembly with mast collapsed in true vertical position as determined by a clinometer. (This is the actual collapsed mast height). (Check for any projection above collapsed mast height).

   (b) Fully extend and raise rated load until the inner mast or carriage assembly begins to exceed the specified collapsed mast height.

   (c) Measure and record the true vertical distance from the deck to the top surface of the forks at specified load center. (This is the free lift height).

   (d) Adjust rated load to 12 inches, plus or minus 4 inches, above deck level and position mast in true vertical position using clinometer and plumb bob.

   (e) Attach the plumb bob to the theoretical intersection of the front surface and top surface of the forks and mark a reference point on the deck.

   (f) Elevate the test load to the minimum specified fork height and check the reference point. If necessary, reposition the mast so that the plumb bob is directly over the original reference point.

   (g) Measure and record the true vertical distance from deck to the top surface of the forks of the mast. (This is maximum mast height).

   (h) Elevate the test load to the maximum height and check the reference point. If necessary, reposition the mast so that the plumb bob is directly over the original reference point.

   (i) Measure and record the true vertical distance from deck to the top surface of the forks at the specified load center. (This is maximum fork height).

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TEST METHOD NO. 2

LIFTING SPEED, LOWERING SPEED, EXTENSION AND RETRACTION SPEED

1. Test Apparatus:

   (a) Tape measure.
   (b) Stopwatch.

2. Test Procedure, Lifting Speed - Lowering speed:

   (a) Measure and record distance in inches from floor to top surface of forks in fully lowered position.

   (b) With battery fully charged record time in seconds required to raise rated load to maximum fork height using timing device. Record the difference between maximum fork height and the height of the forks in the lowered position.

   (c) Record time to lower rated load at maximum speed (full open valve) to 3- to 4-foot height. Load to be abruptly stopped at the 3- to 4-foot height.

   (d) Repeat steps (b) and (c) a minimum of 20* times, except no measurements are required.

   (e) Remove load and raise empty forks to maximum fork height.

   (f) Record time in seconds required to lower forks to lowered position.

3. Test Procedure, Extension and Retraction Speed:

   (a) Measure and record distance in inches of movement of forks from fully retracted to fully extended position.

   (b) With battery fully charged record time in seconds to extend rated load from fully retracted to fully extended position with forks at maximum height.

   (c) Record time in seconds to retract rated load from fully extended to fully retracted position with forks at maximum height.

   (d) Repeat steps (b) and (c) a minimum of 20* times.

   (e) Lower forks, retract forks and remove load.

   (f) Record time in seconds required to fully extend forks.

* During quality conformance test repeat steps (b) and (c) only 3 times.

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TEST METHOD NO. 3

RIGHT ANGLE TURN

1. Test Course:

   (a) Level paved surface.
   (b) Test course in accordance with "course layout" (see Figure A-1).

2. Test Apparatus:

   (a) Tape measure.
   (b) Movable vertical barrier.
   (c) Clinometer.

3. Test Procedure:

   (a) Truck is placed with the most forward edge of centered rated load coincident to line "B". (see Figure A-1). When forks are longer than rated load, the fork tips shall touch line "B" and the fork length is included in the "A" dimension. Mast in vertical position.

   (b) Pallet is raised 6 inches above floor with mast true vertical/measured with the clinometer.

   (c) Position movable vertical barrier within 4 inches of counterweight of truck.

   (d) Turn steer wheels to the extreme left position and back truck through 90-degree turn.

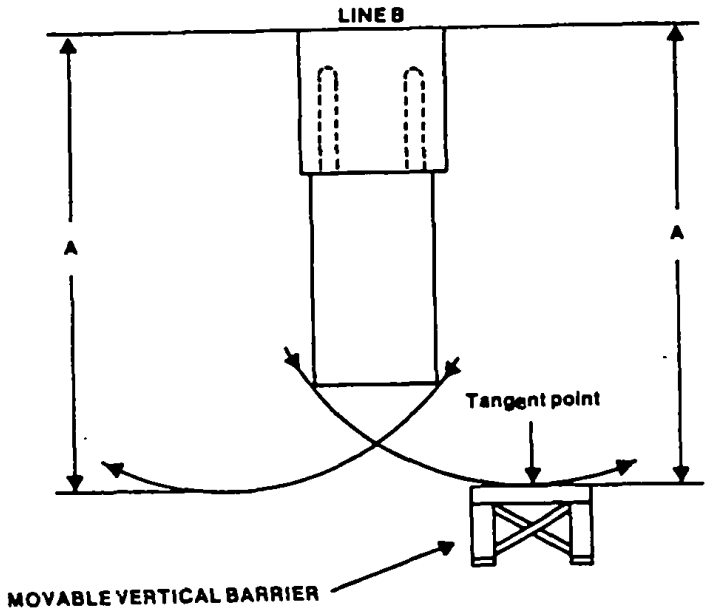
   (e) Measure the perpendicular distance from line "B" to the position assumed by the movable barrier. This is dimension "A".

   (f) Return truck to initial position.

   (g) Turn steer wheels to extreme right and repeat (a) through (e).

Figure A-1. COURSE LAYOUT

Test Method No. 3



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TEST METHOD NO. 4

STEERING

Part I. Wear of Steering Mechanism.*

* This part of test method to be followed before and after reliability test.

1. Test Course: Smooth, clean, dry, level surface.

2. Test Apparatus:

   (a) Piece of stiff fiber board.
   (b) Ruler.

3. Test Procedure:

   (a) Place unloaded truck on a dry, level concrete surface with its front wheels parallel to the longitudinal axis of the truck. With power steering, pump motor is to be running.

   (b) Attach to the steering column, immediately below the steering wheel and parallel to it, a piece of stiff fiber board or similar material which is semi-circular in shape and which has a radius at least one inch greater than the radius of the steering wheel.

   (c) Mark a reference point on the upper portion of the outer edge of the steering wheel; mark a corresponding point on the fiber board templet.

   (d) Turn the steering wheel counterclockwise until the wheels of the truck begin to turn. Mark a point on the fiber board templet corresponding to the reference point on the outer edge of the steering wheel.

   (e) Repeat operation (d) in the clockwise direction.

   (f) Remove the fiber board templet from the truck and place it on a flat surface. Measure the distance between the 2 points made in accordance with operations (d) and (e) above. This distance, in inches, is the free play of the steering wheel.

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TEST METHOD NO. 4 (CONTINUED)

Part II. Steering Wheel Turning and Tangential Force Tests.

1. Test Course: Smooth, clean, dry, level surface.

2. Test Apparatus:

   (a) Steering wheel adapter pulley.
   (b) Tension dynamometer.

3. Test Procedure:

   (a) Place unloaded truck on clean, dry, level, smooth concrete with steer wheels in a straight ahead position.

   (b) Attach an adapter pulley, having a root diameter equal to the steering wheel diameter, to the spokes of the hand steering wheel.

   (c) Apply a steady force to a dynamometer attached to the adapter pulley in a counterclockwise direction and in the wheel plane until the wheel turns.

   (d) Record the maximum gage reading in 60-degree increments of steering wheel to within 15 degrees of the roadwheel steer angle.

   (e) Perform (c) and (d) in a clockwise direction.

   (f) Steps (b) through (e) may be performed with a torque reading nstrument in lieu of an adapter pulley.

   (g) Turn steering wheel clockwise until steer wheels hit the stop. Apply 150 lb. unbalanced tangential force to the steering wheel and maintain force for a minimum of 15 seconds. Perform this operation two more times.

   (h) Repeat step (g) in counterclockwise direction.

   (i) Measure the number of turns of the hand steering wheel required to turn the steer wheels from the extreme left position to the extreme right position. Repeat operation in the opposite direction.

   (j) Measure and record steering wheel diameter and steering wheel to seat clearance.

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TEST METHOD NO. 5

SPEED

1. Test Course:

   (a) Test course shall be a dry, level surface of sufficient length to attain maximum speed prior to entering measured distance, plus measured distance, plus sufficient stopping distance.

2. Test Apparatus:

   (a) Tape measure.
   (b) Stopwatch or electronic timer.

3. Test Procedure:

   (a) Operate the truck with fully charged battery with no load 15 minutes prior to test.

   (b) Drive the truck a sufficient distance to attain maximum speed prior to entering the measured test course.

   (c) Record length of measured distance and time to traverse measured distance. Measured distance shall be equal to or greater than 44 feet.

   (d) Repeat for a total of six runs, in forward gear, three in each direction, except only time measurement is required.

   (e) Repeat total of six runs in reverse gear, three in each direction, except only time measurement is required. Travel speeds in forward and reverse shall be the average of the six runs in the corresponding runs.

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TEST METHOD NO.6

SLOPE ASCENSION - PARKING BRAKE - UNDERCLEARANCE

1. Test Course:

   (a) Ramp

2. Test Apparatus:

   (a) Clinometer.
   (b) Spring scale.

3. Test Procedure:

   (a) Drive truck forward with rated load along horizontal approach and up a ramp of specified percent grade and bring to complete stop. (All wheels supported on the ramp).

   (b) Apply parking brake and using the spring scale measure force required at end of the operating lever.

   (c) Release service brakes and observe whether truck remains stationary.

   (d) Release parking brake and start from a standstill. Proceed up ramp and onto a horizontal surface. Record any interference of truck with ramp.

   (e) Repeat steps 3(a) through 3(d) without load.

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TEST METHOD NO. 7

UPRIGHT TILT

1. Test Course:

   (a) Level, flat surface.

2. Test Apparatus:

   (a) Clinometer.

3. Test Procedure:

   (a) Tilt.

      (1) Place truck without load on flat level surface, using clinometer to insure truck is level.

      (2) Raise forks to an elevation of 2 feet above the surface, tilt boom as far forward as possible, and record angle of tilt shown on clinometer located on front surface of outer mast channel.

      (3) Tilt boom as far rearward as possible and record angle of tilt on clinometer located on front surface of outer mast channel.

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TEST METHOD NO. 8

LIFT ASSEMBLY DRIFT

1. Test Course:

   (a) Level, flat surface.

2. Test Apparatus:

   (a) Temperature thermocouples.
   (b) Clinometer.

3. Test Procedure:

   (a) Install thermocouple in the hydraulic reservoir. Heat the hydraulic oil by exercising the lift, tilt and extension functions and maintain hydraulic oil temperature above 120 degrees F temperature during the duration of the test.

   (b) Raise rated load to maximum fork height and extension obtainable with outer channel in true vertical position measured with the clinometer. Mark reference point on mast upper stage.

   (c) Record initial outer mast tilt and hydraulic oil temperatures.

   (d) Hold for specified time and record downward drift, rotational drift, and hydraulic temperature.

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TEST METHOD NO. 9

ACCELERATION

1. Test Course:

   (a) Level, flat surface.

2. Test Apparatus:

   (a) Tape measure.
   (b) Stopwatch.

3. Test Procedure:

   (a) Operate truck 15 minutes prior to test.

   (b) Accelerate the truck in forward gear at maximum speed through the specified distance from a standing stop. Record time at end of required distance.

   (c) Repeat (b) for a total of six runs, three in each direction, except only time measurement is required.

   (d) Acceleration time shall be the average of six runs.

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TEST METHOD 10

LIFTING AND TIEDOWN ATTACHMENTS

1. Lifting Attachments

(a) Test Procedure:

(1) Lift the truck with battery and hold in suspension in normal transport position using slings that converge not more than 24 feet above the lowest extremity of the truck. Measure clearance between each sling and the truck. Measure eye openings and clearance dimensions of the attachment. Measure pull on each attachment.

(2) Restrain the truck by anchoring the main frame and subject each attachment to a pull of 2-1/2 times the load it carried when initially suspended. This pull shall be applied in the direction as determined in (a) above.

(3) An alternative method of test is to lift the truck with battery as in (a) above and add weights to the main frame until the force is 2-1/2 times the initial force on each attachment. Hold each load for a minimum of 90 seconds.

2. Tiedown Attachments

(a) Test Procedure:

(1) Inspect that tiedown attachments are so located that tiedown legs will fall within a 45 degree working cone.

(2) With the truck anchored by means other than the tiedown attachments, subject each attachment to the load specified below.

(3) Each tiedown eye shall withstand without yielding, its proportion of the following loads: 4.0 times the maximum weight of truck and battery in the direction of the longitudinal axis of the equipment, 2.25 times in the direction of the vertical axis, and 1.5 times in the direction of the lateral axis. The loads shall be applied in each direction of the axis and shall be distributed proportionally only among the tiedown eyes which would effectively resist motion if the combined directional load was applied through the center of gravity of the equipment. The test loads shall be applied for not less than 3.0 seconds and not more than 6.0 seconds.

(4) Breakage or deformation of the tiedown such that it can no longer withstand the required loads or failure to conform to 3.3.5.4 shall constitute failure of the test. Local deformation in the tiedown and nearby vicinity does not constitute failure of the test.

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TEST METHOD NO. 11

MAST ASSEMBLY OVERLOAD

1. Test Course:

   (a) Level, flat surface.
   (b) Anchor.

2. Test Apparatus:

   (a) Magnetic particle or dye penetrant capability.

3. Test Procedure:

   (a) Place truck on level surface and support it with blocks under the axle or frame to relieve strain on tires. Position mast in true vertical position, with rated load on forks in normal carrying position and forks fully retracted. External means may be utilized to hydraulically lock the tilt cylinder.

   (b) Secure truck to floor in a manner to compensate for the additional test loads to be placed on forks. Counterweight may be added to assist the holding force. Apply counterbalancing forces in a vertical direction.

   (c) With crane or another truck, place a test load of the rated capacity in position over the first test load such that the center of mass of the test load is on the truck's longitudinal centerline and at the rated load center.

   (d) Check strain or holddown devices and hydraulic system to determine whether the additional test load can be placed on forks. Tighten holddown devices if necessary.

   (e) With the crane or another truck, place the third test load carefully in position over the first two loads so that the center of mass of load is on the longitudinal centerline of the truck and at the rated load center.

   (f) When placing the overload on trucks, personnel should stand clear and crane operator should stand by to remove load if there is any evidence of immediate collapse or failure in truck structure.

   (g) The 300 percent rated load may be applied as one load in lieu of three loads as described in (c) through (f).

   (h) If truck accepts the additional test load without immediate failure, let overload stand on truck for 10 minutes.

   (i) Remove loads.

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(j) Repeat steps (a), (b), (c), (d), (f), (h), and (i) with forks fully extended.

(k) Inspect truck structure, frame, mast assembly, the hydraulic system for evidence of deformation, fractures, leakage in hydraulic system, broken welds, etc.

(l) Inspect forks a minimum of 6 inches each side of heel by magnetic particle or dye penetrant method.

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TEST METHOD 12

STATIC DISCHARGE

1. Test Course:

   (a) Shop area.

2. Test Apparatus:

   (a) Test instrument detailed below.
   (b) Plywood
   (c) Small piece brass or aluminum plate.

3. Test Procedure:

   (a) Place a piece of 1/8-inch thick plywood under each non static tire in order to eliminate any conductivity between truck tires and floor.

   (b) Place brass or aluminum plates, 1/8-inch thick by 2-1/2 inch minimum diameter, on the floor such that each conductive static discharge tire of truck rests on a plate.

   (c) Connect one electrode of the test instrument detailed below to the chassis of the truck.

   (d) Connect the other electrode of the test instrument to the brass or aluminum plate. This electrode shall consist of a spring clip that is clamped to the edge of the plate.

   (e) Confirmed resistance greater than 250,000 ohm shall be cause for rejection of static discharge device.

NOTE: Test instrument details:

The voltage applied by the testing instrument should be between 90 and 500 volts. Low voltage instruments may be used, but if the static discharge device shows more than the maximum resistance by tests with instruments of less than 500 volts, a test with a 500 volt instrument should be made to obtain confirmation. The instrument used should consist of two dry electrodes. One electrode should consist of a spring clip for clamping to the aluminum or brass plate. The other electrode should be such as to provide a good electrical connection to some metallic portion of the truck chassis.

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TEST METHOD NO. 13

MAINTAINABILITY

1. Test Course:

   Shop area of sufficient size to permit unobstructed surveillance of maintenance.

2. Test Apparatus:

   (a) Common handtools.
   (b) Special tools (if furnished with truck).

3. Test Procedure:

   (a) Examine truck for accessibility of major assemblies.

   (b) Examine position of drains with respect to accessibility.

   (c) Using the tools, demonstrate that major assemblies are accessible for repair and maintenance.

   (d) Demonstrate both the accessibility of drains and the path of discharge of lubricants by activating drainage controls.

   (e) Perform and time each operation on the maintenance operations list (see 3.1.3.7.1).

   (f) Determine if battery cover can be opened at least 90 degrees.

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TEST METHOD NO. 14

OVERHEAD SAFETY GUARD

1. Test Apparatus:

   (a) Tape measure.
   (b) 100 pound solid hardwood core (or equivalent) test weight.
   (c) 500 pound high density cube (when a high density overhead safety guard is specified).

2. Test Procedure:

   (a) Place truck on level surface.

   (b) Examine safety guard and take measurements from a suitable reference point to various points on the bars or tubings in order to determine the amount of deflection at conclusion of test.

   (c) Place or hold 100 pound test weight 5 feet above the safety guard so that it will drop vertically on the safety guard between the supporting side rails of the guard. The test weight shall be positioned so that it will drop flat on the bars or tubes and not edgewise.

   (d) Release test weight.

   (e) Repeat steps (c) and (d) selecting points at random on safety guard upon which test weight is to be dropped a total of 10 times.

   (f) At conclusion of drops, examine the overhead safety guard for fractures, permanent deformation in excess of allowable deflection.

   (g) Apply static test load on the applicable specification sheet to overhead guard and observe whether guard has sufficient strength to withstand applied load(s).

The following tests are required when a high strength overhead guard is specified.

   (h) See (a) & (b) above.

   (i) Place or hold 500 pound test weight 8 feet above the safety guard so that it will drop vertically on the safety guard between the supporting side rails of the guard. The test weight shall be positioned so that it will drop flat on the bars or tubes and not edgewise.

   (k) See (d), (e) and (f) above.

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TEST METHOD NO. 15

SERVICE BRAKE DRAG AND PRESSURE

1. Test Course:

Level, clean, dry, concrete, having a coefficient of friction not less than .50.

2. Test Apparatus:

(a) Pedal force gage.
(b) Tension dynamometer.
(c) Block and tackle.

3. Test Procedure:

(a) Brake Pressure Test.

(1) Attach the pressure gage to the brake pedal in a manner which enables pressure to be applied to the face of the gage.

(2) Apply 250 pound pressure to the brake pedal, hold for one minute and release. Repeat this operation 10 times.

(3) Inspect for component failure.

(b) Brake Drag.

(1) Determine gross weight of truck with rated load.

(2) Attach pressure gage to brake pedal in a manner which will enable pressure to be applied to the face of the gage.

(3) Attach a tension dynamometer to the front of the truck with mast in maximum rearward tilt.

(4) Attach one end of a block and tackle, or similar mechanical device, to the tension dynamometer, and the other end to an anchoring device.

(5) With transmission in neutral, tow truck forward and reverse with block and tackle or similar mechanical device.

(6) Apply sufficient brake pedal pressure to produce a force recorded on dynamometer equal to 30% of the total weight of truck plus rated load and record brake pedal and dynamometer readings.

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TEST METHOD NO. 16

STABILITY

1. Lateral Stability:

(a) Stacking:

Lateral stability for stacking shall be such that all tires remain in contact with the platform under a laterally centered rated load at maximum fork elevation, forks at maximum retraction and upward tilt, when the platform is tilted as specified on the specification sheet about an axis parallel to a line connecting the center of either load wheel tire and the center of the steer wheel tire on the same side of truck.

(b) Traveling:

Lateral stability for traveling shall be such that all tires remain in contact with the platform, without load, with the forks positioned approximately 17 inches above floor level, at maximum upward tilt and in the retraction position, when the supporting platform is tilted as specified on the specification sheet about an axis parallel to a line connecting the center of either load wheel tire and the center of the steer wheel tire on the same side of truck.

2. Longitudinal Stability:

(a) Stacking:

Longitudinal stability for stacking shall be such that all tires remain in contact with the platform, carrying rated capacity load at maximum fork elevation and forks retracted when the supporting platform is tilted as specified on the specification sheet about an axis parallel to the axis of the load wheels, and in a direction to increase the load overhang.

(b) Traveling:

Longitudinal stability for traveling shall be such that all tires remain in contact with the platform carrying specified rated load, forks fully retracted and the forks positioned approximately 17 inches above floor level, when the supporting platform is tilted as specified on the specification sheet about an axis parallel to the axis of the load wheels, and in a direction to increase the load overhang.

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TEST METHOD NO. 16 (CONTINUED)

3. Rearward Stability:

(a) Stacking:

Rearward stability for stacking shall be such that all tires remain in contact with the platform, without load, with forks at maximum elevation, retraction and upward tilt, when the supporting platform is tilted as specified on the specification sheet about an axis parallel to the axis of the drive wheels and in the rearward direction.

(b) Traveling:

Rearward stability for traveling shall be such that all tires remain in contact with the platform, without load, with forks at maximum retraction and upward tilt and positioned approximately 17 inches above floor level when the supporting platform is tilted as specified on the specification sheet about an axis parallel to the axis of the drive wheels and in a rearward direction.

4. Static Stability:

The truck, empty and loaded, with load in lowest carrying position, shall be such that all tires remain in contact with the platform in both transverse and longitudinal directions on minimum slopes as specified on the specification sheet while in a static condition.

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TEST METHOD NO. 17

STOPPING DISTANCE

1. Test Course:

   (a) Test course shall be a dry, level surface of sufficient length to obtain maximum speed plus sufficient stopping distance.

2. Test Apparatus:

   (a) Tape measure.

3. Test Procedure:

   (a) Operate truck for 15 minutes prior to test.

   (b) Run the truck carrying rated load in forward and rearward direction. Load shall be in normal carrying position.

   (c) After reaching top speed, the brakes shall be applied.

   (d) Measure the distance traveled by the truck after application of the brake to the final stopping point. Record this distance.

   (e) Perform operations (c) and (d) a second and third time in both forward and rearward directions.

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TEST METHOD NO. 18

TIRE LOADING

1. Test Apparatus:

   (a) Platform scales.

2. Test Procedure:

   (a) Determine the weight supported by each drive wheel without a load on the forks by driving the drive wheels onto a platform scale or jacking them up with two axle scales. When the drive wheels are weighed together, the total weight should be divided by the number of drive tires. The upright shall be in a vertical position and the forks approximately 12 inches above the floor.

   (b) Determine the weight supported by the load wheels with rated load in a carry position on the forks by driving the load wheels on a platform scale or jacking up with two axle scales. When a side-shift mechanism is not provided and the load wheels are weighed together, divide the total weight by the number of load carrying tires. When a side-shift mechanism is provided, the load shall be shifted to the extreme left and the weight carried by each load wheel determined separately. Repeat the procedure with the load shifted to the extreme right. The upright shall be vertical and the load shall be approximately 12 inches above the floor.

   (c) Repeat steps (a) and (b) with rated load on the forks centered on the carriage.

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TEST METHOD NO. 19

POWER CONSUMPTION TEST

1. Test Course:

   Test course shall be identical to that of Test Method No. 22.

2. Test Apparatus:

   Test apparatus shall be identical to that of Test Method No. 22.

3. Test Procedure:

   (a) The test shall be conducted prior to Test Method No. 22. Test procedure shall be identical to that of Test Method No. 22, except that the time of test shall be limited to 6 hours and the laps completed shall be counted as part of Test Method No. 22. The truck shall be run continuously for 6 hours over the test course with only one battery. Battery shall not be charged during the test.

   (b) Lap rate shall be 20 to 25 laps per hour.

   (c) Laps shall be timed and recorded.

   (d) Record number of laps per hour.

   (e) Observe that truck negotiated test course for 6 hours without changing or charging the battery.

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TEST METHOD NO. 20

WATER TEST

1. Test Apparatus:

   (a) Timing Device.
   (b) Measuring Device
   (c) Spray Fixture.

2. Test Procedure:

   (a) Subject the truck to a simulated magazine sprinkler/flooding. Expose top side of the truck to 4 gallons per minute per square foot for 1 minute.

   (b) Examine all instruments, electrical panels and controld for evidence of moisture penetration.

   (c) Demonstrate operation of truck by operating all controls.

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TEST METHOD NO. 21

FRAME RACKING

1. Test Description: This test may be performed before or after truck is completely assembled. When performed as a bench test prior to assembly, a truck of similar rating and characteristics may be used to determine the maximum static forces to be applied to support area.

2. Test Procedure:

(a) Determine by weighing or other means, the vertical static force exerted by the completely assembled truck at the support areas of the frame when carrying rated load and without load.

(b) Secure all but one support area of the frame of truck in a jig or similar device. The frame shall be in a horizontal position.

(c) Apply a vertical force to the unsecured support area equal to 200 percent of the maximum static force obtained in step (a) for that support area.

(d) Repeat steps (b) and (c) for the other support areas.

(e) Examine truck frame for evidence of fractures, permanent deformation or distortions.

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TEST METHOD NO. 22

RELIABILITY TEST

1. Test Course:

(a) Layout of course. The test course shall be set up equivalent to the provisions of Figure A-2. Aisle widths shall not exceed the dimensions shown in Table I. The course perimeter shall be demarcated with suitable barriers or indicators. Rubber pylons or other suitable marking shall be placed on all corners and other critical points to assist in keeping the truck being tested within the course limits.

TABLE I

AISLE WIDTHS FOR TEST COURSE	
Capacity (lb) of Truck	(FT)
2000	10
4000	14

(b) Obstacle inclusion. The obstacle test shall be set up in accordance with the provisions of Figure A-3, as a part of the test course. Iron, wood, cement or steel blocks may be used. A guideline 15 feet long shall be provided to the left of the centerline of the course and parallel to it. The inner edge of this guideline shall be at a distance from the course centerline equal to one-half of the truck width or one-half of the load width (whichever is greater) plus 6 inches. This spacing and arrangement will allow the left wheels of the truck under test to pass over the first block and then the right wheels to pass over the second block while the truck is moving forward in a straight line parallel to the guideline.

(c) Ramp inclusion. The course shall include a ramp constructed in accordance with the provisions of Figure A-4.

(d) Course surface. The course shall be paved with concrete having a fine float finish, or equivalent, having a road resistance of approximately 30-50 pounds per ton. It shall be dry, clean and free of any nonplanned obstacles or foreign material while conducting the reliability test.

(e) Pallet areas. Pallet loads in the first pallet area shall be stacked in accordance with Figure A-5. They shall be placed 2 inches apart in a direction parallel to, and touching in a direction perpendicular to the axis of the test course at that point. Side pallet stacks shall be high enough that the bottom of the top face of the top pallet in each stack is 6 inches below the maximum lift height of the vehicle under test. The stack marked "X" on Figure A-2 shall be high enough that the bottom of the top face of the pallet, when placed upon it, shall be 6 inches below the maximum lift height of the vehicle. Pallet loads in the second pallet area shall be stacked in accordance with Figure A-6. They shall be placed 2 inches apart in a direction parallel to, and touching in a direction perpendicular to the axis of

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the test course at that point. Side pallet stacks shall be high enough so that the bottom of the top pallet will be approximately as high as the maximum lift height of the truck under test. The stack marked "Y" on Figure A-2 shall be high enough that the bottom of the top face of the pallet, when placed upon it, shall be at the midpoint between ground level and the maximum lift height of the vehicle under test.

Pallet loads in the third pallet area shall be stacked in accordance with Figure A-7. They shall be placed 2 inches apart, positioned as shown on Figure A-2, in a direction parallel to, and touching in a direction perpendicular to the axis of the test course at that point. Side pallet stacks shall be one pallet load (48 inches plus the height of the pallet) high.

2. Test Procedure:

Truck shall complete 2000 laps (Including laps completed in Test Method No. 19). Successful testing of Test Method 19 shall precede this test.

(a) The light switch shall be turned "off" and "on" and horn sounded at the beginning of each lap. Forks shall be extended and retracted and side shift moved to both sides upon entering each pallet area.

(b) The truck under test shall begin each lap at the point labeled "START" on Figure A-2. As the operator starts the truck, he shall operate the horn for approximately 1 second. On lap number 1, the truck shall proceed in a forward direction, following the centerline along the portion of the course marked "A" until it reaches the first pallet area. The rated load will have been placed in this location on the stack marked "X".

(c) The truck shall make a 90-degree right-hand turn in one motion without backing, proceed to the face of the pallet stack marked "X", raise forks to maximum fork height so hydraulic relief valve is activated, then adjust fork height and remove the loaded pallet. The truck shall back out of the stack aisle into the main aisle making a 90-degree left-hand turn in one motion, without going forward, and proceed rearward along the main aisle in the portion of the course marked "B" until it reaches the second pallet area.

(d) The truck shall proceed rearward to a point beyond the pallet area opening, reverse its direction, and move forward to the face of the pallet stack marked "Y", making the 90-degree right-hand turn in one motion without backing. The rated load shall be placed on top of the pallet stack marked "Y".

(e) The truck shall back out of the stack aisle into the main aisle, making the 90-degree left-hand turn in one motion without going forward, and proceed forward along the main aisle in the portion of the course marked "C" until it reaches the third pallet area.

(f) The truck shall make a 90-degree right-hand turn in one motion without backing and pick up rated load which has been placed in the location marked "Z". The truck shall back out into the main aisle, making the

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90-degree right-hand turn in one motion, and proceed forward along the main aisle in the portion of the course marked "D" until it reaches the portion of the course marked "E", containing the obstacle blocks.

(g) The obstacle blocks shall be traversed by the truck being driven through this area in a straight line so that its left wheels pass over the first block and the right wheels pass over the second block. This part of the test may be conducted at low speed with the transmission in low range. However, the truck shall not be stopped prior to or while going over the blocks.

(h) The truck shall proceed further along the main aisle in the portions of the course marked "F" and "G" until it reaches the position on the ramp labeled "Stopping Point". The driver shall stop the truck and then resume ascending the ramp. After the top of the ramp is reached, proceed along the main aisle in the portion of the course marked "J", "K", and "L".

(i) When the truck reaches the portion of the course marked "M", the operator shall stop. On every other lap, the operator shall turn off the master switch, then turn "ON". After completion of this portion fo the test,proceed along the main aisle and start the next cycle. All stops shall be at the maximum safe deceleration rate. The operator shall actuate and release the parking brake at least once during each circuit.

(j) The truck shall then reenter the portion of the course marked "A". In portions "A", "B", "C", and "D", the procedure shall be the same as described in preceding paragraphs, except that the truck shall place a test load at each point where it was previously indicated that the truck picked one up, and pick up a load where it was previously indicated one was placed. Maneuvers in the balance of the course beyond the portion marked "D" shall be the same as described in preceding paragraphs.

(k) One-half of the total number of laps shall be traversed in the opposite direction with all operations reversed accordingly. This may be accomplished after completion of each 8-hour operating day or multiple thereof. That is, 50 percent of the laps shall be accomplished in the clockwise direction and 50 percent in the counterclockwise direction or vice versa. The test course need not be rearranged for the reverse travel.

(l) "The Hourly Time Record Sheet" (page 81) shall be filled out for each operating hour of the performance test. Average lap speed per hour and hour meter readings shall be recorded.

(m) Maintenance and inspections shall be performed in accordance with the maintenance service and inspection sheet (page 80).

(n) Record all servicing to vehicle during testing, including battery recharging and replacement and hour meter readings.

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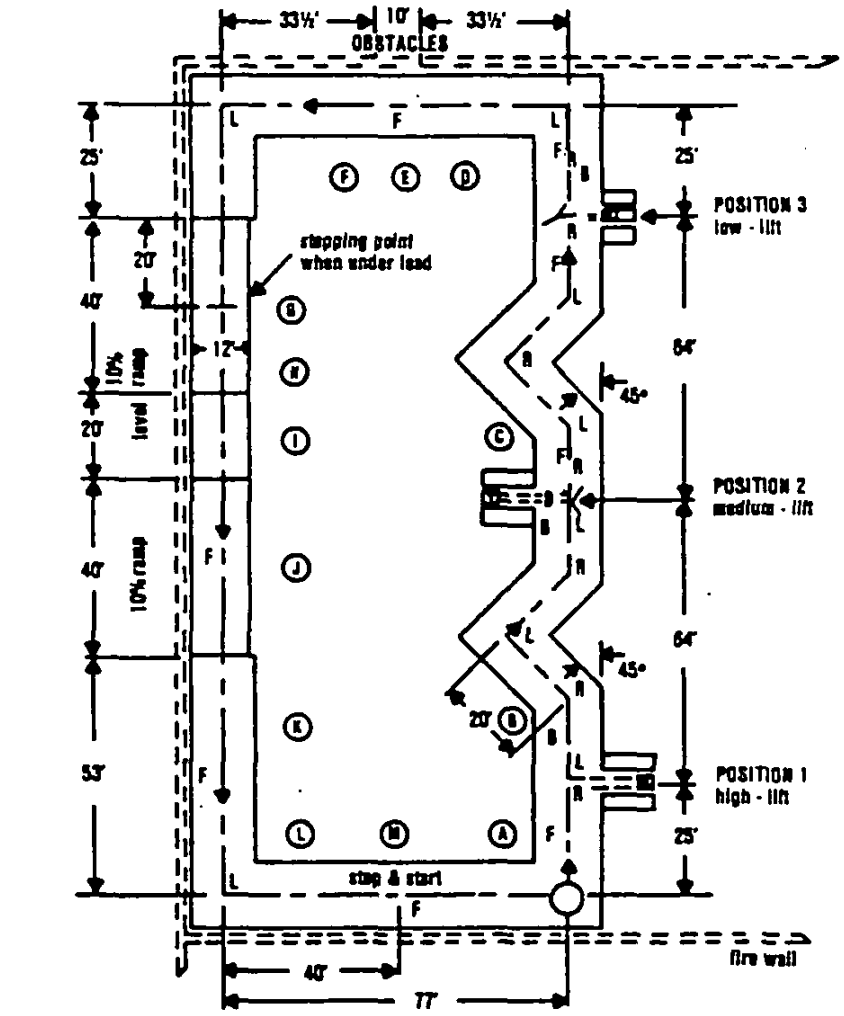
TYPICAL INDOOR TEST COURSE



LEGEND:
F = Forward
B = Backward
L = Left turn (facing forward)
R = Right turn (facing forward)
Ⓐ ETC. = Section designation

FIGURE A-2

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DETAILS OF OBSTACLE CONSTRUCTION
FIGURE A-3

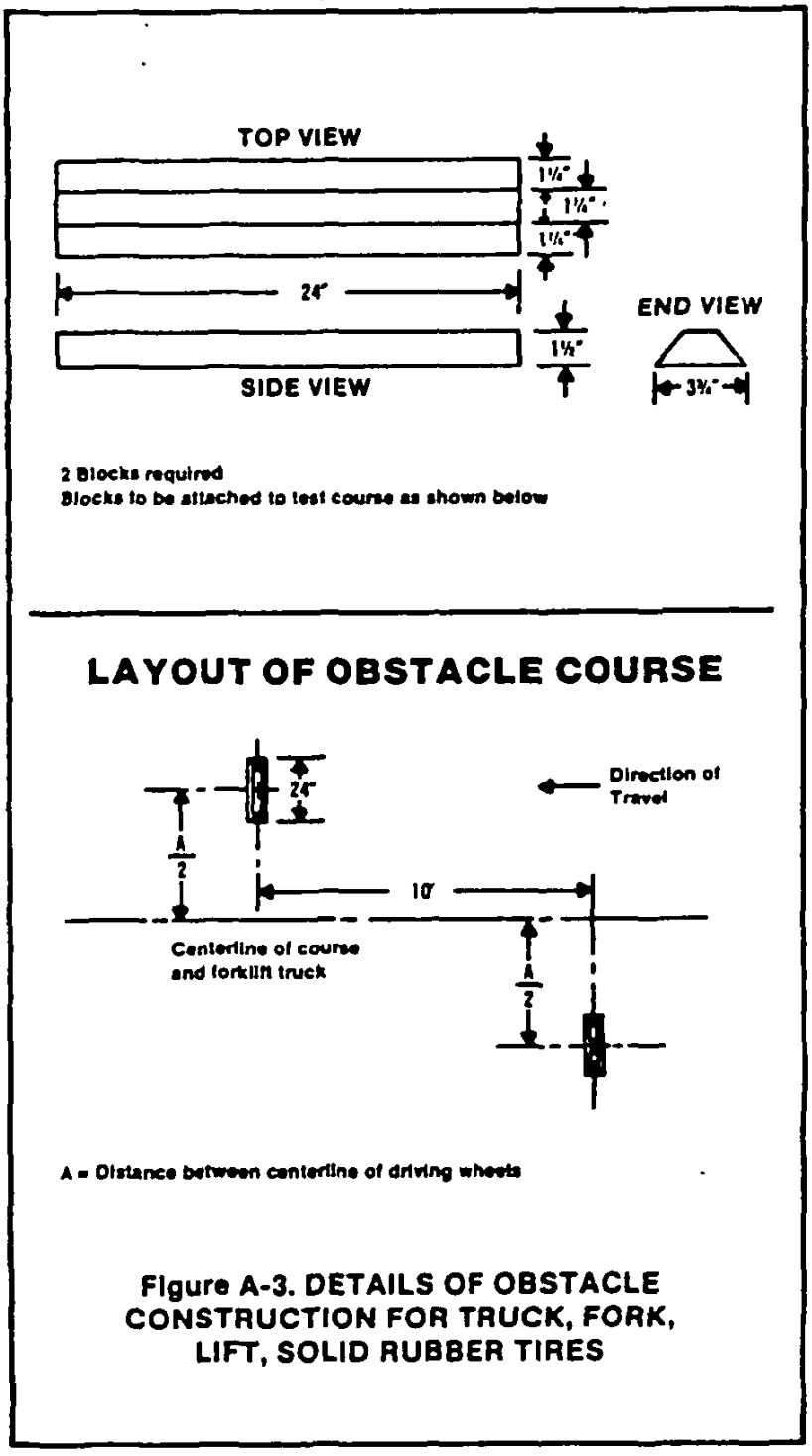

Figure A-3. DETAILS OF OBSTACLE CONSTRUCTION FOR TRUCK, FORK, LIFT, SOLID RUBBER TIRES

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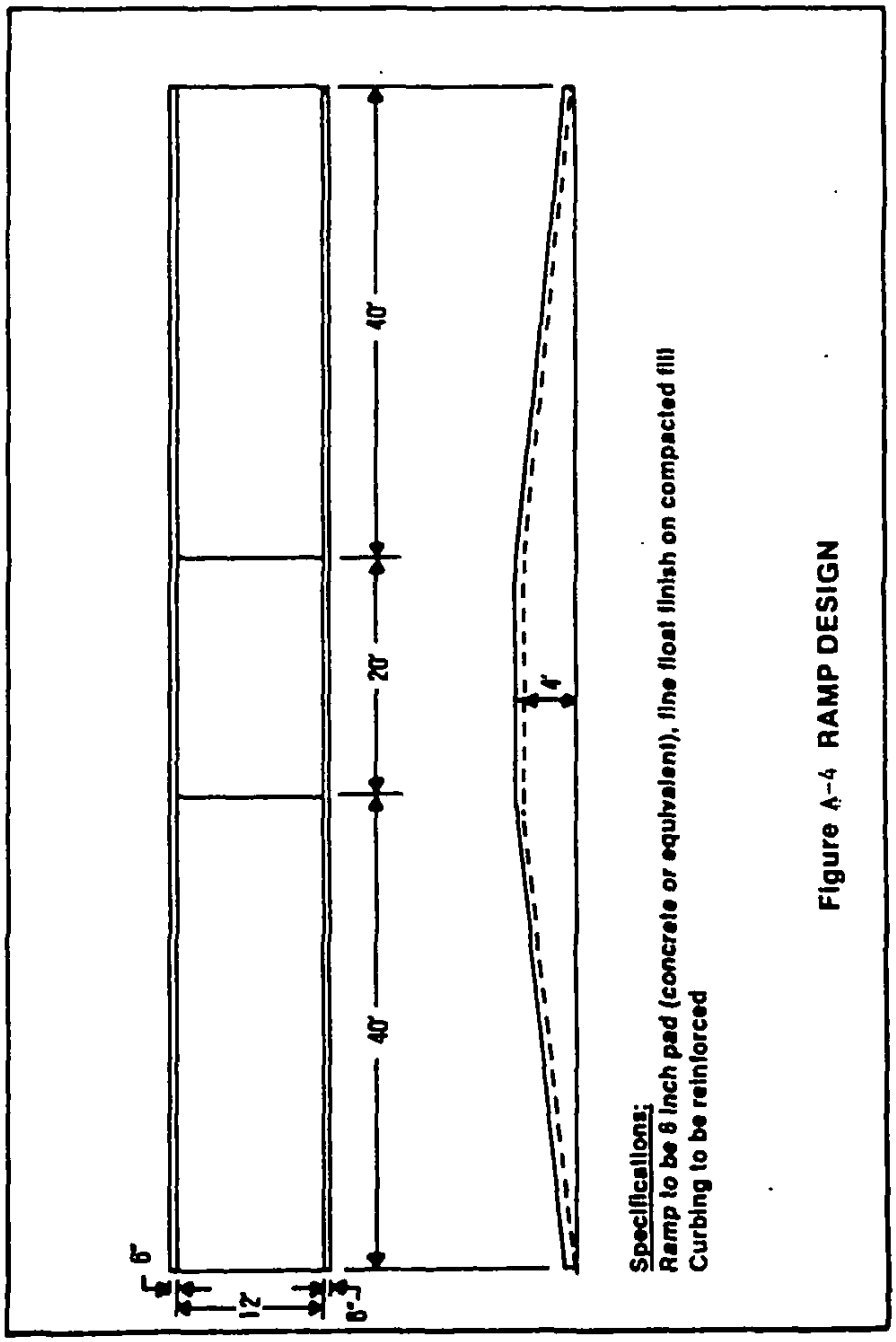
RAMP DESIGN



Specifications:
Ramp to be 8 inch pad (concrete or equivalent), fine float finish on compacted fill
Curbing to be reinforced

Figure A-4 RAMP DESIGN

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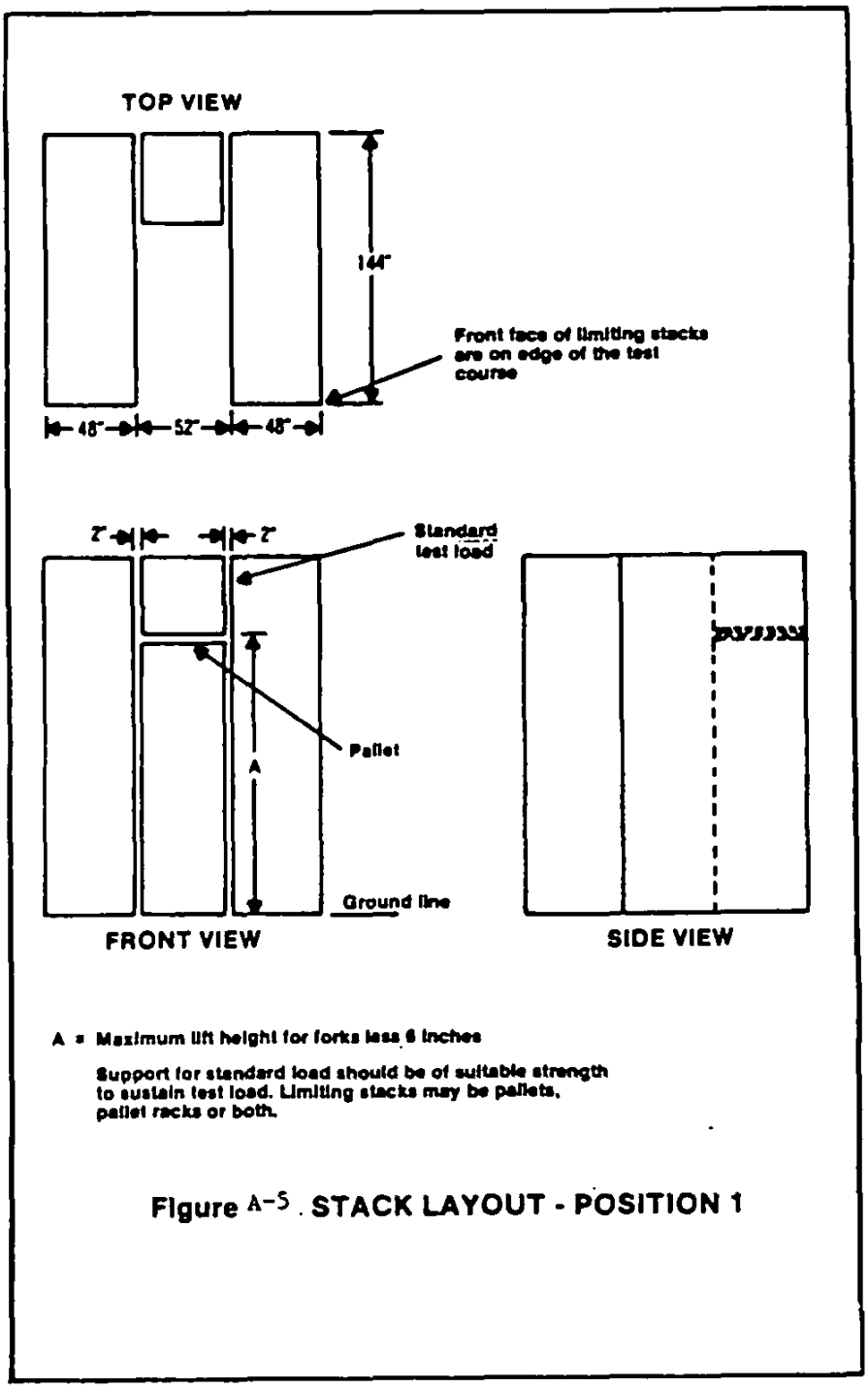
STACK LAYOUT-POSITION 1
FIGURE A-5



A = Maximum lift height for forks less 6 inches

Support for standard load should be of suitable strength to sustain test load. Limiting stacks may be pallets, pallet racks or both.

Figure A-5. STACK LAYOUT - POSITION 1

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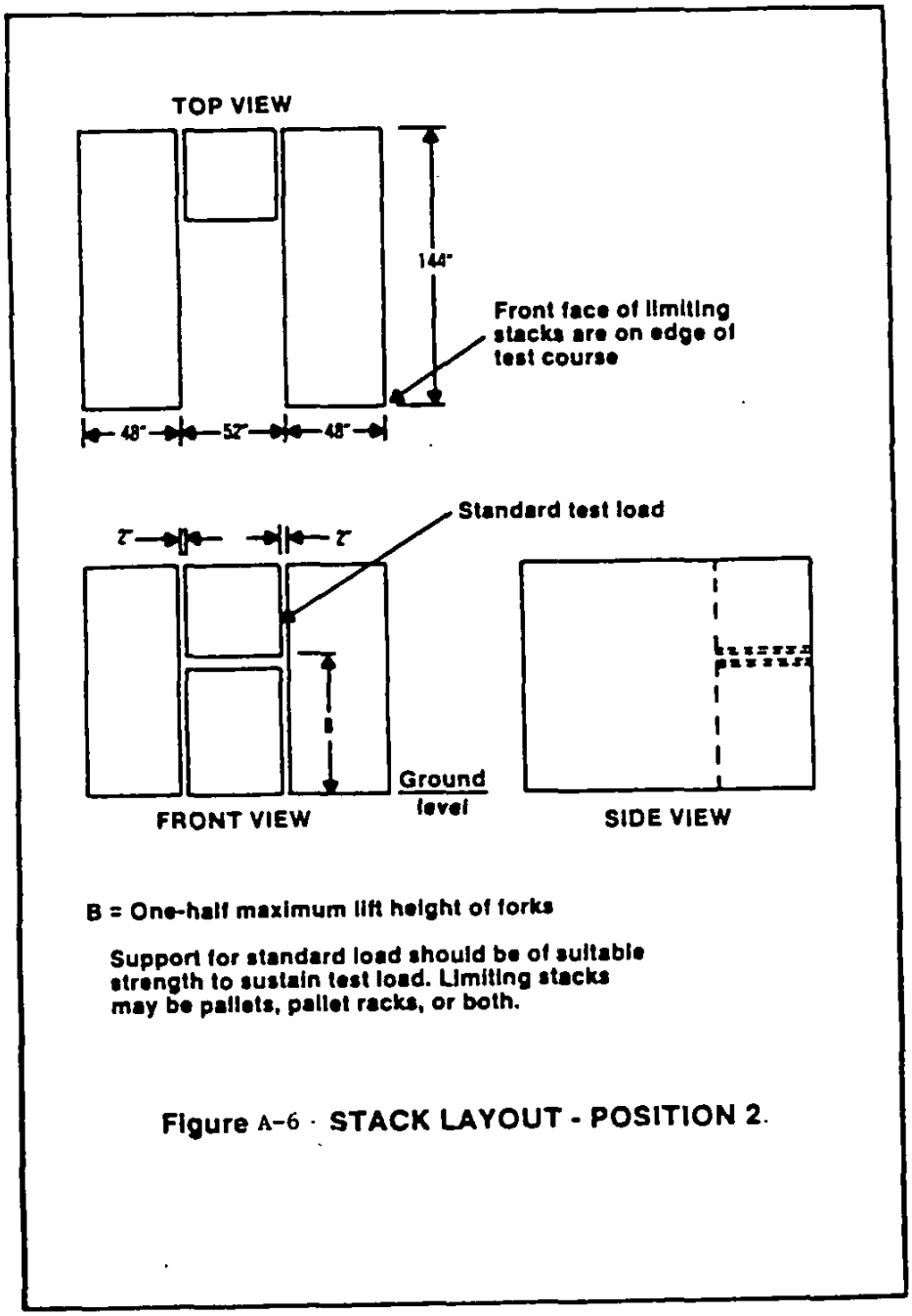
STACK LAYOUT-POSITION 2
FIGURE A-6



B = One-half maximum lift height of forks

Support for standard load should be of suitable strength to sustain test load. Limiting stacks may be pallets, pallet racks, or both.

Figure A-6 · STACK LAYOUT - POSITION 2.

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STACK LAYOUT-POSITION 3
FIGURE A-7

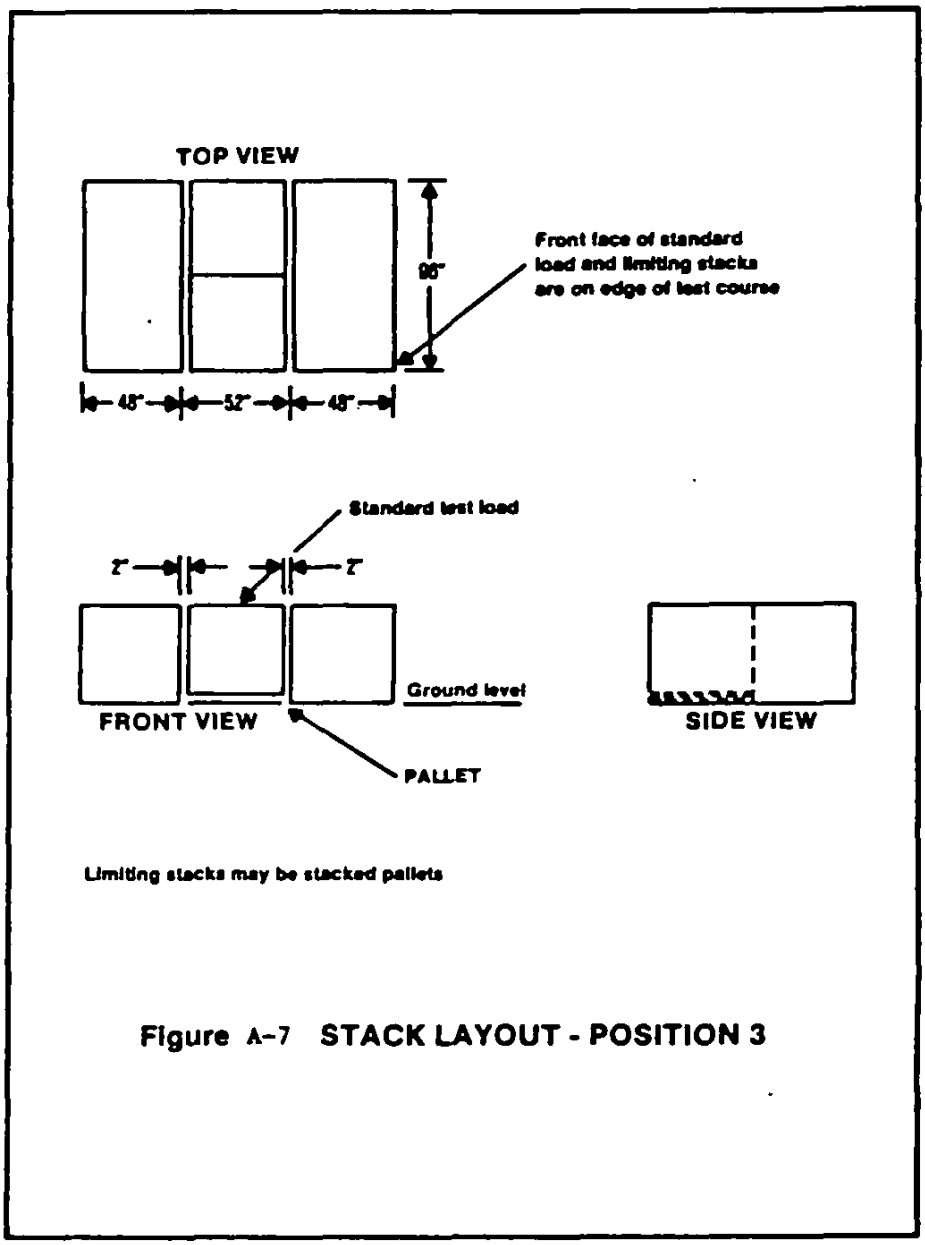

Figure A-7 STACK LAYOUT - POSITION 3

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MAINTENANCE SERVICE AND INSPECTION SCHEDULE
MATERIALS HANDLING EQUIPMENT-ELECTRIC

The following inspections and checks shall be made prior to endurance testing (Test Method No. 22) and prior to the post testing. Items 1 through 12 shall be accomplished after completion of the endurance test, and prior to power consumtion test (Test Method No. 19).

1. Check all instruments for proper operation--check free play in steering--check horn operation.

2. Check brake pedal travel--check fluid level--adjust brakes if necessary--check safety seat brake--check linkage and operation-- inflate tires to proper pressure (cold) and remove all foreign matter from tires.

3. Inspect light, instruments, horn and controls.

4. Check battery--water level and specific gravity.

5. Check hydraulic oil dipstick--add oil if necessary.

6. Inspect all safety equipment--fire extinguishers, overhead guards; check for cracked or bent forks.

7. Check controller contact tips, switches, operation.

8. Check motors' brush wear, spring tension, commutator wear--blow out carbon dust.

9. Check acceleration control--speed--time delay--general operation.

10. Check cylinders for leaks and wear--wipe off.

11. Inspect all wires and terminals; tighten and replace where necessary.

12. Lubricate chassis using manufacturer's reference charts--replace missing or broken fittings where necessary--make all necessary adjustments.

13. Inspect drive unit--check for noise--check oil level--fill if necessary--do not overfill.

14. Inspect steering gear--check oil level, fill if necessary-do not overfill.

15. Inspect carriage and channel assembly (rollers, carriage and mast) for wear and damage--adjust and align if necessary.

16. Inspect lift chains for wear and damage.

17. Check brake lining and drums, check wheel cylinders.

18. Wheel bearings--repair and adjust, tighten all hub flange bolts.

19. Hydraulic system--check for noise, leaks, and operation--tighten all lines and fittings.

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HOURLY TIME RECORD SHEET

Date _____

Truck Manufacturer _____ Clock Readings: _____

Model _____ Test Location _____ Start _____

Serial No. _____ Recorded by _____ Finish _____

Time	Laps	Average Lap Time	Comments

Instructions:

1. Start decimal minute stop watch at zero at beginning of each hour.
2. Record watch reading at end of each hour and record elapsed time.

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TEST METHOD NO. 23

LOAD BACK REST TEST

1. Test Course:

   (a) Shop area.

2. Test Apparatus:

   (a) Test weight.
   (b) Stop watch.

3. Test Conditions: A completely assembled truck may be used for this test or it may be performed as a bench test using fork carriage and back rest. A force equal to the rated load shall be applied at right angles to the back rest and uniformly distributed over the entire area comprising the back rest.

4. Test Procedure:

   (a) Place a metal sheet over the total area comprising the back rest.

   (b) Apply a weight equal to the rated load, at right angle to the back rest area.

   (c) Hold weight on truck's load back rest for not less than three (3) minutes.

   (d) Release pressure and inspect the entire back rest, for cracks, breaks, failures or any permanent deformations of any members of the back rest.

   (e) Check back rest for ease of removal after loading.

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TEST METHOD NO. 24

HYDRAULIC SYSTEM CLEANLINESS

1. Test Apparatus:

   (a) Liquid Automatic Particle Counter.

2. Test Procedure:

   (a) When hydraulic line volume exceeds 1/2 the volume of the related cylinder, connect the hydraulic lines on the cylinders to bypass related components.

   (b) Run the pump pumping the oil through each circuit for not less than 5 minutes. Perform the particle count as described in (d) below.

   (c) Connect each line to its related component. Operate each previously bypassed function of the system for 5 minutes continuously through full stroke and at maximum rates. Perform the particle count as described in (d) below.

   (d) The procedure for determining contamination shall be as follows:

      (1) Contamination levels shall be determined by particle counts. The particle counter used for evaluation of the samples shall be calibrated in accordance with ANSI Recommended Standard Method for Calibration of Liquid Automatic Particle Counter using "AC" Fine Test Dust (ANSI B93.28). The required counts shall be the average of not less than three consecutive counts. Samples may be taken from the reservoir or upstream of the filter(s) used for cleanup.

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TEST METHOD NO. 25

TEMPERATURE STABILIZATION

1. Test Course:

   (a) Shall be in accordance with Figure 1.

2. Test Apparatus:

   (a) Thermocouple(s).
   (b) Pyrometer.
   (c) Oven.
   (d) Thermometer

3. Test Procedure:

   (a) Remove thermal switches and place in oven. Slowly INCREASE temperature until switches open. Read and record temperatures at which thermal switches open.

   (b) Reinstall thermal switches on truck and install thermocouple(s) adjacent to thermal switches. Additional thermocouple shall be submerged in the hydraulic reservoir.

   (c) When required, place truck in facility where ambient temperature can be maintained.

   (d) Operate truck continuously at low speed over the test course. Read and record temperatures including ambient at intervals not more than 15 minutes. Continue operation on test course until all critical temperatures stabilize for two consecutive readings.

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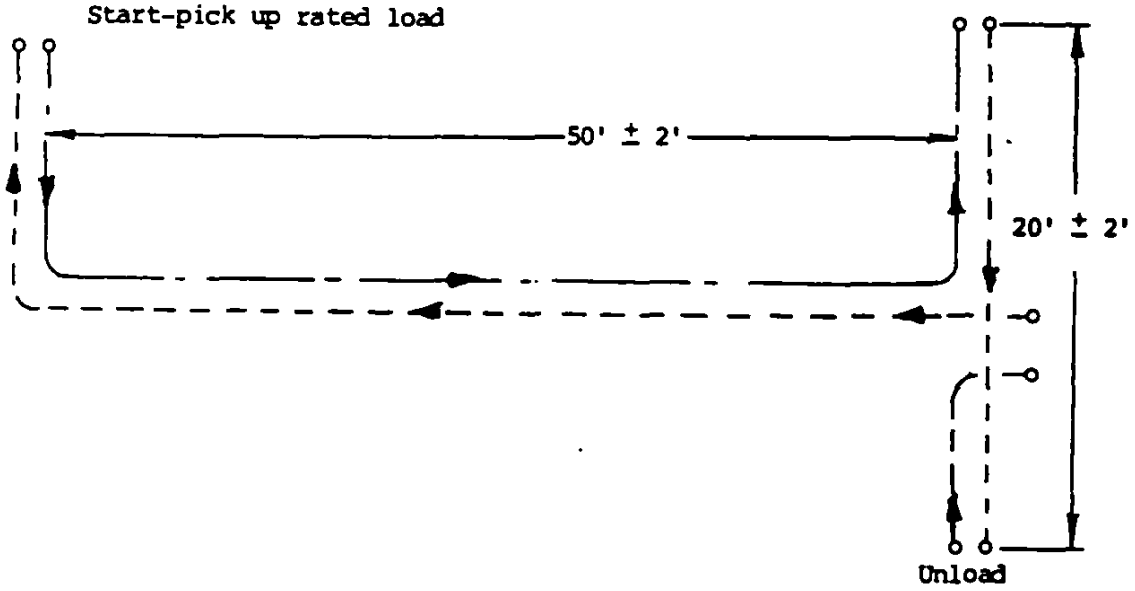
TEST METHOD NO. 25
FIGURE 1



Reverse, Low Speed, W/Rated Load
Forward, Low Speed, W/Rated Load
Reverse, Low Speed, W/O Rated Load
Forward, Low Speed, W/O Rated Load

Note: On alternate laps, the load shall be picked up where it was previously deposited and redeposited where it was previously picked up. The load shall be raised to full lift height before it is deposited.

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TEST METHOD NO.26

HYDRAULIC FILTER

1. Test Apparatus:

(a) Pressure gages.
(b) Temperature gages.
(c) Flowmeter.
(d) Timer.
(e) Oil conforming to MIL-L-2104, Grade 10.

2. Test Procedure:

(a) Filter housing proof test.

(1) Block housing outlet port. Pressurize the filter housing to 100 psi (30 psi for suction filters) minimum, and hold for not less than 60 seconds. Examine for leaks.

(b) Pressure drop.

(1) Install the filter with a new element in the test stand or on the truck. Establish maximum system flow through the filter at an oil temperature of 150 degrees F, plus or minus 5 degrees F. Measure and record the pressure drop across the filter assembly.

(c) Bypass valve pressure drop.

(1) Plug the filter element chamber oil exit or otherwise obstruct all flow through the filter element. Reinstall the housing in the test circuit with outlet port open. Establish and maintain the oil temperature at 150 degrees F. Increase upstream pressure to 10 psi more than that determined in (b) above (1.75 psi for suction filters). Observe contamination indicator. Increase upstream pressure until the indicator enters bypass area or bypass valve leakage exceeds 5 percent of maximum system flow, whichever occurs first. Observe and record pressure. Increase pressure until bypass is fully open. Establish maximum system flow. Observe and record pressure and flow.

(2) Use any combination of on-the-truck and off-the-truck filtration for cleanup.

(3) When bottle sampling is used, extract a sample for analysis from a turbulent point in the system with the pump running or within 2 minutes of shutdown. When dynamic sampling is used, connect the counter sensor to the system, using a bypass line and a branch line. The bypass line shall connect to the system, have a flow rate not less than 5 times the sensor flow rate, and may return fluid directly to the reservoir. The branch line to the sensor shall tee into the bypass line and shall be not more than 12 inches in length. Any flow restriction devices shall be placed down-stream of the particle counter sensor. Particle counts should be allowed to stabilize before

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recording counts.

(e) Continue cleanup procedures as described in respective paragraphs above until the average of not less than three consecutive counts is less than 1000 particles per milliliter larger than 10 micrometers and less than 10 particles per milliliter larger than 20 micrometers.

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TEST METHOD NO. 27

CYLINDER PROOF

1. Test Apparatus:

   (a) Hydraulic test bench or the truck capable of developing two times system working pressure.
   (b) Pressure gage.
   (c) Thermocouple.

2. Test Procedure:

   (a) Double acting cylinder.

      (1) Position and mechanically hold the piston at the approximate midpoint of the cylinder.

      (2) Fill both sides of the piston with oil at a minimum of 120 degrees F.

      (3) With the head end port capped, apply an oil pressure equal to 1.5 times the working pressure to the rod end of the piston for minimum of 60 seconds. Release pressure.

      (4) With the rod end port capped, apply an oil pressure equal to 1.5 times the working pressure to the head end of the piston for minimum of 60 seconds. Release pressure.

   (b) Single acting cylinder.

      (1) Extend cylinder to maximum extension by filling with oil at a minimum of 120 degrees F.

      (2) Apply oil pressure equal to 1.5 times the working pressure at the inlet port for a minimum of 60 seconds. Release pressure.

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TEST METHOD NO. 28

HYDRAULIC FITTINGS

1. Test Apparatus:

   (a) Common handtools.

2. Test Procedure:

   (a) Remove one hydraulic hose assembly which has permanent type fittings.

   (b) Replace the hose assembly with an equivalent field attachable fitting only to assure interchangeability.

   (c) Repeat (a) and (b) above until each hose assembly with permanent type fittings is replaced with a hose assembly with reuseable fittings.

   (d) After every hose assembly with permanent fittings has been replaced with a hose assembly with reuseable fittings, reinstall the original hose assemblies on the truck.

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TEST METHOD NO. 29

WEIGHING DEVICE

1. Test Area:

   (a) Level, flat surface.

2. Test Apparatus:

   (a) Test load.

3. Test Procedure:

   (a) With the truck at rest on a smooth, level surface and with the mast vertical, the unloaded forks shall be elevated to a height of 20 to24 inches. By use of the control valve, the forks and carriage shall be dropped 1 to 4 inches and abruptly stopped.

   (b) Repeat (a) four times.

   (c) Adjust tare to show zero load where readout most consistently came to rest during (b) within approximately the first ten seconds and mark the zero position.

   (d) With the truck at rest on a smooth level surface and with the mast vertical the forks shall elevate a calibrated load equal to the rated capacity of the truck plus zero, minus 1-percent to a height of 20 to24 inches and through the control valve the load shall be dropped from 1 to 4 inches and then stopped abruptly.

   (e) Repeat (d) four times.

   (f) Failure of the weighing device to weigh the calibrated load during (e) within the required accuracy shall be cause for rejection.

   (g) With the truck at rest on a smooth level surface, mast vertical, forks 20 inches above the surface, a calibrated load equal to 150 percent of the truck rated capacity shall be placed on the forks.

   (h) Remove the load and repeat the weight accuracy test procedure prescribed in (g).

   (i) Failure of the weighing device to weigh the calibrated load within the required accuracy and repeatability shall be cause for rejection.

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TEST METHOD NO. 30

SIDESHIFT AND UPRIGHTS

1. Test Apparatus:

The test apparatus shall consist of a hydraulic test bench capable of providing the necessary hydraulic power and control to perform the required testing. The test upright may be mounted on a fixture or on a truck.

2. Test Conditions:

(a) All tests shall be conducted using oil conforming to MIL-L-2104.

(b) Oil temperature shall not exceed 225°F.

(c) Oil in all test circuits shall be filtered by a filter conforming to MIL-F-52723.

(d) Upright lubrication shall be performed at not less than 50 test cycles with lubricants specified in the applicable truck technical manual.

(e) All tests shall be conducted at a lifting speed and lowering speed equal to the lifting and lowering speeds specified for the truck. Speeds may vary plus or minus 5 feet per minute.

3. Test Procedures:

The upright shall be subjected to testing as specified below:

(a) Cycle consists of lifting and lowering rated load to not less than 3 inches of maximum fork height and lowering to not more than 3 inches above ground level and shifting the load from side to side.

(b) Lift load to maximum lift height, side shift load to one side, extend forks, retract forks, side shift load to other side, lower load.

(c) Repeat (b) for 50 cycles.

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TEST METHOD NO. 31

BATTERY PROTECTOR

1. Test Apparatus:

   (a) Potentiometer.

2. Test Procedure:

   (a) Verify with a potentiometer that battery voltage is 2.12 volts times the number of cells and that the signal light or fuel gauge indicates "full charge". Operate the lift control.

   (b) Increase the value of potentiometer resistance observing voltage across the battery protector voltage terminal to 1.7 volts per cell and after one half hour observe that the warning light indicating "low state of discharge" has been activated. After a short interval of time (not to exceed 15 minutes) operate lift control and confirm lift will not operate.

   (c) Unplug and replug the battery and verify the lift control will not operate. Increase the voltage with the potentiometer to 2.06 volts per cell and observe that the lift control will operate and warning lights are reset.

Custodian:

Navy - SA

Review Activities:

Navy - SA,MC

User Activities

Navy - SA,SH,MC

Preparing Activity

Navy - SA

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