MILITARY SPECIFICATION

TRUCK, LIFT, FORK, VARIABLE REACH, DIESEL-ENGINE-DRIVEN: PNEUMATIC-TIRED, ROUGH TERRAIN; 6,000 POUND CAPACITY AT 24-INCH LOAD CENTER

This specification is approved for use by the USA Belvoir Research and Development Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for diesel-engine-driven, four-wheel drive, rough terrain, pneumatic-tired variable reach boom forklift trucks.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

GG-P-455	- Plates and Foils, Photographic (Photo-sensitive Anodized Aluminum.
QQ-P-35	- Passivation Treatments for Corrosion Resisting Steels.
TT-C-494	- Coating Compound, Bituminous, Solvent Type, Acid Resistant.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research and Development Center, ATTN: STRBE-DS, Fort Belvoir, VA 22060 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MILITARY

MIL-V-173	- Varnish, Moisture-and-Fungus Resistant (For Treatment of Communications, Electronic, and Associated Equipment).
MIL-P-514	- Plates, Identification, Instruction and Marking, Blank.
MIL-T-704	- Treatment and Painting of Materiel.
MIL-C-1283	- Can, Gasoline, Military, 5-Gallon.
MIL-L-2104	- Lubricating Oil, Internal Combustion Engine, Tactical Service.
MIL-G-3859	- Grease Guns, Hand-Operated, Lever, Push and Screw Type.
MIL-A-8421	- Air Transportability Requirements, General Specification for.
MIL-P-15011	- Pallet, Material Handling, Wood Post Construction, 4-Way Entry.
MIL-C-21567	- Compound, Silicone, Soft Film.
MIL-S-40626	- Sign Kit, Vehicle Class.
MIL-S-43926	- Suit, Chemical Protective.
MIL-G-43976	- Glove Set, Chemical Protective.
MIL-F-43987	- Footwear Cover, Chemical Protective (Overboots).
MIL-A-46153	- Antifreeze, Ethylene Glycol, Inhibited, Heavy Duty, Single Package.
MIL-L-46167	- Lubricating Oil, Internal Combustion Engine, Arctic.
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-B-46176	- Brake Fluid, Silicone, Automotive, All Weather, Operational and Preservative.
MIL-M-51282	- Mask, Chemical - Biological, Field, M17A1.
MIL-H-51291	- Hood, Chemical - Biological Mask: M6A2.
MIL-A-52363	- Air Cleaners, Intake: Dry-Type (for Internal-Combustion Engine).
MIL-H-52471	- Hose and Hose Assemblies, Rubber: Hydraulic Pressure-Type, General Specification for.
MIL-E-52649	- Engine Cold Starting Aids, Ether Fuel Primers.
MIL-F-52723	- Filter Element, Hydraulic, Disposable.
MIL-T-62314	- Test Equipment (Simplified) for Internal Combustion Engine (STE/ICE).

STANDARDS

FEDERAL

FED-STD-H28	- Screw Thread Standards For Federal Services.

MILITARY

MIL-STD-130	- Identification Marking of US 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 and Tying Down Military Equipment.
MIL-STD-461	- Electromagnetic Interference Characteristics Requirements for Equipment.
MIL-STD-642	- Identification Marking of Combat and Tactical Transport Vehicles.
MIL-STD-889	- Dissimilar Metals.
MIL-STD-1223	- Administrative Wheeled Vehicles Treatment, Painting, Rustproofing, Undercoating, Identification Marking, Data Plates and Warranty Notice Standards.
MIL-STD-1366	- Material Transportation System Dimensional and Weight Constraints, Definition of.
MIL-STD-1410	- Methods for Selection of Industrial Engines for End Item Application.
MIL-STD-1472	- Human Engineering Design Criteria for Military Systems, Equipment and Facilities.
MIL-STD-1474	- Noise Limits for Army Materiel.
MS24207	- Coupling, Grease Gun; Hydraulic Type Nozzle.
MS35000	- Battery, Storage, Lead-Acid, Waterproof.
MS51113	- Switch, Vehicular Lights, 24-Volt DC, Waterproof.
MS51118	- Pintle Assembly, Towing: 40,000 Lbs. Capacity, Manual Release.
MS51318	- Headlight: Blackout, 24 Volt, Waterproof.
MS51330	- Stop Light - Taillight, Vehicular - 24 Volt, Blackout Tail, Blackout Stop.
MS52125	- Composite Light - Tail, Stop, Turn and Marker.
MS52126	- Composite Light - Front, Turn, Park and Marker.
MS52131	- Connector, Plug, Electrical Inter-vehicle Power Cable.
MS53052	- Bracket Assembly, Liquid Container, Five Gallon.
MS500004	- Pad Eye Vehicular Towing Lug.
MS500048	- Towbar, Motor Vehicle, Light, Medium and Heavy Duty.

HANDBOOK

MILITARY

Air Force System Design Handbook DH1-11	-Air Transportability.
MIL-HDBK-157	- Tranportability Criteria.

(Copies of military specifications and military standards required by manufacturers in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Military handbooks should be obtained from the procuring activity or as directed by the contracting officer.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

DRAWINGS

TACOM

12258941	- Connector, Receptacle 54 Pin.
12258955	- Vehicle Test Card.

REPORT

CR 82-588-003	- STE/ICE Design Guide for Vehicle Diagnostic Connector.

(Application for copies should be addressed to Department of the Army, U.S. Army Tank-Automotive Command, ATTN: DRSTA-RGD, Warren, MI 48090.)

UNITED STATES DEPARTMENT OF AGRICULTURE

Forest Service Standard 5100-1.

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

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the issue of the DoDISS specified in the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

B56.6 Safety Standard for Rough Terrain Fork Lift Trucks.
B93.30M Hydraulic Fluid Power - Contamination Analysis Data - Reporting Method.
B93.42 Testing Hydraulic Fluid Power Quick Disconnect Couplings.
MH11.3 Load Handling Symbols for Powered Industrial Trucks.
Z26.1 Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways.

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D - 1171 Rubber Deterioration - Surface Ozone Cracking Outdoors or Chamber.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Welding Qualifications, Section IX.

(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.)

AMERICAN WELDING SOCIETY, INC. (AWS)

D1.1 - Structural Welding Code, Sections 5 and 6, Welding Qualifications.
D14.3 - Earthmoving and Construction Equipment Welding, Section 5, Qualification.

(Application for copies should be addressed to the American Welding Society, Inc., 2501 N.W. Seventh Street, Miami, FL 33125.)

ASSOCIATION OF AMERICAN RAILROADS (AAR)

General Rules Governing the Loading of Commodities on Open Top Cars.
Rules Governing the Loading of Department of Defense Material on Open Top Cars.

(Application for copies should be addressed to the Association of American Railroads, 50 East Van Buren Street, IL 60605).

INDUSTRIAL FASTENERS INSTITUTE (IFI)

Standard 114 - Standard for Break Mandrel Blind Rivets.

(Application for copies should be addressed to the Industrial Fasteners Institute, 1517 Terminal Tower, Cleveland, OH 44113.)

NATIONAL FLUID POWER ASSOCIATION
T.3.9.18 - 1976 - NFPA Recommended Standard for Calibration of Liquid Automatic Particle Counters.

(Application for copies should be addressed to the National Fluid Power Association, P.O. Box 49, Thiensville, WI 53092.)

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Rule 442 - Usage of Solvents.

(Application for copies should be addressed to the South Coast Air Quality Management District, 9150 Flair Drive, El Monte, CA 91731.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE Handbook.

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

TIRE AND RIM ASSOCIATION, INC. (TRA)

Tire and Rim Association Yearbook.

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

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited in 2.1.1, 2.1.2, and 2.2, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Description. The forklift truck (hereinafter called "truck" or "forklift") shall be a four-wheel drive, pneumatic tired, diesel-engine-driven, variable reach boom type truck (see ANSI B56.6). The truck shall not be equipped with stabilizers.

3.1.1 Rated capacity load. Rated capacity load (see 6.8.2) for the forklift shall be 6,000 pounds measured with the load center (see 6.8.1) of the weight 24 inches from the forward face of the vertical member of the tines and 24 inches above the load-bearing surface of the forks.

3.1.2 Pick load. The pick load for the forklift shall be not less than 4,000 pounds measured with the load center (see 6.8.1) of the weight 24 inches from the forward face of the vertical member of the tines and 24 inches above the load-bearing surface of the forks.

3.1.3 Physical characteristics.

3.1.3.1 Weight. Axle weights shall not exceed 20,000 pounds for the heaviest axle and 10,000 pounds for the other axle for vehicles with a wheelbase less than 120 inches. Axle weight shall not exceed 20,000 pounds per axle for vehicles with wheelbase 120 inches and greater. Maximum allowable vehicle weight shall be 35,000 pounds.

3.1.3.2 Overall height. The overall forklift height, as defined in SAE J1234 with the boom horizontal shall not be more than 102 inches.

3.1.3.3 Axle spacing. Axle spacing for the forklift shall be not less than 96 inches.

3.1.3.4 Width. The width of the forklift as defined in SAE J1234 including tire bulge at manufacturer's recommended tire pressure shall be not more than 102 inches.

3.1.3.5 Ground clearance. The ground clearance of the forklift as defined in SAE J1234 shall not be less than 12 inches and shall apply with the forklift fully fueled and serviced, with rated capacity load at retracted carry position. The forklift with and without load, shall be capable of negotiating a 25 degree ramp of length greater than the trucks wheelbase with level surfaces at both top and bottom of the ramp. No portion of the forklifts other than the tires, shall come in contact with the ramp when the forklifts travel over the ramp in either direction. Hydraulic fittings, hoses, tubing, and linkages shall not be the lowest portion of the truck and shall be protected by structural members from striking obstacles.

3.1.4 Transportability. The forklift shall be transportable worldwide without damage, by highway, air, marine, and rail transport modes. Transportability criteria are established by MIL-STD-1366 and MIL-HDBK-157 as described herein.

3.1.4.1 Highway transportability. The forklift shall be capable of being towed with a dead engine without damage. The drivetrain shall be provided with a means to disengage the wheels from the transmission for towing. Disengagement and reengagement shall each be performed in not more than one hour by one person using only manual devices and common tools. The forklift, in its reduced configuration, shall be capable of highway movement worldwide when transported on US Army M871 semitrailer, and highway transportable in NATO countries. The forklift shall not exceed the permit limits as defined in table I of MIL-HDBK-157 for transport in CONUS, excluding Guam and Puerto Rico.

3.1.4.2 Air transportability. The forklift shall be transportable in USAF C-141, and C-5A aircraft. Transportability requirements shall be in accordance with MIL-A-8421, Air Force Design Handbook DH1-11, and as specified herein. The fully assembled forklift truck shall be capable of being driven on and off the aircraft. The air transport configuration shall be with a minimum of 1/2 to a maximum of 3/4 tank of fuel.

3.1.4.3 Rail transportability. The forklift shall have unrestricted movement by railroad when loaded on a 50-foot flat car (see MIL-HDBK-157). The forklift shall withstand railroad humping without permanent deformation or damage to any of its components when secured to the flatcar in accordance with the Association of American Railroads (AAR) Rules Governing the Loading of Department of Defense Material on Open Top Cars. The railroad humping test shall be in accordance with the AAR General Rules Governing the Loading of Commodities on Open Top Cars (Section 1, Part 3).

3.1.4.4 Marine transportability. The forklift shall be transportable by breakbulk cargo ships, roll-on/roll-off (RORO) ships, C-8 and larger, lighter aboard ship (LASH), barge carrying ships (SEABEE), LARC60 and larger amphibious vessels, and army barges and lighters in accordance with MIL-HDBK-157.

3.2 First articles.

3.2.1 First article. Unless otherwise specified (see 6.2), the contractor shall furnish three or more trucks as specified (see 6.2) for examination and testing within the time frame specified (see 6.2) to prove prior to starting production that his production methods and choice of design detail will produce trucks that comply with the requirements of this specfication. Examination and tests shall be as specified in section 4 and, unless otherwise specified herein, all examination and tests shall be conducted by the contractor, subject to the surveillance and approval by the Government (see 6.3). When specified (see 6.2), the Government will conduct any or all of the first article model examination and tests. When specified by the Government, one of the first article trucks shall be made available to the Government for air tranportability analysis.

3.2.2 First article (Initial production). When specified (see 6.2), the contractor shall furnish two or more trucks (see 6.2) for examination and testing by the Government as specified in 4.4.

3.3 Material. Material shall be as specified herein. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification. It is encouraged that recovered material be used when practical as long as it meets the requirements of this specification (see 6.8.7).

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

3.3.1.1 Material deterioration and control. The forklift shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that may affect the normal performance of the vehicle or during storage of the vehicle when stored in accordance with proper storage procedures for the type of storage involved.

3.3.1.2 Drain holes. Drain holes shall be provided where applicable, to prevent collection or entrapment of water or other unwanted fluids.

3.3.2 Screw threads. Screw threads shall be in accordance with FED-STD-H28.

3.3.3 Tire age. Tires shall not exceed 8 calendar quarters in age from date of cure of the rubber to date of acceptance of the forklift by the Government.

3.3.4 Recovered materials. For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces and parts incorporated in the forklift may be newly fabricated from recovered materials to the maximum extent practicable, provided the forklift produced meets all other requirements of this specification. Used, rebuilt or remanufactured components, pieces and parts shall not be incorporated in the forklift.

3.4 Environmental and use requirements.

3.4.1 Operating conditions. The forklift truck shall withstand the usage encountered in military operations without damage, permanent deformation or failure of components. The military operations include loading and unloading of palletized ammunition and Multiple Launch Rocket System (MLRS) pods weighing 6000 pounds each (see figures 1 and 2) from 8-foot by 8-foot by 20-foot ISO 1C shipping containers both on the ground and trailer mounted (container doors 5 feet from the end of the trailer), loading and unloading of boxcars, flatbeds, flatbed trailers, trucks and aircraft with palletized and containerized loads of heavy supplies. These operations shall be capable of being conducted over unprepared, unstabilized surfaces, especially over rough terrain such as beach operations in soft sand, snow and mud where high flotation is needed, and travel without load between work sites.

3.4.2 Operating temperatures. The engine shall start without preheating within 5 minutes and the forklift shall operate as specified herein within 15 minutes after engine start in any ambient temperature in the range of minus 25° F to plus 120° F.

3.4.3 Storage temperature. The forklift shall not be damaged by storage under the conditions indicated in table I.

TABLE I. Storage.

Air Temperature	Time Period
Plus 160° F	1 hour daily.
Plus 155° F	4 hours daily.
Minus 25° F	6 hours daily.

3.4.4 Rain. The forklift shall start within 5 minutes and operate as specified herein when tested as specified in 4.6.2.28.

a. Without malfunction of any electrical component, switch, gage, light or instrument.
b. Without leakage of water into filters incorporating a sediment chamber in the air-intake filter in excess of 8 percent of the fluid capacity of the sediment chamber.
c. Without leakage of water into the torque converter oil chamber, engine crankcase sump, transmission, transfer case, instruments, switches, gages, lights, or fuel tank.
d. Without any leakage into the cab which causes a malfunction.

3.5 Safety. The truck shall meet the safety requirements specified in SAE J98 and ANSI B56.6 unless otherwise specified herein. All rotating and reciprocating parts and parts subject to high temperature shall be guarded when such parts are exposed to contact by operator and maintenance personnel performing daily maintenance functions. Nonfunctional edges shall be rounded, projecting points shall be blunted or rounded, and excessive length of fasteners shall be avoided. Steps and platforms for entering the forklift shall have antiskid, ice resistant surfaces. Oil level indicators for engine, transmission, and other components shall be within easy and safe access of the operator or maintenance personnel.

3.5.1 Roll over protective structures (ROPS) and falling objects protective structure (FOPS). The forklift shall be equipped with a complete ROPS and FOPS structure conforming to SAE J1040 and SAE J231. The ROPS and FOPS shall be free from sharp edges, particularly at any point where a sling may come in contact during lifting (see 3.31) or at points likely to be contacted by personnel.

3.5.2 Seatbelt. An adjustable weather-resistant seatbelt with buckle conforming to SAE J386, type I shall be furnished equipped with sleeves and retractor or seat mounted.

3.5.3 Backup alarm. A backup alarm conforming to SAE J994, type C or D shall be furnished. The backup alarm signal shall be audible above, and distinguishable from the surrounding vehicle noise level.

3.5.4 Boom safety stop. A means shall be provided to prevent the boom from retracting far enough to cause the MLRS pod, carried longitudinally or laterally, to come into contact with the forklift body or front tires when the truck is stationary or moving.

3.6 Human factors. The characteristics of the forklift, with cab, ROPS and FOPS installed, shall provide for operation and maintenance by personnel ranging from the small person clothed, through the large person arctic clothed, in accordance with SAE J833, SAE J925, and MIL-STD-1472 as specified herein.

3.6.1 Noise limits.

3.6.1.1 Personnel noise (steady state). The noise produced by the forklift shall not exceed 85 dB(A) at the operator's position when tested in accordance with 4.6.2.27. If technical infeasibility is established via MIL-STD-1474, or the means of reduction is too costly, the written permission of the procuring activity shall be requested to exceed the 85 dB(A) limit. The precautions of 6.5 shall be provided if, and only if, MIL-STD-1474 procedures have been pursued and documented to the satisfaction of the procuring activity. Hazard signs shall conform to MIL-STD-1474 and be readable at the distance indicated on the sign.

3.6.1.2 Exterior noise. The forklift shall neet the requirements of MIL-STD-1474 for exterior noise for construction and materials-handling equipment.

3.7 Maintainability. Provision shall be made for adjustment, servicing or replacement of parts and components. When access openings are used on the exterior of the forklift, the edge of the opening shall be smooth and shall be provided with a removable or hinged cover whenever it is required. Dimensions of hand or arm access openings shall be in accordance with MIL-STD-1472 for arctic clothing. Steps and platforms for servicing the forklift shall have antiskid surfaces. When tested as specified in 4.6.2.36, the forklift shall have a Maintenance Ratio (MR) of not more than 0.247. The MR is defined as the ratio of total active maintenance man-hours required (scheduled and unscheduled) to the total operating time. Man-hours for repair of replaced components and scheduled before-and-after operation checks are excluded. Scheduled maintenance shall be required not more often than every 50 hours, except for before-and-after operation checks. Each operation in the following maintenance operations list shall be accomplished by one person (except where otherwise specified) in not more than the time specified, using common tools and special tools, if any, furnished with the forklift.

a. Remove, replace and adjust all engine-driven belts - 3/4 hour.
b. Remove and replace alternator - 1/2 hour.
c. Remove and replace all hydraulic-system filter, screens and strainers - 1 hour.
d. Remove and replace engine coolant-system hoses - 1 hour.
e. Drain engine lubricating oil, remove and replace oil filter elements and refill crankcase - 1 hour.
f. Remove and replace fuel filter elements - 1/2 hour.
g. Disconnect battery cables, remove and replace batteries, reconnect battery cables - 1/2 hour.
h. Drain torque converter oil and transmission oil, remove and replace all transmission filter elements and strainers, and refill converter and transmission - 1 hour.
i. Remove and replace starter - 1 hour.
j. Bleed and adjust brakes and refill master cylinder (if applicable) - 2 men - 1 hour.
k. Remove and replace headlight, floodlight and taillight bulbs (not including blackout lights) - 1/4 hour each bulb.

l. Remove, disassemble, service and install air cleaner - 1/2 hour.
m. Lubricate all lubrication fittings with 2 strokes per fitting using the gun and extension specified in 3.29.1 - 1 hour.

3.8 Reliability. The forklift(s) shall complete 2940 cycles (maximum 210 hours) on the load placement course and 80 cycles (maximum 100 hours) on the productivity course with a maximum of two relevant failures as defined in 4.6.2.35.

3.9 Performance. The forklift shall conform to the requirements specified herein under all conditions specified without damage or permanent deformation. There shall be no evidence of accelerated wear or failures when operated under service conditions specified herein.

3.9.1 Stability.

3.9.1.1 ANSI stability. Forklift shall conform to ANSI B56.6 stability requirements.

3.9.1.2 Static stability. The rear wheels of the forklift shall not clear the ground when a load of 4400 pounds is applied to the load center on the forks under the following conditions:

a. Forklift on a hard, level surface and stationary, without operator.
b. Forks horizontal and centered on the carriage.
c. 21.5 foot reach.
d. Forklift fuel tank no more than 1/2 full.

3.9.1.2.1 MLRS static stability. The rear wheels of the forklift shall not clear the ground when 9000 pounds is applied to the MLRS carry lifting tool which is attached to the forklift in the MLRS configuration.

3.9.1.3 Dynamic stability. The forklift shall negotiate a 30 percent slope with and without rated capacity load in the retracted carry position (see 6.8.3), in full circle operation at maximum steer angles in both directions without any wheel leaving the ground. The forklift while descending a 30 percent grade in the forward direction with rated capacity load in the retracted carry position at not less than 2 mph, shall be capable of stopping within a distance of 15 feet by applying the service brakes at a pressure that prevents the rear wheels from leaving the ground.

3.9.2 Vehicle flotation. The truck shall have a Flotation Index (FI) of not more than 25 unloaded with forks in retracted carry position and with rated capacity load in MLRS carry position. The FI shall be calculated using the following formula:

$$FI = \text{Antilog} \left[0.211 - 0.350\,C + 0.00710\,P - \frac{0.0752(P_F - P_R)}{P} - \frac{0.0402(A_F - A_R)}{A} + 0.0346K \right]$$

Where:

P_F = Tire pressure, front (psi)

P_R = Tire pressure, rear (psi)

P = Tire pressure, average = 1/2 (P_F + P_R)

A_F = Axle load, front (lbs)

A_R = Axle load, rear (lbs)

A = Gross vehicle weight = A_F + A_R

K = 53.75 + 0.000139A (for nonradial tires)

K = 55.77 + 0.000032A (for radial tires)

$$C = \text{Log} \frac{A}{0.607P + 1.35\left[\frac{117R}{5W + D}\right] - 4.93}$$

R = Tire ply rating
W = Tire width (in. - as cited in tire size)
D = Rim diameter (in. - as cited in tire size)

The FI shall be determined with the forklift fully fueled and serviced with lubricants. For the purpose of calculating both loaded and unloaded FI, the front tire inflation pressures shall be based on front axle weight with rated capacity load in MLRS carry position and rear tire inflation pressures shall be based on rear axle weight with no load on forks in retracted carry position. Pressures may be reduced by not more than 30 percent of the recommended pressure published in the TRA Yearbook for the forklift's tire load at 5 mph rating.

3.9.3 Longitudinal gradeability. The forklift shall ascend a 45 percent grade in forward gear range at a speed of not less than 2 mph with rated capacity load.

3.9.4 Travel speed. The forklifts shall be capable of travel speeds as follows:

Forward without load - 17 mph minimum.
Forward with rated capacity load in retracted carry position - 15 mph minimum.
Reverse with rated capacity load in retracted carry position - 7.5 mph minimum.

3.9.5 Fording. The forklift shall be capable of operation in freshwater to a fording depth of 30 inches. Forklift components shall be protected from damage, malfunction and corrosion due to immersion followed by drying for those components below the fording level, and due to splash and spray for those components above the fording level. When tested as specified in 4.6.2.31 the truck shall operate during and after fording operation without malfunction or damage from corrosion.

3.9.6 Lifting speed. The forklift shall lift rated capacity load from ground level to the MLRS pick position at fixed boom extension at a constant speed of not less than 55 feet per minute.

3.9.7 Lowering speed. The lowering speed with rated capacity load from the MLRS pick position to ground level at fixed boom extension shall be not more than 100 feet per minute at maximum engine speed with the control valve in the full open position. The lowering speed, measured under the same conditions, without load shall be not less than 60 feet per minute.

3.9.8 Boom extension and retraction speeds. The forklift shall be capable of extending the boom at maximum lift angle with the pick load from the retracted boom position to full boom extension at a constant speed of not less than 55 feet per minute. The forklift shall be capable of retracting the boom at the maximum lift angle from full boom extension to the retracted boom position at a speed of not less than 55 feet per minute with no load and not greater than 100 feet/minute with pick load at maximum engine speed with the control valve in the full open position.

3.9.9 Curb-clearance circle. The curb clearance circle as defined in SAE J695 shall be 34.5 feet, maximum.

3.9.10 Fork tilt. When unloaded, the forks and MLRS handling attachment shall have 12 degrees minimum forward tilt (fork tips lowered) and 12 degrees minimum rearward tilt (fork tips raised) from the horizontal. The minimum rearward tilt angle shall apply at the retracted carry position (see 6.8.3) and the minimum forward tilt angle shall apply with the boom retracted and at the maximum lift angle.

3.9.11 Fork position and sideshift. The forks shall be hydraulically powered to obtain a forkspread not greater than 10-1/2 inches in closed position, measured outside of fork to outside of fork, and not less than 38 inches in maximum spread position, measured outside of fork to outside of fork. Each fork shall be hydraulically powered, and as a minimum, be capable of traversing from its maximum forkspread position to a position where the outside edge of the fork is at or beyond the centerline of the carriage. The forks shall be capable of

sideshifting a 155 mm SLP pallet (see figure 3) across the full width of the carriage and against the sidewalls of an 8-foot by 8-foot by 20-foot ISO 1C shipping container with forks positioned outside the pallet skids. The fork carriage assembly width shall not exceed 40 inches. There shall be no permanent structural deformation or damage when the sideshift mechanism is tested in accordance with 4.6.2.23. When the fork tines are fully sideshifted, the overall width of the fork carriage shall not increase. There shall be no protruding bolts or appendages beyond the side plane of the carriage assembly.

3.9.12 Fork reach. The forklift shall be capable of engaging and lifting, and disengaging the following loads at the specified heights and reaches (see 6.8 for definitions):

Load	Reach	Lift Height
4,000 lb.	21-1/2 ft.	10 ft.
6,000 lb.	4 ft.	12 ft.
6,000 lb.	13 ft.	12 ft.

3.9.12.1 MLRS pod reach. The forklift shall be capable of engaging and lifting, and removing the MLRS pod at the MLRS pick position when the MLRS pods are stacked two wide and two high inside 8-foot by 8-foot by 20-foot ISO 1C shipping containers both on the ground and trailer mounted (with container doors 60 inches from the end of the trailer). Maximum clearance from the top pod to the ceiling of the container is 18 inches (see figures 4 and 5). The MLRS hoisting rod (see figure 2) is located 120 inches from the door of the container. The forklift shall be tested as specified in 4.6.2.42.

3.9.12.2 Pallet load reach. The forklift shall be capable of engaging and lifting, and removing the 105 mm pallet loads arranged in four high and five high configurations (see figure 6). The pallets shall be removed individually when the pallets are stacked two wide and two high in 8-foot by 8-foot by 20-foot ISO 1C shipping containers both on the ground and trailer mounted (with container doors 5 feet from the end of the trailer). The container shall be loaded with 20 pallets, the bottom pallets in the five high configuraton and the top pallets in the four high configuration (see figure 7). The forklift shall be tested as specified in 4.6.2.34.

3.9.13 Minimum boom lift angle. The boom shall be capable of achieving a minimum lift angle, with pick load at full boom extension, of 45 degrees from the horizontal without the rear wheels clearing the ground.

3.9.14 Low engagement height. The lowest engagement height of the forks shall be not less than 6 inches below ground level when measured at the top surface of the forks with the forks at 6-foot reach.

3.9.15 Drift. The boom lift assembly shall be capable of holding the pick load at maximum lift angle and full boom extension not less than 10 minutes with not more than 1 inch of cylinder travel. The boom assembly shall also be capable of holding the rated capacity load at the MLRS pick position not less

than 10 minutes with not more than 2 degrees of tilt as measured from the horizontal. Specified drift rates shall be measured when hydraulic oil temperature is not less than 120° F.

3.9.16 Oscillation. Hydraulically powered oscillation of the fork carriage or vehicle chassis shall be furnished which shall be capable of oscillating the forks and, if incorporated, the MLRS handling attachment. The forklift shall be capable of oscillating rated capacity load at each maximum side shifted position. The oscillation of the rated capacity load from horizontal shall be not less than 6 degrees clockwise when the load is side shifted to extreme left and not less than 6 degrees counter clockwise when load is side shifted to extreme right (12 degrees total oscillation). Time to oscillate the total 12 degrees shall be not more than 15 seconds at low engine idle and not less than 5 seconds at high engine idle for both clockwise and counter clockwise rotation. The forklift shall be capable of oscillating the rated capacity load when tested in accordance with 4.6.2.23.

3.9.17 Endurance. The truck shall be capable of completing 200 hours of performance on the durability course as specified in 4.6.2.34, 2940 cycles of load placement in not more than 210 hours when tested as specified in 4.6.2.35, and 80 cycles of the productivity test in not more than 100 hours as specified in 4.6.2.34 without failure, damage, or permanent deformation, and without exceeding specified temperature limits for the cooling system (3.10.2.6), engine oil (3.10), transmission oil (3.11.1.1 or 3.11.1.2 as applicable), universal joints (3.11), or hydraulic system (3.12).

3.9.18 High speed. The forklift shall be capable of 4 hours of high speed operation when tested as specified in 4.6.2.32 without malfunction, damage, or permanent deformation, and without exceeding specified temperature limits for the cooling system (3.10.2.6), engine oil (3.10), transmission oil (3.11.1.1 or 3.11.1.2 as applicable), universal joints (3.11) or hydraulic system (3.12).

3.10 Diesel engine. For the purpose of selecting the engine, the forklift truck shall be classified as a class II end item in accordance with MIL-STD-1410. The engine, including all systems, components, and accessories, shall conform to MIL-STD-1410, unless otherwise specified herein. All engine accessories shall be furnished by or approved by the engine manufacturer for this application. The engine shall be capable of operating on fuels and lubricating oils as specified in MIL-STD-1410. Unless otherwise specified herein, the engine shall meet all operational requirements and conditions specified in table I of MIL-STD-1410, or the engine manufacturer's recommended operating limits when operating in a 120° F ambient. Emergency manual shutdown provisions shall be furnished when recommended by the engine manufacturer.

3.10.1 Power and speed rating. The power and speed rating of the engine shall be such that operation of the forklift under any of the operational requirements and conditions specified herein will not require horsepower in excess of the intermittent horsepower rating of the engine for the applicable governed speed as established by the engine manufacturer.

3.10.2 Engine accessories.

3.10.2.1 Starting priming system. Either a glow plug for each cylinder or an auxiliary fluid priming system, conforming to MIL-E-52649, type III, shall be furnished and shall be operable from the operator's seat. The size of the primer shall be in accordance with the engine manufacturer's 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 which is labeled "engine primer" in accordance with MIL-STD-1472. The primer shall be furnished with a temperature control.

3.10.2.2 Alternator. A heavy duty splashproof alternator with double mounting lug shall be provided. The alternator shall be not less than 50 amp capacity and shall provide charge at engine low idle speed. The regulator shall be integral with the alternator.

3.10.2.3 Starting system. The starting system shall be 24 volts and shall include, as a minimum, a starting motor solenoid, a starting motor, necessary wiring and cable, starter relay and starting motor switch. A means shall be furnished to prevent energizing the starter motor whenever the engine is running. The forklift shall be provided with either an interlock in the starting system or other means to prevent energizing the starter motor except when the transmission is disengaged. The starter shall be in accordance with the engine manufacturer's recommendations. The starting motor and starter solenoid shall be splashproof.

3.10.2.4 Fuel system. The capacity of the fuel tank shall provide for not less than 10 hours operation when tested as specified in 4.6.2.35, 4.6.2.34 and Test Method No. 31. The fuel-tank filler cap shall be captive chained or hinged. The fuel fill port shall be labeled "Diesel Fuel" with cast or embossed letters in not less than 1-inch letter height. The tank shall accept fuel at the rate of not less than 17 gallons per minute and shall be located so that the tank can be filled from a 5-gallon can conforming to MIL-C-1283 by a person standing on the ground or a surface on the forklift intended for standing. The tank shall be able to accept a fuel nozzle of 2 inches diameter with sufficient air release clearance. The fuel tank shall be equipped with a drainplug at the lowest point of the tank. The drainplug shall be removable with handtools without the removal of any other component and shall be located such that the tank contents can be drained into a container. The fuel tank shall be protected by position or otherwise from external damage. Fuel lines shall provide continuous operation at full throttle and maximum loads, including slope ascension. The fuel system shall include a fuel transfer pump, fuel strainer, water separator with provisions for draining sediment, fuel filter(s) in accordance with engine manufacturer's recommendations and a fuel injection pump, including provisions for priming. The fuel strainer or fuel filter(s) shall be between the fuel tank and fuel transfer pump. A fuel shutoff valve in the fuel line shall be provided between the tank and the fuel filter(s) if fuel filter(s) are located below the top of the fuel tank.

3.10.2.5 Air cleaner. The engine shall be furnished with a heavy-duty, dry-type air cleaner in accordance with MIL-A-52363, class II or class III. The cleaner shall be of the dual-element type and shall include a dust scavenger. The capacity of the air cleaner shall be in accordance with the engine manufacturer's recommendations. An air-cleaner intake-restriction indicator shall be provided and shall be visible from the operator's compartment. The intake-restriction indicator shall have graduated markings with continuous reading on remaining service of the air cleaner with and without the engine running. The indicator shall also have reset capabilities.

3.10.2.6 Cooling system. When a liquid-cooled engine is furnished, the cooling system shall be the closed-pressure-type, incorporating a radiator with a radiator pressure cap, hoses, thermostat, fan, and circulating pump. Under all operating conditions specified herein, the temperature differential between the cooling system (radiator top tank) and ambient air temperature shall be less than the difference betweeen the boiling point of the pressurized system and 120° F. Drains shall be provided to completely empty the cooling system. Petcocks on all drains shall be accessible and contents should drain into a container. The cooling-system fluid shall be a solution of ethyleneglycol and water conforming to MIL-A-46153. All fill ports shall be accessible. When an air-cooled engine is furnished, the engine shall be cooled by a fan that is either gear-driven, belt-driven, or directly driven from the crankshaft. The air intake face of the fan shroud shall be provided with a removable grille or screen guard.

3.10.2.6.1 Fan. The fan shall either discharge away from the operator, or be a suction type used in conjunction with a radial flow type shrouding such that the air drawn through the radiator is redirected in a radial direction around and about the radial shrouding and then expelled out the sides of the engine compartment. The fan shall rotate on antifriction bearings. When utilized, the fan belt takeup shall be at least 3 percent of the belt circumferential length, plus an allowance for replacement of new belts without forcing. The belts shall be clear of all other components within the adjustment range. Belts shall be accessible for easy replacement. If the fan operates below the 30 inch water fording, provisions shall be made for disconnecting the fan when necessary for water fording operations without affecting coolant circulation within the engine. Fan disengagement, shall be controlled from the operator's compartment with a control labeled "fan disengagement". A welded wire or expanded metal fan guard shall be provided.

3.10.2.6.2 Water pump. When utilized, the water pump(s) shall be of the centrifugal type, shall be replaceable, and shall be equipped with shaft seals that will prevent leakage. The shaft shall be corrosion resistant when exposed to water and a mixture of ethylene-glycol and water. Either a lifetime lubrication system or accessible pressure lubrication fittings shall be provided.

3.10.2.6.3 Thermostat. When utilized, the thermostat shall be in accordance with the engine manufacturer's recommendations. The thermostat shall be removable.

3.10.2.6.4 Radiator. When utilized, the radiator assembly shall be a heavy duty type and shall consist of a core with an expansion tank and sediment tank. Where the top of the radiator is lower than the top outlet of the engine, a surge tank may be used. The radiator cap shall meet the requirements of SAE J164 and be accessible without removal of the engine hood. A sign warning "CAUTION - DO NOT OPEN WHEN HOT" shall be placed near radiator cap. The radiator shall be mounted to prevent its being damaged due to shock and racking experienced in normal operation of the forklift. The radiator shall be protected by a heavy grilled guard or by the counterweight. A shield shall be provided, if necessary, to protect the radiator from mud and gravel thrown by the tires. Hoses shall clear the forklift structure and other components under all operating conditions specified herein. The cooling system shall include baffles and shroud to prevent recirculation of cooling air.

3.10.2.6.5 Gaskets, seals, and packing. 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 conforming to SAE J1034.

3.10.2.6.6 Engine coolant hose. All engine coolant hoses shall be SAE J20, heavy-duty type. All hose clamps shall be of the double wrap stainless steel type in accordance with SAE J536, type F, style 1, 2, or 4.

3.10.2.7 Governor. A governor shall be provided to limit the engine speed to not more than the intermittent duty speed recommended by the engine manufacturer when the forklift is operated under any condition specified herein.

3.10.2.8 Exhaust system. The exhaust system shall be protected against entry of rain. The back pressure of the exhaust system, including muffler, shall in no case exceed the maximum recommended by the engine manufacturer when measured approximately 2 inches beyond the header outlet at any load up to rated net continuous load. The exhaust system shall be arranged or shielded to prevent burns to the operator and maintenance personnel while working on the step surfaces of the forklift. Exhaust discharges shall be directed so as to minimize the exhaust fumes at the operator's station. The exaust system shall not obstruct the view of the operator. The exhaust system shall be provided with a spark arrestor conforming to Forest Service Standard 5100-1 and SAE J350 for not less than 80 percent efficiency. The spark arrestor shall be provided with a means for cleaning out trapped particles.

3.10.2.9 Crankcase ventilation system. The crankcase ventilation system shall prevent water entering the engine during fording operations. When the crankcase vapors are directed into the induction system, means shall be provided on turbocharged engines to prevent coking of turbocharger blades. Vapors or condensation shall not flow through the air-cleaner element.

3.10.2.10 Oil filter. Oil filter(s) of the heavy-duty full flow type or heavy-duty full flow and partial flow type shall be furnished in accordance with the engine manufacturer's recommendations. A label specifying filter type shall be placed near the point of filter installation. Oil lines, when applicable, to

and from the filters shall be installed to minimize vibration and shall be of flexible hose meeting the requirements of SAE J30(d) with reusable fittings.

3.10.2.11 Tachometer drive. A heavy-duty key type tachometer drive shall be provided and shall have a 5/32 inch female connection in accordance with SAE J678 for diagnostic purposes. The speed of the tachometer drive shall be 1/2 of the crankshaft speed.

3.10.2.12 Oil sampling valve. An oil sampling valve shall be provided on the engine and transmission. The valve shall be manually operated and shall automatically close after release. It shall be made of material resistant to corrosion such that it will not contaminate the sample. The discharge port of the valve shall be covered with a captive chained metal threaded cap which provides a positive seal of the sampling port. The valve shall be located in such a way as to insure that personnel will not be exposed to danger when taking oil samples with the engine running. The location of the oil tap shall be such that when samples are taken, it shall be a true representation of oil that is flowing while the engine is running. The sampling valve shall be labeled in accordance with MIL-STD-1472 adjacent to the valve indicating the type of oil sampled (engine or transmission, whichever is appropriate).

3.11 Drive assembly. The drivetrain assembly shall consist of all components necessary to transmit power from the engine to all four wheels. Rear wheel drive disconnect may be provided for high speed operation. All rotating shafts and axles shall be supported on antifriction bearings. All gears shall operate in lubricant, and a standard pressure grease lubrication system shall be provided for other friction parts. Gear housing shall be equipped with filler plugs and magnetic drainplugs. Differential ring and pinion gears shall be adjustable. Drive shafts shall be provided with a minimum of two heavy-duty universal joints and a nonbinding slip joint. Drivetrain components shall conform to and shall be installed in accordance with each component manufacturer's recommendations. Drivetrain universal joints shall not exceed 180° F when the forklift is tested as specified herein.

3.11.1 Transmission. The forklift shall be provided with either a hydrodynamic powershift or hydrostatic transmission as defined in SAE J645. The forklift shall be capable of accelerating from a standstill to maximum speed under continuous full engine throttle on level ground and this shall be accomplished without damaging the transmission. The transmission shall be protected from damage when the operator moves or attempts to move the directional control to the opposite direction while the forklift is in motion. The transmission oil shall conform to MIL-L-2104, Grade 10, or MIL-L-46167. The fill tube shall be functionally labeled. All transmission component material shall be compatible with these oils. The transmission fluid shall be filtered by filter(s) having replaceable elements in accordance with the transmission manufacturer's recommendations. The transmission controls shall include a disconnect valve.

3.11.1.1 Hydrodynamic powershift transmission. The transmission shall provide controlled application of the clutches to provide smooth shifting,

limiting slippage which would damage the clutches. All transmission gears shall be constant mesh. Oil pressure for actuation of the transmission clutches, for torque converter supply, and for transmission lubrication shall be supplied by a mechanically driven pump. The transmission shall be capable of withstanding maximum stall operation for a minimum of 30 seconds without damage or permanent deformation and without exceeding the fluid temperature limit of 250° F with an initial fluid temperature of not less than 157° F in an ambient temperature of not lower than 25° F.

3.11.1.2 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 sufficient oil under pressure to retard 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 140° ± 5° F and new filter, the vacuum at the charge pump inlet port shall not exceed 5 inches Hg when tested in accordance with 4.6.2.21.1. 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 in direction of the forklift. A set of reduction gears with a minimum of 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 accessible to the operator in the normal operating position and shall be labeled to indicate speed ranges. Oil temperatures in the transmission shall not exceed 180° F 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 transmission shall be capable of withstanding maximum stall operation for a minumum of 30 seconds without damage or permanent deformation and without exceeding the fluid temperature limit of 180° F. The system shall withstand all operations specified herein without permanent deformation, damage, or leakage.

3.11.2 Rear axle oscillation. The rear axle shall oscillate freely such that the total vertical travel of each rear wheel shall be a minimum of 12 inches (six inches above and six inches below the horizontal axle centerline.)

3.11.3 Traction control. The front differential shall be of the automatic locking or operator controlled locking type to insure power is transmitted to the wheel having traction when the opposite wheel loses traction or is off the ground. If an operator controlled locking differential is used, an engaged warning light shall be installed and labeled "front differential is locked" (in accordance with MIL-STD-1472) in a position clearly visible to the operator. The differential lock control shall be a momentary action type which shall automatically disengage after release.

3.12 Hydraulic system. The hydraulic system shall consist of all fluidpower components necessary for the operation of the forklift, including the steering system and hydrostatic transmission system but does not include the brakes or the hydrodynamic type power train. All filler tubes shall be labeled. The working hydraulic system (lift, tilt, extension, fork functions and steering) maximum operating pressure (relief valve setting) shall not exceed 3000 psi and if furnished, the hydrostatic transmission relief valve setting shall not exceed 6100 psi. The system fluid shall conform to MIL-L-2104, Grade 10 or MIL-L-46167. All hydraulic system component material shall be compatible with these fluids. The temperature of the hydraulic fluid shall not exceed 100° F above the ambient during all operations and tests specified herein. Hydraulic fittings on pumps, valves and cylinders shall be either the O-ring, straight thread type, as specified in SAE J514 or the 4-bolt flange type as specified in SAE J518 for 1 inch and smaller, and only the 4-bolt flange type as specified in SAE J518 for ports larger than 1 inch. The hydraulic system shall be flushed free of foreign matter including weld slag and spatter. The connection ports of the hydraulic components shall be sealed by the component manufacturer. In event of failure or damage to the hydraulic system, a means to prevent the boom from automatically lowering or retracting, the forks from tilting, or the frame (forks) from oscillating shall be provided. A straight thread "O" ring boss diagnostic port conforming to SAE J514 shall be provided at the pump(s) outlet or pressure inlet of each control valve.

3.12.1 Hydraulic lines. Hydraulic lines shall consist of tubing, flexible hose and steel fittings. Hose or a combination of hose and tubing shall be used between components that are not mounted to a nonflexing, rigidly connected structural member or rigidly connected subassembly. All lines shall be routed to provide the minimum number of bends, ease of maintenance and maximum protection. Provision shall be made to prevent damage of lines due to chafing. The hose installation, such as angle of fittings and location, shall cause no stress concentration on the hose at the fitting, and the hose shall be supported, when necessary, to eliminate sagging at the fitting. All lines, other than suction lines, and cylinder bleeder lines, shall be considered pressure lines. All lines shall be flushed free of foreign matter.

3.12.1.1 Pressure hose assemblies. Pressure hose shall be as specified in SAE J517 or MIL-H-52471. Permanently attached type pressure hose couplings are acceptable as original equipment hose assemblies. The truck shall be compatible with hose assemblies with field attachable reusable fittings in place of each hose assembly with permanently attached couplings, when tested as specified herein. All fittings shall be 37-degree flare, female swivel or 4-bolt split flange as specified in SAE J516. Hose ID shall be limited to 1/4, 3/8, 1/2, 3/4, 1, 1-1/4, 1-1/2, and 2 inches. The hose selected shall have a rated operating pressure that is greater than the hydraulic circuit maximum relief valve setting. The hose installation shall not cause the hose to be bent beyond the minimum bend radius specified in SAE J517.

3.12.1.2 Pressure tubing. Pressure tubing shall be in accordance with SAE J524 or SAE J525 and shall meet the requirements specified herein. Pressure tube sizes shall be limited to 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 1, 1-1/4, 1-1/2,

and 2 inches. Tubing shall have a minimum burst pressure that is equal to or greater than 3.0 times the system maximum working pressure. Tubing shall be securely clamped. All bends shall be smooth without flattening, kinking or wrinkling of the tube. The term "without flattening" is defined as follows:

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

3.12.1.3 Pressure tube fittings. Unless otherwise specified herein pressure tube fittings shall be 37-degree flared and straight thread fittings conforming to SAE J514 or 4-bolt split-flange type conforming to SAE J518. Jump size tees may be used. The 4-bolt split-flange type connections may terminate in either a flange head that incorporates a SAE J518 plain mating face or a flange head that integrally incorporates four boltholes and an O-ring groove for mating to a SAE J518 port face. Pressure tube fittings that incorporate the SAE J518 connection shall contain a boss into which the tube shall be brazed or welded. Pressure tube fitting sizes shall be limited to 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 1, 1-1/4, 1-1/2, and 2 inch. Pressure tube fittings shall have a minimum burst pressure 3 times the maximum operating pressure.

3.12.1.4 Suction lines. A pump inlet suction line shall include provision for flexibility when there is vibration or movement between the reservoir and the pump. The suction line shall be sized so that the pump inlet pressure does not drop below atmosphere by more than 5 inches of mercury vacuum at 140° F plus or minus 10° F oil temperature and at governed engine speed. The inlet suction line installation shall include no stress concentration at the end fittings and no kinks. Hose shall conform to SAE J517, SAE 100R4 or shall be oil resistant hose. Suction hose clamps shall be of the double wrap stainless steel type in accordance with SAE J536, Type F, Style 4 or saddle worm thread type with stainless steel inner liner or a heavy duty T-bolt clamp, or shall be in accordance with fittings specified in 3.12.1.1.

3.12.1.5 Quick disconnect couplings. Quick disconnect hydraulic couplers shall be used in hydraulic lines where separation is necessary for changing handling attachments. The hydraulic couplings shall connect to lines equal to or smaller than 1 inch with straight thread fittings conforming to SAE J514 and to lines larger than 1 inch with the SAE J518, 4-bolt, split flange face fittings. The coupler halves shall be restrained to prevent contact with the ground or any surface of the boom when connected and when disconnected. The coupler halves shall be identified with metal identification plates, metal tags, metal bands or by color coded anodized aluminum fittings to assure assembly of correct mating halves. Each coupler half shall be provided with a captive chained cap to protect the opening when the coupler is disconnected. The caps of the mating coupler halves shall fit together when not in use to prevent corrosion, damage, and contamination of the mating surfaces. The hydraulic coupler shall not have any partially coupled, unlocked positions in which the couplings can remain stable and permit flow. After 50 connections and disconnections, the coupler shall meet all requirements specified herein. When

coupled and uncoupled with 60 psi or relief valve pressure, whichever is greater, is applied, the coupler shall seal the ends of the disconnected lines at the point of disconnection and shall not permit external fluid loss exceeding 1/2 fluid ounce. At full line flow, the pressure drop across the quick disconnect coupler shall not exceed 15 psi at 120° F. The connected couplings and disconnected halves shall withstand a surge pressure equal to 150 percent of the relief valve setting without leakage or rupture. The quick disconnect couplings shall show no leakage and shall be in accordance with ANSI B93.42 and meet all requirements specified therein.

3.12.1.6 Return lines. Return lines shall be in accordance with SAE J517.

3.12.2 Hydraulic pumps. The hydraulic pump(s) shall have been tested in accordance with NFPA Recommended Standard T.3.9.18-1976. When tested in this manner, the contaminant tolerance profile for the hydraulic pump(s) shall either:

a. Not fall below or cross the B_{10} curve of the hydraulic system filter when tested in accordance with MIL-F-52723 (see 4.6.2.21.2).

or else

b. The pump Omega rating shall be less than the filter Beta 10 rating.

3.12.3 System filtration. System filter(s) shall be furnished either in the pressure line, return line (suction line of charge pump allowed for filtration of hydrostatics), or combinations (as specified in 3.12.3.1 or 3.12.3.2). Labels identifying each filter shall be provided near the points of filter installation.

3.12.3.1 Return line filters. Although the system filter element need not be qualified to MIL-F-52723, it shall meet the performance requirements as stated therein. The filter shall maintain a full flow condition for the duration of reliability testing as specified in 4.6.2.35. The filter bypass may open for system oil at a temperature less than 70° F. The filter element shall have been tested to the performance requirements of MIL-F-52723 at a flow rate equal to or greater than the truck maximum system oil flow at maximum governed engine speed. All return oil shall pass through the filter except relief oil which may return directly to the reservoir. The filter shall be located so that the element may be removed, without removal of other components, for examination or replacement without spilling or draining oil from the reservoir. At the maximum system oil flow through the filter, including lowering rated capacity load at maximum governed engine speed and an oil temperature of 150° F plus or minus 5° F, the pressure drop across a new filter assembly shall not exceed 10 psi. An automatic bypass shall be provided in the system filter and shall open at not less than 10 psi greater than the pressure drop measured across the new filter assembly and it shall permit full flow at a pressure drop not greater than 35 psi. The filter housing shall have a minimum proof pressure of 100 psi without permanent deformation, damage, or leakage. The system filter shall be equipped with a contamination indicator which may be remotely mounted. The indicator shall be clearly readable without the removal of any components. As a minimum, the indicator shall show when the filter element is clean and when the system filter is beginning to bypass, requiring a change of the element.

3.12.3.2 Pressure filter. The pressure filter(s) shall conform to 3.12.3.1 except that proof pressure test shall be 150 percent of the maximum system operating pressure.

3.12.4 Reservoir. A hydraulic reservoir shall be furnished to contain the hydraulic system oil. The reservoir shall include a filler opening, screen, cap, and other items required to function as specified herein. The reservior shall be mounted to prevent vibrations that could result in leaks, loosening of fasteners, brinelling of material, or cracks. The location shall not impair operational visibility or access to either side of the operator's compartment. The reservoir shall have sufficient capacity to prevent air entering the system with all hydraulic pistons fully extended and sufficient free air capacity to prevent oil being discharged through the reservoir air vent when maximum return flow of oil is surged into the reservoir from the system. The Add and Full marks on the dipstick or sightglass(s) shall be in accordance with SAE J614b and indicate the correct oil level when the truck and forks are on level ground, and the oil is at normal operating temperature. The fillercap and tube shall be located to provide for filling from a standard 5 gallon container conforming to MIL-C-1283 by a person standing on the ground or a surface on the forklift intended for standing, and to prevent entrance of contaminants throughout filling and checking operations. The reservoir filler neck shall contain a removable 50 mesh, or finer, strainer retained in place. The filler tube labeled "hydraulic fill" shall be not less than 1-inch inside diameter. The reservoir pump inlet line suction openings except for the auxiliary steering pump opening, shall be located a minimum of 2 inches above the bottom of the reservoir. When furnished, the auxiliary steering pump inlet line suction opening shall be located a minimum of 1/2 inches above the bottom of the reservoir. Except for sealed reservoir, a pressurized breather with a 30 psi maximum relief valve and 1 inch Hg vacuum breaker shall be furnished. The breather shall have a nominal rating of 40 microns. The breather shall preclude the entrance of water. The reservoir shall provide a tortuous flow path from the reservoir inlet to the reservoir outlet in order to prevent a direct current between the two ports. All return line flow except the vent line shall discharge into the reservoir at a level which is below the oil level in the reservoir. When filters are located within the reservoir, a removable 50 mesh, in-tank suction strainer with bypass valve shall be installed in the suction line of the reservoir. The reservoir shall have suction flanges and one or more access holes with covers for inspection, cleaning and maintenance of the entire inside.

3.12.5 Relief valve. A relief valve shall be provided to limit the pump pressure to the maximum required to perform the necessary system functions. Pressure equal to the relief valve setting shall be generated only when a cylinder is bottomed or when the system is subjected to shock loading.

3.12.6 Hydraulic control valves. The control valve spools shall be spring centered with sufficient force to return and retain the levers at the center position throughout all forklift operations. The spool connection eye end shall conform to SAE J748 and shall not bind while operating as specified herein. The exposed control-valve spool surfaces shall show no evidence of corrosion or pitting when tested as specified herein. The contractor shall verify that the

control valves were tested in accordance with procedures specified in SAE J747 and J1117. The inlet to outlet port pressure differential shall not exceed 3 percent of the maximum operating pressure at rated flow.

3.12.7 Cylinders. All hydraulic system and steering cylinders shall be fabricated from either seamless steel tubing or welded and redrawn tubing. All welding and brazing to the cylinder within the zone of piston operation shall be done prior to final machine honing or rolling of the cylinder. Cylinders shall be so located as to provide for ease of maintenance and replacement. All internal cylinder ports shall be located beyond the area of piston travel. Each cylinder shall have an exclusion device to prevent foreign material and fluids from entering around the piston rod and damaging the seal and other cylinder components. All hydraulic system and steering cylinders shall perform as specified herein without buckling or bending. Each piston shall have a bearing surface concentric with the piston to carry the piston side loads against the cylinder walls. The bearing surface shall be of a material that will not scar, score, or gall the inside surface of the cylinder. All cylinder rods shall be hard chrome plated. All cylinders shall withstand a pressure that is equal to 1.5 times the system relief valve setting without evidence of rupture, permanent deformation, damage, internal or external leakage.

3.12.8 Contamination levels for hydraulic system. The particulate matter in hydraulic fluid removed from the system directly upstream of the filter, shall not exceed the ISO code level of 19/16 in accordance with SAE J1165 after completion of assembly of the truck when tested as specified in 4.6.2.21.3.

3.12.9 External leakage. After completing tests specified in 4.6.2 the degree of external hydraulic system leakage shall not exceed a class 4, for dust-free conditions and a class 4D for dusty conditions of SAE J1176. External hydraulic system leakage shall not exceed a class 3 for production trucks under normal operation.

3.13 Boom assembly. The boom assembly shall pivot from a location clear of the operator's position to provide the vertical lift without interference to the operator's movement necessary to operate the forklift, or to ingress or egress from the operator's seat in any lift position. The movement of the boom and fork carriage shall be controlled by means of double-acting hydraulic cylinders. Structurally, the fully extended boom shall be capable of supporting 1.5 times the pick load placed on the forks without permanent structural deformation or evidence of mechanical damage, when tested under the following conditions.

a. Forklift on a hard, level surface and stationary.
b. Boom level and at maximum extension.
c. Forks level and fully sideshifted to either side.

If cables or chains are used in the boom assembly, data shall be provided by the contractor illustrating the capability of the cables and chains to withstand a force of 3.5 times the total force in the cable/chain system when extending the boom at maximum lift angle carrying rated capacity load. 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. Both a boom length indicating system and a boom lift angle indicating system shall be provided with units of measure compatible with the load rating chart of the truck. The systems shall be located so that the operator can obtain readings from his normal operating position. The boom length indicating system shall be in increments of two feet. The boom lift angle indicating system shall be increments of five degrees.

3.13.1 Tilt mechanism. The fork and MLRS handling attacment tilt angle shall be automatically maintained throughout the lifting/lowering cycle, allowing not more than 2 degree tilt back or 2 degree tilt forward when the forks, carrying rated capacity load, are lifted from ground level to maximum boom angle and lowered from maximim boom angle to ground level, at the retracted boom position. Tilt control valve or other positive means shall be provided to prevent cavitation in the tilt cylinder(s) when tilting rated capacity load to full forward tilt position at engine low idle speed at a minimum 120° F oil temperature, when the tilt valve is wide open and cracked open. Tilt speed from maximum forward tilt to maximum rearward tilt or from maximum rearward tilt to maximum forward tilt shall be not less than 0.8 degree/second.

3.13.2 Lift and extension mechanisms. The forklift shall be capable of accomplishing boom lift and boom extension both simultaneously and independently. Control valves or other positive means shall be provided to prevent cavitation in the lifting/lowering cylinders and the extension/retraction cyclinder(s) when tested in accordance with 4.6.2.4 and 4.6.2.44.

3.14 Forks. Structurally, with the boom fully retracted, the forklift shall be capable of supporting a load equal to 300 percent of the rated capacity load on the forks at the applicable load center with the forks and carrier assembly centered, and 200 percent of the rated capacity load on the forks at the applicable load center, with the forks fully shifted to either side of the forklift without permanent structural deformation or evidence of mechanical damage. The forks shall be attached to the carrier assembly in a manner which prevents their lateral movement, except when the fork position is changed by the operator. Fork length, width and thickness shall be as specified below. The taper shall be on the underside of the forks and no less than 14 inches long. The fork tine tips shall be chamfered and corners rounded to faciliate fork engagement. When a separate MLRS handling attachment is used, the fork carriage shall be capable of being removed from the truck by one person without the use of special tools, in less than 15 minutes.

TABLE II. Fork dimensions.

Length	40 +0 or -1 inch
Width	4-1/2 in. max.
Thickness	2-9/16 in. max. tapered to 3/4 in. max. at tip

Note: The heel of the forks may be 3/16 in. thicker/wider in the bend for added strength.

3.14.1 MLRS handling. For use of the forklift in extracting MLRS pods from 8-foot by 8-foot by 20-foot ISO 1C shipping containers as detailed in section 3.9.12, a lifting tool shall be provided to attach the forks or the MLRS handling attachment (section 3.14.2), whichever is used, to the MLRS hoisting rod (see figures 1 and 2). The lifting tool shall not exceed a total weight of 35 pounds and shall be capable of supporting a load equal to 200 percent of the rated capacity load without permanent structural deformation. Attachment of the lifting tool to the MLRS pod shall be accomplished in less than one minute by one person without the use of any tools or equipment. The truck shall be capable of engaging and disengaging the lifting tool when mounted on the MLRS pod inside the ISO container, without the aid of additional personnel. The lifting tool/MLRS handling attachment assembly shall support the MLRS pod in a level position, and shall prevent rotation and translation of the MLRS pod. When not in use, the lifting tool shall be stored on the truck. When in its stored position, the lifting tool shall not interfere with any of the operational capabilities of the truck specified herein.

3.14.2 MLRS handling attachment. If the forklift forks are not capable of handling MLRS pods as described in section 3.9.12, a separate MLRS handling attachment shall be provided. Structurally, it shall be capable of withstanding 200 percent of the rated capacity load at the applicable load center without permanent structural deformation. It shall be capable of being attached to the truck by one person without the use of special tools, in less than 15 minutes. The handling attachment shall be hydraulically powered to be sideshifted not less than 5 inches to either side of the handling attachment centerline. The handling attachment shall be subject to all MLRS pod operations specified herein. When not in use, the MLRS handling attachment shall be stored on the truck. When in its stored position, the MLRS handling attachment shall not interfere with any of the operational capabilities of the truck specified herein.

3.15 Wheels and tires.

3.15.1 Wheels. The forklift shall be mounted on four hubs with four demountable rim and tire assemblies as recommended by SAE J751. The wheels shall be fastened to the hubs in accordance with the axle manufacturer's recommendations for off highway application. Wheel rims shall be in accordance with the TRA Yearbook.

3.15.2 Tires. All tires shall be new and unused, wide base, or 65 series, off-the-road type, and of identical size and construction. The tires shall be pneumatic, low pressure, tubeless, furnished with type L-2 traction-type tread. Tire loading shall be based on front axle weight with rated capacity load in the MLRS carry position and shall be in accordance with the TRA Yearbook and the tire manufacturer's published literature for a 5 mph load ratings. Valves and caps shall be in accordance with the TRA Yearbook. Large bore valves shall be furnished. A valve adapter shall be furnished to reduce the large bore to the standard passenger vehicle size bore. Valve caps shall be metal with elastomer innerseal. Hydroinflated tires are not acceptable.

3.16 Wheel guards. Wheelguards shall be furnished at all four wheels to provide protection for the operator from material being thrown radially off the

rotating tires. Each fender shall structurally support a weight of 300 pounds without evidence of damage.

3.17 Steering and steering control. The steering method shall be the Ackermann type steering. The steering shall be accomplished by fluid power actuators. The steering system shall permit control of the forklift while traveling at any speed up to the maximum attainable travel speed (see 3.9.4). Ackermann type steering shall be provided with an adjustable, mechanical follow-up mechanism to maintain a positive ratio between the amount the steering wheel is turned and the amount the forklift turns, except that a follow-up need not be provided for a hydrostatic steering system. The power steering actuating device shall be located so as to absorb all road shock without transmitting the shock effect to the steering wheel. The forklift shall operate without loss of operator control when tested as specified in 4.6.2.12.

3.17.1 Steering control. The steering system shall be controlled by a single steering wheel. The effort required to turn the steering wheel shall not exceed 10 pounds pull at the rim. The steering wheel shall require not more than 6 turns to move the wheel from one stop to the opposite stop. The steering wheel shall require not more than 8 seconds for the maximum range of movement at low idle engine speed and shall require not less than 4 seconds at governed engine speed. There shall be a minimum of 7 inches clearance measured vertically between the lowest point on the steering wheel rim and a line parallel to the floor and passing through the highest point of the unoccupied seat cushion. There shall be a minimum of 3 inches between the rim of the steering wheel and the directional control lever(s) for all positions of the lever(s). The steering wheel shall be capable of withstanding a minimum 300 pound force applied perpendicular to the plane of the steering wheel, and a minimum 150 pound force applied tangentially to the rim of the steering wheel, without permanent deformation or damage.

3.17.2 Emergency steering. Emergency steering conforming to SAE J53 shall be provided for retaining steering control in the event of engine failure or steering power source failure when traveling at any speed to the maximum speed.

3.18 Brake system. Service and parking brakes shall be provided and shall be independently actuated systems. If a separate hydraulic system for the brakes is utilized, the brake system shall be filled with a fluid that is listed on the qualified product list of MIL-B-46176 unless the fluid used is petroleum base non-hygroscopic oil conforming to MIL-L-2104. If air brakes are provided, air brake service and emergency line coupling conforming to SAE J318 shall be provided on the rear of the vehicle.

3.18.1 Service braking system. Unless otherwise specified herein, controlled service brakes shall be provided and shall conform to SAE J1152 for loaders. The brakes shall be capable of bringing the forklift, with rated capacity load on the forks in retracted carry position, and with no load on the forks to a complete stop without any wheel leaving the ground from maximum forklift speed as follows:

a. Dry - within distances specified in table 1 of SAE J1152 with fishtailing of no more than 1 foot when tested as specified in 4.6.2.18.
b. Fade - within distances specified in table 1 of SAE J1152 with fishtailing of no more than 1 foot when tested as specified in 4.6.2.18.
c. Wet - Within 10 feet greater distances than those specified in table 1 of SAE J1152 with fishtailing of no more than 1 foot when tested as specified in 4.6.2.31.

Pedal force while making any stop shall not exceed 90 pounds. The brake system shall provide for bleeding of air from hydraulic lines and for draining of moisture from the compressed air system, as applicable. Automatic or manual brake adjustment provisions shall be provided. Automatic adjustment shall maintain correct lining to drum or disk adjustment without looseness or lockup. Automatic adjusters shall be enclosed or guarded for protection from environmental damage or malfunction. The brake system shall withstand an operator's brake application force of not less than 300 pounds as specified by ANSI B56.6 at the pedal, a minimum of 10 times, without permanent deformation or evidence of mechanical damage.

3.18.2 Parking system. The parking brakes shall provide on-grade parking performance, but not necessarily stop the gross weight of the forklift with rated capacity load on the forks in retracted carry position when the forklift is stopped on a 30 percent grade in both the ascending and descending attitude when tested in accordance with Test Method 7. The parking brakes shall be hand- or foot-operated and equipped to remain applied until manually released by the operator. The manual control shall be located within reach of the operator and in a noninterfering position. Hand-lever pull to set the parking brake shall not exceed 50 pounds. The foot pedal force shall not exceed 75 pounds. The parking brake shall be an independent mechanical friction brake mounted on the drive or propeller shaft rotating with the wheels, or a separate isolated system actuating the service brakes. Adjustment of parking-brake shoes or bands shall be accomplished without the removal of any component parts.

3.18.3 Emergency braking provisions. The truck shall provide not less than six "dead engine" stops with rated capacity load in retracted carry position while descending a 30 percent grade. The emergency braking provisions may be provided through either the parking brake or service brake system. Means shall be provided to release the brakes for towing.

3.19 Operator access. Operator-access systems to the forklift shall be in accordance with minimum requirements of SAE J185.

3.20 Operator's seat. A cushioned bucket type operator seat shall be furnished in accordance with minimum requirements of SAE J899 and located in accordance with SAE J1163 to permit 90 percent of US Male/Female operator population (SAE J833) to reach controls in the optimum areas of the forklift as defined in SAE J898 by operator clothed in NBC and cold-wet gear. The cushion material shall be foam rubber or polyurethane, covered with slip-coated vinyl upholstery having a minimum weight of 45 ounces per linear yard.

3.21 Cowl or hood. The engine shall be protected by a hood cover and sideplates, except that sideplates may be omitted when the wheel guards provide the engine compartment with protection from road splash and debris. The sideplates shall be either the quick opening or the bolted type with quick access openings for the performance of daily maintenance checks. The sideplate shall be capable of being opened or removed by one person wearing gloves and shall be within the design weight limits of MIL-STD-1472, figure 21, table XXVI and 5.9.11.3. Elastomer hood latches or paddle latches shall be provided on the quick opening type sideplates or the quick access opening of the bolted type sideplates. The elastomer latches shall withstand an air ozone rating of two or better in accordance with ASTM D1171. Handtools shall not be required to release these latches. All engine accessories shall be completely accessible without requiring the removal of any additional forklift components when the hood cover and sideplates are opened/removed.

3.22 Instrument panel. The instrument panel shall be located so that the operator can read the instruments from his normal operation position. The instrument panel shall be installed on an incline at a minimum of 5 degrees to a maximum of 80 degrees. On this panel shall be mounted the charging system monitor, engine oil-pressure-monitor, engine-coolant temperature monitor, torque converter or transmission-fluid temperature monitor, fuel gage, and any other instruments used, unless otherwise specified herein. Universal symbols shall be furnished in accordance with SAE J298 and ANSI MH11.3. All gages shall be flush mounted and shall be provided with switch-controlled illumination. A lateral level indicator for the truck shall be provided on the instrument panel.

3.23 Controls and instrumentation. Each control shall be provided with symbolic labels either on plates conforming to 3.32 or embossed or depressed on or near the control. Labeling for levers which control any part of the lift mechanism shall conform to ANSI MH11.3. The labels shall be visible to the operator from his normal operating position. All controls for the forklift shall be located in the operator's compartment and shall be within the maximum area specified in SAE J898. Unless otherwise specified herein, the controls shall conform to MIL-STD-1472. Electric controls and instrumentation shall be weather-tight. All hand operated control shall be operable by persons wearing cold-wet gloves. Mechanical push-pull remote controls, when furnished, shall be of waterproof, heat resistance, antifriction type, conforming to requirements for marine cables specified in SAE J917, except as specified herein. As a minimum, all exposed parts of the control cables shall be fabricated of corrison-resistant steel that has been passivated as per QQ-P-35. The cables shall be covered with a polyethylene or vinyl jacket. Cable ends shall be tailored to actuate all levers through their respective arcs without binding. Bend radii shall be as recommended by the cable manufacturer. The "as-installed" mechanical efficiency of each installation shall be not less than 70 percent and the no-load friction shall not exceed 5 ounces per foot. The control manufacturer's recommended load ratings for continuous operation shall not be exceeded for any required operation of the control specified herein. Only controls associated with the cab, such as windshield wiper and heater controls, may be mounted on the cab structure.

3.23.1 Charging system monitor. A remote indicating ammeter or voltmeter, or alternator indicator red light shall be furnished. The ammeter shall be of sufficient capacity to indicate variations in the current supply or demand experienced by the truck, exclusive of starter requirements. The indicator light shall light when the alternator is not charging and the engine run control is "on" and shall be labeled "alternator" or with appropriate universal symbology.

3.23.2 Engine oil pressure monitor. A remote indicating engine oil pressure gage shall be furnished. A low pressure red indicator light or low pressure alarm shall be furnished in addition to the gage. Means shall be provided to check operation of the light or alarm.

3.23.3 Engine coolant temperature monitor. For liquid cooled engines, a remote indicating engine coolant temperature gage shall be furnished and a high temperature red indicator light or alarm shall be furnished in addition to the gage. Means shall be provided to check operation of the light or alarm.

3.23.4 Transmission temperature monitor. A remote indicating torque converter or transmission temperature gage shall be furnished. A high temperature red indicator light shall be furnished in addition to the gage. Means shall be provided to check operation of the light.

3.23.5 Air pressure monitor. When a compressed air system is furnished, an air pressure gage shall be furnished and an audible alarm which exceeds operating noise levels by 20 dB shall indicate when air pressure is inadequate for proper brake operations.

3.23.6 Hourmeter. An hourmeter which registers the number of engine operating hours up to a minimum of 9999 hours shall be provided. The hourmeter shall be accessible for reading without removing any component of the truck.

3.23.7 Fuel monitor. A fuel gage shall be provided.

3.23.8 Engine run control. An engine run control shall be furnished and shall be a keyless type. It shall have not less than two positions: "On" and "Off". The switch shall control the actuation of all electrical monitors and electrical equipment except the horn.

3.23.9 Light switches. "On-off" light switches shall be furnished on the instrument panel. One switch shall control the forward flood lamps, one switch shall control the rear floodlamps and one switch shall control the boom floodlamp(s) as specified in 3.24.4. All internal and external lights, the horn, and the backup alarm shall be made inoperable when blackout lights are used (see 3.24.4.1) except for warning lights, such as temperature and oil lights, which shall remain operative in the blackout mode. One light switch conforming to MS5113 shall be provided for the headlamps (see 3.24.4), blackout headlight (see 3.24.4.1), two blackout stoplight-taillights (see 3.24.4.1), and instrument panel lights (see 3.22).

3.23.10 Braking and transmission disconnect pedals. A 2-pedal system shall be furnished and shall comply to MIL-STD-1472, pedals and foot operated controls requirements, unless otherwise specified herein. The right pedal shall be located for

convenient right foot operation and shall provide the braking control only; the left pedal shall be located for convenient left foot operation and shall be a combination transmission disconnect and braking pedal. Each pedal shall be a minimum of 2-1/2 inches wide and shall have an all around clearance of not less than 2 inches except that 1 inch minimum clearance is acceptable next to the steering column providing the pedal width is a minimum of 3-1/2 inches wide. Grease fittings or permanent lubrication shall be provided for lubricating moving parts of all pedals and shafts.

3.23.11 Engine speed control. The engine speed control pedal shall be installed for comfortable right foot operation and shall be located to the right of and shall be free of interference from the brake pedals. The engine speed control pedal shall have an all around clearance of not less than 3 inches and shall be in accordance with MIL-STD-1472, pedals requirements, unless otherwise specified herein.

3.23.12 Transmission controls. Selective forward and reverse and speed range controls shall be provided and shall be located for convenient left hand operation. Forward, reverse, and speed ranges shall be labeled in accordance with SAE J298. Movement of the control lever in a forward or upward direction shall cause forward motion of the forklift. Transmission control levers and linkage shall withstand, without permanent deformation or damage, a force of 100 pounds at the handgrip and the shock and vibration encountered during operation specified herein. The force necessary for the movement of the hand control levers shall not exceed 20 pounds.

3.23.13 Hydraulic controls. Lift, tilt, fork positioning, oscillation, boom extension, and sideshift hydraulic controls shall be self-centering lever(s) in accordance with ANSI B56.6, located for convenient right-hand operation. The boom lift control and the boom extension control shall be located for convenient right hand operation, both simultaneously and independently. The sideshifting control shall simultaneously move both forks in the same direction at the same rate plus or minus 15 percent. Fork positioning controls shall provide independent control of each fork's position. Control labeling shall be in accordance with SAE J298. Fork positioning, sideshifting, and oscillation actuation may be through electric switches in lieu of lever actuators. All control levers and linkage shall withstand, without permanent deformation or damage, a force of 75 pounds at the handgrip and the shock vibration encountered during operations specified herein. The force necessary to move any control to the end of its travel shall not exceed 20 pounds and shall have a minimum force of 2 pounds at the handgrip. Control functions and predominant control motion shall be as stated in ANSI B56.6.

3.23.14 Starter switch system. The starting system solenoids (see 3.10.2.3) shall be operated by a pushbutton or a spring-loaded starter switch. If a spring-loaded starter switch is provided it may be incorporated as part of the engine run control (see 3.23.8). The starter switch shall be inoperable when the engine run control is in the "off" position.

3.24 Electrical system. The forklift electrical system shall be for heavy duty, 12 volt or 24 volt service and in accordance with SAE J539. The

electrical circuits shall be assigned identification numbers or be color coded as shown in table I of SAE J821. All electric wiring shall be routed so as to provide ease of maintenance and maximum protection.

3.24.1 Batteries. Batteries shall be furnished and shall be in accordance with MS35000, type 6TN and shall be readily accessible for service. The batteries shall be negative grounded in accordance with SAE J538. The battery terminals shall be accessible for removal without requiring disassembly of other components.

3.24.1.1 Battery mounting. Batteries shall be located so they can be cleaned, serviced, and removed without removing any component except the quick-release battery box cover if a battery box is furnished. Battery supports, holddowns, and areas around the installation which could possibly be affected by dripping or seepage of acids shall be protected with a coating conforming to TT-C-494, type II. The battery shall be mounted in such a manner as not to interfere with access to engine components (accessories). 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 be provided to hold the battery in a fixed position. The battery compartment (if furnished) shall have provision for drainage and provision for gas venting at or near the top of the compartment. Cover and positioning shall be protected against short circuiting. Ungrounded cable shall be protected by rubber grommets or insulated passages at entry to the battery box.

3.24.1.2 Battery cable. Battery cables shall be furnished which meet the requirements of SAE J1127. The voltage at the storage battery terminals and the starting motor terminals including connections shall not differ more than those shown in table I of SAE J541. Postive and negative cable terminals shall be identified and corrosion-resistant SAE bolts and nuts provided.

3.24.2 Slaving components. The truck shall be equipped with a 24-volt slave receptacle conforming to MS52131. The slave receptacle shall permit charging of the truck batteries and slave starting of the engine from an external power source and shall also provide a power source for charging and slaving other equipment. The slave receptacle shall be installed on the exterior of the truck near the battery enclosure and shall be accessible to personnel standing on the ground. A plate shall be furnished adjacent to the slave receptacle which reads "24 Volts". The plate shall be in accordance with 3.32.1.

3.24.3 Circuit breaker. Each electrical circuit shall be protected with a circuit breaker in accordance with SAE J553 and shall have labels which describe the function served by the circuit breaker. Fuses are not acceptable.

3.24.4 Lights. The forklift shall be provided with not less than two headlamps for forward illumination, not less than two floodlamps mounted so as to illuminate the forks and MLRS handling attachment in any boom position, not less than two floodlamps for rearward illumination, and a minimum of one

floodlamp mounted on the forward area of the boom. The lights shall be shock mounted in elastomer ring housings and shall conform to SAE J598. Headlamps shall conform to SAE J1029. Front floodlamps shall be adjustable a minimum of 45 degrees above and below the horizontal plane and laterally a minimum of 15 degrees right and 15 degrees left and shall be capable of being adjusted by the operator from inside the operator's cab. Lights positioned in such a way as to be subject to damage shall be protected by guards.

3.24.4.1 Blackout lighting. A separate wiring harness may be provided for the blackout lights. One blackout headlight conforming to MS51318 shall be mounted on the extreme left within the plan outline of the forklift at the front, positioned to provide illumination when the forks are in retracted carry position. The blackout headlight shall be adjustable in accordance with SAE J598. Two blackout stoplight-taillights conforming to MS51330 or MS52125 shall be mounted adjacent to the rear taillights, and shall be mounted in 6-inch-diameter holes or shall be provided with guards. Each light shall be recessed not less than 1/2 inch behind the hole or face of the guard. Two blackout marker lights conforming to MS52126 shall be mounted on the front, one each side of the vertical centerline, at the same level, and as far apart as practicable.

3.24.4.2 Taillights. Two taillight-stoplight assemblies in accordance with SAE J585 and SAE J586 shall be installed, one on the left rear and one on the right rear of the forklift, with the lens face recessed not less than 1/2 inch back of a protecting member.

3.24.4.3 Interior lighting. The truck shall be equipped with gauge lighting or indicators which are readily visible to the full range of user personnel. The gauges and instruments shall be adequately lighted for night operation and shall have blue-green blackout lens with spectral emission in the 400 to 625 nanometer wavelength range.

3.25 Horn. The forklift shall be equipped with an electric, air, or air-over-electric horn. The 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. The horn button may be mounted on the steering wheel or instrument panel.

3.26 Pintle hook assembly and towing lugs.

3.26.1 Pintle hook assembly. A rear mounted swivel pintle hook assembly conforming to MS51118 shall be provided. The pintle hook assembly shall be located on the vertical center line of the truck with a minimum height of 31 inches and a maximum height of 39 inches. The pintle hook assembly mounting shall be of sufficient strength to withstand, without permanent deformation or damage, the drawbar pull induced when the pintle hook assembly is restraining forward motion at transmission stall.

3.26.2 Towing lugs. Two vehicular towing lugs, conforming to MS500004, 10-50 tons, shall be furnished and shall provide clearance to connect a towbar

conforming to MS500048, medium duty capacity. The lugs shall be installed between 17 to 21 inches on each side of the truck center line, on the rear of the truck.

3.27 Personnel cab. The forklift shall be equipped with an insulated, weathertight personnel cab, which may be combined with ROPS and FOPS specified in 3.5.1. The cab space envelope shall be in accordance with SAE J154. The seated operator clearance dimensions shall be based upon a 95 percentile U.S. male wearing arctic gear and safety helmet. The cab shall withstand all operational shock and vibration without deformation or damage under operating conditions specified herein. The cab shall be constructed of metal or fiberglass and shall be equipped with a minimum of one door and another unobstructed emergency exit (either door or window that can be opened) on another side of the cab. The emergency exit shall be labeled. All doors and windows that can be opened shall be capable of being opened and closed by personnel wearing gloves. All doors shall have closing latches, except that cab door(s) need not latch open if the door is equipped with a window that can be latched open to provide adequate operator ventilation, opening stops and hold-open catches. The doors shall either slide and latch at each end of travel or shall swing open a minimum of 180 degrees and latch open except that if a split door is furnished only the top half must latch open. All hardware shall be of the heavy-duty truck- or industrial-type, resistant to corrosion. Front and rear window defrosters, operating in conjunction with the heater blower (see 3.27.4), or not less than two (2) minimum 6 inch diameter ventilation fans, or the same performance rotating cage type blowers, shall be furnished. The fans shall be directionally adjustable to direct air flow toward all glazing. Each fan shall have an "on-off" switch.

3.27.1 Safety glazing. Safety glazing of the windshield, door windows, side and rear window shall be provided. The upright seated operator shall have all-around visibility and visibility of the fork carrier in all possible fork positions. When a glazed roof window is provided, it shall be sloped to provide for water drainage and guarded as necessary to meet the FOPS requirement (see 3.5.1). Glazing shall conform to ANSI Z26.1, Type AS1 for the windshield and roof window and type AS1 or AS2 for other windows. Fixed or hinged glazing shall be sealed in waterproof, stress-absorbent molding and movable windows shall be sealed on extra-heavy-type, pile-lined channels.

3.27.2 Interior. The interior of the cab shall be fitted with insulation, retarding both heat loss and noise intrusion. Heavy-duty floor mats shall be furnished. All cab openings shall be sealed with elastomer grommets, seals, weather stripping, or body compound. The elastomer components shall withstand an ozone rating of two or better in accordance with ASTM D1171.

3.27.3 Windshield and window wipers. The cab shall be equipped with at least two (2) wiper assemblies to clear the windshield and the rear window in accordance with the performance requirements of SAE J198. Wipers shall be capable of being operated at two or more frequencies. The frequencies must be maintained during normal engine speed and workload. Wiper arms shall be of the heavy duty commercial type and wiper element shall withstand an ozone rating of two or better in accordance with ASTM D1171. The wiper arms shall provide tension on the glazed surfaces of at least 1 ounce per inch of wiper arm length. A windshield washer shall be provided for the front windshield.

3.27.4 Heater. A recirculating-air-type heater shall be furnished in accordance with the performance requirements of SAE J1129. The heater controls shall be within reach of the operator and shall provide for variable selection of blower speeds and temperature. If a fuel-fired heater is furnished, it shall be in accordance with SAE J1024.

3.28 Electromagnetic interference. The electromagnetic interference emission characteristics of the truck shall meet the limits specified in MIL-STD-461, part 8, class C1, group II, except that a 20 dB relaxation is permitted in the emission limits. The operators horn is exempt from electromagnetic interference requirements.

3.29 Lubricants. Unless otherwise specified herein, the forklift shall be serviced with military lubricants selected by the contractor in accordance with table I, SAE J754. Run-in and testing shall be performed with these lubricants as applicable for the ambient operating temperature. A lubrication data plate identifying military lubricants and applicable temperature ranges shall be provided and mounted (see 3.32.1) on each forklift.

3.29.1 Lubrication fittings. Lubrication fittings shall conform to SAE J534. Fittings shall be located in a protected accessible position. Fittings shall be accessible to a grease gun conforming to MIL-G-3859, equipped with a hydraulic coupler conforming to MS24207 and 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 handoperated fasteners may be removed to provide accessibility. Accessibility shall be in accordance with SAE J925 for personnel normally clothed.

3.29.2 Enclosures with integral reservoir of lubricant. Enclosures such as the gearcases, transmission housing and engine crankcase, which contain a reservoir of liquid lubricants for the lubrication of the parts enclosed, shall be equipped with dipsticks, marked in accordance with SAE J614, check plugs not less than 1/2-inch pipe size, or sight gages to determine the acceptance level of the lubricant. Each enclosure shall be equipped with a means for filling the enclosure with lubricant and for draining. The drain, except planetaries, shall be fitted with a SAE J531 or J532 magnetic drainplug. The drainplug shall be located so that removal of the plug will result in complete drainage of the lubricant from the enclosure. Drainage, except from planetary hubs, shall be to a container on the ground when the forklift is on level ground. Integral tubes or troughs may be used to convey the lubricant from the drain to the container. Accessibility to the drainplug, the filling means, and the lubricant-level checking device shall be provided without the removal or adjustment of accessories or parts. Plates equipped with hand-operated fasteners may be removed.

3.30 Fungus and moisture resistance. Electrical circuitry, including all components and connections except as specified below, shall be protected from the effect of fungus growth and moisture by an overall treatment with a varnish conforming to MIL-V-173, composition specified in 3.30.1:

a. Components or circuit elements which are inherently fungus and mositure resistant or which are hermetically sealed need not be treated.
b. Components of circuit elements whose functions will be adversely affected by the varnish coating shall not be treated.

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

3.30.1 Composition. Composition II shall be used only in the case when local air pollution regulations governing the application of varnish precludes the use of composition I. When composition II is used, the contractor shall provide evidence to the Government that the use of composition II is required, and shall certify that the composition II material complies with Rule 442, South Coast Air Quality Management District.

3.31 Slinging and tiedown provisions. Permanently affixed slinging and tiedown provisions that enable the forklift to be lifted, without the use of spreader bars, in its transport and operational configuration and to be fastened to the floor or deck of a transportation medium shall be provided. Provisions shall conform to MIL-STD-209, classes 1 and 2 or class 3 for type II equipment, including air transport requirements.

3.32 Identification marking. Each individual forklift and each separable attachment removable for either surface or air transportable purposes (e.g., cab, ROPS, fork carriage, or counterweights) except forks, shall be identified in accordance with MIL-STD-130 on identification plates conforming to MIL-P-514, type I, style 1, composition C (GG-P-455, type I, grade A, class 1) material. Additional or specific information to be indented or embossed on the plate(s) shall be as specified (see 6.2). Plates shall be furnished and mounted by the contractor. A shipping data plate shall be furnished and shall conform to MIL-P-514, type III, composition C (GG-P-455, type I, grade A, class 1) material and, in addition, shall indicate the silhouette of the forklift in transport position indicating the center of gravity, the location and capacity of the lifting and the tiedown attachments. The plates shall be attached by screws, drive screws, bolts, or rivets in conspicuous protected locations. A load capacity chart conforming to ANSI B56.6 and MIL-STD-1472, 5.5 shall be furnished.

3.32.1 Instruction plates/labels. The forklift shall be equipped with instruction plates/labels conforming to MIL-P-514, type III, composition C (GG-P-455, type I, grade A, class 1) material, including warnings, cautions and diagrams describing any special or important procedures to be followed in assembling, operating or servicing the forklift.

3.33 Treatment and painting. The portions of the forklift normally painted, both internally and externally, shall be cleaned, treated, and painted in accordance with MIL-T-704, type F for ferrous metals and type G for non-ferrous

metals and fiberglass, top coat color camouflage green 383, conforming to MIL-C-46168. Parts and components may be primed with alkyd base primer (color immaterial) which has been allowed to cure for a minimum of 14 days and then cleaned and painted as specified herein either prior to or at final truck assembly painting. If another color is specified (see 6.2), the above system shall be overcoated with MIL-C-46168 of the desired color.

3.34 Markings. Registration and other markings shall conform to and shall be applied in accordance with MIL-STD-642 and MIL-STD-1472. The gross weight of the forklift shall be stenciled on each side of the forklift. The prescribed tire pressure shall be stenciled in a suitable location adjacent to each tire with block or stenciltype letters not more than 1 inch and not less than 3/4 inch high. All suitable lifting and tiedown points shall be marked either "Lifting Point", "Tiedown Point", or "Lifting and Tiedown Point". Unless otherwise specified (see 6.2), vehicle markings and their locations for Air Force use shall be in accordance with MIL-STD-1223 and MIL-STD-1472. Registration numbers will be furnished by the contracting officer.

3.35 Toolbox. A toolbox shall be fabricated integrally inside the cab area or a separate toolbox made of steel having a minimum nominal thickness of 0.048 inch, shall be provided. The toolbox shall have a hinged opening and a hasp accomodating a padlock shackle of 3/8 inch diameter, accessible and operable by personnel wearing gloves. The toolbox shall be bolted or welded to the forklift in a protected position, shall have provisions for drainage of liquids and shall accommodate any maintenance tools furnished. The toolbox shall be treated and painted in accordance with 3.33.

3.36 Decontamination bracket assembly. A decontamination bracket assembly in accordance with MS53052 shall be furnished. The location of the bracket shall be such that it is accessible to personnel and provides clearance to remove and emplace a 5-gallon container conforming to MIL-C-1283.

3.37 Workmanship.

3.37.1 Castings and forgings. All parts, components and assemblies of the forklift which include castings and forgings shall be clean of harmful extraneous material such as sand, dirt, sprues, scale and flux. Rework shall be limited to procedures which do not reduce mechanical properties or affect function.

3.37.2 Metal fabrication. Metal used in fabrication shall be free from kinks and sharp bends. The straightening of material shall be done by methods that will not cause damage to the material. Corners shall be square and true. Flame-cutting, using tips suitable for the thickness of the steel may be employed instead of shearing and sawing. All bends shall be made with controlled means to insure uniformity of size and shape. Precaution shall be taken to avoid overheating. Heated steel shall be allowed to cool slowly, except in the performance of designed heat treatment. External surfaces shall be free from burrs, sharp edges and corners, except when sharp edges or corners are required or where they are not detrimental to safety.

3.37.3 Fiberglass fabrication. Fiberglass reinforced plastic (FRP) and FRP coated plywood bodies shall be smooth surfaced and free from bubbles, glazing cracks, and discontinuities and shall have a uniform FRP thickness. All edges and openings of FRP coated plywood shall be completely sealed to prevent water intrusion between the laminates. The FRP shall be free of parting agents which impair paint adhesion. Welding, bonding, connections, and fabrication of the FRP shall be in accordance with the recommended methods of the manufacturer of the material for this application.

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

3.37.4.1 Welders. Before assigning any welder to manual welding work covered by this specification, the contractor shall provide the contracting officer with certification that the welder has passed qualification tests as prescribed by one of the following listed codes or the manufacturer's commerical code, for the type of welding operations to be performed and that such qualification is effective as defined by the particular code:

Structural Welding Code, AWS D1.1, Welding Qualifications, Sections 5 and 6
Welding Qualifications of the ASME, Section IX
Earthmoving and Construction Equipment Welding, AWS/ANSI D14.3
Qualification, Section 5.

Contractors who only make horizontal welds need not qualify welders for "all position welding." Subject to approval by the Government, the contractor's standard welder qualification may be substituted in lieu of the above codes provided that the contractor's procedure is equivalent to the above codes. The contractor shall be responsible for determining that automatic welding equipment operators are capable of producing quality welds in accordance with AWS and ASME codes.

3.37.4.2 Weld quality.

a. The contractor shall be responsible for determining the inspections needed to insure that, when the welded parts are assembled together to make the forklift, the forklift shall conform to the inspection requirements specified in section 4.
b. All weldments shall be free of slag, flux, weld spatter, and other impurities detrimental to either the appearance or strength of the weldment.
c. Undercut in weldments shall be held to a minimum and shall not be more than 1/32 inch deep.

3.37.4.3 Welding practices.

a. Preheat of materials being welded and maximum interpass temperature during welding shall be in accordance with the contractor's recommendations.
b. Tack welds shall be subject to the same quality requirements as final welds.
c. Work shall be positioned for flat welding whenever practicable.
d. Procedures and sequences shall be such that distortion and shrinkage will be held to a minimum. When straightening is required, caution shall be exercised to insure that the straightening process does not weaken the part and forklift.

3.37.5 Bolted connections. Boltholes shall be accurately formed and shall have the burrs removed. Washers, lockwashers, or other positive locking devices shall be provided where necessary. Matching thread areas securing bolts conforming to SAE J429 or capscrews shall be sufficient strength to withstand the tensile strength of the bolt. All fasteners shall be correctly torqued and shall have full thread engagement.

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

3.37.7 Machine work. Tolerances and gages for metal fits shall conform to the limits specified herein and to the standards of the Materials Handling Equipment Industry or the Construction Equipment Industry.

3.38 Nuclear-biological-chemical (NBC) protection. The forklift shall be operable by personnel wearing the following complete protective ensemble:

a. Chemical-biological mask, MIL-M-51282.
b. Chemical-biological hood, MIL-H-51291.
c. Chemical protective suit, MIL-S-43926.
d. Chemical protective glove set, MIL-G-43976.
e. Chemical protective footwear, MIL-F-43987.

The operator shall be capable of actuating all controls (i.e., levers, switches, pedals, knobs, and handles) without interference caused by the ensemble that is detrimental to the operation of the forklift. The forklift shall complete two cycles in 9 minutes or less on the load placement course as specified in 4.6.2.40. The protective ensemble, as listed above, will be loaned as Government loaned equipment in order to permit performance of the tests required under Test Method No. 32.

3.38.1 High altitude electromagnetic pulse (EMP). Schematic and electrical diagrams detailed to the component level (i.e., resistors, capacitors, filters, transistors, SCR's) with value of all components, of the forklift shall be furnished by the contractor to the Government to assist the Government in performing the EMP evaluation. A forklift shall be furnished to the Government and shall be evaluated by the Government to determine necessary protection devices for protection against EMP.

3.39 Vehicle weight classification sign kit. The contractor shall apply the Government furnished vehicle weight classification numbers to each vehicle utilizing a vehicle weight classification number kit conforming to MIL-S-40626. The kit shall be located on the front of the vehicle in a location approved by the contracting officer. The contracting officer shall assign the classification numbers to be displayed on the vehicle. Instructions for changing the number based on the vehicle configuration shall be provided in the operator's manual.

3.40 Government-furnished equipment (GFE). The following items shall be furnished by the Government (see 6.6).

a. Vehicle weight classification sign kit, NSN 9905-00-565-6267, for each truck.
b. Case, NSN 7520-00-559-9618 (the contractor shall furnish fasteners and install the case on the forklift).

3.40.1 Government-loaned equipment. The following items shall be loaned by the Government (see 6.6.1):

a. NBC protective ensemble for Test Method No. 32:

(1) Chemical-biological mask, NSN 4240-00-926-4200.
(2) Chemical-biological hood, NSN 4240-00-999-0420.
(3) Chemical protective suit, NSN 8415-00-407-1062.
(4) Chemical protective glove set, NSN 8415-01-033-3519.
(5) Chemical protective footwear, NSN 8430-01-021-5978.

b. Towbar, MS500048, for Test Method No. 13.
c. Dummy 155mm SLP pallet for Test Method No. 25.
d. Dummy 105mm skidded units.

(1) Ten Pallets - four box high configuration.
(2) Ten pallets - five box high configuration.

e. STE/ICE for test in 4.6.2.41.1
f. DCA tester for use in 4.6.2.41.1
g. MLRS pods for Test Method No. 35.
h. Cold-wet gloves.

(1) Shell, NSN 8415-00-269-5700.
(2) Liner, NSN 8415-00-682-6575.

3.41 Diagnostic connector assembly (DCA) measurement capabilities. The forklift shall incorporate an easily accessible DCA in the operator's cab for interface with the Simplified Test Equipment/Internal Combustion Engine (STE/ICE) test equipment specified in MIL-T-62314, Appendix B. The DCA shall be in accordance with TACOM drawing No. 12258941. All requirements for DCA shall be in accordance with the STE/ICE design guide for vehicle Diagnostic Connector Assemblies, report No. CR-82-588-003. The DCA shall have the capabilities for

measuring the minimum functions defined in table II of report No. CR-82-588-003. A fuel shut-off method shall be provided for running compression unbalance checks. A separate wiring harness shall be provided for the DCA assembly and include all wiring and necessary hardware to perform required capabilities. The contractor shall also provide STE/ICE vehicle test cards as specified on TACOM drawing No. 12258955, and incorporate the test cards into forklift technical manuals.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Component and material inspection. The contractor is responsible for insuring 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. The inspection requirements specified herein are classified as follows:

a. First article (preproduction) inspection (see 4.3).
b. First article (initial production) inspection (see 4.4).
c. Quality conformance inspection (see 4.5).
d. Inspection comparison (see 4.7).
e. Inspection of packaging (see 4.8).

4.3 First article preproduction inspection. Prior to examination and test of the forklift specified in 4.3.1.1 and 4.3.2, the following shall be performed:

a. Service the forklift with oils, greases, and fuel specified herein and designated for use in the ambient temperatures at which the tests will be conducted.
b. Conduct the run-in as prescribed (4.6.2.37).
c. Set the hydraulic systems relief pressure as specified by the contractor and in 3.12 and record. Any change made to this setting shall constitute failure of all tests.
d. Furnish a schedule of maintenance to be followed during all testing of the forklifts. A list of tools required to perform this maintenance shall also be provided.

4.3.1 First article (preproduction) examination.

4.3.1.1 Pretest examination. Prior to testing, one forklift shall be examined for the defects marked "X" in column 1 of table III (see 4.6.1). Presence of one or more defects shall be cause for rejection.

4.3.1.2 Post-test disassembly and examination. Upon successful completion of all tests specified in 4.3.2, the truck that underwent endurance testing (see 4.6.2.34) shall be subjected to the tests marked "X" in column 3 of table IV (see 4.6.2). Presence of one or more defects shall be cause for rejection.

4.3.2 First article preproduction tests. Upon successful completion of the examination specified in 4.3.1.1, one first article forklift shall be subjected to the productivity test, load placement test and the tests marked "X" in column 1 of table IV except for the endurance tests (see 4.6.2.34) and EMP tests (see 4.6.2.40.1). One other first article forklift shall be subjected to the endurance tests (see 4.6.2.34) and one other first article forklift shall be subjected to the EMP tests (see 4.6.2.40.1). Tests may be performed in any order. Except as otherwise specified herein, test conditions shall apply throughout testing. Failure of any test except for EMP testing as specified in 4.6.2.40.1 shall be cause for rejection. Failure of a first article forklift to meet any requirement specified herein shall be cause for rejection of the first article forklifts.

4.4 First article (initial production) inspection. When specified (see 3.2.2), two or more initial production trucks will be selected at random by the Government from the trucks being produced by production tooling and will be examined for the defects marked "X" in column 2 of table III (see 4.6.1), and subjected to the tests marked "X" in column 2 of table IV (see 4.6.2) to determine conformance to the requirements of this specification. The inspection will be performed by the Government at a site selected by the Government. Acceptance of an initial production truck shall not exclude the remaining trucks from the quality conformance inspection and acceptance provisions specified in section 4. In addition to any test specified as part of the initial production test, the Government reserves the right to conduct any and all other tests contained in this specification as part of the initial production test, and failure of such additional tests shall have the same effect as failure of those tests specified as initial production tests.

4.4.1 Inspection failure. Failure of an initial production truck to meet any requirement specified herein during and as a result of the examination and tests specified in 4.4 shall be cause for rejection of the initial production truck(s), and shall be cause for refusal by the Government to continue acceptance of production trucks until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiencies. Correction of such deficiencies shall be accomplished by the contractor at no cost to the Government on trucks previously accepted and produced under the contract. Any deficiencies found as a result of the initial production inspection will be considered prima facie evidence that all trucks accepted prior to the completion of initial production inspection are similarly deficient, unless evidence to the contrary is furnished by the contractor and such evidence is acceptable to the contracting officer.

4.5 Quality conformance inspection.

4.5.1 Examination. Each forklift shall be examined for the defects marked "X" in column 3 of table III (see 4.6.1). Presence of one or more defects shall be cause for rejection.

4.5.2 Tests. Each forklift shall be tested as specified in column 4 of table IV (see 4.6.2). Failure of any test shall be cause for rejection.

4.5.3 Sampling.

4.5.3.1 Unit of product. A unit of product is defined as a fully-serviced forklift.

4.5.3.2 Lot. A lot shall consist of not more than 25 units of product. Lots shall be formulated from forklifts which have successfully completed the individual examination and tests as specified in 4.5.1 and 4.5.2.

4.5.3.3 Sample tests. One sample shall be selected from each lot (25) and shall be subjected to the tests specified in 4.6.2.5, 4.6.2.6, 4.6.2.8, 4.6.2.11, and 4.6.2.18 (Test Method 17 only) and 4.6.2.41.1. Any sample failing any test shall be cause for rejection of the lot.

4.6 Inspection schedule.

4.6.1 Examination. Forklifts shall be examined as specified herein in accordance with table III. An (X) in the column indicates the examinations that shall be conducted.

TABLE III. Examination schedule.

First Article Preproduction	First Article Initial Production	Quality Conformance	Defects	Requirement paragraph
1	2	3	4	5
X	X	-	101. Dissimilar metals not insulated as specified.	3.3.1
X	X	-	102. Materials not as specified.	3.3.1.1
X	X	X	103. Water or fluid accumulation, drain holes not provided.	3.3.1.2
X	X	-	104. Screw threads not as specified.	3.3.2
X	X	X	105. Tire material not as specified.	3.3.3
X	X	X	106. Safety provisions not as specified.	3.5
X	X	X	107. ROPS and FOPS missing or not as specified.	3.5.1
X	X	X	108. Seatbelt missing or not as specified.	3.5.2
X	X	X	109. Backup alarm missing or not as specified.	3.5.3

TABLE III. Examination schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Quality Conformance	Defects	Requirement paragraph
1	2	3	4	5
X	X	-	110. Human factors not as specified.	3.6
X	X	X	111. Noise hazard warning sign missing or not as specified.	3.6.1.1
X	X	-	112. Maintainability provisions not as specified.	3.7
X	X	-	113. Calculated flotation index not as specified.	3.9.2
X	X	-	114. Engine not as specified.	3.10
X	X	X	115. Starting priming system missing or not as specified.	3.10.2.1
X	X	-	116. Alternator not as specified.	3.10.2.2
X	X	-	117. Starting system not as specified.	3.10.2.3
X	X	-	118. Fuel system not as specified.	3.10.2.4
X	X	X	119. Air cleaner and restriction indicator not as specified.	3.10.2.5
X	X	-	120. Cooling system not as specified.	3.10.2.6
X	X	-	121. Fan not as specified.	3.10.2.6.1
X	X	-	122. When utilized, water pump not as specified.	3.10.2.6.2
X	X	-	123. When utilized, thermostat not as specified.	3.10.2.6.3
X	X	-	124. Radiator not as specified.	3.10.2.6.4
X	X	-	125. Gaskets, seals, and packing not as specified.	3.10.2.6.5
X	X	-	126. Engine coolant hose not as specified.	3.10.2.6.6
X	X	-	127. Governor not as specified or not set to manufacturer recommended speed.	3.10.2.7
X	X	-	128. Exhaust system not as specified.	3.10.2.8
X	X	-	129. Crankcase ventilation system not as specified.	3.10.2.9
X	X	-	130. Oil filters not as specified.	3.10.2.10
X	X	-	131. Tachometer drive not as specified.	3.10.2.11
X	X	X	132. Oil sampling valve and label not as specified.	3.10.2.12

TABLE III. Examination schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Quality Conformance	Defects	Requirement paragraph
1	2	3	4	5
X	X	-	133. Drive assembly not as specified	3.11
X	X	-	134. Transmission not as specified.	3.11.1 thru 3.11.1.2
X	-	-	135. Differential locking not as specified.	3.11.3
X	-	-	136. Hydraulic system not as specified.	3.12
X	-	-	137. Hydraulic lines not as specified	3.12.1
X	-	-	138. Pressure hose assemblies not as specified.	3.12.1.1
X	-	-	139. Pressure tubing not as specified.	3.12.1.2
X	-	-	140. Pressure tube fittings not as specified.	3.12.1.3
X	-	-	141. Suction lines not as specified.	3.12.1.4
X	-	X	142. Quick disconnect couplings not as specified.	3.12.1.5
X	-	-	143. Return lines not as specified.	3.12.1.6
X	-	-	144. System filtration not as specified.	3.12.3 thru 3.12.3.2
X	-	-	145. Reservoir not as specified.	3.12.4
X	-	-	146. Relief valve not as specified.	3.12.5
X	-	-	147. Hydraulic control valves not as specified.	3.12.6
X	-	-	148. Cylinders not as specified.	3.12.7
X	X	X	149. External leakage exceeds limits specified.	3.12.9
X	-	-	150. Boom assembly and fork carriage not as specified.	3.13, 3.9.11
X	-	-	151. Wheels not as specified.	3.15.1
X	X	-	152. Tires not as specified.	3.15.2
X	X	-	153. Wheelguards not as specified.	3.16
X	-	-	154. Steering and steering control not as specified.	3.17, 3.17.1
X	X	X	155. Brake fluid not as specified.	3.18
X	-	-	156. Service brakes not as specified.	3.18.1
X	-	-	157. Parking brakes not as specified.	3.18.2
X	X	-	158. Operator access not as specified.	3.19
X	X	-	159. Seat not as specified.	3.20
X	X	-	160. Hood not as specified.	3.21
X	X	-	161. Instrument panel not as specified	3.22

TABLE III. Examination schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Quality Conformance	Defects	Requirement paragraph
1	2	3	4	5
X	X	X	162. Controls and instrumentation not as specified.	3.23
X	X	X	163. Charging system monitor not as specified.	3.23.1
X	X	X	164. Engine oil pressure monitor not as specified.	3.23.2
X	X	X	165. Engine coolant temperature monitor not as specified.	3.23.3
X	X	X	166. Transmission temperature monitor not as specified.	3.23.4
X	X	X	167. Air pressure monitor not as specified.	3.23.5
X	X	X	168. Hourmeter not as specified.	3.23.6
X	X	X	169. Fuel monitor not as specified.	3.23.7
X	X	X	170. Engine run control not as specified.	3.23.8
X	X	X	171. Light switches not as specified.	3.23.9
X	X	X	172. Brake and transmission disconnect pedal(s) not as specified.	3.23.10
X	X	X	173. Engine speed control not as specified.	3.23.11
X	X	X	174. Transmission controls not as specified.	3.23.12
X	X	X	175. Hydraulic controls not as specified.	3.23.13
X	X	-	176. Starter system not as specified.	3.23.14
X	X	-	177. Electrical system not as specified.	3.24
X	X	X	178. Batteries not as specified.	3.24.1
X	X	-	179. Battery mounting not as specified.	3.24.1.1
X	X	-	180. Battery cable and terminals not as specified.	3.24.1.2
X	X	-	181. Slave receptacles missing or not as specified.	3.24.2
X	X	-	182. Circuit breakers missing or not as specified.	3.24.3
X	X	X	183. Lights missing or not as specified.	3.24.4
X	X	X	184. Blackout lighting missing or not as specified.	3.24.4.1

TABLE III. Examination schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Quality Conformance	Defects	Requirement paragraph
1	2	3	4	5
X	X	X	185. Taillights missing or not as specified.	3.24.4.2
X	X	X	186. Horn missing or not as specified.	3.25
X	X	X	187. Pintle hook missing or not as specified.	3.26.1
X	X	X	188. Towing lugs missing or not as specified.	3.26.2
X	X	X	189. Personnel cab not as specified.	3.27
X	X	-	190. Glazing not as specified.	3.27.1
X	X	X	191. Cab interior not as specified.	3.27.2
X	X	X	192. Windshield, washer, and window wipers not as specified.	3.27.3
X	X	X	193. Heater missing or not as specified.	3.27.4
X	X	-	194. Lubricants not as specified.	3.29
X	X	-	195. Lubrication fittings not as specified.	3.29.1
X	X	X	196. Filling, draining, and checking provisions for lubricant enclosures missing or not as specified.	3.29.2
X	X	-	197. Fungus and moisture resistance provisions not as specified.	3.30, 3.30.1
X	X	X	198. Slinging and tiedown provisions missing or not as specified.	3.31
X	X	X	199. Identification marking missing or not as specified.	3.32
X	X	X	200. Load capacity chart missing or not as specified.	3.32
X	X	X	201. Instruction plates missing or not as specified.	3.32.1
X	X	X	202. Treatment and painting not as specified.	3.33
X	X	X	203. Lateral level indicator not as specified.	3.22
X	X	X	204. Marking not as specified.	3.34
X	X	X	205. Toolbox not as specified.	3.35
X	X	X	206. Decontamination unit space not as specified.	3.36

TABLE III. Examination schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Quality Conformance	Defects	Requirement paragraph
1	2	3	4	5
X	X	X	207. Castings and forgings not as specified.	3.37.1
X	X	X	208. Metal fabrication not as specified.	3.37.2
X	X	X	209. Fiberglass fabrication not as specified.	3.37.3
X	X	X	210. Welding not as specified.	3.37.4 through 3.37.4.3
X	X	X	211. Bolted connections not as specified.	3.37.5
X	X	X	212. Riveted connections not as specified.	3.37.6
X	X	X	213. Machine work not as specified.	3.37.7
X	-	X	214. Schematics and electrical diagrams not as specified.	3.38.1
X	X	X	215. Vehicle weight classification sign kit not as specified.	3.39
X	X	X	216. Parts or components missing or do not function.	Section 3
X	X	X	217. Assembly incorrect or not complete.	Section 3
X	X	X	218. DCA not as specified.	3.41
X	X	X	219. Forks not as specified.	3.14
X	X	X	220. Lifting tool not as specified.	3.14.1
X	X	X	221. When utilized, MLRS handling attachment not as specified.	3.14.1, 3.14.2
X	X	X	222. Boom length and lift angle indicating systems not as specified.	3.13

4.6.2 Tests. Tests shall be conducted in accordance with table IV. An "X" in the column indicates the tests that shall be conducted.

4.6.2.1 Test conditions. Unless otherwise specified herein, tests shall be conducted at the ambient temperature and climatic conditions existing at the place of test. Only that maintenance established by the contractor and submitted

as maintenance schedule prior to commencement of the tests shall be performed during the tests. Safety and human factors considerations (see 3.5 and 3.6) shall be evaluated throughout testing. Test methods referenced in tests specified herein are those contained in the appendix. Operation of the forklift shall be with fuels, oils, lubricants, and antifreeze specified herein as applicable for the temperature conditions existing at place of test.

Table IV. Test schedule.

First Article Preproduction	First Article Initial Production	Post-Test	Quality Conformance	Test	Test Paragraph	Requirement Paragraph
1	2	3	4	5	6	7
X	X	X	X	Test conditions.	4.6.2.1	3.5, 3.6, 3.29
X	X	-	-	Engine.	4.6.2.2	3.10
X	X	-	-	Weight, dimensions, lift height, fork reach, and boom angle.	4.6.2.3	3.1.3.1 thru 3.1.3.4, 3.9.2, 3.9.12 thru 3.9.13, 3.9.14
X	X	X	X	Lifting speed, lowering speed, and lift cyliner cavitation.	4.6.2.4	3.9.6, 3.9.7, 3.13.2
X	X	-	-	Curb clearance circle.	4.6.2.5	3.9.9
X	X	X	-	Travel speed.	4.6.2.6	3.9.4, 3.11.1, 3.10.2.7
X	X	-	-	Underclearance, angles of approach and departure.	4.6.2.7	3.1.3.5
X	X	-	-	Tilt, tilt speed, tilt cylinder cavitation, and automatic tilt leveling.	4.6.2.8	3.13.1, 3.9.10
X	X	X	-	Drift.	4.6.2.9	3.9.15
X	X	-	-	Longitudinal gradeability, dynamic stability, emergency and parking brake.	4.6.2.10	3.9.3, 3.9.1.3, 3.18.2, 3.18.3
X	X	-	-	Static stability and ANSI stability.	4.6.2.11	3.9.1.1, 3.9.1.2, 3.9.1.2.1
X	X	-	-	Steering, obstacle course.	4.6.2.12.1	3.17
X	X	-	-	Emergency steering.	4.6.2.12.2	3.17.2
X	X	-	-	Steering wheel and parking brake force.	4.6.2.12.3	3.17.1, 3.18.2
X	X	-	-	Highway & rail transport-ability.	4.6.2.13	3.1.4.1, 3.1.4.3

Table IV. Test schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Post-Test	Quality Conformance	Test	Test Paragraph	Requirement Paragraph
1	2	3	4	5	6	7
X	-	-	-	ROPS and FOPS.	4.6.2.14	3.5.1
X	X	-	-	Overload.	4.6.2.15	3.14
X	X	-	-	Transmission stall.	4.6.2.16	3.11.1, 3.26.1, 3.11, 3.10.2.8, 3.11.1.1, 3.11.1.2
X	X	-	-	Transmission disconnect.	4.6.2.17	3.11, 3.11.1, 3.23.4, 3.10.2.6, 3.10.1
X	X	-	-	Service brake.	4.6.2.18	3.18.1
X	X	-	-	Maintainability.	4.6.2.19	3.7
X	X	-	-	Other transportability.	4.6.2.20	3.1.3.1, 3.1.3.2, 3.1.3.3, 3.1.3.4, 3.1.4, 3.1.4.1, 3.1.4.2, 3.1.4.3, 3.1.4.4
X	X	X	X	Leakage.	4.6.2.22	3.12.9
X	X	-	-	Hydraulic filter and filter assembly.	4.6.2.21.2	3.12.3.1, 3.12.3.2,
X	-	-	-	Pump inlet pressure.	4.6.2.21.1	3.12.1.4, 3.11.1.2
X	X	X	X	Hydraulic system roll-off cleanliness.	4.6.2.21.3	3.12.8
X	X	-	-	Hydraulic cylinders.	4.6.2.21.4	3.12.7
X	-	-	-	Pump contaminant tolerance.	4.6.2.21.5	3.12.2
X	X	-	-	Hydraulic fittings.	4.6.2.21.6	3.12.1.1
X	-	-	-	Hydraulic control valves.	4.6.2.21.7	3.12.6
X	X	-	-	Sideshift, oscillation, fork spread, fork and carriage dimensions.	4.6.2.23	3.9.11, 3.9.16, 3.14
X	X	-	-	Electromagnetic interference.	4.6.2.24	3.28

Table IV. Test schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Post-Test	Quality Conformance	Test	Test Paragraph	Requirement Paragraph
1	2	3	4	5	6	7
X	X	-	-	Slinging provisions.	4.6.2.25	3.31
X	X	-	-	Tiedown provisions.	4.6.2.26	3.31
-	-	-	-	Noise level measurement.	4.6.2.27	
X	X	-	-	Operator's station.	4.6.2.27.1	3.6.1.1
X	X	-	-	Exterior spectator.	4.6.2.27.2	3.6.1.1
X	X	-	-	Rain.	4.6.2.28	3.10.2.8, 3.4.4
X	X	-	-	Wheel guards.	4.6.2.29	3.16
X	X	-	-	Low temperature (minus 25° F)	4.6.2.30	3.4.2, 3.4.3, 3.10, 3.10.2.1, 3.10.2.6, 3.12
X	X	-	-	Wet brakes and fording.	4.6.2.31	3.9, 3.9.5, 3.10.2.9, 3.18.1
X	X	-	-	High speed.	4.6.2.32	3.9.18
X	X	-	-	Controls.	4.6.2.33	3.23.12, 3.23.13
X	-	-	-	Endurance.	4.6.2.34	3.9.17, 3.10.2.6, 3.10, 3.11, 3.12, 3.11.1, 3.11.1.1 3.11.1.2
-	X	-	-	Reliability.	4.6.2.35	3.8, 3.10, 3.10.2.4, 3.10.2.6, 3.11, 3.12
X	X	-	-	Maintainability.	4.6.2.36	3.7
X	X	-	X	Run-in.	4.6.2.37	Section 3
X	X	-	-	Rear axle oscillation.	4.6.2.38	3.11.2
X	-	X	-	Post-test.	4.6.2.39	Section 3
X	X	-	-	Nuclear-biological-chemical.	4.6.2.40	3.38
X	X	-	-	Electromagnetic pulse.	4.6.2.40.1	3.38.1
X	X	X	X	Diagnostic connector assembly capability.	4.6.2.41	3.41
X	X	X	X	DCA-STE/ICE interface.	4.6.2.41.1	3.41

Table IV. Test schedule. (Cont'd)

First Article Preproduction	First Article Initial Production	Post-Test	Quality Conformance	Test	Test Paragraph	Requirement Paragraph
1	2	3	4	5	6	7
X	X	-	-	MLRS handling.	4.6.2.42	3.14, 3.14.1, 3.14.2, 3.5.4, 3.9.12.1
X	X	-	-	Boom overload strength.	4.6.2.43	3.13
X	X	X	X	Boom extension and speed, retraction speed and extension cylinder cavitation.	4.6.2.44	3.9.8, 3.13.2
X	X	-	-	Lifting tool overload.	4.6.2.45	3.14.1, 3.14.2
X	X	-	-	Heater.	4.6.2.46	3.27.4

4.6.2.2 Engine. The diesel engine shall be tested or certified in accordance with 5.2 and 5.3 of MIL-STD-1410.

4.6.2.3 Dimensions, weight, fork reach, lift height, and boom lift angle. Determine the forklift axle spacing, height, width, and length in accordance with SAE J1234. Obtain front and rear axle weights of the complete vehicle fueled and serviced with rated capacity load in MLRS carry position, and unloaded with boom in retracted carry position (see 6.8.3). Determine the fork reach, lift height, maximum boom angle, and low engagement height in accordance with Test Method No. 1. Nonconformance to 3.1.3.1, 3.1.3.2, 3.1.3.3, 3.1.3.4, 3.9.2, 3.9.12, 3.9.12.1, 3.9.12.2, 3.9.13, or 3.9.14 shall constitute failure of this test.

4.6.2.4 Lifting speed, lowering speed and lift cylinder cavitation. Test the forklift in accordance with Test Method No. 2. Nonconformance to 3.9.6, 3.9.7, 3.13.2 shall constitute failure of this test.

4.6.2.5 Curb clearance circle. Determine the curb clearance circle as defined in Field Test Procedure of SAE J695 with the forks in retracted carry position. Nonconformance to 3.9.9 shall constitute failure of this test.

4.6.2.6 Travel speed. Test the forklift in accordance with Test Method No. 3. Speeds not as specified in 3.9.4 shall constitute failure of this test. Inability to shift as specified in 3.11.1 shall constitute failure of this test.

4.6.2.7 Underclearance, angles of approach, and departure. Test the forklift in accordance with Test Method No. 4. Nonconformance to 3.1.3.5 shall constitute failure of this test.

4.6.2.8 Tilt, tilt speed, tilt cylinder cavitation, and automatic tilt leveling. Test the forklift in accordance with Test Method No. 5. Nonconformance to 3.9.10 or 3.13.1 shall constitute failure of this test.

4.6.2.9 Drift. Test the forklift in accordance with Test Method No. 6. Nonconformance to 3.9.15 shall constitute failure of this test.

4.6.2.10 Gradeability, emergency and parking brake. Test the forklift in accordance with Test Methods No. 7 and 8. Inability of the forklift to operate on slopes as specified in 3.9.1.3, 3.9.3, 3.18.2, and 3.18.3 or inability of the brakes to stop and hold the forklift shall constitute failure of this test.

4.6.2.11 Static and ANSI stability. Test the forklift in accordance with Test Method No. 9 and ANSI B56.6. Nonconformance to 3.9.1.1, 3.9.1.2 and 3.9.1.2.1 shall constitute failure of this test.

4.6.2.12 Steering.

4.6.2.12.1 Obstacle course. Test the forklift in accordance with Test Method No. 10. Inability of the forklift to negotiate the test course or hitting of any markers shall be considered loss of operator control as specified in 3.17 and shall constitute failure of this test.

4.6.2.12.2 Emergency steering. Test the emergency steering capability of the forklift in accordance with SAE J53. Inability of the forklift to negotiate the test courses shall constitute failure of this test.

4.6.2.12.3 Steering wheel and parking brake force. Test the steering wheel and handbrake lever in accordance with Test Method No. 12. Nonconformance to 3.17.1 or 3.18.2 shall constitute failure of this test.

4.6.2.13 Highway and rail transportability. Highway transportability shall be tested in accordance with Test Method No. 13. Rail transportability shall be tested in accordance with the AAR General Rules Governing the Loading of Commodities on Open Top Cars, with the forklift secured to the railcar in accordance with the AAR Rules Governing the Loading of Department of Defense Material on Open Top Cars. Nonconformance to 3.1.4.1 or 3.1.4.3 shall constitute failure of this test.

4.6.2.14 ROPS and FOPS. The ROPS shall be tested in accordance with SAE J1040. The FOPS shall be tested in accordance with SAE J231. Nonconformance to SAE J231 or SAE J1040, as applicable, shall constitute failure of this test. A certified test report on an equivalent ROPS/FOPS installation is acceptable for this test.

4.6.2.15 Overload. Test the forklift in accordance with Test Method No. 14. Nonconformance to 3.14 shall constitute failure of this test.

4.6.2.16 Transmission stall. Test the forklift in accordance with Test Method No. 15. Permanent deformation or damage to the pintle hook mounting provisions or forklift frame (see 3.26.1), temperatures not in accordance with 3.11, or nonconformance to either 3.11.1.1 or 3.11.1.2 as applicable shall constitute failure of this test. Exhaust back pressure not in accordance with 3.10.2.8 shall constitute failure of this test.

4.6.2.17 Transmission disconnect. Test the forklift in accordance with Test Method No. 16. Nonconformance to 3.11 or 3.11.1 shall constitute failure of this test.

4.6.2.18 Service brake. Test the forklift in accordance with Test Method Nos. 17 and 18. Stopping distance not as specified in 3.18.1 or loss of operator control shall constitute failure of this test.

4.6.2.19 Maintainability. Test the forklift in accordance with Test Method No. 20. Nonconformance to 3.7, as applicable, shall constitute failure of this test.

4.6.2.20 Other transportability. Perform examination and tests required by MIL-A-8421. Nonconformance to the requirements of 3.1.3.1, 3.1.3.2, 3.1.3.3, 3.1.3.4, 3.1.4, 3.1.4.1, 3.1.4.2, 3.1.4.3, and 3.1.4.4 shall constitute failure of this test.

4.6.2.21 Hydraulic system.

4.6.2.21.1 Pump inlet pressure. Test each pump in accordance with Test Method No. 21. Pressure differential between atmospheric pressure and the vacuum in the line in excess of that specified in 3.11.1.2 and 3.12.1.4 shall constitute failure of this test.

4.6.2.21.2 Hydraulic filter and filter assembly. Test the hydraulic filter in accordance with Test Method No. 22 and either test to MIL-F-52723 or provide certification with supporting test data. Nonconformance to 3.12.3.1 or 3.12.3.2, as applicable, shall constitute failure of this test.

4.6.2.21.3 Hydraulic system roll-off cleanliness. Test each truck in accordance with Test Method No. 23. Continue cleanup procedure until the average of three consecutive counts conform to 3.12.8.

4.6.2.21.4 Hydraulic cylinders. Test each cylinder in accordance with Test Method No. 24. Nonconformance to 3.12.7 shall constitute failure of this test.

4.6.2.21.5 Pump contaminant tolerance. Either test the pump(s) in accordance with procedure set up in NFPA Recommended Standard T.3.9.18-1976 or provide certification with supporting data. Report contamination analysis data in accordance with ANSI Standard B93.30M (see 3.12.2).

4.6.2.21.6 Hydraulic fittings. Test the truck in accordance with Test Method No. 34. The contractor shall furnish a complete set of hose assemblies with

reusable fittings for conduct of this test. Nonconformance to 3.12.1.1 shall constitute failure of this test.

4.6.2.21.7 Hydraulic control valves. Either test the hydraulic control valves in accordance with 3.12.6 or provide certification with supporting data. Nonconformance with 3.12.6 shall constitute failure of this test.

4.6.2.22 External leakage. An external leakage test shall be conducted at the conclusion of the schedule of test indicated in table IV. Observe and record accumulated leakage at practical intervals over a twelve hour period following the test(s). Leakage greater than 3.12.9 shall be cause for rejection.

4.6.2.23 Sideshift, oscillation, fork spread, fork and carriage dimensions. Test the forklift in accordance with Test Method No. 25. Nonconformance to 3.9.11, 3.9.16, or 3.14 shall constitute failure of this test.

4.6.2.24 Electromagnetic interference. The forklift shall be tested in accordance with MIL-STD-461. Nonconformance to 3.28 shall constitute failure of this test.

4.6.2.25 Slinging provisions. Test the slinging provisions by applying the load for the time period specified in MIL-STD-209. Nonconformance to MIL-STD-209 shall constitute failure of this test (see 3.31).

4.6.2.26 Tiedown provisions. Test the tiedown provisions by applying the ultimate load for the time period specified in MIL-STD-209. Nonconformance to MIL-STD-209 shall constitute failure of this test (see 3.31).

4.6.2.27 Noise level measurement.

4.6.2.27.1 Operator's station. The noise level of the forlift (excluding horns) shall not exceed 85 dB(A) at operator's station during load lifting, load lowering, and high speed operations as specified in MIL-STD-1474 when tested under the following conditions: Engine shall be operated at 2/3 maximum no load governed speed, load shall be 2/3 rated capacity load (4000 pounds), all windows shall be fully opened during all tests. All lifting and lowering operations shall be accomplished with the truck stationary, with the specified load (4000 pounds) at MLRS carry position, at specified engine speed (2/3 maximum no load governed speed), and with the lift/lower control in its wide open position. High speed test shall be accomplished at specified load (4000 pounds) and engine speed (2/3 maximum no load ground speed) in highest gear range, with boom in retracted carry position, over level ground at sufficient distance to insure maximum speed under specified conditions. All measurements shall be taken within 6 inches of the operator's right ear.

4.6.2.27.2 Exterior spectator. Measure the exterior noise level in accordance with SAE J88. Nonconformance to 3.6.1.2 shall constitute failure of this test.

4.6.2.28 Rain. Test the forklift in accordance with Test Method No. 26. Nonconformance to 3.4.4 or 3.10.2.8 shall constitute failure of this test.

4.6.2.29 Wheel guards. Apply a vertical downward force of 300 pounds to the geometric center of the horizontal surface, or to the uppermost point (not including supports or braces), whichever is applicable. The force shall be applied for not less than 2 minutes. Examine the guard for permanent deformation or fractures. Flexible wheel guards may be deformed during the test loading but shall return to their original shape when the load is removed. Nonconformance to 3.16 shall constitute failure of this test.

4.6.2.30 Low temperature minus 25° F. Test the forklift in accordance with Test Method No. 27. One or more of the following shall constitute failure of this test:

a. Damage to any part of the forklift due to storage at minus 25° F. (see 3.4.3).
b. Engine does not start within 5 minutes after beginning the first cranking (see 3.4.2).
c. Engine does not run smoothly within 15 minutes after starting without unnatural or continued control manipulation and without use of primers or priming aids (see 3.4.2).
d. Instruments and gages do not operate.
e. Battery charging system does not show positive charge.
f. With the operator wearing arctic mittens and boots:

    (1) Power train cannot be engaged to the wheels.
    (2) Any clutch, brake, shaft, or cylinder cannot be operated through two complete movement cycles.

g. Operator encounters difficulty in mounting to and dismounting from the operator's position on the forklift.
h. Measured temperatures of engine oil (see 3.10), of engine coolant (see 3.10.2.6), or hydraulic oil (see 3.12) not within specified limits.

4.6.2.31 Wet brakes and fording. The forklift shall be tested in accordance with Test Method No. 19. Nonconformance to 3.9.5, 3.18.1 or any of the following shall constitute failure of this test:

a. Evidence of water damage or malfunction of the torque converter, engine oil sump, transmission, transfer case, fuel tank, hydraulic reservoir, either axle, any wheel, instruments, gages (see 3.9.5) or electrical drivetrain components as applicable.
b. Malfunctioning of any electrical component.
c. Malfunctioning of any brake.
d. Malfunctioning of any hydraulic component.
e. Malfunctioning of the steering system.
f. Water entering the engine (see 3.10.2.9).

4.6.2.32 High speed. Test the forklift in accordance with Test Method No. 28. Nonconformance to 3.9.18 shall constitute failure of this test.

4.6.2.33 Controls. Test the controls in accordance with Test Method No. 29. Nonconformance to 3.23.12 or 3.23.13 shall constitute failure of this test.

4.6.2.34 Endurance. The forklift shall be tested in accordance with Test Method No.'s 30, 31 and 37 for the length of time specified in 3.9.17. The forklift shall perform all the operations as specified, without failure, damage, or permanent deformation and shall perform all tests without exceeding specified temperature limits for the cooling system (see 3.10.2.6), engine oil (see 3.10), transmission oil (see 3.11.1.1 or 3.11.1.2), universal joints (see 3.11), hydraulic system (see 3.12). Nonconformance shall constitute failure of this test.

4.6.2.35 Reliability. For the cycles within maximum time frame specified in 3.8, the forklift(s) shall be tested in accordance with Test Method No's. 31 and 37. A failure is defined as any malfunction which causes any unscheduled maintenance action to be taken in order to restore the forklift to specified requirements. Those malfunctions resulting from accidents, noncompliance with prescribed operational or maintenance procedures, faulty test instrumentation, fail-safe devices operating as specified, and dependent secondary failures shall be considered nonrelevent failures. Nonrepetitive replacement of light bulbs, fuses, tires, and tightening of fasteners shall be considered nonrelevent failures. Any impending malfunction detected which constitutes a safety hazard to operating personnel or would cause secondary damage either to the item under test or testing instrumentation will be corrected prior to malfunction and considered as a relevent failure. Hours specified herein shall be productive clock hours excluding fueling, servicing, and downtime. In addition, failure to meet the fuel tank capacity specified in 3.10.2.4, or exceeding the temperature limits specified for the cooling system (see 3.10.2.6), engine oil (see 3.10), transmission oil (see 3.11.1.1 or 3.11.1.2), universal joints (see 3.11), or hydraulic system (see 3.12) shall constitute failure of this evaluation.

4.6.2.36 Maintainability. Maintenance times shall be recorded throughout load placement testing in accordance with Test Method No. 31. A maintenance ratio of more than 0.247 as specified in 3.7 shall constitute failure of this test.

4.6.2.37 Run-in. Each forklift shall be driven through a run-in for not less than 1 hour. The run-in shall include operating in all gears, operating all electrical equipment, and performing all hydraulic functions with rated capacity load as well as no load. Evidence of any deficiency, need for adjustment or maintenance, malfunction of any component, or evidence of leakage of air, fuel, lubricant or hydraulic oil, shall be cause for rejection of the forklift by the Government until corrected to the Government's satisfaction. The Government may require additional run-in after the deficiency is corrected.

4.6.2.38. Rear axle oscillation. Measure the total rear axle oscillation in accordance with Test Method No. 11. Nonconformance to 3.11.2 shall constitute failure of this test.

4.6.2.39 Post-test disassembly and examination. Upon completion of all endurance testing (see 4.6.2.34) complete the post test list in accordance with column 3 of table IV. Measure and record the compression in each engine cylinder and dismantle the truck that underwent endurance testing sufficiently to permit detailed disassembly and visual examination of the following components:

a. Engine cylinder heads, all valves, two pistons and piston pins taken from the two cylinders having the lowest compression.
b. Torque converter and transmission.
c. Universal joints and drive shafts.
d. Differential.
e. Front axle bearings and seals.
f. Complete brake system components.
g. Steering system cylinders, valves, and pump.
h. Hydraulic system pump, valves, one cylinder of each size, control levers, and any hose and fitting where leakage occurred during and after the tests.
i. Fork carriage assembly.

Additional disassembly and examination of this truck shall be made at the option of the contracting officer. The truck shall be examined in accordance with table III, column 1. Record complete description 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 or evidence of permanent deformantion, breakage, or excessive wear of any component shall constitute a defect. Manufacturing tolerances listed in the contractor's quality control program shall be made available upon request and shall be used as the basis for determining excessive wear.

4.6.2.40 Nuclear-biological-chemical (NBC) protection. The forklift shall be tested in accordance with Test Method No. 32. Nonconformance to 3.38 shall constitute failure of this test.

4.6.2.40.1 Electromagnetic pulse (EMP). The Government will evaluate the schematics and electrical diagrams to determine possible problem areas that may be encountered on the end item. A third preproduction forklift shall be subjected to non-destructive EMP testing by the Government at a Government facility.

4.6.2.41 DCA capability. The contractor will perform a 100 percent visual inspection of all DCA wiring harnesses prior to installation on the forklift to insure wires and connections are free of error. After installation on the forklift, test the DCA harness (reference chapter 5 of design guide for DCA) on each vehicle with the DCA tester (GFE)) prior to interfacing with STE/ICE as required under 4.6.2.4.41.1. Nonconformance to 3.41 shall constitute failure of the DCA.

4.6.2.41.1 DCA - STE/ICE interfaces. Upon completion of inspection and tests specified in 4.6.2.41, test the DCA for all measurements specified in 3.41 using STE/ICE. Nonconformance to 3.41 shall constitute failure of DCA.

4.6.2.42 MLRS handling. The forklift shall be tested in accordance with Test Method No. 35. Nonconformance to 3.14, 3.14.1, 3.14.2, 3.5.4, or 3.9.12.1 shall constitute failure of this test.

4.6.2.43 Boom overload strength. The forklift shall be tested in accordance with Test Method No. 36. Nonconformance to 3.13 shall constitute failure of this test. Certification with supporting data shall be provided to illustrate chain/cable conformance with 3.13. Nonconformance to 3.13 shall constitute failure of this test.

4.6.2.44 Boom extension speed, retraction speed and extension cylinder cavitation. The forklift boom shall be tested in accordance with Test Method No. 33. Nonconformance to 3.9.8 or 3.13.2 shall constitute failure of this test.

4.6.2.45 Lifting tool overload. The lifting tool and MLRS handling attachment shall be tested in accordance with Test Method No. 38. Nonconformance to 3.14.1 and 3.14.2 shall constitute failure of this test.

4.6.2.46 Heater. The heater shall be tested in accordance with SAE J1129. Nonconformance to 3.27.4 shall constitute failure of this test.

4.7 Inspection comparison. The Government may select forklifts at any time during the contract production period and subject these forklifts to the examination specified in 4.6.1 and column 1 of table III, and to the tests marked "X" in column 1 of table IV to determine conformance to the requirements of this specification. The inspection will be performed by the Government, at a site selected by the Government, on units selected at random from those which have been accepted by the Government and will not include the previously inspected initial production forklifts. In addition to any test specified as part of the inspection comparison, the Government reserves the right to conduct any and all other tests contained in this specification as part of the inspection comparison and failure of such additional tests shall have the same effect as failure of those tests specified as inspection comparison.

4.7.1 Inspection failure. Failure of an inspection comparison forklift to meet any requirement specified herein during and as a result of the examination and tests specified in 4.7 shall be cause for rejection of the inspection comparison forklift(s) and shall be cause for refusal by the Government to continue acceptance of production forklifts until evidence has been provided by the contractor that corrective action has been taken to eliminate the deficiencies. Correction of such deficiencies shall be accomplished by the contractor at no cost to the Government on forklifts yet to be produced by the contract. Any deficiencies found as a result of the inspection comparison will be considered prima facie evidence that all forklifts accepted prior to the completion of inspection comparison are similarly deficient unless evidence to the contrary is furnished by the contractor and such evidence is acceptable to the contracting officer. Where forklifts previously accepted by the Government are determined to be deficient, the contractor will negotiate with the Government to determine the method of correction.

4.8 Inspection of packaging. The preservation, packing, and marking of the forklift truck shall be inspected as specified in Appendix B of MIL-STD-162.

5. PACKAGING

5.1 Preservation, packing and marking. Each forklift truck shall be preserved, packed and marked in accordance with the requirements of MIL-STD-162 for type I mobile shipment. For all degress of preservation, liquid cooling systems shall be preserved by filling the system with equal parts of water and antifreeze conforming to MIL-A-46153. The degree of preservation shall be level A, B, or C; and the degree of packing shall be level A, B, or commercial as specified (see 6.2).

6. NOTES

6.1 Intended use. The forklift is intended for use as a materials handling forklift with a capability of unloading, transporting, and loading boxes, containers, palletized ammunition loads, and MLRS pods. The mobility of the forklift, with and without payload, is intended to cover working areas where high flotation and traction characteristics are required.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification.
b. Date of issue of DoDISS applicable and exceptions thereto (2.1.1).
c. When first article preproduction tests are not required (see 3.2.1).
d. Time frame required for submission of the first-article preproduction model and number of forklifts required (see 3.2.1).
e. When the Government will conduct any or all of the first article examination and tests. When the Government will conduct some but not all of the first article preproduction model examination and tests, the contracting officer should specify time frame and which examination and tests will be conducted by the Government, and which examination and tests shall be conducted by the contractor (see 3.2.1).
f. When first article initial production examination and tests are requred (see 3.2.2).
g. Number of initial production trucks to be furnished (see 3.2.2).
h. When additional or specific information is required on plates (see 3.32).
i. Color(s) required (see 3.33).
j. When vehicles procured for Air Force shall be marked other than in accordance with MIL-STD-1223 (see 3.34).
k. Degree of preservation and of packing required (see 5.1).
l. When DCA is not required (3.41).

6.3 First article forklift. Any changes or deviations of production forklifts from the approved first article forklift during production will be subject to the approval of the contracting officer. Approval of the first-article forklift will not relieve the contractor of his obligation to furnish forklifts conforming to this specification.

6.4. Incident report. The contracting officer should require the contractor to furnish a written report within 24 hours of any incident of equipment

malfunction or failure during the conduct of the test. As a minimum, the report should describe components and parts affected, test and operating conditions, date of incident, hourmeter reading, how detected, description of incident, and corrective action taken.

6.5 Noise. When the noise level of the forklift is 85 dB(A) or greater, the appropriate discussion of the noise hazard per MIL-STD-1474 (MANUALS Paragraph) shall be incorporated in the manuals and should include the requirement for hearing protection, the noise level of the forklift, the distance from the forklift at which 85dB(A) will always be met, and what operational situations or system configuration will reduce the level to 85dB(A).

6.6 Government-furnished equipment. The contracting officer should arrange to furnish the equipment specified in 3.40.

6.6.1 Government-loaned equipment. The contracting officer should arrange to loan the equipment specified in 3.40.1.

6.7 Contaminant tolerance profile. The contracting officer should arrange to furnish the computer program for Contaminant Tolerance Profile required in 4.6.2.21.5, when requested by the contractor.

6.8 Definitions.

6.8.1 Load center. The horizontal longitudinal distance from the intersection of the horizontal load carrying surfaces and vertical load engaging faces of the forks to the center of gravity of the load.

6.8.2 Rated capacity load. Rated capacity load shall be established with a load equivalent to an unrestricted cube with overall dimensions twice the load center dimensions and whose center of gravity is located at the geometrical center of the cube.

6.8.3 Carry positions.

6.8.3.1 Retracted carry position. Retracted carry position is defined as:

- Boom fully retracted
- Forks at max. rear tilt
- Heel of forks 24 inches above ground
- Fork reach of 48 inches, maximum

6.8.3.2 MLRS carry position. MLRS carry position is defined as follows:

- MLRS skids 24" above ground
- MLRS pod longitudinal to truck
- MLRS pod level
- MLRS pod suspended by the MLRS hoisting rod

6.8.4 Pick positions.

6.8.4.1 Load pick position. Load pick position is defined as:

- 21.5 foot reach
- boom level
- forks level

6.8.4.2 MLRS pick position.

- MLRS hoisting rod located at 180 inches forward of vertical plane of the foremost portion of the truck (excluding boom and fork carriage).
- MLRS hoisting rod located at 144 inches above ground plane.

6.8.5 Reach. The horizontal distance from the vertical plane of the foremost portion of the truck (excluding boom and fork carriage) to the inside heel of the forks for handling palletized loads, and to the MLRS hoisting rod when handling MLRS pods.

6.8.6 Lift height. The vertical distance from level ground to the horizontal, load carrying surface of the forks.

Custodian:
Army - ME

Preparing activity:
Army - ME

Project 3930-A555

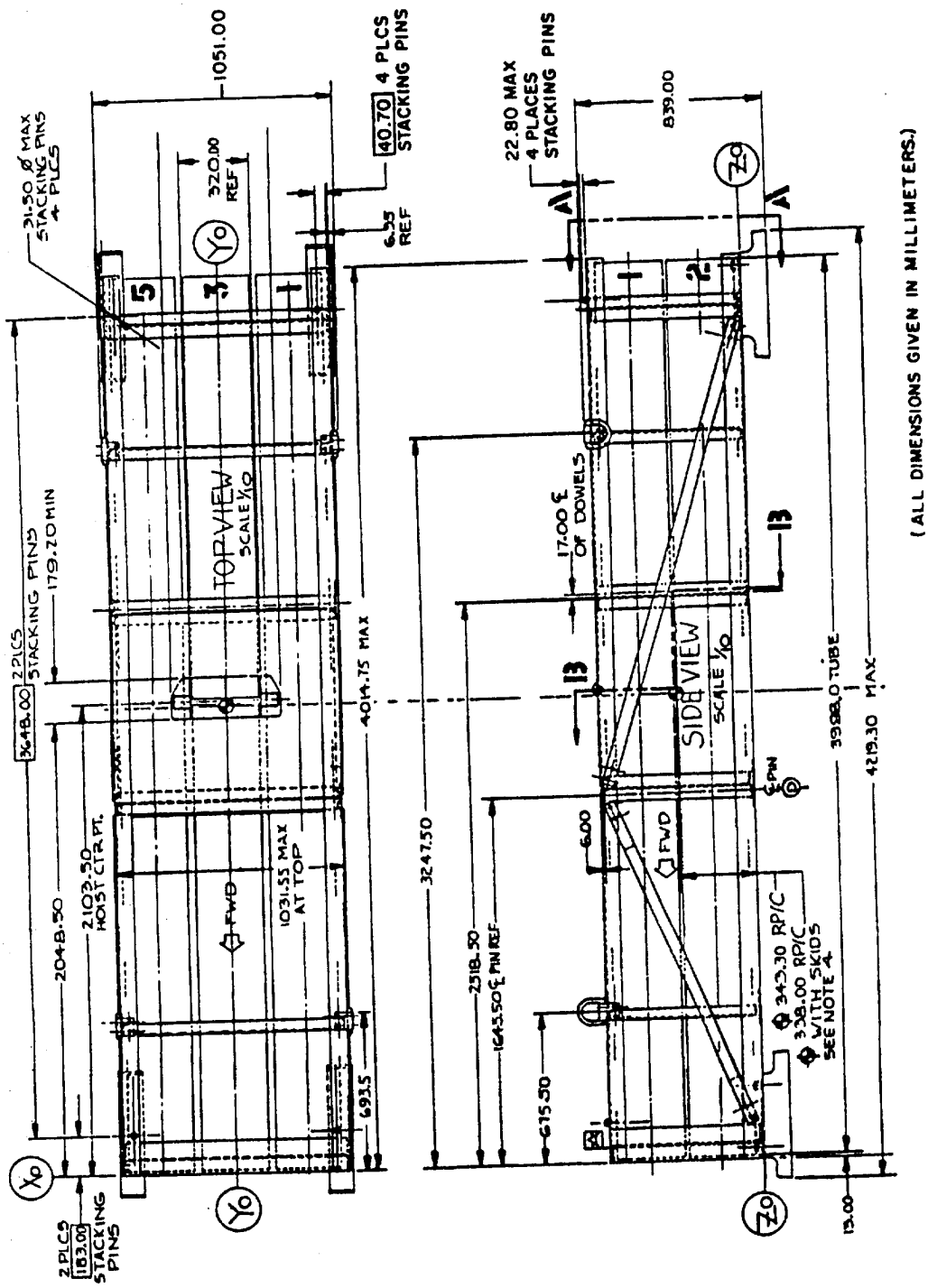
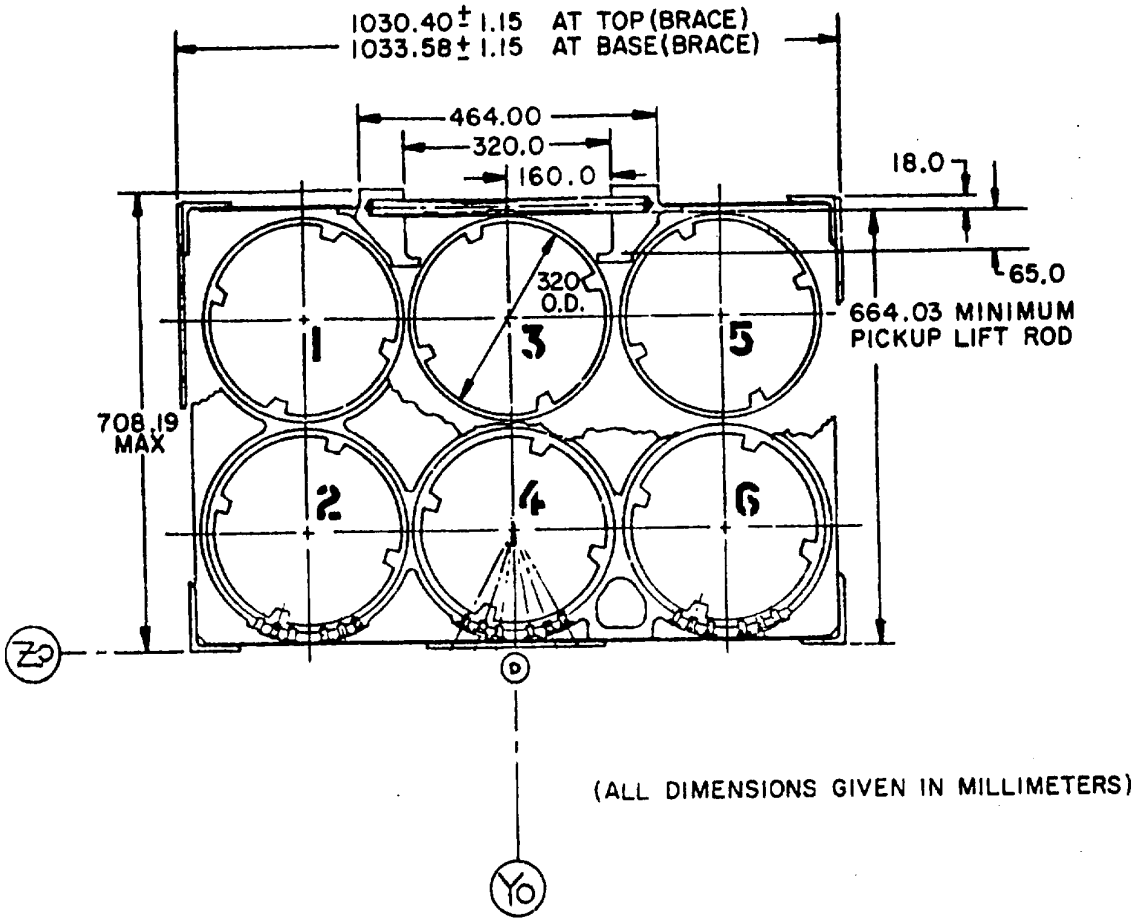


FIGURE 1. Multiple launch rocket system.

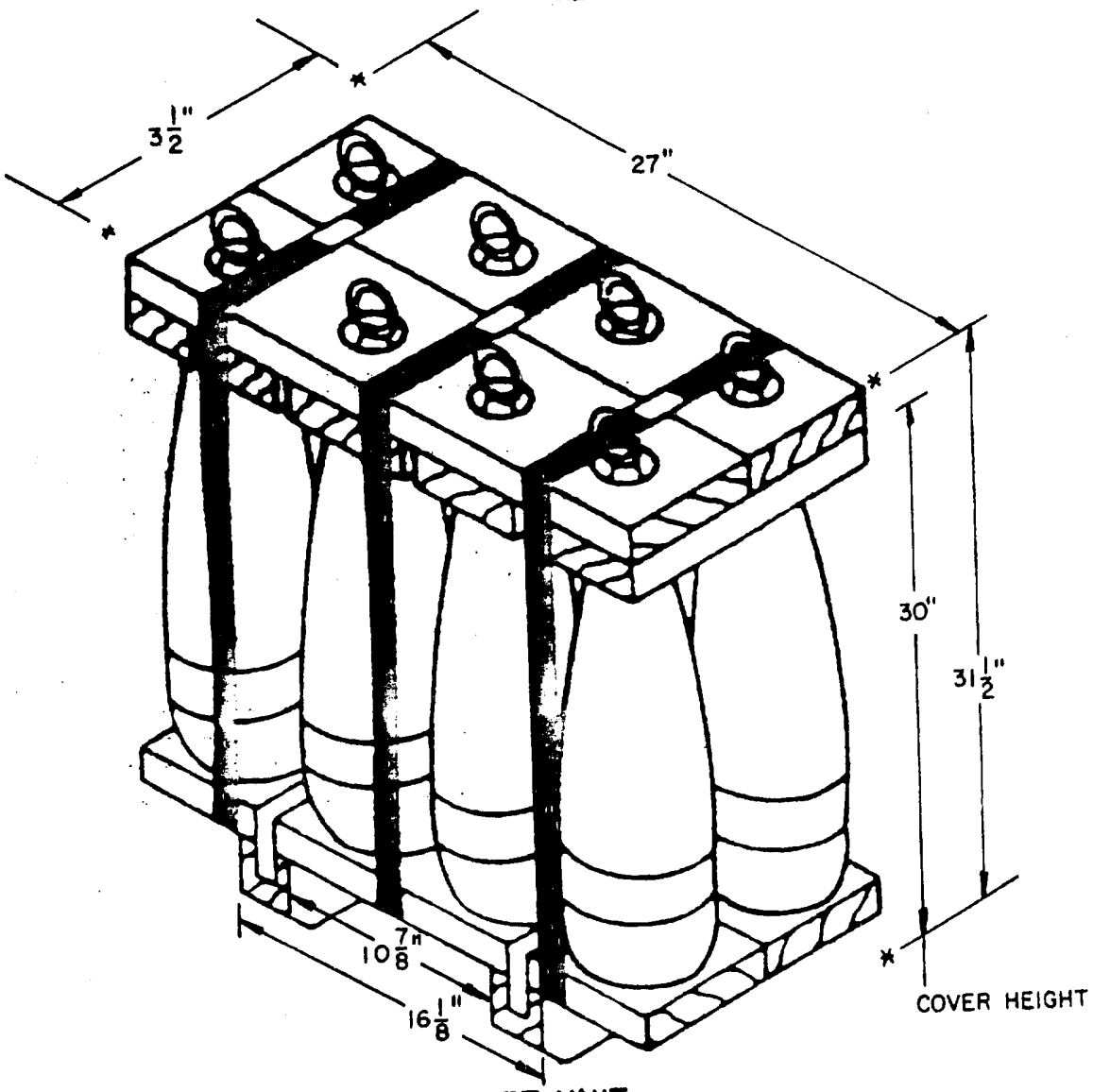
X-4150



DOWEL & LIFT ROD DETAILS VIEW 1313
SCALE 1/5

FIGURE 2. Multiple launch rocket system.

X-4151



PALLET UNIT

UNIT WEIGHT - 800 POUNDS (APPROX).
CUBE----------6.6 CUBIC FEET.

NOTE: THE 31-1/2 UNIT HEIGHT DIMENSION WILL VARY SLIGHTLY, DEPENDING ON THE PROJECTILE BEING SHIPPED: THE PROCEDURES SPECIFIED BY THIS DRAWING ARE APPLICABLE TO ALL 155 MM SLP'S WHICH ARE PALLETIZED 8 PER PALLET UNIT. VARIANCE IN UNIT WEIGHT DOES NOT EFFECT THE VALIDITY OF THE DELINEATED PROCEDURES.

FIGURE 3. 155 mm SLP palletized load.

X-4152

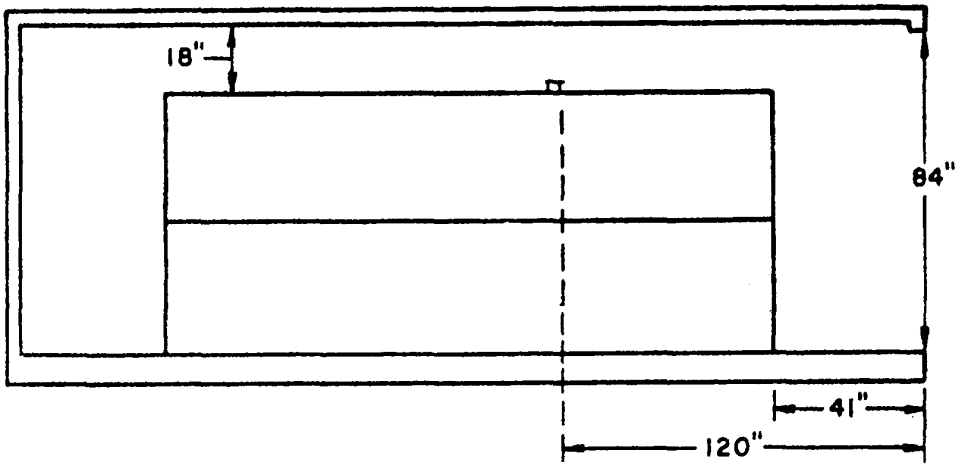


FIGURE 4. MLRS pods in grounded 20ft. containers.

X-4153

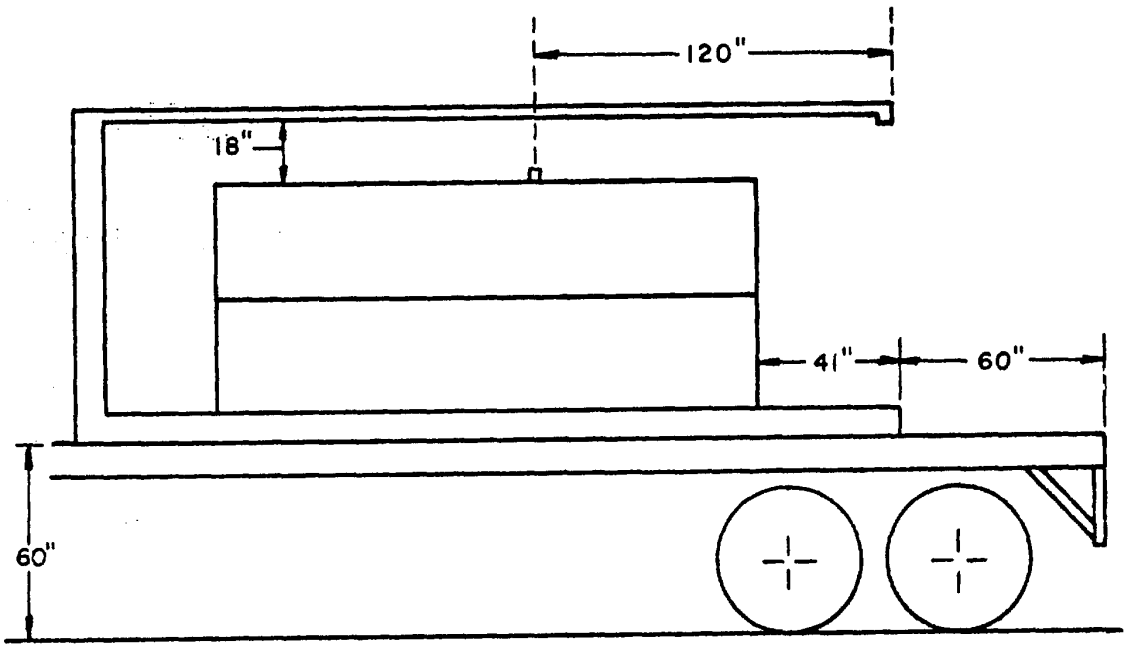
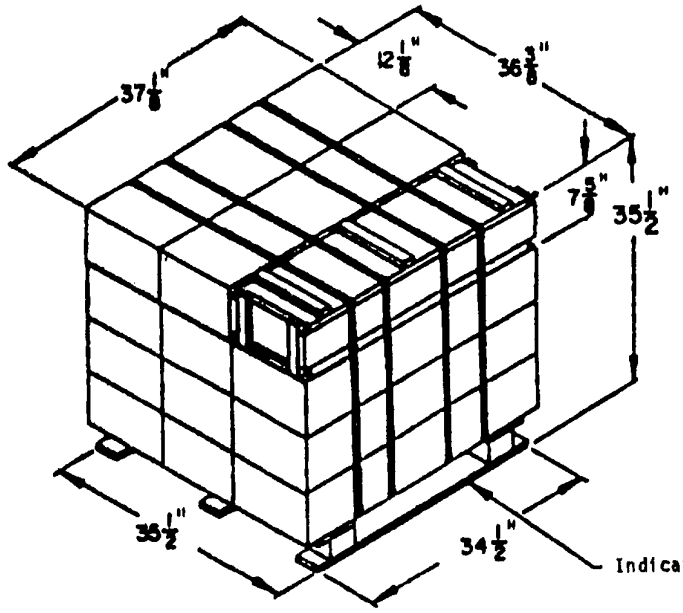
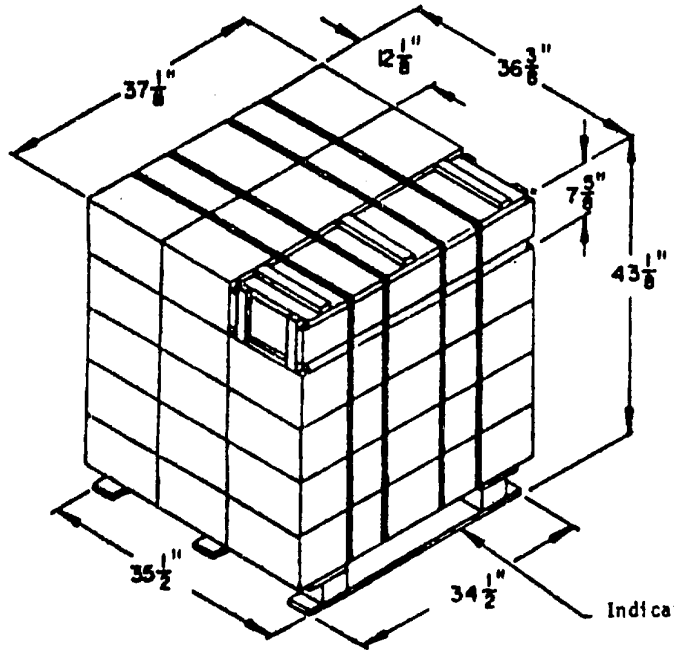


FIGURE 5. MLRS pods in trailer mounted 20 ft. container.

X-4154



105 mm Skidded Unit
Four High Configuration
Gross Weight-------1,560 lbs (approx)
Cube----------26.3 cu ft (approx)



105 mm Skidded Unit
Five High Configuration
Gross Weight---------1,700 lbs (approx)
Cube----------33.7 cu ft (approx)

FIGURE 6. 105mm skidded unit configurations.

X-4155

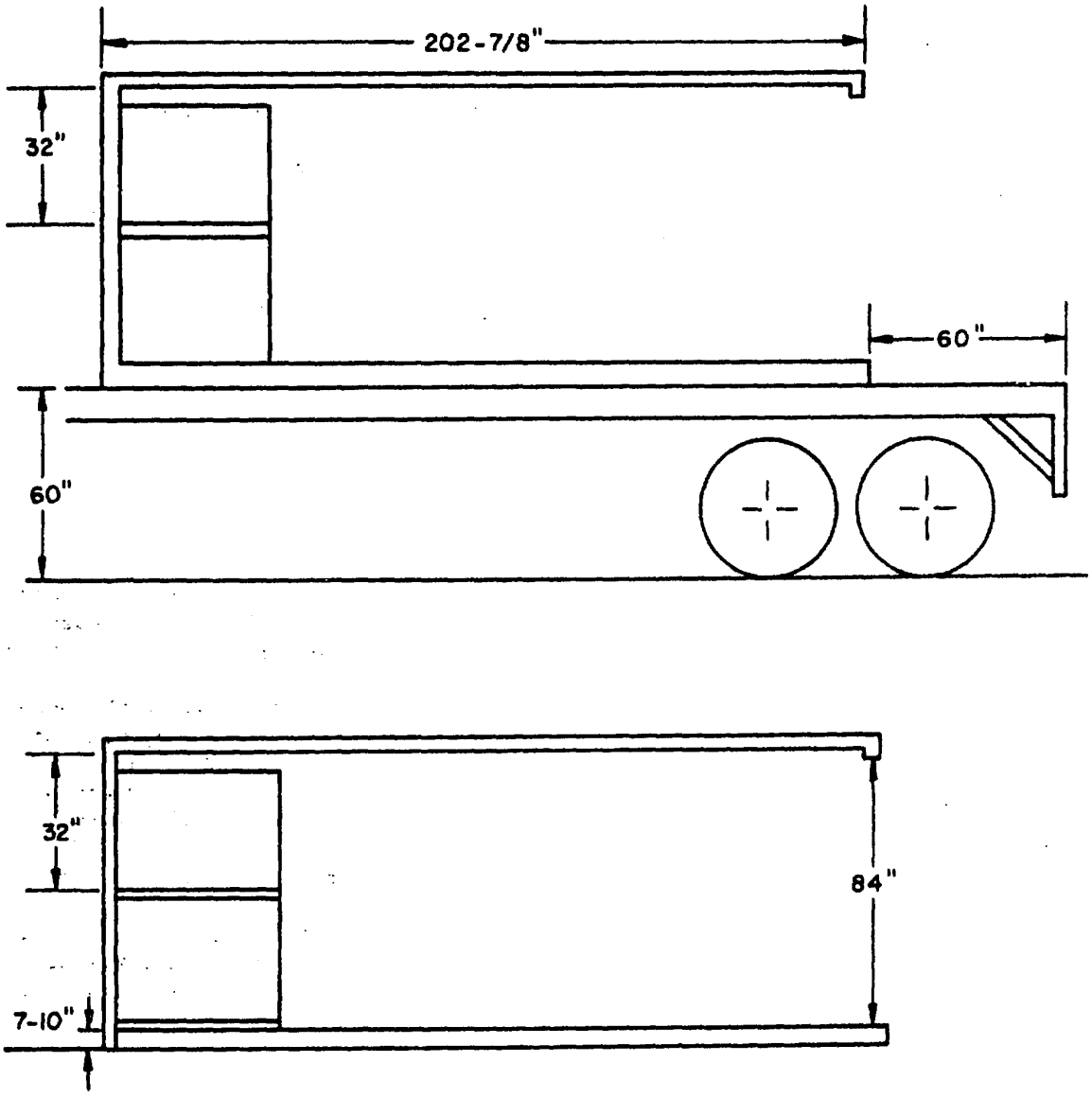


FIGURE 7. Palletized loads in trailer mounted and grounded 20 ft. containers.

X-4156

APPENDIX

TEST METHOD NO. 1

MAXIMUM LIFT HEIGHT - LOW ENGAGEMENT HEIGHT - MAXIMUM BOOM LIFT ANGLE - MAXIMUM FOR REACH

1. TEST COURSE:

   a. Level, flat surface.
   b. Level, flat surface with sharp drop-off over an edge.

2. TEST APPARATUS:

   a. Linear measurement equipment.
   b. Liquid level or clinometer.
   c. Straight edge.

3. TEST PROCEDURE:

   a. Lift the rated capacity load at a constant 4-foot reach to the maximum vertical height. Adjust the fork tilt to level the load. Measure the true vertical distance from the ground to the top surface of the forks (this is the maximum lift height).
   b. Position the forklift on the edge of the drop-off. Lower the boom to the maximum angle below the horizontal at a 6-foot reach, with no load on forks. Adjust the fork tilt to level the top surface of the forks. Measure the true vertical distance between the surface on which the forklift is positioned and the top surface of the forks (this is the low engagement height).
   c. Raise fully extended boom to maximum lift angle. Measure the boom angle from the horizontal. (This is the boom lift angle.)
   d. Fully extend boom horizontally. Measure the horizontal distance from the vertical plane of the foremost portion of the truck (excluding boom and fork carriage) to the inside heel of the forks. (This is the maximum for reach).

APPENDIX

TEST METHOD NO. 2

LIFTING SPEED - LOWERING SPEED -

LIFT CYLINDER CAVITATION

1. TEST APPARATUS:

   a. Linear measurement equipment.
   b. Stopwatch.
   c. Hydraulic pressure gages capable of reading below atmospheric pressure.

2. TEST PROCEDURE:

   a. Lifting and lowering speeds.

      (1) Record time in seconds required to raise rated capacity load from ground level to the MLRS pick position (15-foot reach, 12-foot height) at fixed boom extension. Note whether lifting speed remains constant throughout the lift operation.
      (2) Record time to lower rated load at maximum speed (full-open valve) to 3- to 4-foot height at fixed boom extension. Load to be abruptly stopped at the 3- to 4-foot height. Record height at stop. Note whether lowering speed remains constant throughout the lowing operation.
      (3) Repeat steps (1) and (2) a minimum of 3 times.
      (4) Compute lifting speed and lowering speed and use the fastest rate obtained from each as the established speeds.
      (5) Repeat steps (1) through (4) without load.

   b. Lift cylinder cavitation.

      (1) Install the pressure gages to read hydraulic pressure on both ends of the boom lift cylinder.
      (2) With the engine at low idle speed, and the boom fully extended, raise the pick load from ground level to maximum lift angle. Lower the load to ground level and return again to maximum lift angle not less than 10 times. Lowering shall be accomplished with control valve open 5 times and "feathered" 5 times. Observe and record any evidence of cavitation in the lift cylinder or loss of operator control. Record pressure readings. Note: Pressure readings are not required for determining lift cylinder cavitation for quality conformance testing purpose.

APPENDIX

TEST METHOD NO. 3

TRAVEL SPEED

1. TEST COURSE:

The 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. Linear measurement equipment.
b. Stopwatch or electronic timer.

3. TEST PROCEDURE:

a. Drive the forklift to attain maximum speed prior to entering the measured test course (do not exceed an operating speed at which the loaded forklift cannot be controlled). While accelerating, perform gear or range changes under full throttle. Forks shall be in the retracted the carry position, (full carriage tilt backward).
b. Drive through the measured distance at maximum speed, recording the length of the distance and the time required to traverse it. The measured distance shall be not less than 88 feet.
c. Turn the forklift around and repeat the test approaching the measured distance from the opposite end. Repeat for a total of six runs, three in each direction through the measured distance.
d. Conduct procedure 3a. through 3c. for the following:

(1) Forward with rated capacity load.
(2) Rearward with rated capacity load.
(3) Forward without load.

APPENDIX

TEST METHOD NO. 4

UNDERCLEARANCE, ANGLES OF APPROACH AND DEPARTURE

1. TEST COURSE:

   a. Level, flat surface.
   b. Ramp inclined to 25 degrees. (Ramp length should be at least the length of the vehicle wheelbase).

2. TEST APPARATUS:

   Linear measurement equipment.

3. TEST PROCEDURE:

   a. Test course 1a. Raise the rated capacity load to retracted carry position, (full carriage tilt backward). Measure the vertical distance from the surface to the lowest point on the vehicle, excluding wheels, tires, forks, and fork carriage. This is the underclearance.
   b. Test course 1b. Drive the forklift with rated capacity load from one horizontal surface over the ramp to the other horizontal surface, ascending and descending the ramp in both forward and reverse. Forks may be adjusted as necessary to clear the ramp. No part of the forklift, except the tires, shall come in contact with the ramp.

APPENDIX

TEST METHOD NO. 5

TILT - TILT SPEED - TILT CYLINDER CAVITATION -

AUTOMATIC TILT LEVELING

1. TEST COURSE:

Level, flat surface.

2. TEST APPARATUS:

a. Clinometer.
b. Stopwatch or electronic timer.
c. Hydraulic pressure gages capable of reading below atmospheric pressure.
d. MLRS pod.

3. TEST PROCEDURE:

a. Tilt.

(1) Place forklift on level, flat surface, using clinometer to insure forklift is level.
(2) With the fork heels 24 inches above the ground, tilt the carrier rearward and record the angle of the carrier from vertical.
(3) With the forks raised to maximum lift height, tilt the carrier forward and record the angle of the carrier from vertical.
(4) Tilt the carrier to the point where the forks are level on the ground. Operate the boom throughout the range of vertical travel and record the range of angular variation of the forks.
(5) Repeat steps (1) through (4) with the forklift in the MLRS handling configuration.

b. Tilt speed.

(1) Lift the rated capacity load about midway between ground level and maximum lift height.
(2) Tilt the load to the minimum specified forward tilt.
(3) Tilt the load from minimum specified forward tilt, to or past minimum specified rearward tilt, and record the time required.
(4) Repeat the procedure tilting from rearward to forward.

c. Tilt cylinder cavitation.

(1) Install the pressure gages to read hydraulic pressure on both ends of the tilt cylinder.
(2) Lift the rated capacity load about midway between ground level and maximum lift height.

TEST METHOD NO. 5 (Cont'd)

(3) With the engine at low idle speed, slowly tilt the load from full rearward to forward 10 degrees below horizontal and back again not less than ten times. Tilt forward shall be done with control valve wide open 5 times and "feathered" 5 times. Observe and record any evidence of cavitation in the tilt circuit or loss of operator control. Record pressure readings. Note: Pressure readings are not required for determining tilt cylinder cavitation for Quality Conformance Testing purpose.

d. Automatic tilt leveling.

(1) Raise the rated capacity load to maximum lift angle.
(2) Lower the load ground level, noting whether or not forks remain level.
(3) Repeat 10 times.
(4) With the forklift in the MLRS handling configuration, raise the MLRS pod to the MLRS pick position.
(5) Lower the MLRS pod to ground level, noting whether or not the MLRS pod remains level.
(6) Repeat steps (4) and (5) ten times.

APPENDIX

TEST METHOD NO. 6

DRIFT

1. TEST COURSE:

Level, flat surface.

2. TEST APPARATUS:

a. Temperature thermocouple and potentiometer or equivalent temperature measuring device.
b. Clinometer.

3. TEST PROCEDURE:

a. Install the thermocouple in the volumetric center of the hydraulic-system oil reservoir. Heat the hydraulic oil by exercising hydraulic functions until the oil temperature exceeds 120° F. Maintain oil temperature above 120° F. for the duration of the test.
b. Raise the pick load to maximum lift angle at full boom extension. Adjust forks to true horizontal position as measured with the clinometer. Mark reference point.
c. Hold the load for 10 minutes and record the cylinder drift for the lift cylinder and the angular tilt of the forks (as measured from the horizontal) in that period.

APPENDIX

TEST METHOD NO. 7

LONGITUDINAL GRADEABILITY - EMERGENCY STOPPING -

PARKING BRAKE

1. TEST COURSE:

The length of the test course shall be not less than three times the wheelbase of the forklift, graded to the specified slope, within plus or minus 1 percent grade. Grade resistance shall be sufficient to prevent significant wheel slip.

2. TEST APPARATUS:

Speed indicator.

3. TEST PROCEDURE:

a. Drive the forklift with rated capacity load in retracted carry position forward up the slope, entering the course at a speed of not less than 2 mph, nor more than 4 mph. Continue through the course, maintaining a speed of not less than 2 mph. Make a total of three such passes up the slope specified for ascending operation.
b. Use the same procedure as described in a, moving forward down the slope specified for descending operation.
c. Drive the forklift with rated capacity load in retracted carry position forward onto the slope specified for brake operation, then stop and hold the forklift with the service brakes for not less than 1 minute, with the forklift in neutral gear range. Set the parking brake, lower the load, release the service brake, and hold for not less than 1 minute. Shift into forward, raise the load, release the parking brake, and continue up the slope off the course.
d. Use the same procedure as described in c, moving forward down the slope at not less than 2 mph. Stop the truck within a distance of 15 feet by applying the service brakes at a pressure that prevents the rear wheels from leaving the ground.
e. Position the forklift with rated capacity load in retracted carry position at the top of and facing down the slope specified for braking operation. Shut off the engine and allow the forklift to roll down the slope in neutral gear range, until a speed of 2 mph is attained. Apply the emergency brake provisions (parking or service brake as applicable) and bring the forklift to a stop. Release the brake, allow the forklift to begin to roll, and apply the brake again to stop the forklift, and repeat for a total of six dead engine stops.

APPENDIX

TEST METHOD NO. 8

DYNAMIC STABILITY

1. TEST COURSE:

The length and width of the test course shall be not less than the forklift curb clearance circle diameter, graded to the specified slope, within plus or minus 1 percent grade.

2. TEST PROCEDURE:

a. Drive the forklift with rated capacity load in retracted carry position onto the slope and perform a complete forward circle, at maximum steer angle, while on the slope.
b. Repeat the procedure in a, steering in the opposite direction.
c. Repeat the procedures in a and b without load.

APPENDIX

TEST METHOD NO. 9

STATIC OVERLOAD STABILITY

1. TEST COURSE:

The test course shall be a hard, level surface with provision for anchoring the forklift to prevent overturning.

2. TEST PROCEDURE:

a. Anchor the rear of the forklift with a device with enough slack to allow the forklift to tip but not overturn.
b. Place 1.10 times the pick load at the specified load center on the forks with the forks level and boom level.
c. Extend the boom to load pick position.
d. Note whether the rear wheels of the forklift clear the ground.
e. Remove the load and retract the boom.
f. Place 1.5 time the rated capacity load on the MLRS lifting tool at the MLRS carry position in the MLRS carry configuration.
g. Note whether the rear wheels of the forklift clear the ground.

APPENDIX

TEST METHOD NO. 10

STEERING

1. TEST COURSE:

The test course shall be a dry, level surface in accordance with Figure A-1.

2. TEST APPARTUS:

a. Speed indicator.

3. TEST PROCEDURE:

a. Obstacle course No. 1 in accordance with Figure A-1. Drive the forklift forward, without load, over the test course, at full-load governed speed in first gear. Repeat with rated capacity load in retracted carry position.

APPENDIX

TEST METHOD NO. 11

REAR AXLE OSCILLATION

1. TEST APPARATUS:

Linear measurement equipment.

2. TEST PROCEDURE:

a. Raise the truck, keeping the truck horizontal, to sufficient height to allow the rear axle to oscillate from stop to stop.
b. Measure at the center of the tire tread.
c. Pivot the rear axle fully clockwise. Measure and record the vertical distance that the tire traveled from horizontal.
d. Pivot the rear axle fully counterclockwise. Measure and record the vertical distance that the tire traveled from hoizontal.

APPENDIX

TEST METHOD NO. 12

STEERING WHEEL AND PARKING BRAKE FORCE

1. TEST APPARATUS:

   a. Force measurement equipment.
   b. Stopwatch.
   c. Linear measurement equipment.

2. TEST PROCEDURE:

   a. With the engine operating at low idle, determine the time, and the tangential force at the steering wheel rim, required to turn the wheel from stop to stop in both directions. Repeat 2 more times.
   b. Repeat 2a except that engine shall operate at maximum governed speed.
   c. Count the number of revolutions required to turn the wheel from stop to stop in each direction. Repeat 2 more times.
   d. Apply a minimum 300 pound force downward perpendicular to the rim of the steering wheel approximately midway between two spokes and hold for a minimum of 10 seconds.
   e. Repeat 2d except the force shall be applied upward.
   f. With engine at low idle, apply the maximum force attainable up to 150 pounds, to the rim of the steering wheel, and hold for a minimum of 10 seconds.
   g. Repeat 2f in the opposite direction.
   h. Measure seat to steering wheel clearance and directional control to steering wheel clearance.
   i. Determine the force necessary to apply the parking brake at the center of the handgrip or at the center of the foot pedal whichever is applicable, tangential to the arc of its travel for pivoted types, or parallel to the path of its travel for lever types. Record the highest force observed.

APPENDIX

TEST METHOD NO. 13

HIGHWAY TRANSPORTABILITY

1. TEST COURSE: Paved roadway.

2. TEST APPARATUS:

   a. Towing vehicle with pintle hook assembly and speed indicator.
   b. Tow bar, medium duty capacity, MS500048.

3. TEST PROCEDURE:

   a. Disengage the driveline using one man provided with common tools. Record the time and tools necessary to perform the operation.
   b. Attach the towbar and safety chains to the towing vehicle and pull the forklift with dead engine for not less than 50 miles at 30 mph, plus or minus 5 mph travel speeds. During the 50 mile towing, include a minimum of 10 right hand 90 degree turns and a minimum of 10 left hand 90 degree turns at intersecting roads after coming to a complete stop before the intersection. Observe tracking ability and note any loss of control.
   c. At the conclusion of the 50-mile-towing, disconnect the forklift from the towing vehicle, reengage the driveline and operate the forklift to observe for damage.

APPENDIX

TEST METHOD NO. 14

OVERLOAD

1. TEST COURSE:

The test course shall be a flat, level surface with provisions for anchoring the forklift to prevent tipping and for blocking the front wheels to prevent overloading the tires.

2. TEST APPARATUS:

a. Test loads or other apparatus to apply load to forks.
b. Magnetic particle or dye penetrant capability.

3. TEST PROCEDURE:

a. Anchor the forklift to prevent tipping. Raise the forks to provide not less than 8 inches ground clearance to level forks.
b. Apply three times the rated capacity load on the forks at the specified load center distance, and hold for 5 minutes.
c. Remove load and sideshift the forks fully to the right (load center shall be shifted a minimum of 5 inches right of center) and apply two times the rated capacity load on the forks at the specified load center distance andhold for 5 minutes.
d. Repeat procedure c except sideshift the forks fully to the left (load center shall be shifted a minimum of 5 inches left of center) this time.
e. Remove the load and examine the forklift for damage.
f. Inspect truck structure, frame, lift mechanism, and hydraulic system for evidence of deformation, fractures, leakage, broken welds, etc.
g. Inspect forks a minimum of 6 inches each side of heel by magnetic particle or dye penetrant method.

APPENDIX

TEST METHOD NO. 15

TRANSMISSION STALL

1. TEST APPARATUS:

   a. Timing device.
   b. Thermocouple and potentiometer or equivalent temperature measuring device.
   c. Tachometer.
   d. Thermometer.
   e. Pressure measurement device.

2. TEST PROCEDURE:

   a. Install exhaust system pressure measurement device no more than 2 inches beyond the header outlet. Record exhaust pressure during transmission stall, procedure 2 e.
   b. Install thermocouple to measure oil temperature of the transmission.*
   c. Thermostat shall not be blocked open.
   d. With the ambient temperature not less than 25° F, operate the forklift until the transmission oil outlet temperature is a minimum of 157° F.
   e. Attach the forklift pintle hook assembly to a fixed object to prevent forward motion of the forklift by a horizontal force on the pintle hook assembly . Shift into the highest forward gear and stall the transmission for not less than 30 seconds while the engine is operating at governed speed. The transmission disconnect shall not be used during this test.
   f. Record initial transmission oil temperature and maximum oil temperature after 30 seconds stall, governed speed at stall, and ambient temperature.

*NOTE: Transmission oil temperatures shall be taken at the outlet from the converter for hydrodynamic transmission and at the motor and pump case drain plugs for hydrostatic transmissions.

APPENDIX

TEST METHOD NO. 16

TRANSMISSION DISCONNECT

1. TEST APPARATUS:

   a. Thermocouples and potentiometers or equivalent temperature measuring device.
   b. Timing device.
   c. Linear measurement equipment.

2. TEST PROCEDURE:

   a. Install thermocouples to record temperatures listed below:

      (1) Engine outlet to top tank of the radiator.
      (2) Engine oil sump.
      (3) Transmission sump oil to cooler.
      (4) Transmission oil from cooler.
      (5) Hydraulic tank.
      (6) Ambient air (thermometer may be used).

   b. Block open thermostat.
   c. Place truck on level surface with forks elevated approximately 1 foot from the surface.
   d. With transmission-disconnect pedal fully depressed, transmission in forward low range, fully raise and lower rated capacity load continually for a minimum of 5 minutes while engine is at governed speed. Record initial and final temperature.

Note: Oil temperatures shall not exceed 30° F. above ambient at the start of the tests in 2(d).

APPENDIX

TEST METHOD NO. 17

SERVICE BRAKE

1. TEST COURSE:

The test course shall be a dry, level, improved surface allowing no penetration, with a grade not exceeding plus or minus 1 percent.

2. TEST APPARATUS:

a. Linear measurement equipment.
b. Detonator, brake apparatus, with powder loads, or equivalent apparatus.
c. Speed indicator.

3. TEST PROCEDURE:

a. Connect the detonator to be operated by a switch directly connected to the brake pedal so that it is actuated during the first 1/4 inch of pedal travel. The service brake, without transmission disconnect, shall be used for this test.
b. Place the rated capacity load on the forks with the fork carriage tilted backward the maximum possible and in retracted carry position.
c. Drive the forklift with rated capacity load over the test course. When the forklift reaches the maximum forklift speed, apply the brakes. Measure the distance between the point of brake pedal application and the point of stoppage. Perform the test four times in forward (two times in each direction) on the course. Observe whether the front wheels lock or any wheel loses contact with the test course. Measure the amount of fishtail.
d. Repeat step (c) with no load.

APPENDIX

TEST METHOD NO. 18

BRAKE FADE

1. TEST COURSE:

The test course shall be a dry, improved surface allowing no penetration, with grades not exceeding plus or minus 1 percent

2. TEST APPARATUS:

a. Speed indicator.
b. Decelerometer.

3. TEST PROCEDURE:

a. Drive the forklift with rated capacity load in retracted carry postion at the maximum forklift speed and apply the service brakes to produce a deceleration rate of 8 fps per second, plus or minus 1 fps per second, until the forklift has slowed to one-half the initial speed. Immediately accelerate the forklift at full throttle in high gear until the travel speed reaches the initial speed. Immediately repeat the test for a total of 35 cycles. On completion of the 35th cycle, accelerate the forklift at full throttle in high gear to the initial speed and immediately conduct a service brake stopping test using procedure in Test Method No. 17. After the brakes have completely cooled, perform the test consisting of 35 snubs and one measured stop a second time. Make no adjustments or repairs between the two test runs.
b. Repeat step (a) with no load.

APPENDIX

TEST METHOD NO. 19

WET BRAKE AND FORDING

1. TEST COURSE:

Body of fresh water to the depth specified in 3.9.5.

2. TEST PROCEDURE:

a. Drive the forklift with rated capacity load in retracted carry position into and out of the water a minimum of 10 times. After the 10th submersion, drive the forklift from the water and immediately conduct a service brake stopping test from the maximum forklift speed with load, using the procedure specified in 3c of Test Method No. 17. Service brakes shall not be applied after release in the water until the test application.
b. Drain all reservoirs that were in contact with the water and note any visual evidence of water in the liquids drained from the reservoir.
c. Repeat step (a) with no load.

APPENDIX

TEST METHOD NO. 20

MAINTENANCE

1. TEST FACILITY:

The test facility shall consist of a shop area of sufficient size to permit unobstructed surveillance of maintenance.

2. TEST APPARATUS:

a. Common handtools.
b. Special tools (if furnished by the contractor with the forklift).

3. TEST PROCEDURE:

a. Examine the truck for accessibility of major assemblies.
b. Examine position of drains with respect to accessibility.
c. Using the tools, demonstrate that the major assemblies are accessible for repair and maintenance.
d. Demonstrate the accessibility of drains and path of discharge of lubricants and coolants by activating drainage controls.
e. Perform and time each operation on the maintenance operations list (see 3.7).

APPENDIX

TEST METHOD NO.21

PUMP INLET PRESSURE

1. TEST APPARATUS:

   a. Pressure gage (vacuum).
   b. Hydraulic fittings (as required).
   c. Thermocouple.

2. TEST PROCEDURE:

   a. Install a pressure (vacuum) gage in the pump suction line immediately adjacent to the pump and a thermocouple in the hydraulic tank.
   b. Heat the oil to specified temperature.
   c. Run the pump at the maximum speed it can encounter during vehicle operation and record the pump-inlet pressure, and temperature.
   d. Repeat for each pump installation on the truck.

APPENDIX

TEST METHOD NO. 22

HYDRAULIC FILTER AND FILTER ASSEMBLIES

1. TEST APPARATUS:

   a. Hydraulic test stand may be used in place of on-vehicle test.
   b. Pressure gages.
   c. Temperature gages.
   d. Flowmeter (when test stand is used).
   e. Provisions for controlling oil temperature, if necessary.

2. TEST PROCEDURE:

   a. Pressurize the housing to not less than the minimum proof pressure (100 psi for return line filters or 1-1/2 times maximum system pressure for pressure filters). Hold the pressure for not less than 60 seconds and examine for leaks.
   b. Install a new element in the filter housing. Establish maximum flow through the filter at an oil temperature of 150° F., plus or minus 5° F. Measure and record the pressure drop across the filter assembly.
   c. Plug the filter element chamber oil exit, or otherwise obstruct all flow through the filter element, leaving the outlet port open. Establish and maintain the oil temperature at 150° F., plus or minus 5° F. Increase the upstream pressure to 10 psi more than determined in (b). Observe the contamination indicator. Increase upstream pressure until the indicator enters the bypass area or until bypass flow exceeds 5 percent of the maximum system flow, whichever occurs first. Observe and record this pressure (this is the bypass opening pressure). Increase pressure until the maximum system flow is attained through the bypass valve. Observe and record this pressure.

APPENDIX

TEST METHOD NO. 23

HYDRAULIC SYSTEM ROLL-OFF CLEANLINESS

1. TEST APPARATUS:

Liquid automatic particle counter.

2. TEST PROCEDURE:

a. Connect the hydraulic lines at the cylinders to bypass those cylinders whose capacity is less than 1/2 of the connecting line volume.
b. Run the engine at no-load governed speed pumping the oil through each circuit for not less than 5 minutes. Perform an inline particle count as described in d. below.
c. When applicable, connect each line to its related component. Operate each function of the system for 5 minutes continuously through full stroke and at maximum rates. Perform the particle count as described in (d) below.
d. The procedure for determining contamination shall be as follows:

(1) Contamination levels shall be determined by particle counts. The particle counter used for evaluation of the samples shall be calibrated in accordance with ANSI Recommended Standard Method for Calibration of Liquid Automatic Particle 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-forklift and off-the-forklift filtration for cleanup.
(3) Connect the counter sensor to the system, using a bypass line and a branch line. The bypass line shall connect to the system, have a flow rate not less than 5 times the sensor flow rate, and may return fluid directly to the reservoir. The branch line to the sensor shall tee into the bypass line and shall be not more than 12 inches in length. Any flow restriction devices shall be placed downstream of the particle counter sensor. Start engine and operate at not less than 1000 rpm. Record particle counts.

APPENDIX

TEST METHOD NO. 24

CYLINDER PROOF

1. TEST APPARATUS:

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

2. TEST PROCEDURE:

   a. Double acting cylinder.

      (1) Position and mechanically hold the piston at the approximate midpoint of the cylinder.
      (2) Fill rod end of the piston with oil.
      (3) With the head end port open, apply an oil pressure equal to 1.5 times the working pressure to the rod end of the piston for minimum of 60 seconds. Release pressure.
      (4) Fill the head end of the piston with oil.
      (5) With the rod end port open, apply an oil pressure equal to 1.5 times the working pressure to the head end of the piston for minimum of 60 seconds. Release pressure.

   b. Alternate procedure for double acting cylinder

      (1) Extend the cylinder to maximum extension by filling the head end of the cylinder with oil. Apply oil pressure equal to 1.5 times the working pressure at the head port for a minimum of 60 seconds. Release pressure.
      (2) Retract the cylinder by filling the rod end of the cylinder with oil. Apply oil pressure equal to 1.5 times the working pressure at the rod end port for a minimum of 60 seconds. Release the pressure.

APPENDIX

TEST METHOD NO. 25

SIDESHIFT, OSCILLATION, FORK SPREAD, AND

FORK AND FORK CARRIAGE DIMENSIONS

1. TEST APPARATUS:

   a. Clinometer.
   b. Linear measurement equipment.
   c. Stopwatch.
   d. Thermocouple.
   e. 155-mm SLP pallet.
   f. One 8-foot by 8-foot by 20-foot ISO 1C shipping container.
   g. MLRS pod.

2. TEST PROCEDURE:

   a. Clockwise Oscillation.

      (1) With the forklift on a level surface, block up the front axle evenly so that none of the front tires are in contact with the ground. Place rated capacity load on the forks and sideshift the load to the left side such that the load center is not less than 5 inches to the left of center. Place a clinometer on the load or carriage.
      (2) Oscillate the load to extreme counterclockwise position and record the angle of oscillation relative to the horizontal obtained.
      (3) Oscillate the load to clockwise position and record the angle of oscillation relative to the horizontal obtained.
      (4) Repeat 2a(2) and 2a(3) at low engine idle and high engine idle a minimum of 3 times each and record time for each.
      (5) Repeat steps 2a(1) through 2a(4) while carrying the MLRS pod with the forklift in MLRS handling configuration.

   b. Counterclockwise Oscillation.

      (1) With the forklift on a level surface, block up the front axle evenly so that none of the front tires are in contact with the ground. Place rated capacity load on the forks and sideshift the load to right side such that the load center is not less than 5 inches to the right of center. Place a clinometer on the load or carriage.
      (2) Oscillate the load to extreme clockwise position and record the angle of oscillation relative to horizontal obtained.
      (3) Oscillate the load to extreme counterclockwise position and record the angle of oscillation relative to horizontal obtained.
      (4) Repeat 2b(2) and 2b(3) at low engine idle and at high engine idle a minimum of 3 times and record time for each.
      (5) Repeat steps 2b(1) through 2b(4) while carrying the MLRS pod with the forklift in FLRS handling configuration.

TEST METHOD NO. 25 (Cont'd)

c. Forks and Fork Spacing.

(1) With no load on the forks, move the forks as close together as possible and measure the distance between the outside edges of the forktines. Move the forks as far apart as possible and measure the distance over the outside edges of the forktines.
(2) Measure the forktine length, forktine width, forktine thickness at the heel and at the tip, and the fork taper. Measure the carriage width.

d. Sideshift.

(1) With sideshift carriage and forks centered on the truck, spread the forks to 16-1/8 inches (outside to outside).
(2) Sideshift level forks to extreme left position. Note and measure any increase in truck width and whether there are any protrusions beyond the sideshift carriage.
(3) Sideshift forks to extreme right position. Measure sideshift travel. Note and measure any increase in truck width and whether there are any protrusions beyond the sideshift carriage.
(4) Sideshift forks to extreme left position and measure travel.
(5) Place rated capacity load on the forks. Sideshift to the extreme left position. Oscillate to extreme counterclockwise position.
(6) Oscillate the load to extreme clockwise position. Sideshift load to extreme right side position. Oscillate the load to extreme counterclockwise positon.
(7) With rated capacity load on the forks in the horizontal position, operate the sideshift function for 100 full cycles at maximum speed. During the last 50 cycles, the sideshift control shall be released abruptly when the load is in approximately midposition, and the cycle shall be continued.
(8) Engage a 155-mm SLP pallet. Insert the pallet into a 20-foot ISO 1C shipping container and sideshift the pallet against an inside wall of the container. Only the pallet shall contact the wall.
(9) Repeat 2d. (8) above against the opposite inside wall of the container.

APPENDIX

TEST METHOD NO. 26

RAIN

1. TEST APPARATUS:

   a. Timing device.
   b. Measuring device (U.S. Weather Bureau type preferred).
   c. Spray fixture.

2. TEST PROCEDURE:

   a. Subject the forklift to a simulated rainfall of not less than 4 inches per hour. The simulated rainfall shall impinge on the forklift at an angle of 45 degrees, plus or minus 5 degrees, with a force equivalent to a 30-mile-per-hour-wind. The simulated rainfall shall disperse uniformly over the surfaces of the forklift.
   b. Expose the top and left side of the forklift to the rain described above for a period of 5 minutes with engine off. With rain still flowing, start engine and allow engine to idle for 2 minutes.
   c. Repeat (b) with the top and front exposed.
   d. Repeat (b) with top and right exposed.
   e. Repeat (b) with top and rear exposed.
   f. Stop the rainfall and allow the forklift to stand for not less than 30 minutes with the engine off. Drain a small quantity of fluid from each fluid reservoir (except cooling system) and examine for presence of water.
   g. Check electrical components, gages, cab (if furnished), and the air cleaner for water entry and damage.

APPENDIX

TEST METHOD NO. 27

LOW-TEMPERATURE TEST (MINUS 25° F.)

1. TEST APPARATUS:

   a. Cold chamber.
   b. Arctic clothing.
   c. Thermocouples with potentiometer(s) or other temperature measuring device.
   d. Battery hydrometer.
   e. Wattmeter or ammeter.
   f. Voltmeter.

2. TEST PROCEDURE:

   a. Service the forklift with applicable lubricants for minus 25° F., operation including engine oil, transmission oil, drivetrain lubricants, hydraulic oil and antifreeze.
   b. Check the specific gravity of battery electrolyte to insure full charge.
   c. Cold soak the forklift to attain a stabilized temperature no warmer than minus 25° F. During and after this period, examine the forklift for damage. Stabilization is attained when the engine coolant, fuel, lubricating oil, and battery temperatures reach -25° F., as indicated by thermocouples located as follows:

      (1) In the two center cells of each battery between the plates and at middepth of the electrolyte (unless sealed maintenance free batteries are furnished).
      (2) In the volumetric center of the hydraulic system oil reservoir.
      (3) In the engine lubricating oil gallery and in the oil sump.
      (4) In the engine coolant in the engine-cooling-jacket discharge pipe.
      (5) In the chamber at a horizontal angle of 45 degrees from the sides and ends of the truck, not less than 3 feet from each corner of the truck at engine-crankshaft level.

   d. Maintain the minus 25° F., plus or minus 5° F., temperature throughout the entire test.
   e. One operator wearing arctic clothing, including mittens, shall perform all priming and starting operations.
   f. Substitute or supplementary batteries or other electrical cranking energy shall not be used.

TEST METHOD NO. 27 (Cont'd)

g. Glowplugs or other accessories working off the cranking batteries and auxiliary fluid priming systems which are permanently mounted on the forklift and normally used in starting the engine may be used.

h. Start the forklift. Starting should be accomplished within 5 minutes of the initial attempt. Smooth engine running without unnatural or continued control manipulation, and without use of primers and priming fluids, should be obtained within 15 minutes after starting.

i. When started, run engine 15 minutes. After completion of the 15-minute operation, operate the engine as follows:

(1) 10 minutes idling.
(2) 10 minutes half throttle.
(3) 5 minutes full throttle.

Perform the 25-minute cycle three times.

j. Maintain and record temperatures prior to engine starting, immediately after engine starting, and at 10 minute intervals during warmup and cycling, at the following (but not limited to) locations on the forklift:

(1) Battery (unless sealed maintenance free batteries are furnished).
(2) Hydraulic tank.
(3) Engine oil.
(4) Engine coolant.
(5) Chamber air.

k. During engine cycling, and while wearing arctic mittens and boots, the operator shall perform each of the following:

(1) Engage and disengage power train to the wheels in all gears.
(2) Operate through two complete movement cycles all brakes, shafts and cylinders (as permitted by space limitations in chamber).
(3) Mount to and dismount from the operator's position on the forklift.

APPENDIX

TEST METHOD NO. 28

HIGH SPEED

1. TEST COURSE:

The test course shall be a compacted surface of sufficient size to allow continuous travel at wide open throttle in highest gear range.

2. TEST APPARATUS:

a. Speed indicator.
b. Equivalent temperature measuring device.

3. TEST PROCEDURE:

a. Block thermostat in the open position.
b. Install thermocouples in the hydraulic system reservoir at the pump inlet, in the transmission sump, in the transfer case sump, in the engine coolant outlet (if utilized), in the torque converter outlet line adjacent to the torque converter (if utilized) and engine oil gallery.
c. Record all temperature, including ambient before starting test.
d. Drive the unloaded forklift over the test course for 1 hour at wide open throttle in highest forward gear range. Stop the forklift and record all temperatures immediately, including ambient and universal joint temperatures. Check for universal joint temperature using temperature marker.
e. In not less than 5 minutes after stopping, repeat 3d. above three times, recording all temperatures immediately upon stopping, including ambient and universal joint temperatures each hour. Total operational time not less than 4 hours.

APPENDIX

TEST METHOD NO. 29

CONTROLS

1. TEST APPARATUS:

   a. Thermcouples and potentiometer or equivalent temperature measuring device.
   b. Force measurement equipment.
   c. Linear measurement equipment.

2. TEST PROCEDURE:

   a. Install the thermocouple at the hydraulic pump(s) inlet.
   b. With an oil temperature of 160° F., to 180° F., and the engine operating at no load governed speed, measure the force required to shift each hydraulic control valve and transmission control valve at the handgrip to each position and the distance between each control.
   c. Apply 50 pounds of force to each hydraulic control valve lever in each shifting direction and maintain the force for not less than 15 seconds.
   d. Apply 100 pounds of force to each transmission control lever in each direction and maintain the force for not less than 15 seconds.

APPENDIX

TEST METHOD NO. 30

PERFORMANCE (DURABILITY COURSE)

1. TEST COURSE:

A test course shall be constructed in accordance with Figure A-2.

2. TEST PROCEDURE:

Drive the forklift with rated capacity load in retracted carry position (see 6.8.3.1), over the test course. A minimum (not average) speed throughout the entire course shall not be less than 3.0 m.p.h. Negotiate the course 50 percent of the time in a clockwise direction and 50 percent of the time in a counterclockwise direction.

Notes: The windows and doors may be removed from cab while conducting this test.

APPENDIX

TEST METHOD NO. 31

PERFORMANCE (LOAD PLACEMENT)

1. TEST COURSE:

The test course shall be a level, improved surface, laid out in accordance with Figure A-3.

2. TEST APPARATUS:

a. Pressure gage.
b. Thermocouple and potentiometers or equivalent temperature measuring devices.
c. Palletized loads (three each rated capacity load), with maximum 6-inch-high fork pockets.
d. Two platforms (one 8 feet 6 inches high, the other 8 feet high).

3. TEST CONDITIONS:

The specified cycles on load placement course shall be distributed equally among Courses A, B, and C. Additional time as a result of continued testing may be run on any of the above courses. All cycles shall be run in the four-wheel drive mode at all times.

4. TEST PROCEDURE:

a. Install the thermocouples at engine coolant into and out of the radiator, transmission sump, hydraulic oil reservoir, hydraulic pump(s) inlet and the engine oil sump. Install the pressure gage in the pump test point in the circuit under test. Block thermostat in open position.
b. Record the temperatures at the end of each 1/2 hour for one eight hour shift each week of operation.
c. The operator shall not be given any assistance in engaging any loads during this test.
d. Position the platforms at Points 3 and 2 on Course A with the inside top of the platform at the 25-foot radius.
e. Position the loads at Points 1, 4, and 5 on Course A with the inside edge of the load at the 25-foot radius.
f. Start at Point 1, pick up the load, and move to Point 3. Place the load on the platform at Point 3 and proceed to Point 5. Pick up the load at Point 5 and move it to Point 2. Place the load on the platform at Point 2 and proceed to Point 4. Pick up the load at Point 4 and move it to Point 1. Continue the cycle, moving from Point 1 to Point 3, from Point 3 to 5, etc. The forklift shall maneuver within the area of the course during all operations.

TEST METHOD NO. 31 (Cont'd)

g. Repeat the test in d, e, and f on Course B.
h. Repeat the test in d, e, and f on Course C.
i. For the purpose of load-transfer-rate calculation, one cycle shall be considered to have been completed each time the three loads are Positions 1, 4, and 5 (i.e., five separate load movements per cycle).

Note: As an alternative to d, g, and h above, the course A, B, and C may be run in any order.

APPENDIX

TEST METHOD NO. 32

NUCLEAR-BIOLOGICAL-CHEMICAL

1. TEST COURSE:

The test course shall be a level, improved surface, laid out in accordance with Course B of Figure A-4.

2. TEST APPARATUS:

a. Palletized loads (three each rated capacity load), with maximum 6-inch high fork pockets.
b. Two platforms (one 8 feet 6 inches high, the other 8 feet high).
c. The complete protective ensemble.

3. TEST PROCEDURE:

a. While wearing the complete protective ensemble, each and every control (i.e., levers, buttons, switches, pedals, knobs and handles) shall be actuated by the operator. Record any incident of interference caused by the ensemble that is detrimental to the operation of the forklift.
b. On Course B, position the platforms at Points 3 and 2 with the inside top of the platform at the 50-foot radius.
c. Position the loads at Points 1, 4, and 5 on Course B with the inside edge of the load at the 50-foot radius.
d. The operator shall not be given any assistance in engaging any loads during this test.
e. Start at Point 1, pick up the load, and move to Point 3. Place the load on the platform at Point 3 and proceed to Point 5. Pick up the load at Point 5 and move it to point 2. Place the load on the platform at Point 4 and move it to Point 1. Continue the cycle, moving from Point 1 to Point 3, from point 3 to 5, etc. The forklift shall maneuver within the area of the course during all operations.
f. Record any detrimental effects the ensemble has on the operational capabilities of the forklift.

APPENDIX

TEST METHOD NO. 33

BOOM EXTENSION AND RETRACTION SPEEDS - EXTENSION

CYLINDER CAVITATION

1. TEST APPARATUS:

   a. Linear measurement equipment.
   b. Stopwatch.
   c. Hydraulic pressure gages capable of reading below atmospheric pressure.

2. TEST PROCEDURE:

   a. Boom extension and retraction speeds.

      (1) Record time to extend the boom at maximum lift angle with the pick load from the retracted boom position to full boom extension. Note whether speed remains constant throughout extension.
      (2) Record time to lower the pick load from full boom extension at maximum lift angle at maximum speed (full open valve) to within 1 foot of full boom retraction. Note whether speed remains constant throughout retraction.
      (3) Repeat steps a and b a minimum of 5 times.
      (4) Compute extension and retraction speeds and use the fastest rate obtained from each as the established speeds.
      (5) Repeat steps a through d without load.

   b. Extension cylinder cavitation.

      (1) Install the pressure gages to read hydraulic pressure on both ends of the boom extension cylinder.
      (2) Lift the pick load to the maximum lift angle to full boom retraction.
      (3) With the engine at low idle speed, fully extend and retract the boom maintaining maximum lift angle, not less than 10 times. Boom retraction shall be accomplished with control valve wide open 5 times and "feathered" 5 times. Observe and record any evidence of cavitation in the extension cylinder or loss of operator control. Record pressure readings. Note: Pressure readings are not required for determining extension cylinder cavitation for Quality Conformance Testing purpose.
      (4) With the engine at low idle speed, fully extend and retract the boom at minimum lift angle (maximum angle below the horizontal), not less than 10 times. Boom extension shall be accomplished with control valve wide open 5 times and feathered 5 times. Observe and record any evidence of cavitation in the extension cylinder or loss of operator control.

TEST METHOD NO. 33 (Cont'd)

c. Simultaneous lift and extension.

(1) Place the pick load on the forks with the boom in retracted carry position.
(2) Using only the right hand for control lever operation, the fork-lift operator shall raise the load to maximum lift height at full boom extension and boom lift occur simultaneously.

APPENDIX

TEST METHOD NO. 34

HYDRAULIC FITTINGS

1. TEST APPARATUS:

Common handtools.

2. TEST PROCEDURE:

a. Remove one hydraulic hose assembly that has permanent-type fittings.
b. Replace the hose assembly with an equivalent field attachable fitting only to assure interchangeability.
c. Repeat a and b above until each hose assembly with permanent-type fittings is replaced with a hose assembly with reusable fittings.
d. After completing the above test reinstall the original hose assemblies on the truck.

APPENDIX

TEST METHOD NO. 35

MLRS HANDLING

1. TEST COURSE:

   a. A test course shall be constructed in accordance with figure A-4 for part (a) of this test.
   b. A test course shall be constructed in accordance with figure A-2 for part b of this test.

2. TEST APPARATUS:

   a. Four MLRS pods.
   b. Two 8-foot by 8-foot by 20-foot ISO 1C containers.
   c. One 30 foot flatbed trailer.
   d. Linear measurement equipment.

3. TEST PROCEDURE:

   a. MLRS - productivity.

      (1) Start the test with the four MLRS pods stacked two high and two wide inside the trailer mounted container. The pods shall be situated so that the hoisting rod is 10 feet from the container door. Prepare the truck for MLRS handling by attaching the MLRS handling attachment if used. The installation shall be accomplished by one person without the use of special tools (if necessary, a separate forklift can be used). Note the times required for the installation.
      (2) Off load the MLRS pods from the trailer mounted container to the container on the ground. Note the time required to connect the MLRS lifting tool to the MLRS pods.
      (3) Move all four pods back to the trailer mounted container.
      (4) Steps (2) and (3) constitute one cycle. A cycle is completed each time the last pod is loaded into the trailer mounted container. When placing the last pod in a container, the lifting tool shall be completely disconnected from the pod and the boom fully retracted before beginning a new cycle.
      (5) 10 full cycles shall be completed without any damage to the pods.

   b. MLRS - dynamic stability.

      (1) Drive the forklift with the MLRS pod in MLRS carry position over the test course.
      (2) 25 full cycle shalls be completed on the test course without failure, damage or perment deformation to the forklift (including attachments) or the MLRS pod.

TEST METHOD NO. 35 (Cont'd)

c. MLRS - maneuverability.

(1) Pick up one MLRS pod using the MLRS handling attachment (if needed) and the lifting tool.
(2) Retract the boom until safety stop is activated. Note whether any portion of the truck (excluding fork carriage, MLRS handling attachment, and lifting tool) is in contact with the MLRS pod.
(3) Lower MLRS pod to the MLRS carry position and sideshift the MLRS pod to the extreme left position.
(4) Sideshift the MLRS pod to extreme right position. Measure the total amount of sideshift travel.
(5) Sideshift the MLRS pod to extreme left position. Measure the total amount of sideshift travel.

APPENDIX

TEST METHOD NO. 36

BOOM OVERLOAD STRENGTH

1. TEST COURSE:

The test course shall be a hard, level surface with provision for anchoring the forklift to prevent overturning.

2. TEST PROCEDURE:

a. Block the front axle of the forklift to prevent overloading the front tires.
b. Anchor the forklift to prevent tipping.
c. Measure the distance from the carriage pivot pin to a point on the level surface. Record this distance.
d. Place the rated capacity load at the specified load center on the forks with the forks level and the boom level. The load shall be placed on the forks so as to be accessible for removal by another lifting device.
e. Sideshift the rated capacity load to its maximum left position (load center shall be shifted a minimum of 5 inches left of center).
f. Extend the boom to maximum extension and then retract the boom to its fully retracted position.
g. Repeat f above 5 times.
h. Sideshift the rated capacity load to its maximum right position (load center shall be shifted a minimum of 5 inches to the right of center).
i. Repeat f and g above.
j. Extend boom to its maximum extension with rated capacity load on the forks and allow forklift to remain in this position for not less than 10 minutes.
k. With a suitable lifting device remove the load from the forks while forklift is still in the configuration of j above.
l. Measure the same points as measured in c above.

Note: Locking may be used on hydraulic cylinders to prevent drift of cylinders during this test.

APPENDIX

TEST METHOD NO. 37

PRODUCTIVITY TEST

1. TEST COURSE:

A test course shall be constructed in accordance with figure A-4.

2. TEST APPARATUS:

a. Thermocouple and potentiometer, or equivalent temperature measuring device.
b. 20 pallets of dummy 105 mm shells: 10 pallets in the 5 box high configuration and 10 pallets in the 4 box high configuration (see figure 6).
c. One 30 foot flatbed trailer.
d. Two 8-foot by 8-foot by 20-foot ISO 1C containers.
e. Two dunnage cribs (see figure A-5).

3. TEST PROCEDURE:

a. Block thermostat in the open position.
b. Install thermocouples in the hydraulic system reservoir near the pump inlet, in the transmission sump, in the transfer case sump, in the engine coolant outlet, in the torque converter outlet adjacent to the torque converter, and in the engine oil gallery. At each 30 hour interval measure the temperatures, including ambient, at successive hourly intervals for a period of 6 hours.
c. Start the test with the trailer mounted container fully loaded with the 20 pallets of the 105 mm shells and the two dunnage cribs (see figure A-6). The pallets of 105 mm shells shall be loaded with the 5 high pallets on the bottom and the 4 high pallets on the top. The container shall be secured to the trailer with the container doors located 5 feet from the rear of the trailer.
d. Offload pallets from the trailer mounted container to the container on the ground. Dunnage cribs may be replaced in the containers by hand with the assistance of someone besides the operator.
e. Move all pallets back to the trailer mounted container. The first pallet moved to the trailer mounted container shall not be the last pallet placed in the container on the ground.
f. Steps d and e constitute one cycle. A cycle is completed each time the last pallet is loaded into the trailer mounted container. In successive cycles, the first pallet moved to the container on the ground shall not be the last pallet placed in the trailer mounted container.
g. Run the forklift through the test course for the specified number of hours. Record the total number of cycles completed and the time for each cycle.

APPENDIX

TEST METHOD NO. 38

LIFTING TOOL OVERLOAD

1. TEST COURSE:

The test course shall be a flat, level surface with provisions for anchoring the forklift to prevent tipping and for blocking the front axle to prevent overloading the tires.

2. TEST APPARATUS:

a. Test loads or other apparatus to apply load to lifting tool when it is installed on the forklift.
b. Magnetic particle or dye penetrant capability.

3. TEST PROCEDURE:

a. Anchor the forklift to prevent tipping and block the front axle to prevent overloading the front tires. Install the lifting tool on the MLRS handling attachment (or forks, whichever is used for carrying MLRS pods). Extend the boom to MLRS carry position.
b. Apply two times the rated capacity load on the lifting tool and hold for five minutes.
c. Remove the load and examine the lifting tool and MLRS handling attachment for deformation, fractures, broken welds, or other damage.
d. Inspect areas of stress concentration on both the lifting tool and the MLRS handling attachment using the magnetic particle or dye penetrant method.

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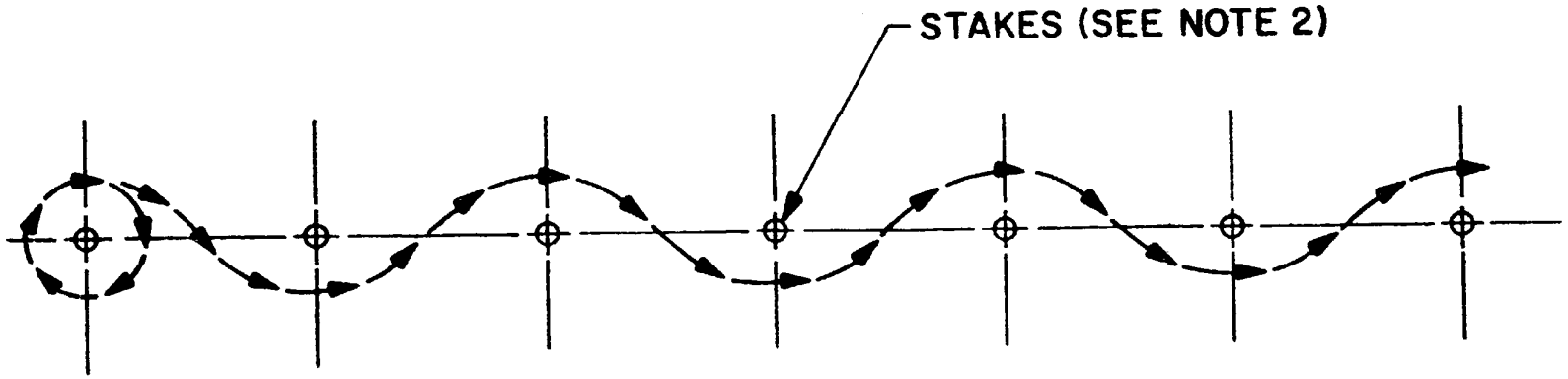


(SEE NOTE 1)

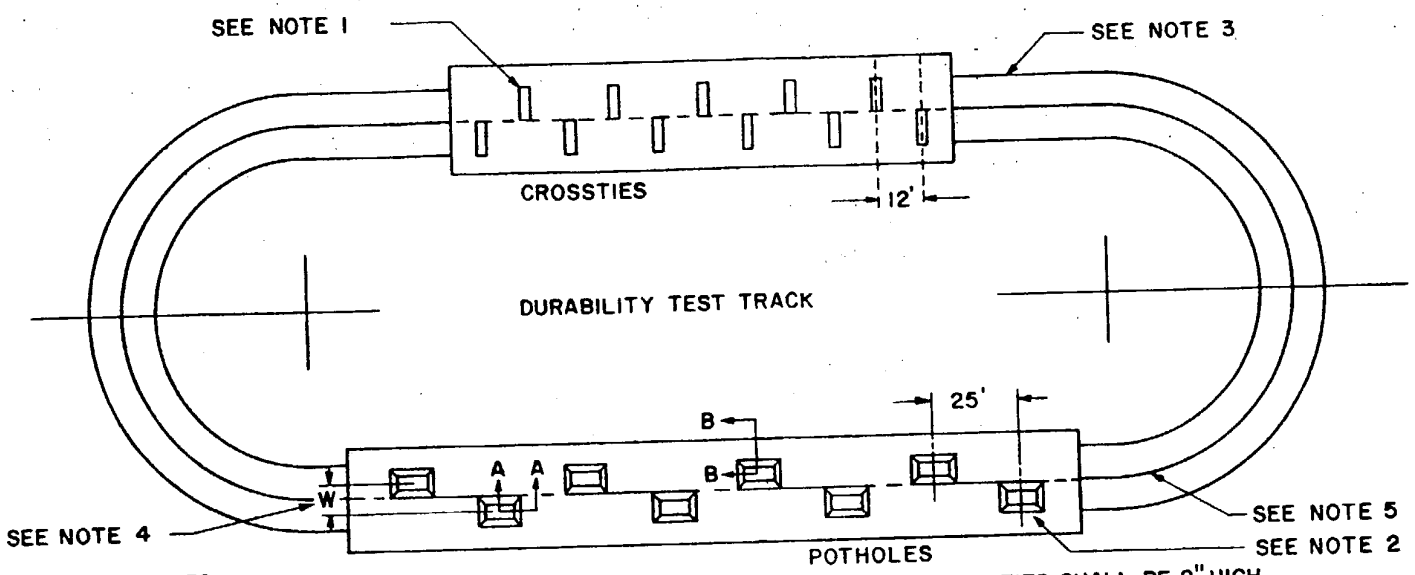
NOTES:

1. THE SPACE BETWEEN THE STAKES SHALL BE EQUAL TO TWO TIMES THE CURB CLEARANCE CIRCLE DIAMETER (SEE 3.9.8).
2. STAKES SHALL BE HIGH ENOUGH TO BE EASILY SEEN BY THE OPERATOR WHILE GOING THROUGH THE TEST COURSE.

FIGURE A-1.

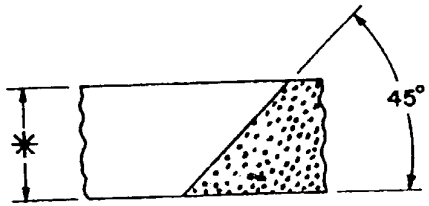
FIGURE A 1. Obstacle course steering test.

X-2983D

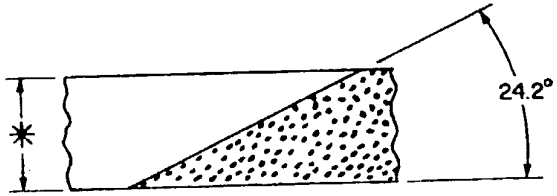


NOTES:
1. ELEVEN CROSSTIES, 6' LONG, ANCHORED TO PREVENT MOVEMENT. CROSSTIES SHALL BE 2" HIGH, 4" WIDE FOR FORKLIFTS UNDER 6000 LB. CAPACITY, 6" BY 6" FOR FORKLIFTS OF 6000 LB. AND OVER CAPACITY.
2. EIGHT CONCRETE POTHOLES 6' WIDE AND 8' LONG SUNK FLUSH WITH GROUND LEVEL.
3. STABILIZED SURFACE 15' WIDE MINIMUM, EACH END OF COURSE.
4. W WILL BE THE APPROXIMATE TREAD OF THE VEHICLE.
5. DISTANCE AROUND COURSE AT CENTERLINE IS 750 ± 30 FEET. THIS COURSE MAY BE CONSTRUCTED WITH CROSSTIE AND POTHOLE SECTIONS IN LINE, END TO END WITH TURN AROUND AT EACH END, PROVIDED TOTAL DISTANCE TRAVELLED IN ONE CYCLE IS 750 ± 30 FEET.

FORKLIFT CAPACITY	POTHOLE DEPTH (*)
UNDER 6000 LBS	4 INCHES
6000 LBS AND OVER	12 INCHES



SECTION A-A



SECTION B-B

FIGURE A-2. DURABILITY COURSE

X-2985

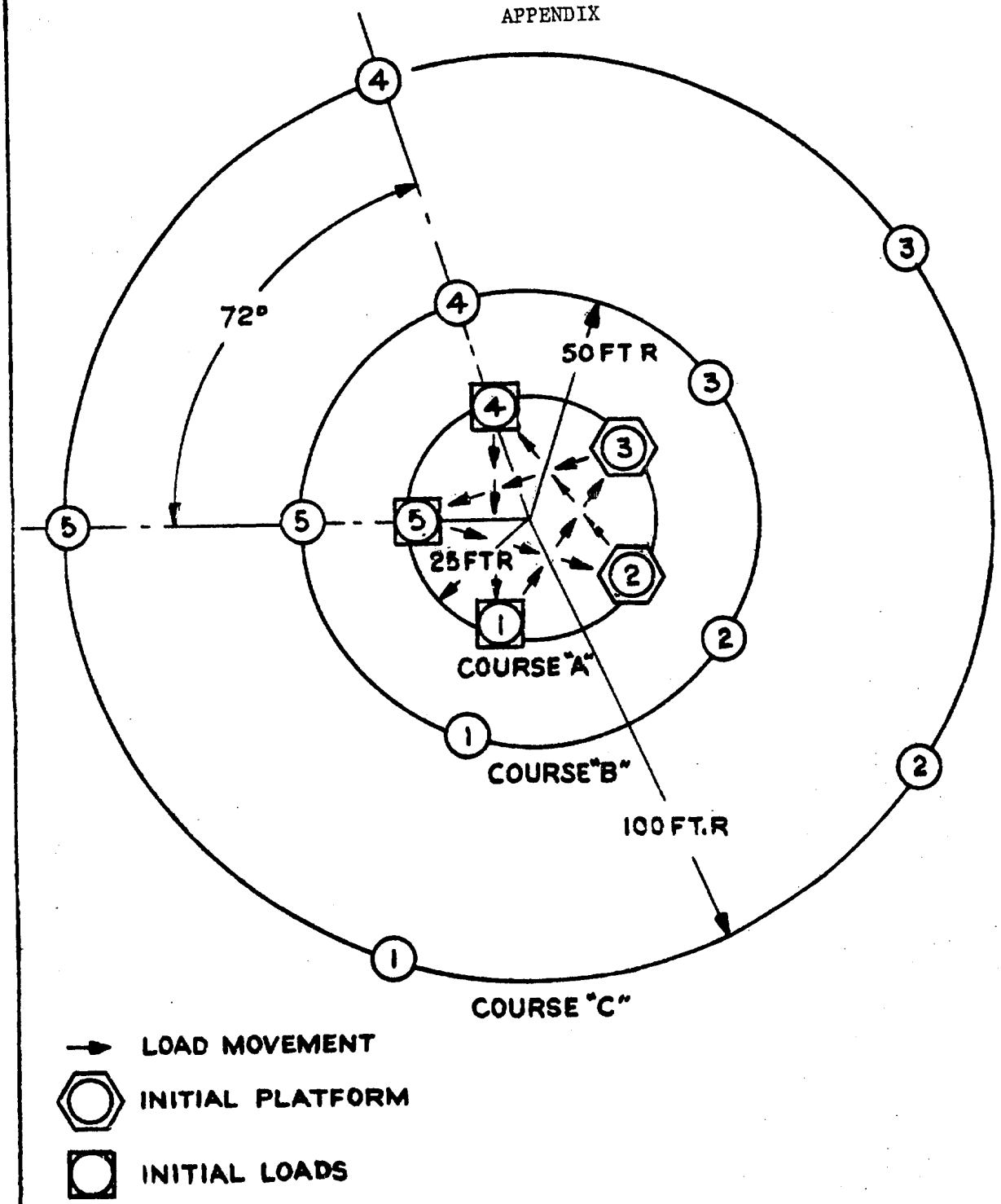


FIGURE A-3. LOAD PLACEMENT COURSE CX-368

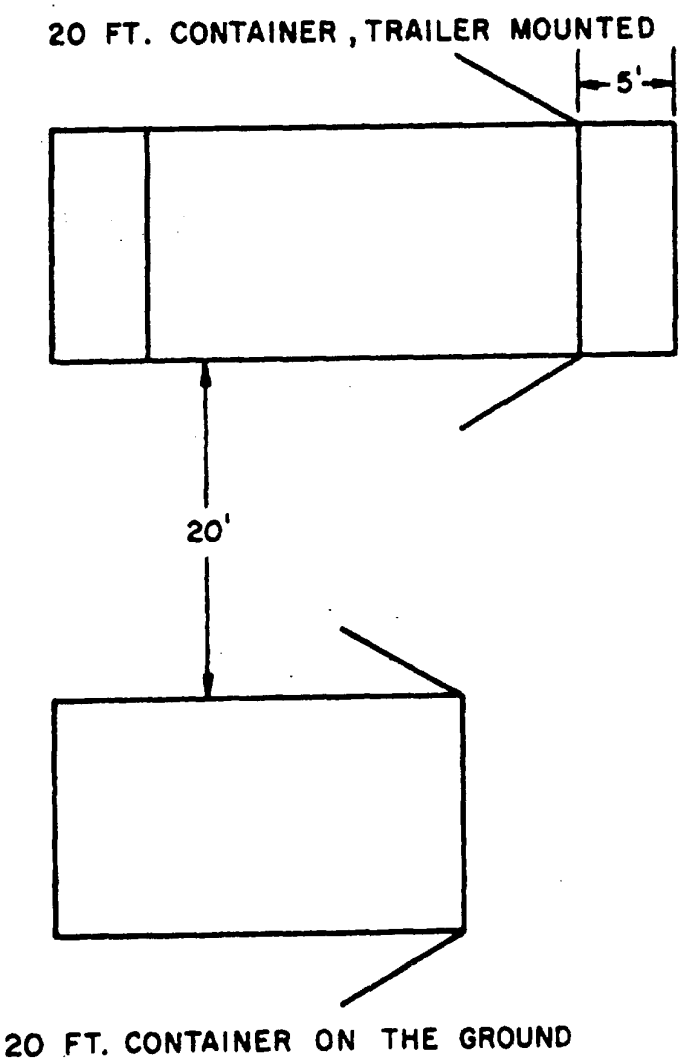


FIGURE A-4. Productivity test course.

X-4157

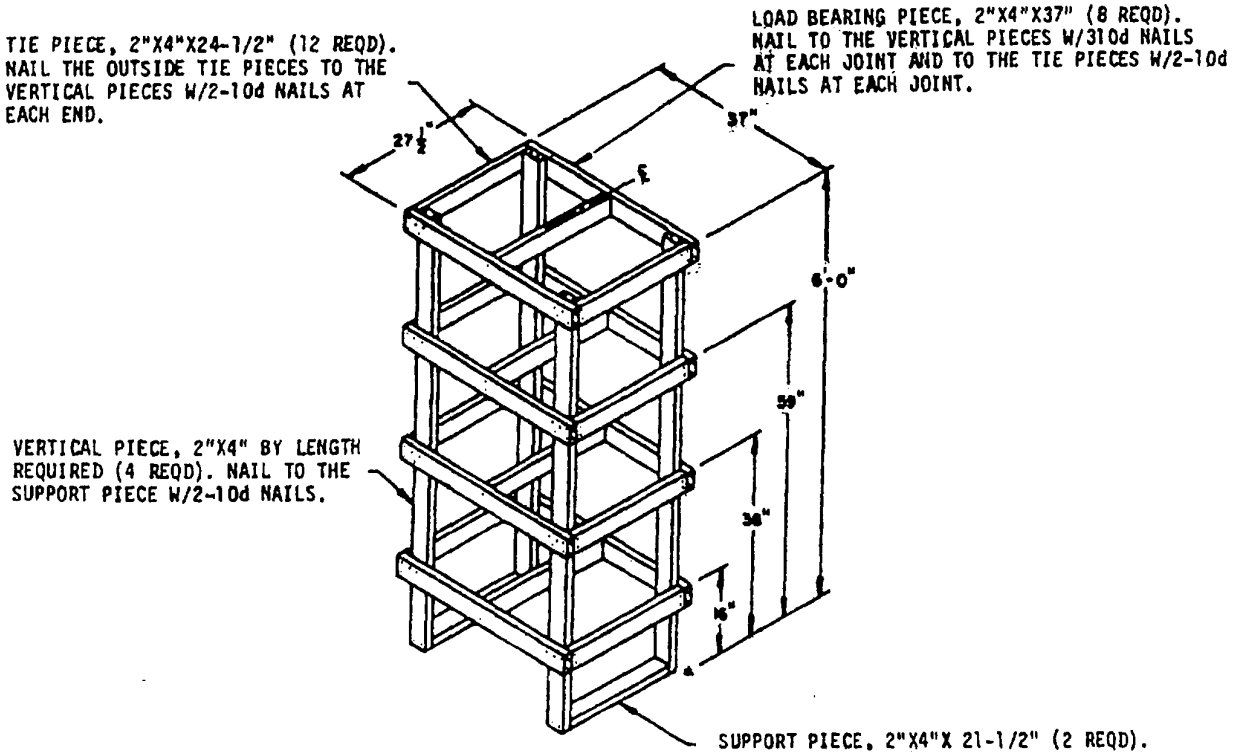


FIGURE A-5. Dunnage crib assembly.

X-4158

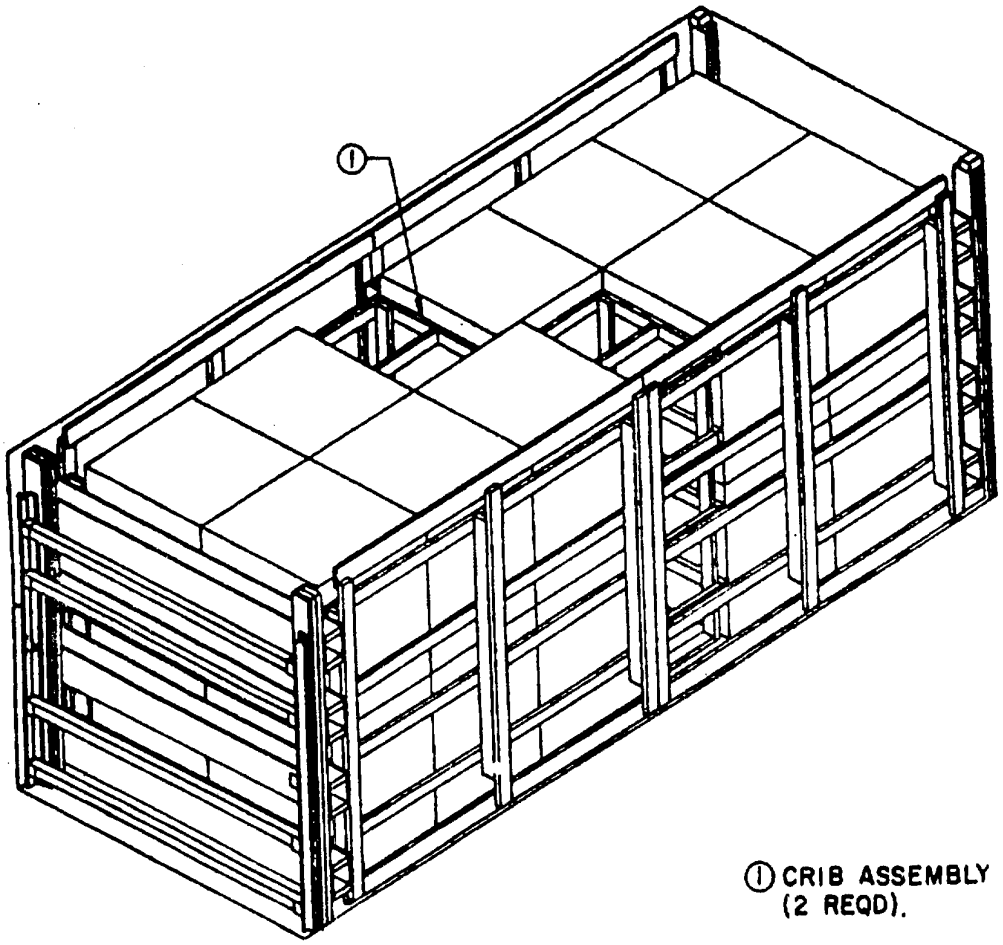


FIGURE A-6. Pallet and dunnage crib configuration inside a 20ft. container.

X-4159

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