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MILITARY SPECIFICATION

TRUCKS, LIFT, FORK, DIESEL; 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 the general requirements for shipboard, diesel powered, industrial type fork lift trucks.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitations 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: Commanding Officer, Navy Ships Parts Control Center, Post Office Box 2020, Attention: Code 0302, Mechanicsburg, Pennsylvania 17055 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

SPECIFICATIONS

Federal

VV-B-680 - Brake Fluid, Automotive

ZZ-H-428 Hose, Rubber, Preformed and Straight, Hose, Preformed,Flexible,Wire Reinforced (For the Coolant Systems of Automotive and Other Liquid - Cooled Engines).

Military

MIL-P-116 - Preservation, Methods of

MIL-V-173 - Varnish, Moisture and Fungus Resistant

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

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

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

MIL-G-3859 - Grease Guns, Hand, High Pressure, Lever Operated; Cartridge and Bulk Loading

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

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

MIL-B-11040 - Belt, V-Type, Engine Accessory Drive.

MIL-F-16884 - Fuel, Naval Distillate

MIL-H-17672 - Hydraulic Fluid, Petroleum, Inhibited.

MIL-M-21861 Manual, Technical,Materials Handling Equipment Preparation, Contents and Approval.

MIL-B-22191 - Barrier Materials,Transparent, Flexible, Heat Sealable.

MIL-W-52574 - Welding and Welding Procedure Requirements For Manufacture of Equipment Utliizing Steels.

MIL-E-52649 - Engine Cold Starting Aid, Ether Fuel Primers

STANDARDS

Federal

FED-STD-595a - Color

Military

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

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

MIL-STD-162 - Materials Handling Equipment: Preparation for Shipment, Storage, Cyclic Maintenance,Routine Testing and Processing.

MIL-STD-209 - Slinging and Tiedown Provisions for Lifting

MIL-STD-461 - Electromagnetic Interference Characteristics.

MIL-STD-810 - Environmental Test Methods.

MIL-STD-1474 - Noise Limts For Army Materials.

MS-51336 - Lunette-Coupler, Drawbar, Ring.

MS-90495 - Plate, Identification, Blank, Mechanical Equipment.

MILITARY HANDBOOK

MIL-HDBK-267 (SH)

(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 or Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, Pa. 19120)

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 invitation for bid or request for proposal shall apply.

AMERICAN NATIONAL STANDARDS INSTITUTE

Safety Standard for Powered Industrial Trucks
ANSI/ASME B56.1

Type Designations, Areas of Use Maintenance and Operation of Powered Industrial Trucks ANSI/NFPA 505

Standards for Safety for Internal Combustion Engine-Powered Industrial Trucks ANSI/UL 558

(Application for copies should be addressed to: American National Standards Institute, c/o American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017)

AMERICAN SOCIETY FOR TESTING AND MATERIALS
Book for ASTM Standards

(Application for copies should be addressed to the American Society for Testing and Materials, 1961 Race Street, Philadelphia, Pennsylvania 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).

SOCIETY OF AUTOMOTIVE ENGINEERS

SAE Handbook

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

THE TIRE AND RIM ASSOCIATION, INC.

YEAR BOOK

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

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).

UNDERWRITERS LABORATORIES, INC.

ANSI/UL 558 Industrial Trucks, Internal Combustion Engine-Powered

(Application for copies should be addressed to Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, Illinois 60062

3. REQUIREMENTS

3.1 Description. Trucks covered by this specification shall be complete and ready for operation when delivered. The individual truck requirements shall be as specified herein and in accordance with the applicable military specification sheet. Trucks shall be constructed and equipped to meet all requirements specified herein. Major and minor assemblies shall be new and of a standard design or model. The component parts of the unit need not be the products of the same manufacturer. However, the manufacturers shall be so established in the industry at prompt and continuing service and delivery of replacement repair parts may be assured.

3.1.1 First article (first produced truck). The supplier shall furnish one or more trucks as specified (see 6.2) for inspections and testing at a specified location (see 6.2) 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. Inspection and tests shall be as speciifed in Section 4 and shall be subject to surveillance and approval by the Government.Supporting test data and documentation shall be subject to approval by Navy Ships Parts Control Center, Code 0302. When specified (see 6.2), the Government will conduct any or all of the first produced examinations and tests, as specified (see 6.2). Any changes or deviations during production from the approved first produced truck shall be subject to the approval of the contracting officer. Approval of the first produced truck by the activity concerned shall not relieve the supplier of his obligation to furnish trucks conforming to this specification. The approved first produced truck may be presented for acceptance as the last unit for delivery under the contract after being rehabilitated to a new appearance. This shall include the furnishing of new tires.

3.1.2 Minimun Qualitity 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.

3.1.3 Material. Material not definitely specified shall be selected by and at least equal to the end item manufacturer's normal commercial product, and shall meet test requirements specified in section 4. "Normal commercial product" shall be interpreted to mean an item furnished by an end item manufacturer normally engaged in commercial production of the item(s) covered by this specification.

3.1.3.1 Castings. Castings provided on all trucks shall be at least of the quality normally used in commercial practice, free from injurious blowholes, porosity, shrinkage, cracks, or other defects. The use of repaired castings in which the repairs could adversely affect the strength or intended use shall not be permitted. Sufficient material shall be furnished to permit machining where necessary for leak-free sealing at covers, closure points, and fasteners.

3.1.3.2 Plating. All threaded fasteners, required to fabricate the truck, except those designed to be 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 are to be Zinc plated in accordance with ASTM B633 except those designed to be in contact with oils in reservoirs and those inside components which are corrosion resisting.

3.1.4 Design. These trucks shall be designed for the rated load at the specified load center measured from the face of the forks and at the specified lift height. Design of trucks covered by the specification and all components therein shall insure safe, efficient, and economical operation under normal service conditions. There shall be no evidence of accelerated wear, or failures, or permanent deformation when operated under normal service conditions. 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. Hose reel, if furnished, is excluded from this requirement. Truck shall be designed to permit selection and operation of travel, lift, steering, tilt, and side shift separately,simultaneously or combinations thereof.

3.1.4.1 Safety. The truck(s) shall conform to the applicable requirements of Safety Standard For Powered Industrial Trucks (ANSI/ASME B56.1) and Standards for Safety for Internal Combustion Engine-Powered Industrial Trucks (ANSI/UL558-Type DS) and OSHA Standards. Trucks shall bear either the Underwriters Laboratories or an independent testing laboratory label indicating their stamp of approval for the DS Rating.

3.1.4.1.1 Certification. The contractor shall submit to the contracting officer or his authorized representative satisfactory evidence that the trucks furnished under this specification meet or exceed the requirements of ANSI/UL558 Type DS. Acceptable evidence of meeting these requirements shall be certified test reports from recognized independent testing laboratories acceptable to the government, indicating that the trucks conform to the requirements of ANSI/UL558.

3.1.4.2 Finish. Castings with fastener holes shall provide for proper seating of fasteners such as bolt, lockwasher and nut assemblies, and cap screws.

3.1.4.3 Bearings. Unless otherwise specified herein, rotating parts shall be mounted on ball, roller or tapered bearings to the extent normally provided in standard commercial practice. Bearing load capacity, including applicable safety and life factors, as recommended by the bearing manufacturer, shall be equal to or greater than maximum bearing loading under operation required by the test course.

3.1.4.4 Lubrication. All surfaces requiring lubrication shall be provided with a suitable means for lubricating.

3.1.4.4.1 Lubricants. The truck(s) shall operate as specified herein when lubricated with standard military lubricants and hydraulic fluids listed in MIL-HDBK-267 (SH). No other lubricants are permitted.

3.1.4.4.2 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. Panels and plates equipped with hand-operable, quick-disconnect fasteners or no more than eight common fasteners may be removed to provide accessibility.

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

3.1.4.6 Screw threads. Screw threads shall be in accordance with Handbook H28.

3.1.4.7 Maintainability. Provision shall be made for adjustment, servicing, or replacement of fan belt, air induction system, fuel pump and components, oil filter and components, starter, alternator, alternator regulator, battery,wearing parts of steering assembly, tires, wheels, lights and horn. When hand access openings are used on the exterior of the truck, the edge of the opening shall be smooth and shall be provided with a removable hinged cover whenever it is required. Dimensions of access openings shall be in accordance with SAE J925 for a bare or normally clothed hand. Drainage of coolant and lubricants shall be to the ground without draining on any part of the truck. When drains are located over other parts of the truck,integral tubes, pipes, troughs, or other means shall be used to convey the coolant or lubricant from the drain to the ground. Drains shall be accessible without the removal or adjustment of accessories or parts other than opening covers. Drain holes with removable drainplugs or covers shall provide for complete drainage of all reservoirs and drive-line housings without disconnecting hose(s). The hydraulic system reservoir, transmission housing or reservoir,steering system reservior, service brake hydraulic system and engine shall be equipped with a means for filling and with dipsticks to determine the fluid level. As a minimum, dipsticks shall be graduated with two marks indicating "full" and "add". Dipsticks shall be accessible without the use of hand-tools.

3.1.5 Certificates of compliance. When specified (see 6.2), or upon request, certificate(s) of compliance with the requirements of this specification shall be furnished to Navy Ships Parts Control Center Code 0302. Such certificates shall be supported by back-up data which shall be available for review. The certificate of compliance shall read as follows:

> This certifies that the _____ (Component, part or assembly) complies with all the provisions and requirements of Specification _____ paragraph _____.

This certificate shall be signed by a duly authorized agent to the contractor.

3.2 Propulsion.

3.2.1 Engine. The basic engine shall be a commercial industrial diesel type and as described hereinafter. The diesel engine shall be capable of operating on fuel conforming to Naval Distillate Fuel (F-76), MIL-F-16884, and Aviation Turbine Fuel (JP-5) and lubricants listed in MIL-HDBK-267 (SH). All other requirements including electromagnetic interference suppression, cooling system, fuel system, starting system and accessories shall be as specified herein. The engine shall be equivalent in design, power and size to the engine normally furnished by the end item manufacturer in similar commercial products

and shall provide sufficient power and torque to meet the performance and operational requirements speciifed herein. If there is no commercial counterpart, the engine shall be equivalent in design, size and horsepower to engines furnished in competitive commercial models. Engine accessories shall comply with requirements of 3.2.2.

3.2.2 Engine accessories.

3.2.2.1 Electrical system. Unless otherwise specified (see 6.2), the truck shall be provided with a 12-volt starting, lighting, and other electrical equipment. All wires and cables shall be adequately supported to minimize chafing and provide adequate clearnace from moving parts, hot engine parts, exhaust and fuel systems. Cables and wires shall not be supported on oil- or grease-retaining surfaces or be exposed to dripping diesel fuel, oil, or grease. When exposed to unusual vibration, cables and wiring shall be protected by flexible tubing or suitable harness. Grommets shall be provided wherever wiring passes through bulkheads, partitions,or structural members or the wiring shall be suitable fastened to prevent chafing or abrasion. All components of the electrical system shall be weather resistant.

3.2.2.2 Alternator. An alternator shall be provided. It shall have output characteristics matched to the electrical load required by the equipment as furnished plus the additional reserve capacity to support the complete electrical system and accessories furnished with the vehicle and a 25 percent safety factor capacity. The alternator shall not utilize externally mounted selenium rectifiers. The alternator shall be driven by single or multiple V-belts conforming to MIL-B-11040 to provide full alternator output at all engine speeds without belt slippage. Polyflex fan belts are also acceptable. A protective device shall be provided and matched electrically to the alternator so that the vehicle's electrical system including alternator is protected from damage when incorrect polarity is applied or arc welding maintenance repairs are performed anywhere on the equipment. Fuses are not acceptable.

3.2.2.3 Alternator regulator. An alternator regulator shall be supplied if required by the alternator and electrical system design. Provision shall be made within the electrical system for:

(a) Alternator voltage regulation.

(b) Current limiting to protect alternator enclosed diodes or the alternator.

(c) Disconnection of circuit to the alternator rotor when the starting switch is off.

(d) Actuation of ammeter or charge indicator lamps.

(e) Field current relay switch to prevent rotor current from passing through the ignition switch where applicable.

3.2.2.4 Starting system. The starting system shall include a starting motor solenoid, a starting motor, necessary wiring and cable, and starting motor switch. A device shall be furnished to prevent re-energizing the starter motor when the engine is running. Trucks shall be provided with an interlock in the

starting system or other means to prevent energizing the starter motor except when the directional control lever is in the neutral position. Cranking torque of the starting motor shall be sufficient to start the engine with battery specified for the truck when both engine and battery are thoroughly cold soaked, at 0 degrees F. When specified (see 6.2), a certificate of compliance is required. Hand crank is not required.

3.2.2.5 Fuel system. The capacity of the fuel tank shall insure not less than 8 hours continuous operation during Test Method No. 22. The tank shall be equipped with a safety filler cap assembly painted with green enamel which shall incorporate a self-closing cap, screw-locking device for cap, removable strainer, and provision for padlocking. The cap assembly and the neck of the fuel tank shall be threaded, and, when installed, the cap shall not be removable without the use of tools. The fuel fill cap must be recessed into the tank outside the engine compantment and away from the exhaust system. The cap shall not be vented thereby precluding the possibility of fuel leakage from the filler if the truck should result in an overturn position. A standpipe or other suitable means at the fuel line inlet shall be provided to prevent foreign matter from entering the fuel line and to prevent drawing fuel from bottom of tank. The fuel tank shall be equpped with a drain plug at the lowest point of the tank. The drain plug shall be removable with hand tools without the removal of any other component. The fuel tank shall be protected by position or otherwise from external damage. A shut-off valve shall be accessibly located immediately adjacent to the fuel tank. Adequate fuel lines shall be provided to insure continuous operation at full throttle and maximum loads, including slope ascension. Other construction and design details shall comply with the requirements of 3.1.4.1. A fuel filter with replaceable elements of adequate capacity shall be provided between the fuel supply and the pump and shall be readily accessible by raising the hood cover or opening the sideplates. Clearance shall be provided for removing and replacing the filter.

3.2.2.6 Air-induction system. The air intake manifold shall be provided with a heavy-duty, oil bath or a replaceable dry type air cleaner having a capacity sufficient to allow the engine to operate under all conditions specified herein without drawing oil from the air cleaner at wide open throttle. The air cleaner shall be located or designed to prevent water from entering the cleaner when the vehicle is operated during inclement weather. The air cleaner shall be constructed so as to permit disassembly without tools for cleaning or replacement of the filter element. It shall be bracket- or throat-mounted, connected to the intake manifold, and accessible for servicing; engine cowl, hood, or access plate may be opened for servicing the air cleaner.

3.2.2.7 Cooling system. The cooling system shall be of the closed pressure type, incorporating a radiator pressure cap, thermostat, fan, and circulating pump. Hoses used in the cooling system shall conform to either ZZ-H-428, Type I, grade A or B,class 2 or SAE J 20R2, class SC. All gaskets, seals, and packing used in the cooling system shall be made of materials capable of resisting deterioration from mixtures of water and ethylene-glycol-base antifreeze.

3.2.2.8 Governor. The governor shall be adjusted to limit the maximum speed of the engine as specified in 3.6.5. The engine speed shall not exceed the engine manufacturer's published recommended maximum engine speed for industrial truck continuous duty.

3.2.2.9 Exhuast system. The exhaust system shall conform to the structural and safety requirements of 3.1.4.1. The exhaust system shall be protected against entry of rain and shall include drainage provisions to prevent accumulation of water and condensed vapors. The exhaust system shall terminate near, but not beyond the plan outline of the truck. The muffler shall be independently supported around the body, muffler outlet, or muffler inlet. If the tail pipe is independent of the muffler or extends more than 12 inches from the muffler,it shall be supported. Exhaust gases shall be emitted in a horizontal direction at the rear or side rear of the truck or shall be dissipated into the fan discharge away from the operator. The exhaust system shall be arranged to prevent burns to the operator during normal operations.

3.2.2.10 Fungus and moisture resistance. The electric circuitry, including all components and connections,shall be protected from the effects of moisture and fungus growth by an overall treatment with a varnish conforming to MIL-V-173 with the following exceptions that: (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 .001 inch 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.

3.2.2.11 Oil filter. Full flow heavy duty filters with emergency bypass shall be used. The oil filter shall be mounted in an accessible location for ease of replacement of elements. Oil lines (if applicable) to and from the filters shall be installed to minimize fatigue from vibration.

3.2.2.12 Starting priming system. An auxiliary fluid priming system conforming to MIL-E-52649, Type III shall be furnished. The size of the primer shall be in accordance with the engine manufacturers recommendations. The primer may be mechanically or electromechanically operated. When the primer is mechanically actuated, it shall be furnished with a total cable length not exceeding 6 feet and a "tee" handle. When the primer is electromechanically actuated, it shall be furnished with a temperature control." Priming system shall comply with the requirements of 3.1.4.1

3.2.3 Drive assembly. The drive assembly shall consist of all components necessary to transmit power from the engine to the wheels. Each gear,shaft, and axle shall be of heat-treated alloy steel. All rotating shafts and axles shall be supported on anti-friction bearings. All gears shall operate in lubricant, and a standard pressure grease lubrication system shall be provided for all friction parts not so lubricated. Gear housing shall be equipped with means for filling and draining. Differential ring and pinion gears, when used, shall be adjustable. All levers to gear enclosures shall be provided with seals, caps, rubber boots, or similar means to prevent the entry of water into the enclosure under normal operation or outside storage. When a drive shaft is provided there shall be a slip joint integrated into the drive line to facilitate the removal of the drive shaft.

3.2.3.1. Power shifted transmission. A power shifted transmission shall be furnished and shall be of the continuous drive type within each speed range(s). For the speed range specified hereafter in foward and reverse, trucks shall

have a hydrodynamic or a hydrostatic transmission capable of providing variable speed or single speed range for trucks up to and including 6000 pound (2722 kg) capacity and two speed range for trucks greater than 6000 pound (2722 kg) capacity. An oil filter is required for the transmission oil. Means shall be provided to check the transmission oil level. Transmissions shall provide for positive inching control of truck (throughout the entire range of engine speed) in the forward and reverse directions. The inching control shall permit tilting and full lifting speeds with rated load independently of and simultaneously with truck motion while in inching travel.

3.2.3.2 Hydrodynamic transmission. The transmission shall be connected to the engine through a torque convertor and shall provide controlled application of the clutches to provide smooth shifting and limit slippage which would damage the clutches. All transmission gears shall be constant mesh. Oil pressure for actuation of the transmission clutches, for torque convertor supply, and for transmission lubrication shall be supplied by a mechanically driven pump.

3.2.3.3 Hydrostatic transmission. The hydrostatic transmission shall be a closed loop type with a reversible variable displacement pump and a reversible variable or reversible fixed displacement motor. A charge pump shall be provided and shall be gear or shaft driven by the engine and shall provide sufficent oil under pressure to prevent cavitation of the pump and motor and to maintain a constant, smooth control lever response independent of operating conditions performed at full throttle engine speeds. With an oil temperature of 120 degrees F. (47 degrees C.) plus or minus 5 degrees F. (2 degrees C.) and new filter, the vacuum at the charge pump inlet port shall not exceed 5 inches Hg (16930 Pa). A shuttle valve or equivalent means shall be provided to automatically prevent loss of high pressure oil from the closed loop pump/motor circuit during the transition of rapid change of direction of the truck. When necessary, a set of reduction gears with two speed ranges capable of being shifted on the move under full engine torque may be used in conjunction with the hydrostatic transmission. When a gear range selector is provided it shall be acessible to the operator in the normal operating position and shall be labeled to indicate high and low speed ranges. Oil temperatures in the transmission shall not exceed 100 degrees F. (38 degrees C.) above ambient when measured at the pump case drain and motor case drain under any operating conditions specified herein. When a heat exchanger is required to meet temperature limits stated herein, means shall be provided to insure recommended case pressures of the pump and motor are not exceeded during all operating conditions specified herein including cold weather start-up. The system shall withstand all operations specified herein without permanent deformation, damage, or leakage.

3.2.4 Hydraulic system. Power used for hydraulic functions shall be furnished by a hydraulic pump(s) driven by the engine or transmission. The lifting system shall provide for lowering of the load at a rate of not more than 80 feet per minute in event of failure of or damage to hydraulic hose supplying the lift cylinder. Hydraulic reservoir and system shall be capable of being drained without spillage. Hydraulic components shall provide protection against contamination of hydraulic fluid by direct impingement or seepage of other fluids. All cylinders shall be provided with "wiper rings" to preclude entry of dust and dirt into the packing. The reservoir shall be of welded construction, free of metal particle or other foreign material, have a capacity of not less than 110 percent of the fluid required for the hydraulic system

operation, have an access not less than 2-1/2 inches (64 mm) in diameter for manual cleaning of the entire inside or be removable for cleaning when baffling within the tank precludes cleaning in place, and be furnished with a dipstick that can be secured in place. Fluid in the hydraulic system shall conform to MIL-H-17672or MIL-L-2104 or commercial hydraulic fluid with rust and oxidation inhibitor, anti-foaming, anti-wear, turbine grade base, and initially not higher in contamination level than will pass through filter required herein. The hydraulic reservoir and system shall be designed and constructed so the hydraulic oil will not be lost from any part of the system in the event of a truck overturn. The reservoir shall have sufficient capacity to prevent air from entering the system with all hydraulic pistons fully extended and sufficient free air capacity to prevent oil from being discharged through the reservoir air vent when maximum return flow of oil is surged into the reservoir from the system. All piston rods shall be provided with a hard chrome plate finish and or be capable of meeting corrision resistant requirements. Surfaces shall be thoroughly cleaned prior to plating in accordance with normal commercial practice. Plating shall be electro-deposited hard chromium finish,having uniform thickness of not less than 0.0005 of an inch (.013 mm). A removable strainer of 50 or less mesh openings or a removeable filter shall be installed in either the hydraulic reservoir or the suction line to protect the pump. When a strainer is provided for pump protection a removable filter must also be installed in the hydraulic system. Filter shall provide the following:

(a) Include an emergency by-pass which may open for system oil at a temperature less than 70 degrees F. (21 degrees C.).

(b) Prevent contaminant trapped by the filter from being released into the system when the emergency by-pass opens or when the filter is removed for servicing.

(c) Include a signal mechanism or contamination indicator to indicate when filter maintenance or replacement is required.

A 10-micron breather filter shall be furnished. Filtration equal to the in-line filtration shall be provided for makeup fluid. A maintenance signal mechanism is not required for the makeup fluid filtration. A pipe tap shall be provided in either the pressure inlet side of each valve or in a tee between the pump and the valve to check pressures in the hydraulic system. Hydraulic hoses shall be properly restrained to protect them from unnecessary flexing, pressure surges, or contact with other moving mechanical components. Means shall be provided to indicate the required level of the hydraulic oil. Hydraulic cylinders which employ pivot type mountings shall be provided with means for lubrication of the bearing areas at such pivots. The use of self-lubricated bearings is permissible when in accordance with 3.1.4.3.

3.2.4.1 Hydraulic fitting,hoses, and tubing. All components utilizing hydraulic fluid from the hydraulic reservoir excluding brakes and steering systems shall conform to the following standards. Hydraulic fittings used on valves and cylinders shall be the "O" ring straight thread type in accordance with SAE J514 or 4-bolt split flange type in accordance with SAE J518 but not limited to the fittings listed therein. When hydraulic tubing is used, fittings shall conform to SAE J514 37 degree two or three piece tube assembly. Return or suction lines where hydraulic pressure does not exceed 200 psi may

use dry seal or barb and clamp type connectors. Hose fittings shall be of the reusable screw-on 37 degree flared type female in accordance with SAE J516. Hydraulic hose sizes shall be restricted to the following sizes: 1/4, 5/16, 3/8, 13/32/, 1/2, 5/8, 3/4, 1, 1-1/4, 1-1/2, 2, and 2-1/2 inches. Hydraulic hoses and/or tubing will be located and shielded so that in the event of a rupture there will be no danger of hydraulic fluid contacting the engine or engine exhaust system. In addition, all hydraulic hosing used on pressurized circuits shall be of the type conforming to SAE J517 Type 100R2. The hydraulic system operating pressures of these circuits shall be limited to the maximun operating pressures specified for SAE J517 Type 100R1 hosing. Hydraulic hose specification with respect to applications shall conform to the following:

SIZE	APPLICATION	HOSE SPECIFICATION
1/4" - 3/4"	Suction and discharge	Double fiber braid SAE 100R3
1" - 2-1/2"	Discharge	Double fiber braid SAE 100R3 or equivalent
3/4: - 2-1/2"	Suction	Wire Inserted SAE 100R4
1/4" - 1/2"	Pressure	Steel Wire SAE 100R2 or Single Wire SAE100R5
1/2" - 1"	Pressure	Steel Wire SAE 100R2

Hose in accordance with SAE 100R7 is unacceptable.

3.2.4.2 Hose reels. When hydraulic reels are used on the mast to maintain hose tension during mast extension,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. Guide blocks, reel divider, or other device shall not abrade hose and cause premature failure.

3.3 Structure.

3.3.1 Chassis and frame. The frame and related structure shall be fabricated from steel and/or 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. The width and length of the truck shall not exceed the dimension specified on the applicable military specification sheet. 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. The complete frame structure shall be tested as outlined in section 4.

3.3.1.1 Uprights and carriage assembly. Uprights shall be of the telescopic roller type with sufficient strength and rigidity to withstand, without permanent deformation,stresses induced by capacity loads and tests in section 4. Rollers shall be of the permanently lubricated type. Uprights shall be

positioned in such a manner that the back surface of lower fork mounting plate or cross bars in the vicinity of the tires is 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, when used, 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"(10 mm). Chains used in the lifting mechanism shall be ANSI Standard. Cross members of the mast structure, when in a lowered position, shall not interfere with the operator's horizontal or downward line of sight directly to the front of the vehicle. The operator shall be able to see the tip of at least one fork at any lift height without leaving his seat 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 sliding surfaces or lateral rolling contacts. Positive means shall be provided to prevent overtravel of the carriage or channel in both upper and lower position. Carriages for trucks equipped with side-shifters shall be supplied with adjustable thrust bearings to resist thrust introduced by off-center loading except when rollers are contoured to inner surfaces of mast sections to take both radial and thrust loadings.

3.3.1.2 Forks. Fork dimensions spacing and mounting shall be as specified on the applicable military specification sheet. Forks shall be attached to the fork carriage in a manner which prevents lateral slippage or permanent deformation of fork carriage components, when subject to the applicable test in section 4. Forks on trucks up to but not including 10,000 pounds (4535 kg) capacity shall be adjustable laterally without the use of hand tools. Trucks of 10,000 pound (4535 kg) capacity and above shall provide for adjustment of the forks simultaneously by hydraulic or auxiliary means, i.e. crank and screw or similar device, from one side of the fork carriage by one man without undue effort and the adjusting mechanism shall not bind or break under normal usage. Undue effort shall be classified as an effort of more than 20 pounds (9 kg) at the handle. Protruding handles, levers, etc., shall fold downward or inward in order to eliminate interference with truck operation. The adjusting worm shall be protected to prevent foreign matter such as dirt and mud collecting on its surfaces. Fork thickness shall not exceed 1/2 inch (15 mm) at the tips and the end taper shall be not less than 14 inches (355 mm) long. Taper shall be on the underside of the forks. The dimensions and spacing adjustment shall be measured between outer edges of the forks. Top and bottom of fork tips shall be rounded to eliminate the sharp edges. On trucks of 6000 pound (2722 kg) capacity folding forks shall be furnished. The forks shall be hinged or pivoted near the heels and shall be capable of being folded back manually against fork upright and backrest. A manually operated locking device shall hold the forks in the upright position. The locking device shall not interfere with the operation of the trucks when forks are in the down position.

3.3.1.3 Load backrest. A metal backrest, removable without disturbing any other component, shall be provided. Load backrest shall be flush with the forward vertical surface of the forks. In conjunction with fork and hanger design it shall provide a vertical rear guard at least 48 inches (1220 mm) high measured from the load carrying surface of the forks and at least equal to the width of the carriage. It shall not unduly obstruct operator's visibility. The spacing of vertical members shall be no more than 6 inches (150 mm) between members. The backrest shall meet the performance requirements of 3.6.29. The

removable backrest may be eliminated if fork and hanger assembly will provide protection equal to the above.

3.3.2 Wheels and tires. Tire type shall be as specified on the applicable military specification sheet.

3.3.2.1 Wheels for solid or cushion tires. The truck shall be mounted on steel, malleable iron, or cast iron wheels,equipped with tapered roller bearings. Wheels shall clear any part of the truck structure and mast structure by at least 1/4 inch (8 mm) under all conditions of operation over the test course described in section 4.

3.3.2.1.1 Solid or cushion tires. The tires shall be new and unused and shall be selected from sizes and load rating listed in Year Book of the Tire and Rim Association. The tires shall be of the industrial, solid rubber or cushion type, molded onto a new press-on type steel band. Drive tires shall have commercial, non-directional type tread; steer tires may have either smooth or non-directional type tread. Tires on a 6000-pound (2722 kg) capacity truck shall be solid press-on type permanently bonded between rubber and rim. The entire width of the wide tread tire shall contact the floor. Wear shall be spread over the whole tire. The tread design shall provide for gripping cleats across the entire width of the tire. The lug shall be a minimum of 3-1/2 times wider than the groove. The gripping cleats shall be such that the center line and point of all cleats starting from one edge shall meet the dividing line between a set of cleats starting from the opposite edge.

3.3.2.2 Wheels for pneumatic tires. The truck shall be mounted on steel, malleable iron, or cast iron wheels, equipped with tapered roller bearings. Each wheel shall be mounted on wheel studs or cap screws with self-centering tapered ends or on tapered bolt holes which shall provide a positive method of locating the wheel on the hub. Wheels shall have demountable type rims which can be removed from hubs without deflating tires. Steer wheels shall clear any part of the truck structure by at least 3/8 inch (10 mm). Spacings between rims of dual tired trucks shall prevent contact between tires when truck is on level surface with rated load.

3.3.2.2.1 Pneumatic tires. The tires shall be new and unused and shall be selected from the sizes and load rating listed in Year Book of the Tire and Rim Assocition. The tires shall be pneumatic, high pressure,tube type or tubeless, furnished with non-directional tread.

3.3.2.2.2 Tubes. When tube type tires are furnished, tubes shall be heavy duty type and the size required to fit the tires furnished. Valve stems shall be arranged to permit inflation of mounted tires from the side of the truck. When split rims are furnished, a canvas or rubberized flap shall be provided between the tube and the rim for protection of the tube.

3.3.2.3 Wheel suspension. Both drive and trail wheels shall be suspended that if any one wheel is raised up 5 inches (125 mm) for pneumatic tires or three inches for solid tires above the plane of the deck due to local obstruction all the other wheels shall maintain contact with the deck. Performance shall be observed during reliability test.

3.3.3 Steering. An automotive type steering wheel not to exceed 20 inches

(510 mm) in diameter, mounted on the steering column, shall turn the steer wheels. There shall be a minimum of 7 inches (180 mm) measured vertically between the lowest point on the steering wheel rim and a line parallel to the floor passing through the highest point of the unoccupied seat cushion when the seat is held full down. Wheels shall steer true in accordance with the Ackermann steering principle. Clockwise rotation of the steering wheel shall provide for right-hand turning of the truck while in forward motion. Power Steering force shall be in accordance with 3.6.4. Power steering is required and a hydraulic steering booster or full power steer shall be supplied. Provision shall be made for precision adjustment for wear and alignment of all major steering components and for lubrication of all friction points by accessible grease fittings or a lubricant reservoir. When provided, the reservoir shall be accessible for filling and checking of lubricant level. Means shall be provided to prevent wheels or tires or steering linkage from contacting any part of truck structure, other than steering stops, irrespective of obstacle magnitude or steer angle. Spindles and kingpins,if used,shall be of heat-treated alloy steel.

3.3.4 Brakes.

3.3.4.1 Service brakes. Service brakes shall be either air or hydraulic power internal expanding or disc type. The brake drum or housing shall be bolted, riveted, or cast integrally on each drive wheel, or the brake shall be rigidly mounted on the pinion drive shaft adjacent to each wheel. Brake backing plate shall be integral with its support or shall be attached and restrained by positive means such as welding, dowel pins, tapered dowel, split ring, or similar method to prevent rotation of the brake backing plate during brake operation. Capscrews and lockwashers installed with or without adhesives and whether tightened into tapped holes or by nuts are not acceptable unless backing plate is also positively restrained. Brake mountings with clamping force or other restraint adequate to withstand the brake torque is acceptable when in compliance with 3.6.15. There shall be no loosening of brake parts designed to be rigid. Brakes shall be applied by depressing a pedal with the right foot. The brake pedal shall have a replaceable rubber cap. When actuated at all speeds, the brake shall provide smooth braking, free of brake chatter and free of feed-back amounting to more than 1/4 inch (6 mm) total movement measured at the foot pedal. Brakes shall be provided to meet the performance requirements of 3.6.15 and 3.6.19. The hydraulic master cylinder shall be reaily accessible for checking and refilling. When the hydraulic master cylinder is located under the floor plate, free access shall be provided thru a hole that will accommodate a 2 1/2" (65 mm) diameter filler line with its center being concentric with the center of the fill port. The access hole shall be provided with a cover which can be easily removed. Brakes shall be designed to insure self-elimination of foreign material from the braking surfaces under normal maintenance and operating conditions and shall be adequately protected to insure satisfactory operation. Wheel cylinders shall be located so that hydraulic lines may be bled of air without the necessity of removing the wheels or disconnecting hydraulic lines. Brake lining,when used, shall be of the woven or molded type and shall be cement-bonded or riveted to shoe. Service brake adjustment shall provide for at least 90-percent contact of brake lining with the drum throughout the service life of the brake lining. Brake adjustment mechanism shall be readily accessible and shall be adjustable using common hand tools or a star wheel brake tool. Self-adjusting brakes are acceptable. The master cylinder and brake pedal linkages shall be rigidly supported. Truck wheels shall be equipped with four wheel brakes and shall be

equipped with a dual output master cyclinder providing a dual hydraulic circuit (split hydraulic) brake system. Brake system shall be equipped with a warning light indicator which shall be energized in the event of a malfunction or loss of hydraulic brake pressure in either circuit.

3.3.4.2 Parking brake. The parking brake shall be an independent mechanical friction brake mounted on the drive or propeller shaft rotating with the wheels or a separate linkage actuating the service brake. It shall be hand or foot operated and equipped with a locking device. The manual 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 or to allow unobstructed egress from the left side only for low silhouette type trucks. If hand lever is of the ratchet type, the ratchet and pawl shall be of heat-treated steel. Adjustment or replacement of parking brake 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 the adjusting device.

3.3.4.2.1 Deadman controls. Deadman controls shall be provided. Upon removal of the operator's weight from the seat, the deadman control shall apply the parking brake(s). It shall also automatically return the transmission to neutral if the engine is running and directional control lever is engaged in other than neutral position. Visual examination shall determine if control lever is returned to neutral position. The deadman control for the brakes shall be capable of retaining the truck on slope equal to the slope ascension required of the truck. Failure of deadman controls to comply with above will be evidence of failure and be cause for rejection of the truck.

3.3.5 Body. The truck body (other than counterweight) shall be constructed of heavy steel sheet or plate equal to that used in the manufacturer's normal commercial product. Trucks having a horizontal floor plate in excess of 28 inches (710 mm) above ground level shall be provided with an intermediate step approximately midway between the ground the the floor plate. The step shall be large enough to accommodate a large foot (size 11) with an overshoe and shall not extend beyond the truck profile.

3.3.5.1 Seat. A weather resistant cushion seat and a cushion backrest, adjustable forward and reverse,shall provide comfortable seating for the operator when operating the truck. The seat shall have a minimum adjustment of 4 inches (100 mm) which shall be adjustable by the operator from the operating position without the use of tools.

3.3.5.2 Cowl or hood. The engine shall be completely enclosed with a hood cover and side plates. Either the hood cover or side plates shall be quick-opening. Hood cover, if lift-up type, shall be held in the open position in a safe manner by counterweight or spring and linkage mechanism or latch which requires no brace or support and cannot be inadvertently released while servicing the vehicle. Hood cover shall be capable of being easily opened or removed by one man. Hand tools shall not be required for release of hood or side plates. All engine components (accessories) shall be completely accessible, without requiring the removal of any additional truck structure,when hood cover and side plates are opened. The hood shall be of such a design that when closed it shall prevent the entry of water on the engine electrical system. Side ventilation openings, if used, shall be located away from the fuel fill area.

3.3.5.3 Instrument panel. An instrument panel shall be installed convenient to and plainly visible to the operator. The instrument panel shall be installed on an inclined or vertical plane to facilitate drainage of water. On this panel shall be mounted the ammeter, oil pressure gauge, coolant temperature gauge, fuel gauge, indicator lights, hour meter, electrical switch, light switch, brake warning indicator light, and starter button or, switch and any other instrument,when used. Starter button or switch may be located on the steering column in lieu of Instrument panel.

3.3.5.4 Wheel guards. If drive or steer wheels, when in a straight ahead position, protrude beyond the body of the truck in excess of 1-1/2 inches (40 mm), suitable wheel guards shall be provided to prevent foreign objects from being discharged in the direction of the operator, endangering personnel, or otherwise creating a hazard. Wheel guards dimensions shall be included in determining overall truck width.

3.3.5.5 Towing device. A ring or pin type towing device shall be provided in the center rear of the truck. It shall not protrude beyond the path followed by the rear end of the truck when making a turn of minimum turning radius. Pin type towing hook shall accept MS-51336 lunette without binding.

3.3.5.6 Slinging and Tiedown Attachments. Vehicles shall be equipped with slinging and tiedown attachments conforming to MIL-STD-209, Class 1, 2 or 3 for Type II or III equipment, excluding air transportation requirements. Attachments shall be indicated on a transportation plate conforming to MIL-P-514 and slinging and tiedown attachments shall be identified by stenciling or other suitable markings in appropiate locations on the exterior of the equipment. Slinging and tiedown markings shall indicate clearly the purpose of each attachment.

3.3.5.6.1 Tiedown attachments for HI Shock. When specified (see 6.2) to meet the requirements of a Grade A item in Type A HI (High-Impact) Shock as specified in MIL-S-901, 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.

3.3.5.7 Battery. Unless otherwise specified (see 6.2) Truck(s) shall be furnished with a 12 volt maintenance free type battery or batteries capable of meeting applicable industry standards for cold cranking capacity when matched against the engine manufacturer's recommended requirements for a cold soaked engine and in conformance with SAE J537. The term "Maintenance Free" is defined as a battery that does not require the addition of water during the expected battery life.

3.3.5.8 Battery mounting. Battery mounting shall be under the engine hood or in an accessible compartment for easy battery removal. Battery shall be mounted in such a manner as not to interfere with access to engine components (accessories), or provision shall be made to swing battery out of the way. Battery mounting shall provide for complete support over the entire base of the battery and shall be in such a position that the level of the electrolyte is directly visible without removing the battery from its mounting bracket or requiring the use of tools. Battery restraining clamps shall not be designed for or dependent upon special battery shapes and shall be provided to hold the battery in a fixed position. If mounted outside, the battery shall be housed

in an individual acid resistant finished metal box, incorporating provision for drainage. The box shall be fitted with a quick release cover to provide for inspection and servicing. Cover and positioning shall be protected against short circuiting. The ungrounded cable shall be protected by rubber grommets or insulated passages at entry to battery box.

3.3.5.9 Battery cable terminals. Battery cables shall be in accordance with standard commercial practices. Clamp-type, secured with a bolt and nut, non-corrodible, terminal shall be provided on the ends of cables connected to the battery to facilitate disconnection and battery removal.

3.4 Controls and instrumentation. Where applicable, the provisions of 3.1.4.1 shall apply. Electric controls and instrumentation shall be constructed to be moisture and weather resistant to prevent the entry of moisture when operated or stored out of doors under all weather conditions.

3.4.1 Controls. All switch and lever type controls shall be provided with position markings (decals are not acceptable) either at the switch, or lever, or in the case of the directional speed controls, on a diagram visible to the operator. The distance from the near edge of one knob to the near edge of an adjacent knob or other surface shall be a minimum of 1-1/2 inches (40 mm). All controls shall be easy to operate and positive in action. The controls shall show no evidence of deformation when the truck is subjected to reliability test.

3.4.1.1 Light switch. An "on-off" switch for simultaneous operation of the flood light(s) and taillight shall be located on the instrument panel.

3.4.1.2 Electrical switch. The electrical switch shall require a key. It shall have not fewer than 2 positions, an "on" and an "off". A second "on" position, for operation of electrical accessories, is permitted. All trucks under each contract shall be keyed identically. Two keys shall be supplied with each truck.

3.4.1.3 Starting motor switch. The starting motor shall be energized through a solenoid plunger type switch connecting the starting motor to the battery. Solenoid shall be operated by depressing a button installed on the instrument panel or turning a spring-loaded switch to a "start" position. If a push button is used, the starter shall be inoperable when the ignition switch is in the "off" position.

3.4.1.4 Braking and inching pedal(s). Two pedals shall be provided for inching and braking controls. The right pedal located for convenient right foot operation may provide braking control only or may be a combination inching-braking pedal. The left pedal located for convenient left foot operation shall be a inching pedal only. Each pedal shall be minimum 3 inches wide within a clear space at least 6 inches (150 mm) wide. Grease fittings shall be provided for lubricating moving parts of all pedals and shafts unless permenently lubricated bushings or bearings are provided. In lieu of two pedals for combination inching/breaking one combination inching-braking pedal not less than 7 inches (180 mm) may be provided and located for convenient right and left foot operation.

3.4.1.5 Accelerator control. The accelerator control shall be installed for comfortable right-foot operation. It shall be located to the right of and

shall be free of interference from the brake pedal by a distance of not less than 1-1/2 inches (40 mm).

3.4.1.6 Directional speed controls. Selective forward and reverse (and speed range when used) speed controls shall be provided and positioned for convenient left hand operation except low silhouette type trucks shall have right hand operation. Movement of the control lever in the forward or upward direction shall cause forward motion of the truck.

3.4.1.7 Lift and tilt controls. Lift and tilt controls shall be self-centering lever(s), conveniently located for right- operation. The tilt control shall be at the right of the control when two levers are employed. Rearward or upward motion of lift and tilt control lever(s) shall raise or tilt load rearward. Lift and tilt controls may be combined in a single control lever.

3.4.2 Instruments. All gauges and meters shall be products of manufacturers regularly engaged in producing these types of instruments. They shall be flush-mounted on the instrument panel and shall be capable of being read by the operator while in his normal sitting operating position. Gauges and Meters shall be constructed to be moisture and weather resistant.

3.4.2.1 Electrical system monitor. A remote indicating ammeter or alternator indicator amber or red light shall be furnished. The ammeter shall have sufficient capacity to indicate variations in current supply or demand experienced by the truck, exclusive of starter requirements. The alternator light shall light when the alternator is not charging and the ignition switch is "on".

3.4.2.2 Engine oil pressure monitor. A remote indicating engine oil pressure gauge or a low-pressure amber or red indicator light shall be furnished. If an indicator light is furnished, means shall be provided to check operation of the light. The light shall come "on" when the engine oil pressure is below the pressure specified by the engine manufacturer.

3.4.2.3 Engine coolant temperature monitor. A remote indicating engine coolant temperature gauge or a high temperature amber or red indicator light shall be furnished. If an indicator light is furnished, means shall be provided to check operation of the light. The light shall come "on" when the engine coolant temperature exceeds the temperature specified by the engine manufacturer.

3.4.2.4 Hour meter. An electrically operated hour meter, which registers the number of engine operating hours only, shall be provided. The hour meter shall be in accordance with MIL-M-3971, Type I, except mounting may be at the supplier's option. The hour meter shall be accessible for reading without removal of any component of the truck. The hour meter shall register up to 9999 hours of operation.

3.4.2.5 Fuel gauge. An electric, thermally stabilized, remote indicating fuel gauge shall be provided.

3.5 Accessories. The provisions of 3.1.4.1 shall apply. All accessories listed below shall be constructed to be moisture and weather resistant to prevent entry of moisture when operated or stored out of doors under all

weather conditions.

3.5.1 Floodlight. Each truck shall be equipped with one sealed beam floodlight of not less than 35 watts mounted on the left side of the mast. Directional focus of this light shall be vertically and horizontally hand adjustable without the use of hand tools. Vertical adjustment of this light shall be a minimum of 60 degrees above and 30 degrees below horizontal plane. Horizontal adjustment shall be a minimum of 300 degrees rotation. When specified (see 6.2), trucks shall be equipped with an identical floodlight mounted on the right side of the mast or a second floodlight is required on the left mast. Adequate protection by position or a guard against damage shall be provided.

3.5.2 Stoplight. One automotive, red, reflector type, combination stoplight and tail lamp of not less than 15 candle power and 3 candle power respectively shall be recessed or mounted on the rear end within the plan outline of the truck. The stoplight shall not operate when ignition switch is in the "off" position. The light shall be protected against damage when mounted on the rear of the vehicle.

3.5.3 Sideshift attachment. Trucks shall be equipped with a side shift attachment. Sideshift mechanism shall be hydraulically operated to move forks a minimum of 4 inches (100 mm) either side of center while carrying rated load. The attachment shall be substantially constructed of welded steel. When specified (see 6.2), fork hanger shall permit the addition of one extra fork at the fork carriage center line to provide 3 forks for bomb handling. Controls for the side shift mechanism shall be located for convenient right-hand operation and to the right of the tilt control. Fork width, length and thickness shall be as specified. Rearward, right or upward movement of the control shall cause the forks to move to the right. The attachment and its components shall show no evidence of permanent deformation when tested as specified in 4.3.2.24.

3.5.4 Load leveling device. When specified (see 6.2), the sideshift attachment specified in 3.5.3 shall include a load-leveling device to compensate for irregular surfaces that may cause the vehicle to tilt sidewise. The load leveling mechanism shall be hydraulically controlled and provide a minimum lateral tilt of the load carrying surfaces with and without rated capacity 6 degrees clockwise and 6 degrees counter clockwise. Controls for the load-leveling mechanism shall be located for convenient left-hand operation and to the right of the tilt control. Rearward or upward movement of the controls shall cause load to rotate clockwise.

3.5.5 Horn. Truck shall be equipped with an electric horn with push button mounted in the center of the steering wheel. Horn button assembly and electrical wiring for the horn shall be constructed to be moisture and weather resistant to prevent entry of moisture when operated or stored outdoors under all weather conditions.

3.5.6 Driver's overhead guard. An overhead guard shall be furnished. The overhead safety guard shall be fabricated from steel bars, tubing, or plate for the protection of the operator. Where the upright in the collapsed position is lower than the overhead guard height, the guard shall be easily removable with hand tools. A solid plate is not acceptable. Openings between bars,tubing or plate, of the overhead guard shall not exceed 6"(150 mm) in one of the two

dimensions, width or length. Clear space shall be uniformly distributed and not less than 50 percent of total overhead area. Provisions shall be made so that failure of tilt cylinder assembly shall not cause overhead guard to injure the operator. A minimum of 39 inches (990 mm) from top of seat to underside of guard shall be provided at all tilt positions of the mast. Effective dimension measurement point on seat to be the highest point on the seat cushion surface in the held down condition. Guard height with mast tilted rearward, measured from ground level to top side of guard shall not exceed that specified on the applicable military 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. Overhead guard shall remain firmly secured to its support brackets under normal and test course operation.

3.5.7 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 next eight sentences particularly apply. The dial shall be not less than 6 inches (150 mm) in diameter, and the increments shall be marked in 50-pound (23 kg) increments on gauges of 10,000-pound (4535 kg) or lesser capacity and in 100-pound (454 kg) increments on gauges of greater than 10,000-pound (4535 kg) capacity. The dial shall be capable of being rotated 360 degrees by means of an external tare adjusting knob. Bearing points or locking devices shall prevent dial rotation owing to shock loads or vibration which occur during test of First Article trucks. The indicating pointer shall be capable of 360 degrees rotation for full scale reading. The entire indicator case shall be filled with Deodorized Kerosene conforming to ASTM standard D-484 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. If a digital indicator is furnished, the next eleven sentences particularly apply: The minimum increments shall be 50 pounds (23 kg) for indicators up to 10,000 pound (4535 kg) capacity and 100 pound (454 kg) increments on indicators greater than 10,000 pound (4535 kg) capacity. The entire instrument and connections shall be shock and corrosion resistant, and any transparent cover shall be resistant to damage by shock or heat. The digits shall have a minimum height of .75 inches (20 mm) visible to direct sunlight and subdued night lighting. The digital weight indicator shall have an easily accessible internal zero and span adjustment for initial calibration and taring out the weight of the forks. The indicator shall have an external push-button auto zero device to tare out extraneous weights on the fork. Instrument must maintain auto zero reference when power is turned on or off or, indicate loss of auto zero reference. Indicator must indicate a truck overload condition of tare load and live load on the forks. The enclosure must be weather resistant to prevent the entry of moisture and water when outdoors. The instrument must have U.L. listing or a certified test report from a recognized independent testing laboratory acceptable to the government, indicating that the indicator conforms to the requirements of 3.1.4.1. The zero button must have a locking device to prevent actuation caused by shock loads or vibrations that occur during test of first article truck or production truck. The pressure sensing transducer must be equipped with a fully adjustable pulsation dampener in an

easily accessible position. Either 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 when tested during 4.3.2.27. Accuracy of weighing device within required tolerance shall be verified by supporting data. Weighing device shall be capable of being adjusted for 25% tare. The 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 4.3.2.27. The readout shall be readable by the operator when he is in the operating position. The truck shall meet all requirements of this specification with weighing device installed.

3.6 Performance.

3.6.1 Lifting speed. Speed of lift with rated capacity load shall be not less than 60 feet per minute (.30 m/s) over the entire distance from ground level to maximum fork height.

3.6.2 Lowering speed. Speed of lowering of unloaded forks shall be not less than 50 feet per minute (.25 m/s) and not more than 80 feet per minute (.41 m/s) with rated load over the entire distance from maximum fork height to ground level. The hydraulic control system shall be damped, metered, or easily manually regulated to reduce shock and prevent truck from overturning when rated load is lowered at maximum speed and then stopped quickly.

3.6.3 Right angle turn. Trucks when carrying rated capacity load shall be capable of backing through a right angle turn in either direction within the dimension specified on the appropriate military 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 6 complete turns of the hand steering wheel. The maximum steering effort through the entire turn shall be not less than 2 pounds (.09kg) nor more than 10 pounds (4.5kg) when measured under the same conditions. Power steering shall be effective at engine idling speed. Steering mechanism wear (free play) shall not exceed 3 inches (75 mm) with engine at idle speed. The steering gear assembly shall be capable of withstanding the 150 pounds (68 kg) unbalanced tangential force applied at the rim of the hand steering wheel without permanently distorting, fracturing, or deforming any part of the steering mechanism.

3.6.5 Speed. While carrying the rated capacity load on a level surface, trucks shall be capable of attaining speeds of six MPH minimum with rated load and 10 MPH (16km/h) maximum without rated load in foward and reverse directions. Trucks shall be governed so that top speeds are within ranges specified.

3.6.6 Slope ascension, first speed, forward direction. Unless otherwise specified on the applicable military specification sheet, the truck shall be capable of ascending a mininum of 22 percent grade (12.4 degrees) loaded or unloaded on a concrete or asphalt surface with and without rated capacity load. Trucks shall be able to accelerate from a dead stop on this slope when carrying rated load.

3.6.7 Upright tilt. Unless otherwise specified on the applicable military specification sheet the unloaded truck mast shall have a minimum forward tilt of 3 degrees and a minimum rearward tilt of 10 degrees.

3.6.8 Collapsed mast height. Collapsed mast height of unloaded truck measured from the ground to the top of the uprights in a vertical position shall not exceed that specified on the individual military specification sheet.

3.6.9 Lift height. The lift height, with truck bearing rated capacity load, and the uprights fully extended and vertical, measured from the ground to the loading carrying surface adjacent to the heel of the fork, shall be not less than that specified on the individual military specification sheet.

3.6.10 Free lift height. Height of forks without increase in the specified collapsed mast height shall be not less than that specified on the individual military specification sheet.

3.6.11 Underclearance. Truck,with rated capacity load, shall have sufficient underclearance to permit operation from one horizontal plane to another, up or down the slope required by 3.6.6 and the obstacle course described in section 4. Minimum underclearance beneath the mast assembly and fore and aft of drive and steer wheel axles shall be not less than that specified on the individual military specification sheet when the truck is loaded.

3.6.12 Drift of lift assembly. The lift assembly shall be capable of holding the rated load at rated maximum lift not less than two minutes with not more than one inch (25 mm) of vertical drift and not more than one degree of rotational drift from the vertical. The lift assembly shall show no appreciable signs of wear after completing the reliability requirements. "Appreciable wear" is defined as any apparent inability to lift and hold rated load for a period of 2 minutes with not more than 1 inch (25 mm) vertical drift. Packing nut (if used) adjustment will not be permitted during reliability test.

3.6.13 Forks, upright, and carriage assembly. The assembly and related structures shall show no permenent deformation or failure following test under 200 percent overload.

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 maximum fork height. The contamination levels for the hydraulic system shall not exceed 2000 particles per millimeter greater than 10 microns (.01 mm) and 20 particles per millimeter greater than 20 microns (.02 mm).

3.6.15 Service brakes. A brake pedal pressure of not more than 125 pounds and not less than 50 pounds (23 kg) shall develop a drawbar pull equal to 30 percent of the gross weight of the truck (with rated load). The brake system shall be capable of withstanding brake pedal pressure of 250 pounds (113 kg) without failure of any component and without loosening of any part designed to be rigid.

3.6.16 Stability. Trucks shall meet the stability requirements for stacking and traveling both longitudinally and laterally in accordance with the applicable military specification sheets.

3.6.17 Overhead guard strength. The overhead safety guard shall be capable of

withstanding the impact of a 100 pound (45 kg), solid hardwood cube (or equivalent) dropped a distance of 5 feet (1524 mm) 10 times, without fracture and without permanent deformation exceeding 3/4 of an inch (19 mm). It shall be of sufficient strength to support the uniformly distributed static test load specified on the applicable military specification sheet.

3.6.18 Acceleration. From a standing start, the truck, when carrying rated load,shall have an acceleration in the forward direction such as to negotiate the distance specified on individual military specification sheets in not more than the designated time. There shall be not more than one second delay in the movement of the truck when accelerated. When truck carrying rated load accelerates to maximum speed in reverse direction,steer wheels shall maintain contact with the surface on which the truck is operating.

3.6.19 Stopping distance. Trucks with rated load shall be capable of stopping in reverse from maximum speed of the vehicle in an average distance not greater than the appropriate distance given in ANSI B56.1, when a brake pressure as specified in paragraph 3.6.15 is applied. Brake parts designed to be rigid shall not loosen as a result of this test.

3.6.20 Parking brake and Deadman controls. The parking brake and Deadman controls shall be capable of retaining truck with rated load on the grade specified in 3.6.6 in both forward and reverse direction.

3.6.21 Resistance to saline atmosphere. The truck shall be designed to withstand the corrosive effects of saline atmosphere without any loss or deterioration of performance and without sustaining harmful corrosion. First Article (First produced) truck shall be tested in accordance with 4.3.2.23.

3.6.22 Truck weight. The truck shall not exceed the weight listed on the applicable military specification sheet.

3.6.23 HI (High-Impact) shock requirement. When specified (see 6.2), 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 4.3.2.28. Reports and test results of High-Impact Shock are to be forwarded to the contracting officer for approval. One copy is to be furnished to SPCC, Code 0302, Mechanicsburg Pennsylvania 17055 and one copy to NAVSEA, Code 56W21, Washington D.C. 20362.

3.6.24 Lifting attachments. Each lifting and tiedown provison shall be capable of withstanding the working load indicated in MIL-STD-209.

3.6.25 Inching control. Truck shall be capable of lifting full load at maximum speed simultaneously with truck inching forward at 1/2 mile per hour (.80 km/h).

3.6.26 Maintainability. 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:

(a) Remove,replace, and adjust all engine driven belts - 3/4 hour.

(b) Remove and replace alternator - 1/2 hour.

(c) Remove and replace regulator - 1/2 hour.

(d) Remove and replace all filters, screens, and strainers in all hydraulic systems - 1 hour.

(e) Remove and replace engine coolant system hoses - 1/2 hour.

(f) Drain engine lubricating oil, remove and replace oil filter elements, and refill crankcase - 1 hour.

(g) Remove and replace fuel filter elements - 1 hour.

(h) Disconnect battery cables, remove and replace batteries, and reconnect battery cables - 2 men for 15000 pound (6803 kg) capacity or greater 1/2 hour.

(i) Drain torque converter oil and transmission oil, remove and replace all filter elements and strainers, and refill converter and transmission - 1 hour.

(j) Remove and replace starter - 1 hour.

(k) Bleed and adjust brakes and refill master cylinder (two men) - 3/4 hour.

3.6.27 Towing hook strength. Hook is to have a towing strength of 30% of the total weight of truck plus rated load without permanent deformation.

3.6.28 Drive train torque. With drive wheels locked, the drive assembly shall be capable of withstanding 150 percent of maximum bare engine torque as published by engine manufacturer, multiplied by the stall torque ratio of the torque converter applied to the input shaft of the transmission. When test is required, the drive assembly may be tested before or after truck is completely assembled. When specified (see 6.2), a certificate of compliance may be furnished in place of a test.

3.6.29 Load backrest. Backrest shall have sufficient strength and stiffness to prevent a rated load of 48 inches (1219 mm) high or less from forcing backrest against the uprights when the mast is at maximum rearward tilt. It 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 load carrying surface of the forks to the top of the backrest.

3.6.30 Tire loading. Tire loadings shall not exceed the values shown in the Year Book of the Tire and Rim Association.

3.6.31 Noise limits. The sound level at the operator's station shall not exceed 85 dB(A) when measured in accordance with 4.3.2.29.3. Failure to meet the 85 dB(A) level will require that hazard warning plates conforming to MIL-STD-1474 shall be applied in clear view of the operator. Warning plates shall include the requirement for hearing protection."

3.6.32 Deck loading. Single wheel loading hall not exceed 7400 pounds (3356

kg). Single wheels shall be such that the average tire pressure over the gross bearing area does not exceed 250 pounds per square inch (psi) for wheel loadings up to 150-percent of the wheel loading specified above. The minimum dimension measured across the gross bearing area of single wheels shall not be less than 6 inches (152 mm) under a wheel loading of 7400 pounds (3356 kg).

3.7 Workmanship. The truck shall perform 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, sprues, risers, 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 Rivet connections. Rivet holes, in the sizes recommended by standard practice, shall be accurately formed and shall have burrs removed. Rivets shall be driven with power tools. Rivet heads shall be full, neatly made, concentric with rivet holes, in full contact with the surface of the member, and shall be in accordance with SAE J492. Excessive upsetting of rivets to fill holes will not be acceptable.

3.7.2 Welds. Welded joints shall be sound, smooth, free from harmful pits, holes, fissures, rough projecting edges, and slag; and shall be thoroughly fused to the base metal.

3.7.3 Bolted connections. Bolt holes shall be accurately formed. Washers or lockwashers or a combination of the two shall be provided on all bolts, studs, and capscrews having straight threads. Self-locking nuts are acceptable in lieu of standard nuts and lockwashers. All nuts shall have full thread engagement, and all other threaded fasteners shall have tightening and thread engagement in accordance with SAE J475.

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. Flame cutting may be employed instead of shearing or sawing. Splatter shall be removed from exposed cuts and from re-entrant cuts. Heated metals shall be allowed to cool slowly, except in the performance of designed heat treatment, and overheating 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. All machined parts shall be manufactured to insure accuracy of assembly through the use of correct jigs, fixtures, or tape controlled machines, or any desired combination of these. Like parts shall be interchangeable.

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 in accordance with FED-STD-595a. 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. Surfaces of components and assemblies of the truck, not normally painted with a finish coat, shall be cleaned and protected in accordance with good commercial practice. Lift chains,sprockets,rollers, plastics, fabric hoses (except hydraulic hoses) and drive belts shall not be painted except that slight overspray will be accpepted provided there is no interference with the proper functioning of the component. Paint must be kept off working surfaces where interference with working parts would result. Engine accessories, such as alternator, starter, radiator, and instruments, plated or painted by the manufacturer of such items, shall not be painted by the contractor and shall be adequately protected or masked from overspray.

3.8.1 Walkway coating. Floor plates and step surfaces shall be coated or matted with type II or III,COLOR 37038, black, of MIL-W-5044 and FED-STD-595a.

3.9 Electromagnetic interference characteristics. The truck(s) shall be suppressed in accordance with class C1, group 2, part 8 of MIL-STD-461.

3.10 Identification marking. The truck shall be identified with an identification plate conforming to MIL-P-514, type I, style 1, (MS 90495), Composition C, Grade A, Class I, which shall be in a visible and safe location on the instrument panel or fire wall of the truck. The identifying data to be applied to the identification plates shall be as indicated herein and as defined in MIL-STD-130. Identification data shall include the truck lifting capacity, name of manufacturer, model number, serial number, contract or order number, the gross vehicle weight, USN registration number, delivery date, technical manual identification number, shipping weight, cube dimension, name or stamp of inspector, HI-Shock test date, and DS safety rating. The truck shall also be equipped with instruction, warning, and caution plates conforming to MIL-P-514, type III, composition C, grade A, class I, prominently located and describing any special or important procedure to be followed in operating, loading, and servicing of the truck or its components. All plates shall be securely attached to the truck with screws, bolts, or rivets, and shall be furnished and mounted by the suppliers.

3.10.1 Shipping data plate. Shipping data plate shall conform to MIL-P-514, Type III, Composition C, of Type I, Grade A, Class 1 material and in addition shall show the silhouette of the forklift in transport position indicating the center of gravity and the location and capacity of the lifting attachments. Plate shall be attached by screws, bolts, or rivets in a conspicuous location. Wheel loading information in 3.10.2 may be included on shipping data plate as specified herein.

3.10.2 Wheel loading plate. Each truck shall be equipped with a wheel loading plate conforming to MIL-P-514, Type III, Composition C, of Type 1, Grade A, Class 1 material. Plate shall be attached by screws,bolts, or rivets in a conspicuous location. As a minimum the plate shall have the following information:

Wheel loading (no load on forks)

Drive wheels (each side)	pounds (kg)
Steer wheels (each)	pounds (kg)

Wheel load (rated loading on forks)

Drive wheels (each side)	pounds (kg)
Steer wheels (each	pounds (kg)

3.11 Vehicle marking. The lifting capacity of the truck shall be painted in block numbers two inches (50 mm) high on each side of mast.The assigned registration number for each truck shall be painted in block numbers one and one-half inches (40 mm) high on each side and on rear of truck. For pneumatic tired trucks the tire pressures for each tire shall be stenciled in block numbers one inch high (25 mm) on each side of the truck near the applicable tire. Durable black enamel markers indicating the DS safety designation of truck shall be applied on each side and on the rear of the truck of the vehicle in a visible but protected location. These markers shall be in accordance with ANSI/UL558. In addition, supplementary marking and load handling symbols as specified in ANSI MH11.3 are also required. Slinging and tiedown markings shall be in accordance with MIL-STD-209. No rider warning shall be painted in block numbers two inches (50 mm) high on rear of mast. Fuel type shall be painted in block numbers one inch (25 mm) high near fuel tank filler. Block numbers shall be painted in black enamel

3.12 Technical manuals. One copy of technical manual shall be furnished by the contractor with each truck at the time of shipment. Unless otherwise specified (see 6.2), The manual shall conform to the requirements of MIL-M-21861. 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 bags heat sealed. Additional copies of the manual shall be furnished as specified (see 6.2).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order,the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the contract or order, the supplier 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 at no cost to the contractor.

4.1.1 Acceptability criteria. Trucks that conform to all requirements in Section 3 and 5 of this specification and pass all applicable examinations and tests in Section 4 of this specification will be considered acceptable by the Government.

4.1.2 Component and material inspection. The supplier 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 3.1.1, 4.3 and 6.2).

(b) Minimum requirements inspection and tests (see 3.1.2, 4.4 and 6.2).

(c) Quality conformance inspection for each production truck (see 4.5).

(d) Inspection comparison (see 4.6).

(e) Inspection of preparation for delivery (see 4.7).

4.3 First produced truck inspection and tests. Prior to inspection and test of the truck(s) specified in 3.1.1 and 6.2 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 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 supplier.

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 and 6.2 shall be inspected for the defects marked "X" in Column 1 of Table I.

4.3.1.2 Post-test disassembly and inspection (see 4.3.2.33).

4.3.2 Tests. Upon successful completion of the inspection specified in 4.3.1.1, 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. Only that maintenance established by the supplier and submitted as a mainteannce 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.

Table I. Inspection Schedule

First Produced Inspection	Minimum Requirements Inspection	Item No	Defect	Requirements Paragraph
1	2		3	4
x		101.	Castings not as specified	3.3.1
x		102.	Plating not as specified	3.1.3.2
x	x	103.	Design not as specified	3.1.4
x		104.	Safety not as specified	3.1.4.1
x		105.	Finish not as specified	3.1.4.2
x		106.	Bearings not as specified	3.1.4.3
x	x	107.	Lubrication and fittings not as specified	3.1.4.4.1
x		108.	Screw threads not as specified	3.1.4.6
x	x	109.	Maintainability not as specified	3.1.4.7
x	x	110.	Engine not as specified	3.2.1
x	x	111.	Electrical system not as specified	3.2.2.1
x	x	112.	Alternator and regulator not as specified	3.2.2.2 3.2.2.3
x	x	113.	Starting system not as specified	3.2.2.4
x	x	114.	Fuel system not as specified	3.2.2.4
x	x	115.	Air induction system not as specified	3.2.2.6
x	x	116.	Cooling system not as specified	3.2.2.7
x		117.	Governor not as specified	3.2.2.8
x	x	118.	Exhaust system not as specified	3.2.2.9
x		119.	Fungus and moisture resistance not as specified	3.2.2.10
x		120.	Oil filter not as specified	3.2.2.11
x		121.	Drive assembly not as specified	3.2.3
x	x	122.	Transmission not as specified	3.2.3.1
x	x	123.	Hydraulic system not as specified	3.2.4
x	x	124.	Hydraulic fittings, hoses, tubing not as specified	3.2.4.1
x		125.	Hydraulic hose reels not as specified	3.2.4.2
x		126.	Chassis and frame not as specified	3.3.1
x		127.	Uprights and carriage not as spcified	3.3.1.1
x	x	128.	Fork and fork carrier not as specified	3.3.1.2
x	x	129.	Load backrest not as specified	3.3.1.3
x	x	130.	Wheels and tires not as specified	3.3.2
x		131.	Wheel suspension not as specified	3.3.2.3
x	x	132.	Steering not as specified	3.3.3
x	x	133.	Service brakes not as specified	3.3.4.1
x		134.	Parking brake not as specified	3.3.4.2
x	x	135.	Deadman control not as specified	3.3.4.2.1
x		136.	Truck body not as specified	3.3.5
x		137.	Seat not as specified	3.3.5.1
x		138.	Cowl or hood not as specified	3.3.5.2
x		139.	Instrument panel not as specified	3.3.5.3
x		140.	Wheel guards not as specified	3.3.5.4

Table I Inspection Schedule

First Produced Inspection	Minimum Requirements Inspection	Item No	Defect	Requirements Paragraph
1	2		3	4
x		141.	Towing hook not as specified	3.3.5.5
x		142.	Slinging and tiedown not as specified	3.3.5.6
x	x	143.	Battery not as specified	3.3.5.7
x		144.	Battery mounting not as specified	3.3.5.8
x		145.	Battery terminals not as specified	3.3.5.9
x	x	146.	Controls and instrumentation not as specified	3.4
x		147.	Floodlights not as specified	3.5.1
x		148	Stoplights not as specified	3.5.2
x	x	149.	Sideshift attachment not as specified	3.5.3
x	x	150.	Load leveling device not as specified	3.5.4
x		151.	Horn not as specified	3.5.5
x	x	152.	Overhead guard not as specified	3 5.6
x	x	153.	Weighing device not as specified	3.5.7
x		154.	Rivet connections not as specified	3.7.1
x		155.	Welds not as specified	3.7.2
x		156.	Bolt connections not as specified	3.7.3
x		157.	Metal fabrication not as specified	3.7.4
x		158.	Machine work not as speciifed	3.7.5
x		159.	Treatment and painting not as specified	3.8
x		160.	Walkway coating not as specified	3.8.1
x		161.	Identification data plate not as specified	3.10
x		162.	Shipping data plate not as specified	3.10.1
x		163.	Wheel loading plate not as specified	3.10.2
x	x	164.	Vehicle marking not as specified	3.11
x	x	165.	Technical manuals not as specified	3.12

Table II. Test Schedule

First Produced	Mininum Requirement	Post Test	Test	Test Paragraph	Requirement Paragraph	Test Method No.
1	2	3	4	5	6	7
x	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	Lift speed, lowering speed	4.3.2.2	3.6.1 3.6.2	2
x	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	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 provisions	4.3.2.12	3.6.24	10
x			Overload	4.3.2.13	3.6.13	11
x			Inching	4.3.2.18	3.6.25	12
x		x	Brakes	4.3.2.16	3.6.15	15
x			Maintainability			
x		x	Stopping distance	4.3.2.14	3.6.19	17
x			Towing hook	4.3.2.15	3.6.27	15
x			Drive train	4.3.2.19	3.6.28	18
x			Fork load backrest	4.3.2.20	3.6.29	--
x			Tire loading	4.3.2.21	3.6.30	19
x			Electromagnetic Interference characteristics	4.3.2.22	3.9	--
x			Saline atmosphere	4.3.2.23	3.6.21	—
x			Sideshift attachment	4.3.2.24	3.5.3	--
x	x		Truck weight	4.3.2.25	3.6.22	—
x			Starter disconnect	4.3.2.26	3.2.2.4	--
x			Weighing device	4.3.2.27	3.5.7	—
x			Hi-shock test	4.3.2.28	3.6.23	--
x			Noise level management	4.3.2.29	3.6.31	
x			Frame test	4.3.2.30	3.3.1	20

Table II. Test Schedule

First Produced	Mininum Requirement	Post Test	Test	Test Paragraph	Requirement Paragraph	Test Method No.
1	2	3	4	5	6	7
x			Hydraulic system cleanliness	4.3.2.31	3.6.14	21
x			Reliability	4.3.2.32		
x		x	Post tests	4.3.2.33		
x	x		Fork size	4.3.2.34	*	
x	x		Fork spacing	4.3.2.34	*	
x	x		Overall truck width	4.3.2.34	*	
x	x		Overall truck length	4.3.2.34	*	
x	x		Overall guard height	4.3.2.34	*	
x	x		Deck loading	4.3.2.35	3.6.32	23

* Applicable Military Specification Sheet

4.3.2.1 Maximum lift 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 or 3.6.10 shall constitute failure of this test.

4.3.2.2 Lift and lowering speeds. Test the 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 military 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 shall constitute failure of this test.

4.3.2.5 Slope ascension, parking brake, deadman controls,underclearance. Test the truck in accordance with Test Method No. 6. Nonconformance to 3.6.6, 3.6.11 and 3.6.20 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.

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 provisions. Test the truck in accordance with Test Method No. 10. Nonconformance to 3.6.24 and requirements of Test Method shall constitute failure of test.

4.3.2.13 Overload. Test the truck in accordance with Test Method No. 11. Nonconformance with the requirements of 3.6.13 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 ANSI B56.1 shall constitute failure of test.

4.3.2.15 Towing hook. Test the truck in accordance with the applicable part of Test Method No. 15. Nonconformance with the requirements of 3.6.27 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 3.6.15 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 3.6.26 shall constitute failure of this test.

4.3.2.18 Inching. Test the truck in accordance with Test Method No. 12. Nonconformance with the requirements of 3.6.25 shall constitute failure of this test.

4.3.2.19 Drive train torque. Test the truck in accordance with Test Method No. 18. Transmission failure, fractures or permanent distortion or deformation shall constitute failure of this test.

4.3.2.20 Fork load backrest. Demonstrate requirements of 3.6.29. Nonconformance to 3.6.29 shall constitute failure of this test.

4.3.2.21 Tire loading. Test the truck in accordance with Test Method No. 19. Nonconformance with requirements of 3.6.30 shall constitute failure of this test.

4.3.2.22 Electromagnetic interference characteristics. The First Article 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.

4.3.2.23 Saline atmosphere. The first article (first produced) truck shall be tested in accordance with MIL-STD-810, Method 509, Salt Fog. 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 side shift cylinder(s) shall be at full extension. The lift cylinder rod which is exposed when the lift assembly is lowered fully 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. Individual electrical components may be tested separately instead of with the entire truck. Any evidence of non-compliance with 3.6.21 shall be cause for rejection of the truck. Pursuant to Method 509, paragraph 4, the following details are designated:

(a) Pretest Data shall be those required by 3.6.1., 3.6.2., 3.6.4., 3.6.5 and 3.6.7.

(b) Evidence of harmful corrision, loss of mobility of parts, or inability to disassemble parts for service or repair shall constitute failure

of this test.

(c) 5-percent.

(d) 72 hours

(e) 168 hours at room temperature while loosely covered with transparent film to retard driving.

(f) Not required

(g) Engine electrical system, alternator, alternator regulator, starting system and battery shall be operated to start the engine. When started, run engine for five minutes. Perform cycle three times.

4.3.2.24 Sideshift attachment. The following test shall be performed: Operate the sideshift attachment for 100 full cycles at full speed from extreme left to extreme right and back to extreme left per cycle with the rated load on the forks. During the last 50 cycles, the control shall be released abruptly when the load is in approximately mid position between the left and right extremes and then the sideshifter shall be restarted. Upon completion of the 100 cycles, the attachment and its components shall be examined for compliance with 3.5.3. Any evidence of noncompliance shall be cause for rejection of the truck. The truck shall be capable of meeting all requirements of Appendix A with the rated load at the load center as specified on the applicable military specification sheet.

4.3.2.25 Truck weight. Truck shall be weighed to comply with 3.6.22. Any evidence of noncompliance shall be cause for rejection of the truck.

4.3.2.26 Starter disconnect. Start the truck by energizing the starter switch. Release starter switch for a minimum of five (5) seconds, and attempt to reactivate starter switch while engine is operating. Any evidence of starter engagement while engine is running shall be cause for rejection of the truck.

4.3.2.27 Weighing device. The weighing device shall be tested for conformance to the requirements of 3.5.7 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 - 24 inches (508 to 610 mm). By use of the control valve, the forks and carriage shall be dropped 1 to 4 inches and abruptly stopped. Repeat four times. Adjust tare to show zero load where readout most consistently came to rest each time within approximately the first ten seconds and mark the zero position. 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 to 24 inches (508 to 610 mm) and through the control valve the load shall be dropped from 1 to 4 inches (25 to 102 mm) and then stopped abruptly. This procedure shall be repeated four times. Failure of the weighing device to weigh the calibrated load each time within the required accuracy shall be cause for rejection. With 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. Remove the load and repeat the weight accuracy test procedure prescribed above. Failure of the weighing device to weigh the calibrated load within the required accuracy and repeatability shall be cause

for rejection.

4.3.2.27.1 Production truck. Each truck weighing device shall be adjusted to zero and marked in accordance with 4.3.2.27. 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.

4.3.2.28 HI Shock test. When truck is specified to be designed to meet HI Shock requirement (see 3.6.23 and 6.2), a first produced truck with battery shall be tested by the contractor 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, contracting shall submit a formal procedure to be used during the high shock test for approval. Procedure shall indicate applicable documents, test requirements, description 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. Operational tests shall include lifting/lowering speed, acceleration, vehicle speed, slope ascension, under-clearance and stopping distance. Pursuant to 6.1 of MIL-S-901, the following ordering data shall apply to the test truck with 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 units.

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

(e) Heavyweight.

(f) Type A Test.

(g) Following the explosion of the depth charge at 20-foot standoff, the truck shall comply with (i) and then with (j). Failure of the truck to comply with (i) and (j) or failure or harmful permanent deformation of any component shall be regarded as failure of the truck to meet the H.I. Shock requirement.

(h) The truck 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 shock, but it shall be operated briefly after each shock, to show lifting, lowering, drive wheels jacked up and rotating forward and reverse, sideshift operation, and steering.

(j) After successful test of the truck and provided the truck did not

sustain damage beyond that permitted in accordance with (g), the shock-tested truck with battery may be submitted as the final production item under the contract after being refurbished to appear new.

(k) See (d).

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

4.3.2.29 Noise level measurement. The maximum steady state noise level shall be measured at the operator's station (microphone located no more than six (6) inches from operator's approximate ear location). Noise level measurement shall be in accordance with MIL-STD-1474 with engine operating at maximum no load governed speed and at the speed required for the rated brake power necessary to lift the rated load.

4.3.2.30 Frame Test. Test the truck in accordance with test method No. 20. Nonconformance with the requirements of 3.3.1. shall constitute failure of this test.

4.3.2.31 Hydraulic System Cleanliness Test. Test the truck in accordance with test method No. 21. Nonconformance with the requirements of 3.6.14. shall constitute failure of this test.

4.3.2.32 Reliability. Truck shall be tested in accordance with Test Method No. 22. The reliability test shall be conducted on a continuous basis during each operating 8 hour day. Maintenance and inspections shall be performed in accordance with the maintenance service and inspection sheet after completion of each 500 circuits of the endurance course. 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 organizational tools and parts within 30 minutes or the totaled time of malfunctions exceeds 5% of the time required to complete the specified number of circuits 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. During this test, maintenance manhours performed shall be recorded.

4.3.2.33 Post test disassembly and inspection. Upon completion of tests in 4.3.2.32 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) Engine cylinder heads, all valves, two pistons and piston pins taken from the two cylinders having the lowest compression readings at the end of the test, one main bearing and one connecting rod bearing.

(b) Differential.

(c) Rear axle bearings and seals.

(d) Front axle bearing and seals.

(e) Complete brake system components.

(f) Hydraulic system pump, valves, one cylinder of each size, control levers and any hose and fitting where leakage occurred during the tests.

(g) Mast assembly bearings and chains.

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

4.3.2.34. Truck Configuration. Truck overall width, length, guard height and fork size and fork spacing shall be determined. Measurements exceeding the dimensions indicated on the applicable military specification sheet shall be cause for rejection.

4.3.2.35 Deck Loading. The vehicle shall be tested in accordance with test method No. 23 by recording each individual wheel loading with the rated load and with the sideshift and fork positioner maximum in each direction. Tire base pad prints shall be made for the maximum loading condition and shall be furnished with the First Article Test report. Non-conformance with the requirements of 3.6.32 shall constitute failure of this test.

4.3.3 Inspection and test failure. Failure of a first produced truck to meet any requirement specified herein, during and as a 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 Minimum Quality Assurance Requirements

4.4.1 Inspections. Prior to testing according to 4.4.2, one truck as specified in 3.1.2 shall be inspected for the defects marked "X" in column 2 of Table I.

4.4.2 Tests. Upon sucessful completion of the inspections specified in 4.4.1, truck shall be subjected to the tests marked "X" in column 2 of Table II.

4.4.3. Inspection and test failure. Failure of truck to meet any requirement specified herein, during and as a result of the inspection and tests specified in 4.4.1 and 4.4.2 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 inspection and tests will be considered prima facie evidence that all trucks accepted prior to the completion of 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.

4.4.4 Truck Configuration. Truck overall width, length, guard height, fork size, and fork spacing shall be determined. Measurements exceeding the dimensions indicated on the applicable military specification sheet shall be cause for rejection.

4.5 Quality conformance inspection and tests.

4.5.1 Inspection. After successful completion of all tests specified in 4.5.2, each truck shall be inspected for the following Item Numbers (Also refer to Table I): Presence of one or more defects shall be cause for rejection.

Item No	Defect
104	Safety not as specified
159	Treatment and painting not as specified
161	Identification marking not as specified
162	Shipping data plate not as specified
163	Wheel loading plate not as specified
164	Vehicle marking not as specified
165	Technical manual not as specified

4.5.2 Tests. Each truck shall be tested as follows:

Test	Test Paragraph	Test Method
Lift speed, Lowering speed	4.3.2.2	2
Slope ascension, Parking break, Deadman controls, Underclearance	4.3.2.5	6
Brakes	4.3.2.16	15

Weighing device	4.3.2.27

Failure of any test shall be cause for rejection.

4.6 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 at no cost to the contractor. 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 and tested 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. Contractor will be permitted to witness Inspection comparison.

4.6.1 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 4.6 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 to the Government on trucks previously accepted and produced under the contract. Any deficiencies found as a result of the 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.

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

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing. These shall be level A, B, or C as specified (see 6.2) in accordance with MIL-STD-162.

5.2 Marking. In addition to any special marking specified in the invitation for bids, marking shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Trucks described herein are intended for stacking, unstacking, and moving cargo on weather and below decks aboard ships.

6.2 Ordering data. Procurement documents should specify the following:

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

(b) Type and size required, applicable individual military specification

sheet.

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

(d) Location where truck(s) are to be tested (see 3.1.1).

(e) When government will conduct tests and to what extent of testing (see 3.1.1).

(f) When minimum quality assurance requirement truck shall be furnished. Time frame required for submission of minimum quality assurance truck (see 3.1.2).

(g) Required cerificates of compliance with specifications (see 3.1.6).

(h) When other than 12 volt electrical system is required (see 3.2.2.1).

(i) When HI-Shock requirement is specified (see 3.3.5.6.2 and 3.6.23).

(j) When a second floodlight is required on the left mast or an additional floodlight is required on the right mast (see 3.5.3).

(k) When fork hanger shall permit an extra fork (see 3.5.3).

(l) When load leveling device is required (see 3.5.4).

(m) When battery type and condition should be other than specified (see 3.3.5.7).

(n) When a certificate of compliance shall be furnished in lieu of drive train torque test (see 3.6.28).

(o) When technical manuals need not conform to MIL-M-21861 (see 3.12).

(p) When additional copies of technical manuals are required (see 3.12).

(q) Specify level of preservation, packaging and packing (see 5.1).

6.3 First produced or minimum quality assurance truck(s). Any changes or deviations of production trucks from the approved model during production will be subject to the approval of the contracting officer. Approval of the model will not relieve the supplier of his obligation to furnish trucks conforming to this specification (see 3.1.1 and 3.1.2).

6.3.1 Incident report. When the supplier conducts the tests specified herein, a written report shall be furnished the contracting officer within 24 hours 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,number of men required to effect repair, time to accomplish repair and description of incident.

APPENDIX

FOR

TRUCK, LIFT, FORK, DIESEL

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

20. APPLICABLE DOCUMENTS. None.

TEST METHOD NO. 1

MAXIMUM LIFT HEIGHT - FREE LIFT HEIGHT

COLLAPSED MAST 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 distance from floor to uppermost projection of the upright assembly with mast in true vertical position as determined by a clinometer. (This is the actual collapsed mast height.)

   (b) Raise rated load until the inner mast begins to exceed the specified collapsed mast height.

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

   (d) Adjust rated load to 12 inches (305 mm), plus or minus 4 inches (102 mm), above ground 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 ground.

   (f) 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.

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

TEST METHOD NO. 2

LIFTING SPEED - LOWERING SPEED

1. Test Apparatus:

   (a) Tape measure.
   (b) Stopwatch.
   (c) Tachometer.

2. Test Procedure:

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

   (b) Record time in seconds required to raise rated load to maximum fork height using timing device. Record engine speed during this test. 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 (914 to 1219 mm) height. Load to be abruptly stopped at the 3- to 4-foot (914 to 1219 mm) 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 lift height.

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

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.

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 (152 mm) above floor.

   (c) Position movable vertical barrier within 4 inches (102 mm) 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

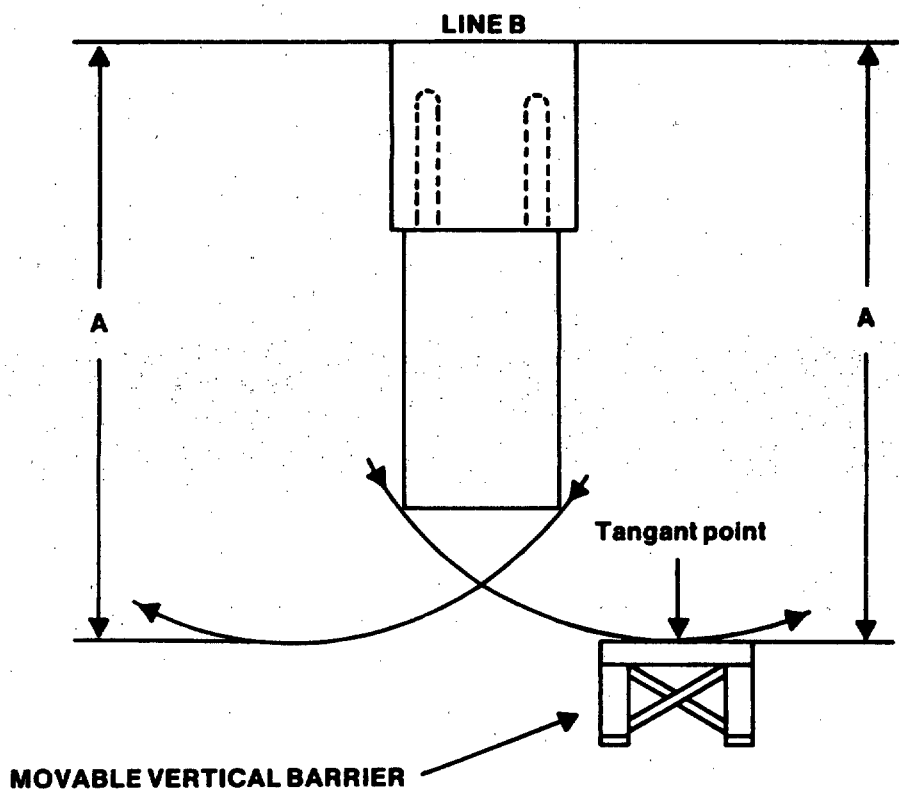


Figure A-1. COURSE LAYOUT

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. Wtih power steering, engine should be at idle speed and 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 front wheels of the truck begin to turn. Mark a point on the fiberboard 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.

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 or springscale.

3. Test Procedure:

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

(b) Attach an adapter pulley, having a root diameter equal to 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 within the first half of the inner steer wheel angle and the maximum gage reading to within 90 degrees of the handwheel stop.

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

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

(g) Turn steering wheel clockwise until steer wheels hit the stop. Apply 150 lb. (68 kg) 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.

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.
   (c) Tachometer.

3. Test Procedure:

   (a) Operate the truck at governed speed with rated load in carry position.

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

   (c) Record length of measured distance, time to traverse measured distance and engine speed. Measured distance shall be equal to or greater than 44 feet (13 m).

   (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.

TEST METHOD NO.6

SLOPE ASCENSION - PARKING BRAKE - DEADMAN CONTROLS- UNDERCLEARANCE

1. Test Course:

   (a) Tilt table or ramp.
   (b) Underclearance template (optional).

2. Test Apparatus:

   (a) Clinometer.
   (b) Spring scale.

3. Test Procedure:

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

   (b) Apply parking brake.

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

   (d) Upon removal of the operators weight from the seat and with the directional control lever in forward direction and engine running observe whether truck remains stationary and the control lever automatically returns the transmission to neutral.

   (e) Repeat step 3(d) in with directional control lever in reverse.

   (f) Starting from a standstill, proceed up ramp and onto a horizontal surface. Observe underclearance.

   (g) From a horizontal surface drive truck in reverse, down slope, stop on slope, and repeat steps (b) through (e).

   (h) Repeat steps 3(a) and 3(f) without load.

   (i) In lieu of driving onto a horizontal surface at top of incline, a template may be used to check underclearance.

   (j) Measure and record underclearance beneath the mast assembly beneath each axle and the frame of the truck. Record the underclearance of the lowest component and note the component. Note whether any hydraulic components and linkages are not protected.

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 (610 mm) above the surface, tilt mast 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.

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 and tilt functions and maintain hydraulic oil temperature above 120 degrees F (49 degrees C.) temperature during the duration of the test.

   (b) Raise rated load to maximum fork height 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 not less than two minutes and record downward drift, rotational drift, and hydraulic temperature.

TEST METHOD NO.9

ACCELERATION

1. Test Course:

   (a) Level,flat surface.

2. Test Apparatus:

   (a) Tape measure.
   (b) Stopwatch.
   (c) Tachometer.

3. Test Procedure:

   (a) Warm up truck prior to test.

   (b) Accelerate the truck in forward gear at maximum speed with rated load through the specified distance from a standing stop. Record time, distance and engine speed 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.

TEST METHOD NO. 10

LIFTING ATTACHMENTS

1. Test Apparatus:

(a) Tape measure.
(b) Tension dynamometers.

2. Test Procedure:

(a) Lift the truck and hold in suspension in its normal transport position using slings that converge not more than 24 feet (7315 mm) 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.

(b) 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.

(c) An alternative method of test is to lift the truck 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.

TEST METHOD NO. 11

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. 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.

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

(k) Inspect forks a minimum of 6 inches (152 mm) each side of heel by magnetic particle for steel forks or dye penetrant method for non ferro magnetic forks.

TEST METHOD NO. 12

INCHING MECHANISM

1. Test Course:

   (a) Level, flat surface.

2. Test Apparatus:

   (a) Tape measure.
   (b) Stop watch.

3. Test Procedure:

   (a) Place truck on level concrete surface with rated test load on forks.

   (b) Position mast at rearward tilt and raise load enough to clear floor surface.

   (c) With direction control in forward position, depress accelerator to provide governed speed of engine and at the same time actuate the inching pedal to hold truck stationary.

   (d) Raise load to a height of approximately 2/3 full lift height at not less than lifting speeds required by applicable equipment specifications while truck is held stationary by the inching pedal.

   (e) Lower load. Inch truck forward at 1/2 mile per hour (.80 km/h) and at same time raise load at maximum lifting speeds.

   (f) Repeat above procedure in reverse direction.

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 3.6.26).

TEST METHOD NO. 14

OVERHEAD SAFETY GUARD

1. Test Apparatus:

(a) Tape measure.
(b) 100 pound (45 kg) solid hardwood core (or equivalent) test weight.

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 test weight 5 feet (1524 mm) 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,or 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).

TEST METHOD NO. 15

SERVICE BRAKE, DRAG AND PRESSURE, TOWING HOOK STRENGTH

1. Test Course:

Level, clean, concrete or asphalt surface.

2. Test Apparatus:

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

3. Test Procedure:

A. Brake Pressure Test.

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

(b) Apply 250 pound (113 kg) force to the brake pedal, hold for one minute and release. Repeat this operation 10 times.

(c) Inspect for component failure.

B. Brake Drag and Towing Hook Strength.

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

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

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

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

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

(f) 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.

(g) Repeat operations (b) through (f) with dynamometer attached to rear towing eye.

TEST METHOD NO. 16

LONGITUDINAL AND LATERAL STABILITY (SEE NOTES 1 AND 2)

1. Test Course:

(a) Tilt table.

2. Test Apparatus:

(a) Clinometer
(b) Plumb bob.
(c) Tape measure.

3. Test Procedure:

A. Longitudinal - Stacking (See Note 3).

(a) Place truck with specified rated load on an initially level platform with axis of load wheels parallel to tilting axis of the platform. Center of mass of the test load should be on the longitudinal centerline of the truck and at the rated load center.

(b) Elevate test load approximately 12 inches (305 mm) above platform and position mast in true vertical position using level and plumb bob, or equivalent.

(c) Attach plumb bob to the theoretical intersection of the front surface (tips of forks) and top surfaces of the forks and mark a reference point on platform.

(d) Elevate the test load to the maximum height and check the reference point. If there has been any change, re-position mast so that plumb bob is directly over the original reference point.

(e) Tilt platform to the slope specified on the individual military specification sheet in the direction of the load overhand. Truck position on the platform shall be maintained by parking brakes or external locking of service brakes or other similar means. Wheel chocks shall not be used, except as specifically permitted by applicable equipment specification.

NOTE 1. During test there shall be no driver on the truck.

NOTE 2. Surface of platform may be covered with a friction increasing material such as liquid paint or adhesive applied tape containing friction material.

B. Longitudinal Traveling (See Note 4).

(a) Place truck carrying the specified rated test standard load on an initially level platform with the axis of the load wheels parallel to the tilting axis of the platform. Center of mass of test load shall be on the longitudinal centerline of the truck and at the rated load center.

(b) Tilt mast to full rearward tilt and elevate the test load until the point of intersection of the two load carrying surfaces of the forks is 12 inches (305 mm) from the floor.

(c) Tilt the platform to the slope specified on the individual military specification sheet about an axis parallel to the axis of the load wheels, and in a direction to increase the load overhang. The truck position on the platform shall be maintained by parking brake or external locking of service brakes or other similar means. Wheel chocks shall not be used, except as specifically permitted by applicable equipment specification.

C. Lateral Stacking (See Note 5).

(a) Place specified rated test load on truck in normal carrying position with center of mass of load on the longitudinal centerline of truck and at the rated load center.

(b) Position truck on initially level platform so that the tilting axis of platform is parallel to a line drawn from the center of one drive wheel tire (or outermost tire where multiple tires are used) to a point on the platform directly beneath the center of the steer wheel axis.

(c) Position the steer wheel nearest the tilting axis so that it is parallel to the tilting axis and raise the load to maximum height and full rearward tilt.

(d) Tilt platform to the slope specified on the individual military specification sheet. Truck position may be maintained by parking brake, external locking of service brakes or similar means, but not by means of wheel chocks, except as specifically permitted by the equipment specification.

NOTE 3. Where attachments are supplied as original equipment, this same stability test shall apply, except that the plumb line shall be attached to the underside of the carriage, attachment or load - whichever is lowest. The truck shall be equipped with the attachment, and the test shall be representative of the rated load for the combined truck and the attachment.

D. Lateral - Traveling (See Note 6).

(a) Place truck without rated load on initially level platform. Position truck on platform so that the tilting axis of the platform is parallel to a line drawn from the center on on load wheel tire (or outermost tire where multiple tires are used) to a point on the platform directly beneath the center of the steer wheel axis.

(b) Position the steer wheel nearest the tilting axis so that it is parallel to the tilting axis.

(c) Position mast to full rearward tilt and elevate forks so that the top load carrying surface of the forks is approximately 12 inches from platform.

(d) Tilt platform to the slope specified on the individual military specification sheet. Truck position on platform shall be maintained by parking brake, external locking of service brakes or similar means, but not by means of wheel chocks, except as specifically permitted by the equipment specification.

NOTE 4. Where attachments are required as original equipment, this same stability test shall apply, except the 12 inch (305 mm) measurement shall be to the undersurface of the attachment, carriage, or load - whichever is lowest. The truck shall be equipped with the attachment and the test load shall be representative of the rated load for the combined truck and attachment.

NOTE 5. Where attachments are required as original equipment this same stability test shall apply. The truck shall be equipped with the attachment and the test load shall be representative of the rated load for the combined truck and attachment.

NOTE 6. When attachments are supplied as original equipment, this same stability test shall apply, except the 12 inch (305 mm) measurement shall be made to the underside of the attachment or carriage - whichever is lowest.

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.
(b) Foot operated pressure gage.

3. Test Procedure:

(a) Warm up truck for 15 minutes prior to test.

(b) Attach pressure gage to brake pedal in such a way to permit the operator to apply foot force to one face of the gage.

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

(d) After reaching top speed, the brakes shall be applied with the brake pedal force specified in 3.6.15 without disengaging the engine.

(e) Measure the distance traveled by the truck after application of the brake pedal force to the final stopping point. Record this distance and the brake pedal force.

(f) Perform operations (d) through (f) a second and third time.

TEST METHOD NO. 18

DRIVE TRAIN STATIC TORQUE TEST

1. Test Course:

Shop area.

2. Test Apparatus:

(a) Torque arm.
(b) Tension dynamometer.

3. Test Procedure:

(a) Transmission shall be placed in lowest gear range.

(b) Lock both drive wheels to prevent turning.

(c) If transmission is the hydraulic power operated type, increase hydraulic pressure or lock clutch by external means to prevent slippage.

(d) Clamp a torque arm of (L) feet to the input shaft of the transmission or in case of power operated to the output shaft of torque converter.

(e) Obtain from manufacturer's published data, the bare engine torque (T) foot pounds of the engine. If drive includes hydraulic torque converter obtain also the stalled torque converter ratio (R).

(f) Apply to the torque arm, a force equal to $\frac{1.5T}{L}$ for mechanical transmission; apply $\frac{1.5TR}{L}$ for trucks equipped with hydraulic converter.

(g) Disassemble transmission and examine for failures, fractures, or permanent distortion and deformation.

TEST METHOD NO. 19

TIRE LOADING

1. Test Apparatus:

   (a) Platform scales.

2. Test Procedure:

   (a) Determine the weight supported by each trail wheel without a load on the forks by driving the trail wheels onto a platform scale or jacking them up with two axle scales. When the trail wheels are weighed together, the total weight should be divided by the numer of trail tires. The upright shall be in a vertical position and the forks approximately 12 inches (305 mm) above the floor.

   (b) Determine the weight supported by the load wheels without a load on the forks by driving the load wheels on a platform scale or jacking them up with two axle scales. When the load wheels are weighed together, divide the total weight by the number of load-carrying tires. The upright shall be vertical, and the forks shall be approximately 12 inches(305 mm) above the floor.

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

TEST METHOD NO. 20

FRAME RACKING

1. Test Description: Test is described under test procedure. 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 Apparatus:
   (a) Jig
   (b) Tension dynaometer

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 300 percent of the maximum static force obtained in step (a) for that support area.

d. Repeat steps b. anc c. for the other support areas.

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

TEST METHOD NO. 21

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 engine at no-load governed speed 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 Automtic Particle Counters 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.
(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 engine 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 five times the sensor flow rate, and may return fluid directly to the reservoir. The branch line to the sensor shall tie into the bypass line and shall be not more than 12 inches in length. Any flow restriction devices shall be placed downstream of the particle counter sensor. Start engine and operate at not less than 1000 rpm. Particle counts should be allowed to stabilize before 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 2000 particles per milliliter larger than 10 micrometers and less than 20 particles per milliliter larger than 20 micrometers.

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 A-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 A-I

Aisle Widths For Test Course (FT)

Capacity (lb)	Solid-Tired Trucks	Pneumatic-Tired Trucks
6,000 (2722 Kg)	14 (4267 mm)	18 (5486 mm)
15,000 (6803 kg)	--	25 (7620 mm)
20,000 (9070 kg)	--	25 (7620 mm)

(b) Obstacle inclusion. The obstacle test shall be set up in accordance with the provisions of Figure A-3 or A-4, as applicable, as a part of the test course. Iron,wood, cement or steel blocks may be used. A guideline 15 feet (4572 mm) 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 (152 mm). 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-5.

(d) Course surface. The course shall be paved with concrete or asphalt . It shall be 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-6 or A-7, as applicable. They shall be placed 2 inches (51 mm) 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 (152 mm) below the maximum lift height of the vehicle under test. The stacked 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 (152 mm) below the maximum lift height of the vehicle under test.

Pallet loads in the second pallet area shall be stacked in accordance with Figure A-8 or A-9, as applicable. They shall be placed 2 inches (51 mm) 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 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-10. They shall be placed 2 inches (51 mm) 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 (1219 mm) plus the height of the pallet) high.

2. Test Procedure:

The truck shall complete 2000 circuits of the test course. However, 2000 ciruits must be completed without any failures (see 4.3.2.32). If failure(s) occur before completion of 2000 circuits, the failure(s) must be corrected and test restarted beginning at the first circuit. Testing shall be conducted at the rate of 20 to 25 laps per hour. The truck shall complete the circuits of the test course as detailed below.

(a) The light switch shall be turned "off" and "on" at the beginning of each lap and 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" (position 1).

(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"(position 2), 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"(position 2).

(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"(position 3). The truck shall back out into the main aisle, making the 90-degree right-hand turn in one motion, and proceed further 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, activate the deadman controls 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 and restart the engine. On alternate laps the operator shall engage the starter switch without turning off the engine unless the power switch has an interlock which defeats the starter unless the switch is turned off. After completion of this portion of 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) Capacity of the fuel tank shall insure not less than 8 hours continuous operation over the test course.

(m) During reliability test the wheel suspension is to be observed that all other wheels of truck maintain contact with the test course even though one wheel is raised up 5 inches (127 mm) for pneumatic tires or three inches (76 mm) for solid tires above above the deck due to local obstruction. Note: This obstruction height is higher than the 3" (76 mm) and 4" (102 mm) high obstacles traversed during the reliability test. Conduct test at completion of 2000 circuits.

(n) "The Hourly Time Record Sheet" shall be filled out for each operating hour of the performance test. Average lap speed per hour shall be recorded.

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

FIGURE A-2 TYPICAL TEST COURSE

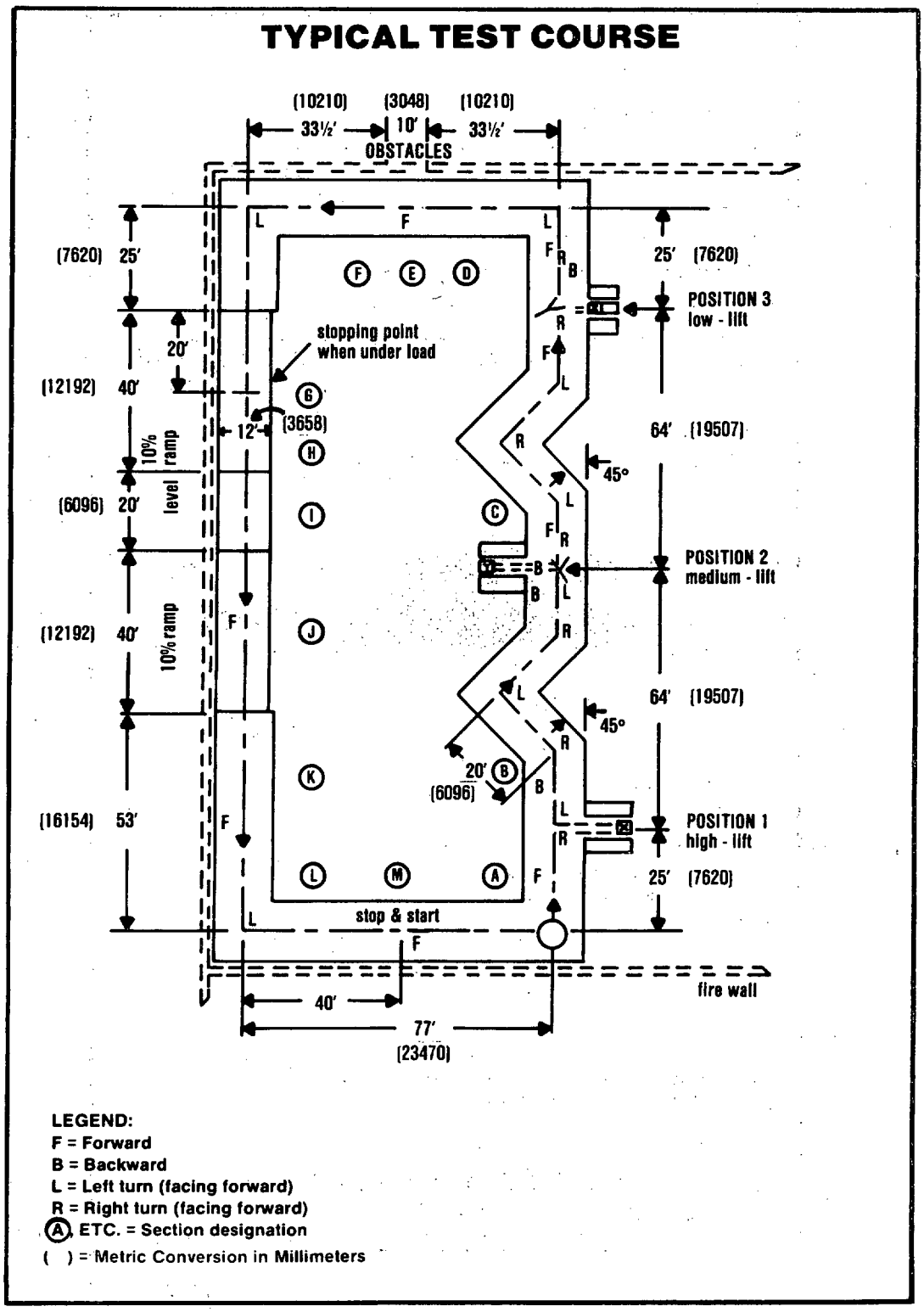


FIGURE A-2

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

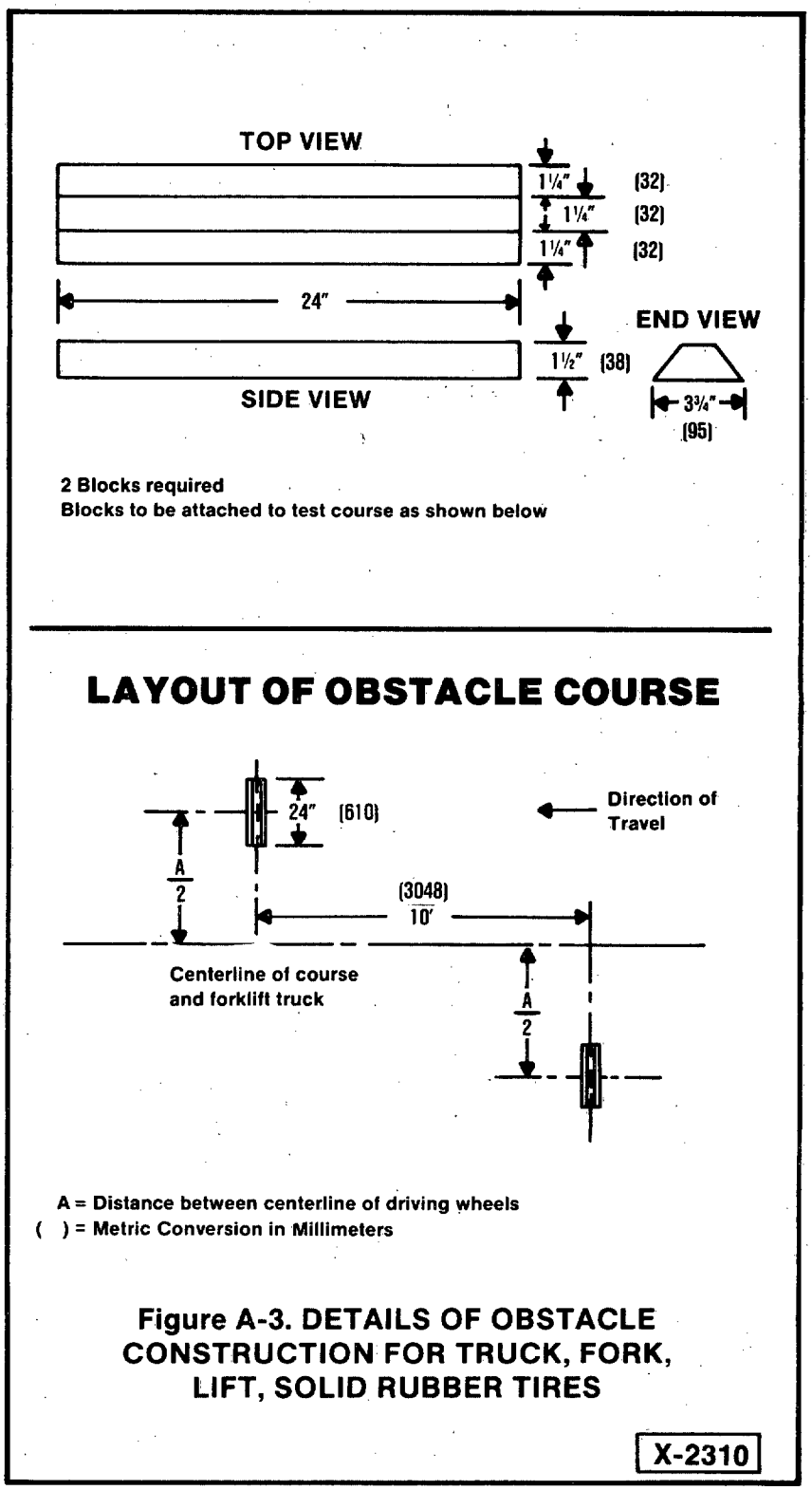


FIGURE A-4 DETAILS OF OBSTACLE CONSTRUCTION FOR TRUCK, FORK, LIFT, PNEUMATIC RUBBER TIRES

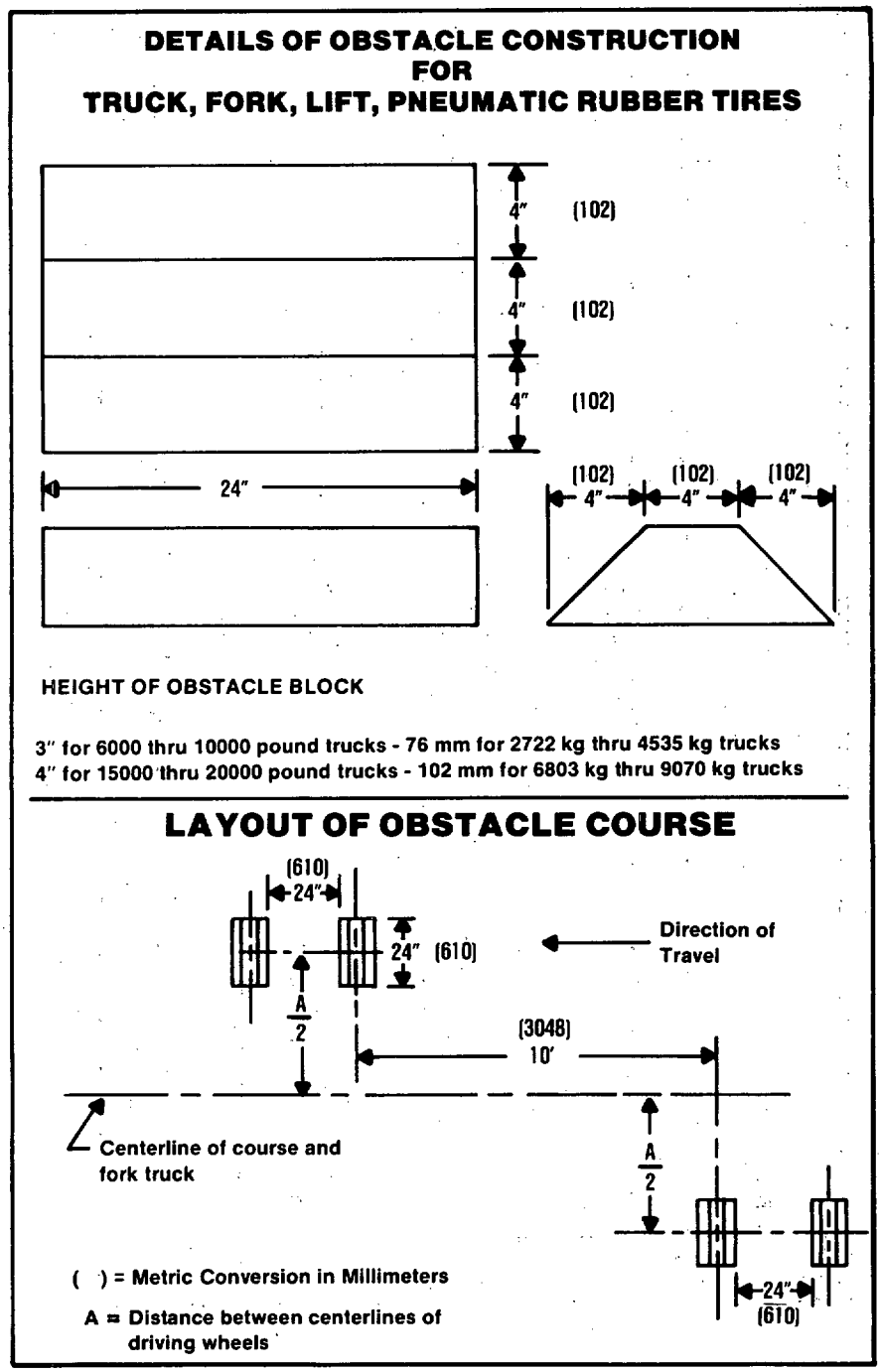


FIGURE A-4

Figure A-5. RAMP DESIGN

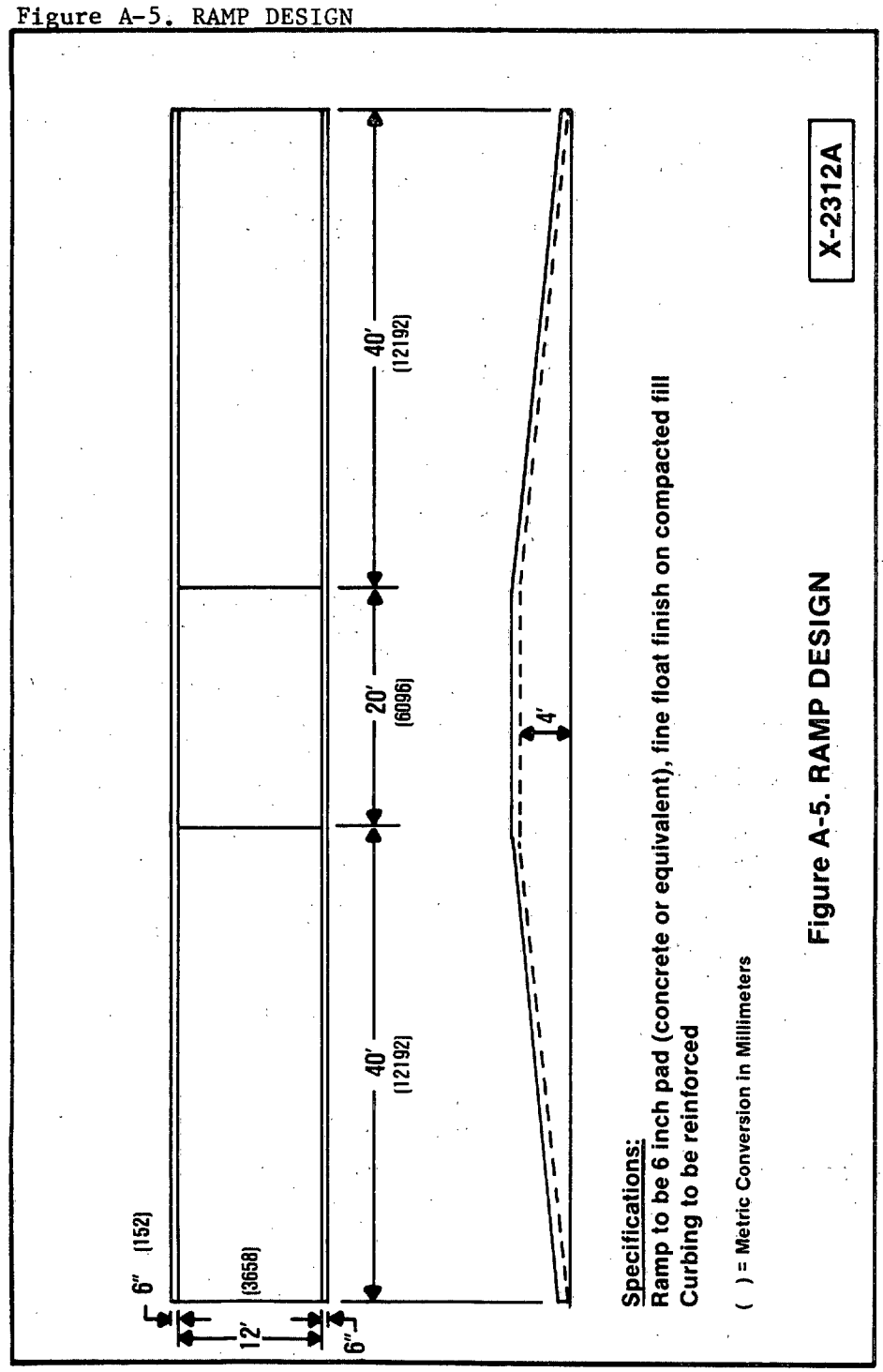
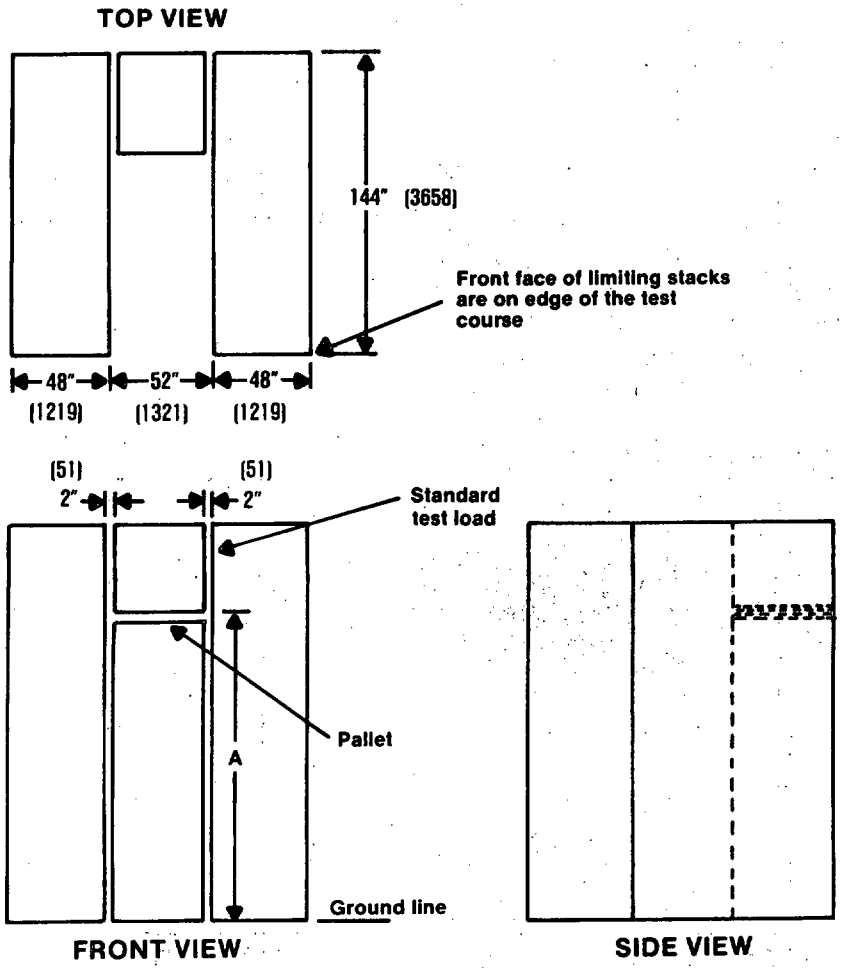


Figure A-6. STACK LAYOUT - POSITION 1 SOLID RUBBER TIRED TRUCKS



A = Maximum lift height for forks less 6 inches (152)

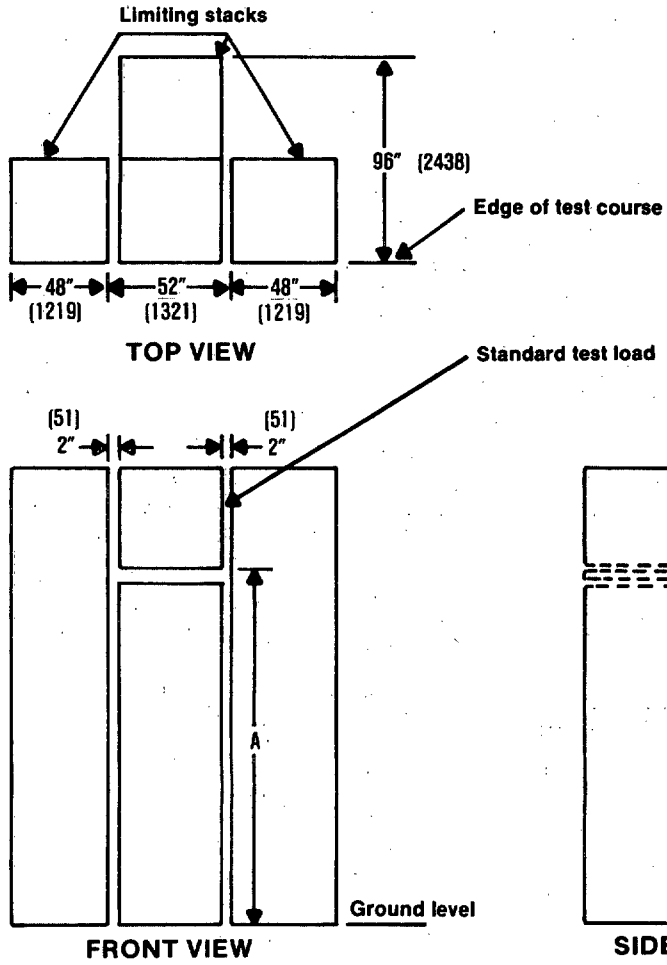
Support for standard load should be of suitable strength to sustain test load. Limiting stacks may be pallets, pallet racks or both.

( ) = Metric Conversion in Millimeters

Figure A-6. STACK LAYOUT - POSITION 1 SOLID RUBBER TIRED TRUCKS

X-2313

Figure A-7. STACK LAYOUT - POSITION 1 PNEUMATIC RUBBER TIRED TRUCKS



A = Maximum lift height of forks less 6 inches (152)

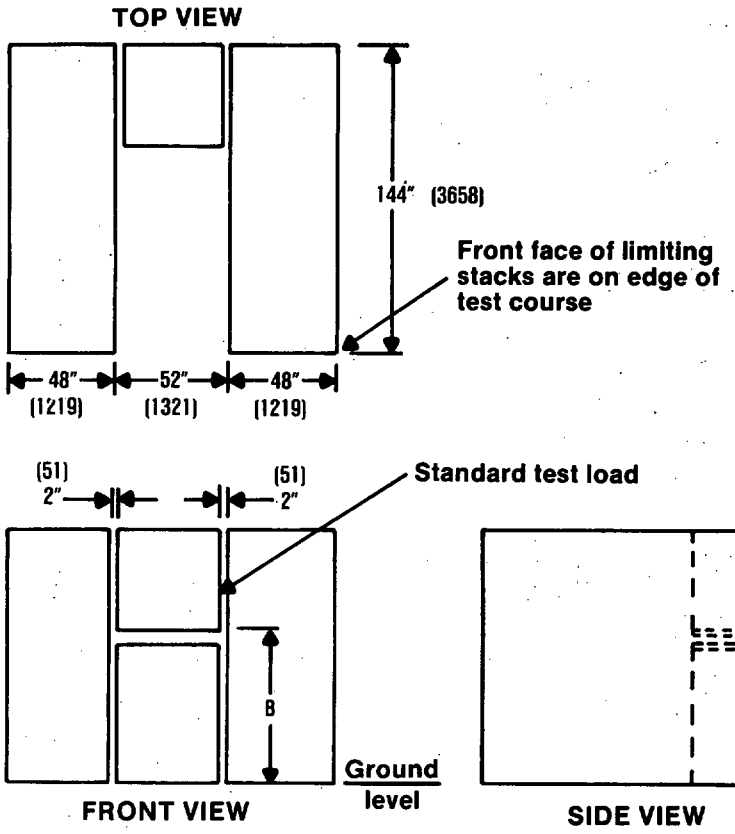
Support for standard load should be of suitable strength to sustain test load. Limiting stacks may be pallets, pallet racks or both.

( ) = Metric Conversion in Millimeters

Figure A-7. STACK LAYOUT - POSITION 1 PNEUMATIC RUBBER TIRED TRUCKS

X-2314

Figure A-8. STACK LAYOUT - POSITION 2 SOLID RUBBER TIRED TRUCKS



B = One-half maximum lift height of forks

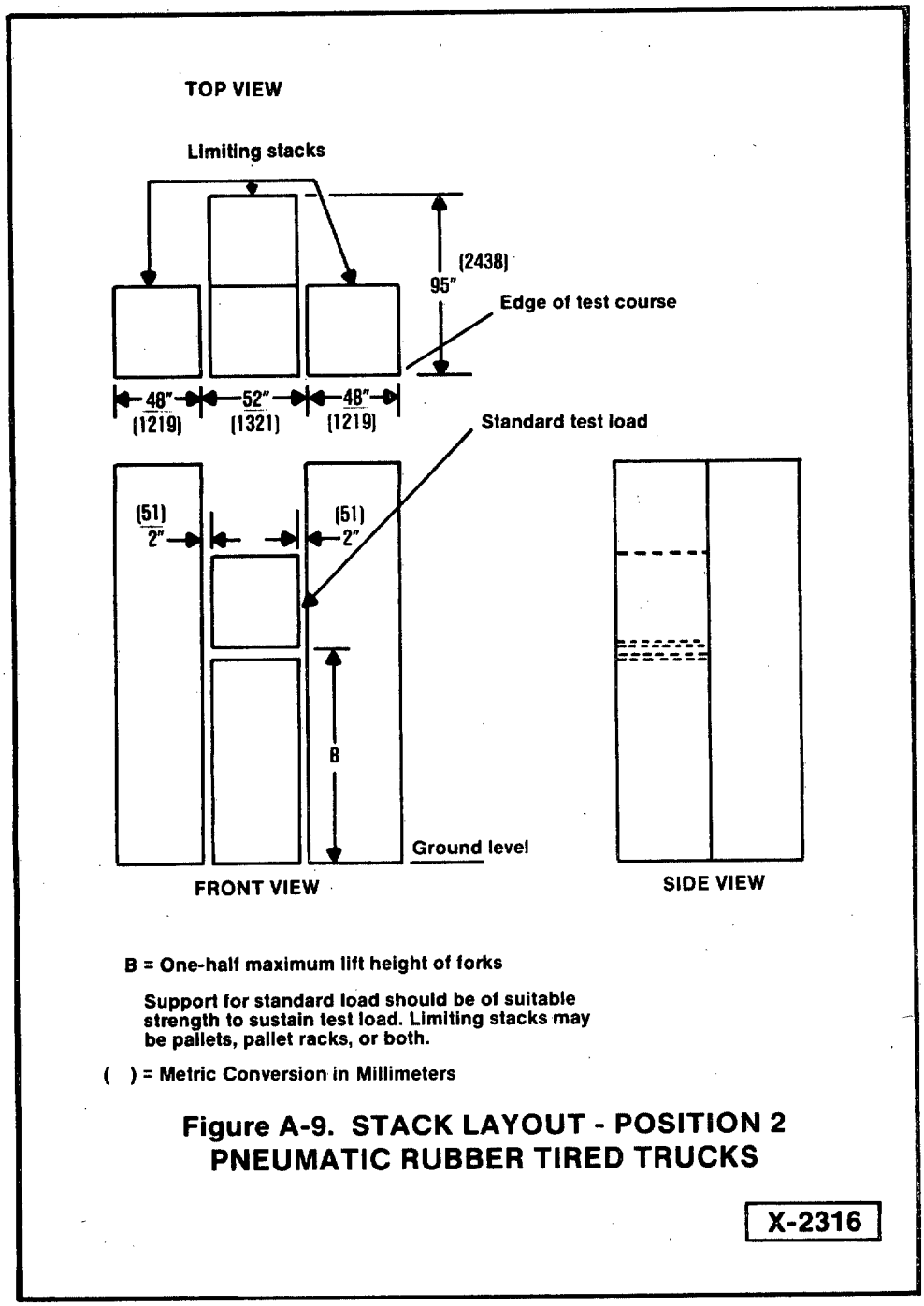
Support for standard load should be of suitable strength to sustain test load. Limiting stacks may be pallets, pallet racks, or both.

( ) = Metric Conversion in Millimeters

Figure A-8. STACK LAYOUT - POSITION 2 SOLID RUBBER TIRED TRUCKS

X-2315

Figure A-9. STACK LAYOUT - POSITION 2 PNEUMATIC RUBBER TIRED TRUCKS



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.

( ) = Metric Conversion in Millimeters

Figure A-9. STACK LAYOUT - POSITION 2 PNEUMATIC RUBBER TIRED TRUCKS

X-2316

Figure A-10. STACK LAYOUT - POSITION 3

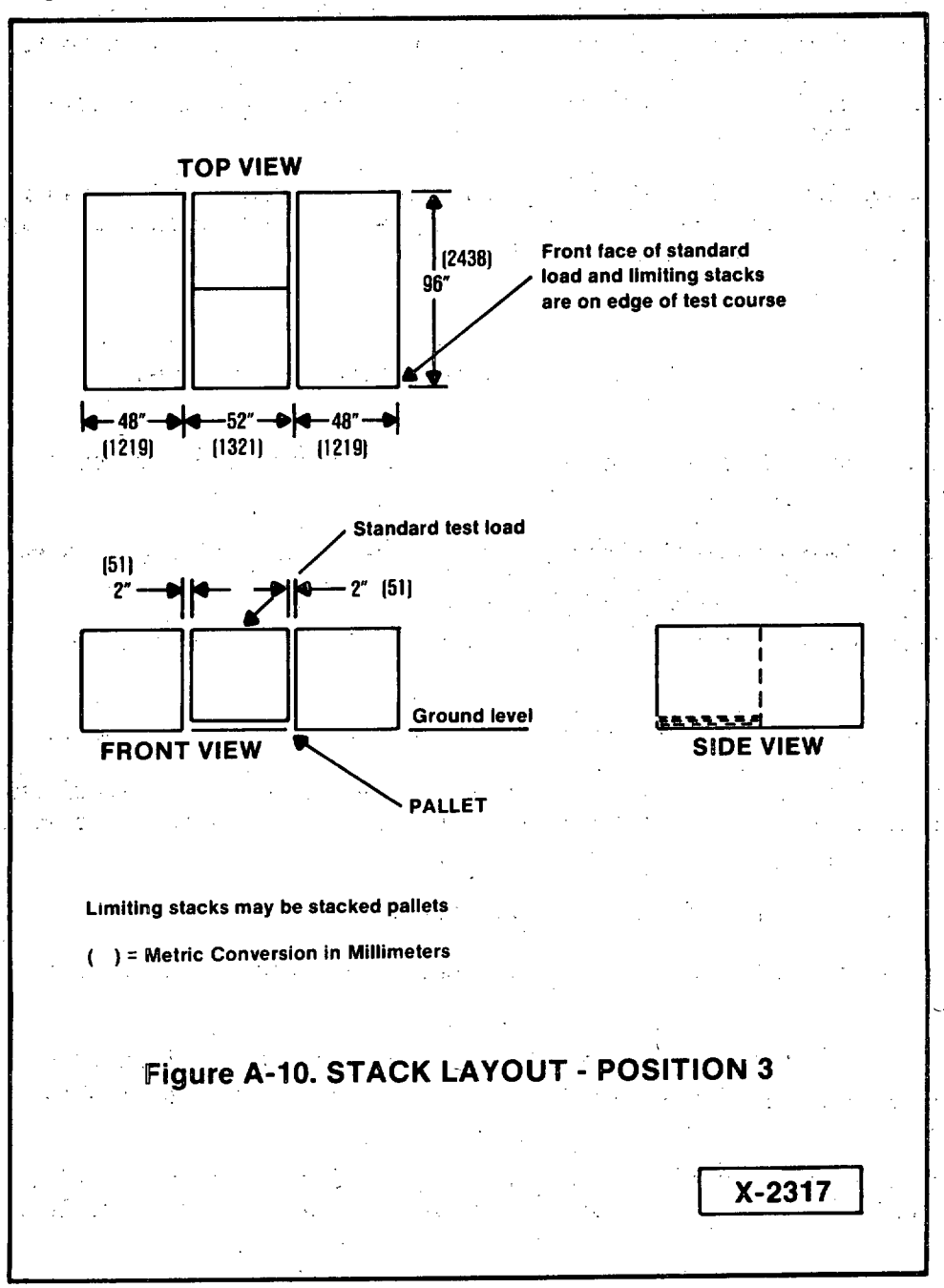


Figure A-10. STACK LAYOUT - POSITION 3

MAINTENANCE SERVICE AND INSPECTION SHEET
MATERIALS HANDLING EQUIPMENT --
INTERNAL COMBUSTION ENGINE

The following inspections and checks shall be made prior to endurance testing and prior to the post testing. Items 1 through 13 shall be checked after completion of each 500 circuits of the endurance test.

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

2. Test brake pedal travel, fill master cylinder, adjust brakes if necessary, report if fluid is below 1/2 full, inflate tires to proper pressure (cold) and remove all foreign matter from tires.

3. Inspect all lights.

4. Fill radiator, check and tighten radiator hose connections, check anti-freeze in season.

5. Inspect fan and hydraulic pump belts, adjust if necessary, use ruler or straight edge (1/2" play).

6. Check engine for water and oil leaks, check filter caps, oil lines, gasket and muffler.

7. Visually check battery, check water level, check for dirty or acid condition.

8. Check fuel filter and fuel pump screens and bowls, clean as necessary.

9. Check engine oil dipstick, add oil if necessary -- disassemble air-cleaner and wash, refill with oil or replace with dry type filter with new element -- breather cap.

10. Check hydraulic oil dipstick, add oil if necessary.

11. Inspect all safety equipment -- overhead guards -- check for cracked or bent forks.

12. Lubricate chassis, using manufacturer's reference charts; replace broken fittings, change oil filter if necessary, lubricate: generator, starter, distributor shaft.

13. Check timing and compression. Drain engine oil, flush crankcase, refill with oil. Remove engine oil filter cartridge -- clean filter -- replace with fresh cartridge.

14. Chains and cables -- clean, adjust and lubricate. Inspect: forks, rollers, carriage and mast -- adjust and align if necessary.

15. Check tie rod, drag link, and wheel alignment of steering assembly.

16. Check wheel bearings -- repack and adjust.

17. Inspect and tighten hub flange bolts.

18. Check gear cases and fill all units -- report excessive consumption.

19. Check brake linings and drums; check wheel and master cylinders.

20. Inspect all wires and terminals -- tighten and replace where necessary.

21. Check hydraulic system for noise, leaks and operation -- inspect and adjust.

22. Drain and flush radiator -- check all connections and hoses -- refill with water and anti-freeze (if in season).

23. Inspect entire exhaust systems for leaks or breaks.

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.

Custodians:

Army	None
Navy	-SA
Air Force	None

Preparing Activity

NAVY SA

Project No. 3930-0536

Interested Activities

User and Review - Navy, SA, SH,MC

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-T-21868B	

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
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b. ADDRESS *(Street, City, State, ZIP Code)*	

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
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