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MIL-PRF-83812D

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SUPERSEDES

MIL-PRF-83812C

08 Aug 2006

## PERFORMANCE SPECIFICATION

### FORKLIFT, TRUCK, 10,000 AND 13,000 POUND CAPACITY, ADVERSE TERRAIN

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

#### 1. SCOPE.

1.1 Scope. This document covers a standard commercial, diesel-engine, four wheel drive, adverse terrain forklift truck, which is air-transportable in C-130, C-17 and C-5 aircraft. The truck will be used primarily to load and unload palletized cargo to and from military aircraft. It will also be used to handle loads of various sizes and weights, up to the rated load. The truck will operate on hard paved surfaces, soft soil, mud, snow, and sand, on level and hilly terrain.

1.2 Classification. The forklifts should be one of the following types as specified (see 6.2):

Type I - 10,000 pound capacity at 48 inch load center

Type II - 13,000 pound capacity at 54 inch load center

#### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

#### 2.2 Government documents.

Comments, suggestions, or questions on this document should be addressed to 642 BSG/GBEC, 460 Richard Ray Blvd, Suite 200, Robins AFB, GA 31098-1813. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <a href="https://assist.daps.dla.mil/">https://assist.daps.dla.mil/</a> .
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AMSC/ NA

FSC 3930

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2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## FEDERAL STANDARD

FED-STD-595/14052 Green, Gloss  
FED-STD-595/30313 Brown, Lusterless

## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	Identification Marking of US Military Property
MIL-STD-209	Lifting and Tiedown Provisions
MIL-STD-461	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1366	Transportability Criteria
MIL-STD-1472	Human Engineering

## DEPARTMENT OF DEFENSE SPECIFICATION

MIL-DTL-25959	Tiedown, Tensioners, Cargo, Aircraft
MIL-DTL-6458	Chain Assemblies, Single Leg, Aircraft Cargo Tiedown
MIL-DTL-83133	Turbine Fuel, Aviation, Kerosene Type, JP-8 (NATO F-34), NATO F-35, and JP-8+100 (NATO F-37)
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537

## COMMERCIAL ITEM DESCRIPTIONS

A-A-52557	Fuel Oil, Diesel; For Posts, Camps and Stations.
A-A-59295	Corrosion Preventative Compounds, Cold Application.

## DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-1791	Designing For Internal Aerial Delivery in Fixed Wing Aircraft.
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## NATO STANDARDIZATION AGREEMENT (STANAG)

STANAG 2828	Military Pallets, Packages, and Containers
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. (Copies of these documents are available online at [www.assist.daps.dla.mil/quicksearch/](http://www.assist.daps.dla.mil/quicksearch/) or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

AMERICAN WELDING SOCIETY (AWS)

AWS D14.1/D14.1M

(AWS documents may be obtained at [www.aws.org](http://www.aws.org) or from American Welding Society 550 N.W. LeJeune Rd., Miami, FL 33126)

INDUSTRIAL TRUCK STANDARDS DEVELOPMENT FOUNDATION (ITSDF)

ANSI/ITSDF B56.6-2005      Safety Standard for Rough Terrain Forklift Trucks

(ITSDF documents may be obtained at <http://www.itsdf.org/> or from Industrial Truck Standards Development Foundation, 1750 K Street NW, Suite 460, Washington DC 20009)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO 3471                      Earth-moving Machinery-Roll-Over Protective Structures,  
Laboratory Tests and Performance Requirements

(Electronic copies of this document are available from <http://www.iso.ch> or International Organization for Standardization, American National Standards Institute (ANSI), Inc., P.O. Box 2900, Fairfield, NJ 07007)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J98	Personnel Protection for General Purpose Industrial Machines
SAE J185	Access Systems for Off-Road Machines
SAE J386	Operator Restraint System for Off-Road Work Machines
SAE J1176	External Leakage Classifications for Hydraulic Systems

(SAE documents may be obtained at [www.sae.org](http://www.sae.org) or from Society of Automotive Engineers Inc., 400 Commonwealth Drive, Warrendale, PA 15096)

TIRE AND RIM ASSOCIATION, INC. (TRA)

Tire and Rim Association Yearbook

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(Application for copies should be addressed to the Tire and Rim Association, Inc., 175 Montrose West Ave. Suite 150, Copley, OH 44321)

UNDERWRITERS LABORATORIES INC.

UL 299 Dry Chemical Fire Extinguishers  
UL 711 Rating and Fire Testing of Fire Extinguishers

(UL documents may be obtained at <http://ulstandardsinfolnet.ul.com/catalog> or hardcopies and CD's can be found at COMM 2000 1414 Brook Drive, Downers Grove, IL 60515)

**2.4 Order of precedence.** Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specified exemption has been obtained.

### 3. REQUIREMENTS

**3.1 First article.** When specified (see 6.2), one forklift sample shall be subjected to first article inspection in accordance with 4.2.

**3.2 Forklift description.** The forklift shall be the supplier's standard, commercial, rigid or articulated frame forklift, or a front end loader modified with a forklift attachment in place of the scoop bucket. If the forklift is rigid frame type, it shall have operator selected 2-wheel/4-wheel crab steering, and operator selected 2-wheel/4-wheel drive. If the forklift is the articulated frame type, it shall have operator selected 2-wheel/4-wheel drive, except as noted (see 3.9.2). Whatever type is furnished, it shall meet all requirements specified in this document. The forklift shall be air transportable in C-130, C-17 and C-5 aircraft, as a reference only, refer to MIL-HDBK-1791. The forklift shall be equipped with, but not limited to, instruments, components and accessories that are standard on the commercial product, whether specified herein or not.

**3.3 Design and construction.** The forklift shall be designed and constructed so that no parts will work loose in service. They shall be built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation, and service. They shall be weatherproof and designed to prevent the intrusion of water and sand into critical operating components. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be in intimate contact with each other.

#### 3.3.1 Materials, protective coatings, and finish.

**3.3.1.1 Protective coatings.** Materials that deteriorate when exposed to sunlight, weather, or operational conditions normally encountered during the service life of the item shall not be used or shall have means of protection against such deterioration that does not prevent compliance with the performance requirements specified herein. Protective coatings that chip, crack, or scale

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with age or extremes of climatic conditions or when exposed to heat shall not be used. Fasteners, handles, and fittings used in the assembly of the item shall also be primed and painted.

3.3.1.2 Tropical rust proofing. When specified (see 6.2), tropical rust proofing shall be provided. This should be considered a premium rust proofing package usually consisting of an additional coating. The forklift shall be treated with a corrosion preventative compound complying with A-A-59295. Many of these vehicles are used in tropical/coastal environments and experience high humidity and salt spray. Therefore, they usually exhibit high levels of corrosion in the areas listed below. At a minimum, these areas shall be coated:

- a. Cab, interior
- b. Cab, exterior
- c. Seams
- d. Welds
- e. Hidden recessed areas
- f. Locations where dissimilar metals come in contact
- g. Area above fuel tank(s)
- h. Engine oil pan & transmission oil pan
- i. Radiator support structure
- j. Battery box

3.3.1.3 Preparation and primer. All surfaces normally painted by the forklift manufacturer shall be prepared and primed using procedures compatible with the final paint.

3.3.1.4 Finish. The exterior finish color of the forklift shall be a standard, commercially available, polyurethane, closest to gloss green color number 14052 of FED-STD-595. If the manufacturer has a process that is more durable than polyurethane top coat and is willing to certify the process for the warranty period, it is acceptable. When specified (see 6.2), the final paint shall be standard, commercially available, polyurethane, closest to no-gloss tan color number 30313 of FED-STD-595.

3.3.2 Markings. Markings must be made with paint. Markings for green forklifts shall be black paint, and tan forklifts shall be white paint. The following markings shall be applied in the indicated locations:

- a. Vehicle capacity (“10,000 POUNDS” for Type I or “13,000 POUNDS” for Type II) in

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1-1/2 inch high letters on the lifting arms, mast, or front of forklift

- b. "NO RIDERS" in 2 inch high letters on each side of forklift

### 3.3.3 Identification and information plates.

3.3.3.1 Identification plate. An identification plate in accordance with MIL-STD-130 shall be securely attached to the forklift in a readily accessible location. The identification plate shall contain the following information: nomenclature, make and model, manufacturer's serial number (VIN), registration number, asset NSN number, vehicle curb weight (lbs), maximum payload (lbs), gross vehicle weight (lbs), delivery date, manufacturer's name, Commercial and Government Entity (CAGE) code, date of warranty expiration, contract number, and "US Property".

3.3.3.2 Transportation data plate. A transportation data plate shall be securely attached to the forklift in a readily accessible location. The plate shall contain at least the following information:

- a. Side and rear silhouette views of the forklift
- b. Horizontal and vertical location of the center of gravity of the forklift in air transportable configuration, marked on the silhouette views
- c. Shipping weight (pounds)
- d. Loading cubage (inches<sup>3</sup>)
- e. Overall height, width, and length (inches)
- f. Front and rear axle loads (pounds)
- g. Tiedown information

3.3.3.3 Instruction plates. All warning and instruction plates normally installed by the forklift manufacturer, describing procedures or safety items shall be included.

3.3.4 Safety. The forklift shall conform to the applicable requirements of ANSI/ITSDF B56.6-2005, SAE J98, and OSHA standards in effect at the time of issue of the solicitation. All surface areas subject to personnel standing or walking shall have a nonskid, tread-plate, or expanded metal surface. A commercial fire extinguisher shall be mounted on the forklift in an easily accessible location. The fire extinguisher shall be a minimum 2-1/2 pound capacity ABC type, or equivalent. The fire extinguisher shall be UL299 listed and UL711 tested.

3.3.4.1 Component protection. All space in which work is performed during operation, service, and maintenance shall be free of hazardous protrusions, sharp edges, or other features which may cause injury to personnel. All rotating and reciprocating parts and all parts subject to high operational temperatures or subject to being electrically energized, that are of such nature or so located as to be hazardous to personnel, shall be guarded or insulated to eliminate the hazard.

3.3.4.2 Foreign object damage (FOD). All loose metal parts, such as pins or connector covers, shall be securely attached to the forklift with wire ropes or chains. "Dog tag" style beaded chains

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shall not be provided. Removable panels, if provided, shall be attached with captive fasteners. Tire valve stem caps shall be made of plastic.

### 3.3.4.3 Seatbelts and operator's restraint.

3.3.4.3.1 Seat belt. An operator's seat belt with a retractor shall be installed. The seat belt must conform to SAE J386, Type One. However, the installation of a lap belt alone will not be considered as adequate occupant restraint.

3.3.4.3.2 Additional restraint. Additional restraint devices designed to ensure the operator's body remains entirely within the protection of the frame and overhead guard in the event of tip over will also be provided. The restraint system shall not interfere with operator access or mobility, or the vehicles operation. (That is special seat, shoulder belt, etc.)

3.3.4.3.3 Decal. A warning decal shall be provided advising of the hazards of tip over and the importance of using the restraint system.

3.3.4.4 Sound levels. The sound level measured at the operator's station should not exceed 84 dB(A). If the sound level is above 84 dB(A), the contractor shall provide a hazardous noise warning plate stating that operator's hearing protection is required when operating this forklift. The plate shall be made of a corrosion resistant material and shall be at least 4.0 square inches. It shall have black lettering on a yellow background and shall be located to be visible as the operator enters the cab, or is seated. Sound level shall not exceed 93 dB(A).

3.3.5 Electromagnetic interference (EMI). The forklift shall be in accordance with the following radiated emission and susceptibility requirements of MIL-STD-461: RE102 and RS103.

3.3.6 Human engineering. The forklift shall be designed in accordance with MIL-STD-1472 for ease of operation, inspection, and maintenance, including the use of arctic mittens and Mission-Oriented Protective Posture (MOPP) Level 4 Chemical Warfare Gear.

3.3.7 Fastening devices. All screws, bolts, nuts, pins, and other fastening devices shall be properly designed, manufactured, and installed with adequate means of preventing loss of torque or adjustment. Cotter pins lock washers, or nylon patches shall not be used for this purpose, except for the attachment of trim items or as provided in commercial components. Tapped threads shall have a minimum thread engagement in accordance with TABLE I.

TABLE I. Minimum thread engagement.

<b>Material</b>	<b>Minimum Thread Engagement</b>
Steel	1.0 times the nominal fastener diameter
Cast iron, brass, or bronze	1.5 times the nominal fastener diameter
Aluminum, zinc, or plastic	2.0 times the nominal fastener diameter

3.3.8 Welders and welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface parts to be welded shall be free from rust, scale, paint,

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grease, and other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the welded parts. Welds shall transmit stress without cracking or permanent distortion when the parts connected by the welds are subjected to test, proof, and service loadings.

**3.3.9 Design.** The forklift shall be designed for safe operation with the rated load capacity (see 3.3.9.1) at all lift heights, fork tilt and fork positions that the forklift is capable of achieving. The forklift shall be designed for a safety factor (based on material yield strength) of at least three times the test load (see 3.3.9.2).

**3.3.9.1 Rated load.** The rated load capacity for the Type I shall be 10,000 pounds at a horizontal and vertical load center of 48 inches. The rated load capacity for the Type II shall be 13,000 pounds at 54 inch horizontal load center, and 48 inch vertical load center.

**3.3.9.2 Test load.** The test load capacity for the Type I shall be 5,000 pounds at a horizontal and vertical load center of 48 inches. The test load capacity for the Type II shall be 6,500 pounds at 54 inch horizontal load center, and 48 inch vertical load center.

**3.3.9.3 Load center.** The horizontal load center is defined as the horizontal distance from the load carrying surface of the load backrest to the center of gravity of the load. The vertical load center is the vertical distance from the upper (load carrying) surfaces of the forks to the center of gravity of the load.

**3.3.9.4 Fork spacing and side shift.** The forks shall be capable of being adjusted laterally by hydraulic power, and meeting the requirements of 3.8.15. Rigid frame type forklifts only shall be capable of side shifting the forks by hydraulic power and meeting the requirements of 3.8.16.

**3.3.9.5 Load backrest.** A metal backrest shall be provided, either as an integral part of the fork carriage, or as a removable part thereof. The top of the backrest shall be 44 to 56 inches above the horizontal load carrying surfaces of the forks. The lowest portion of the backrest shall be from 1.0 to 10.0 inches above the top surfaces of the forks. Two ring type devices to restrain the load shall be located on the load backrest at 30.0 inches  $\pm$  4.0 inches above the load carrying surfaces of the forks. The devices shall have a minimum inside diameter of 2.0 inches, and made of a material not more than 0.75 inches thick. The devices shall have a safety factor of at least 3 when a forward horizontal load, equal to the rated load, is equally applied to both devices. Location of the devices shall not interfere with positioning the load against the backrest.

**3.3.9.6 Fork back-guard.** A removable fork back-guard shall be installed above the load backrest (see 3.3.9.5) to prevent small containers from falling rearward off the forks. The guard shall not obstruct operator view. Its height shall be such that the total height of the load backrest and the fork back-guard shall be 80.0 to 82.0 inches when measured from the ground.

**3.3.9.7 Instruments.** In addition to the instruments supplied on the standard commercial forklift, an hour meter shall be installed in the instrument panel. When specified (see 6.2), the forklift shall be equipped with an inclinometer. All instruments, except the hour meter shall be lighted when the front floodlights (see 3.10.2) are illuminated.



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3.3.9.8 Service brakes. Full air, air-over-hydraulic, or hydraulic-over-hydraulic type, foot controlled, all-wheel, service brakes shall be provided.

3.3.9.9 Parking brake. The parking brake actuation shall be independent from the service brakes. The control shall be located within reach of the seated operator and in a position to permit easy and safe movement on and off the vehicle.

3.3.9.10 Steering. The forklift shall have power steering. In the event of a power failure the forklift shall be equipped with an emergency power steering mechanism (mechanical or electrical) conforming to SAE J1511. This supplement power steering mechanism shall allow the vehicle to be controlled while moving.

3.3.9.11 Load handling controls. All load motion controls shall be right hand operation and shall be of the self-centering type, i.e. controls shall return to the neutral position when released.

3.3.9.12 Cab. The forklift shall be equipped with an enclosed cab that shall incorporate the overhead protection requirements of ANSI/ITSDF B56.6-2005, and roll over protective structure (ROPS) requirements of ISO 3471. There shall be a door on each side; or one door and one side, front, or rear window that meets the emergency exit requirements of SAE J185. There shall be at least two windows, one on each side, which can be opened for ventilation. The doors and windows shall be capable of securely locking in both the closed and open positions. A minimum clearance of 39 inches from seat to underside of cab, when measured in accordance with ANSI/ITSDF B56.6-2005 shall be provided. The cab shall be equipped with an internal rear view mirror. When specified (see 6.2), the forklift shall be equipped with any of the following options. These options shall not interfere with the requirements in ANSI/ITSDF B56.6-2005:

- a. Cab air conditioning
- b. Rear window sunscreen
- c. Front sun visor
- d. external rear view mirrors

3.3.9.12.1 Removable cab. If the cab must be removed to meet air transportability requirements, a cab lifting device shall be provided. Any electrical connection that must be separated for cab removal shall be the quick-disconnect type. The cab lifting device shall be capable of being securely stored on the forklift when not in use. It shall be capable of lowering and raising the cab from the installed position to and from ground level.

3.3.9.12.2 Adjustable cab. If the vehicle is designed to operate with the cab in only one position, the ROPS/FOPS is only required in that position. If the vehicle is designed to operate with the cab in each discrete position, the ROPS/FOPS are required in each discrete position.

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3.3.9.13 Heater and defroster. The heater and defroster normally provided on the contractor's standard, commercial model shall be provided.

3.3.9.14 Towing hitch. A pintle type, towing hitch shall be installed at the center rear of the forklift, with the center of the hitch opening 22 to 30 inches above ground level. The pintle shall be capable of sustaining a rearward, horizontal force of at least three times the gross vehicle weight (GVW) of the forklift. The pintle type, towing hitch shall be designated as a retrieval device only, either by marking on the forklift or in the operator's manual.

3.3.9.15 Towing lugs. Two lugs, one on each side of the towing hitch, used for towing or securing safety chains shall be installed. The lugs shall be of sufficient diameter to accept common chains and hooks three inches in diameter and capable of sustaining a rearward, horizontal force of at least three times the GVW of the forklift for a maximum of 500 feet.

3.3.9.16 Tires. The tires shall be pneumatic, with an off-road tread pattern. Tire loading shall not exceed the tire load limits specified in Tire and Rim Association Yearbook when using the off the road 5 MPH tables. When specified (see 6.2), the manufacturer shall provide a balanced wheel and tire assembly.

3.3.9.17 Horn. The manufacturer's standard horn shall be provided.

3.3.9.18 Conveyorized fork attachment. The forklift shall be equipped with two conveyorized fork attachments (one for each fork) to be used for the transfer of a loaded 88 inch wide by 108 inch Air Force HCU-6E aluminum pallets; 10,000 pounds for Type I and 13,000 pounds for Type II. The pallets shall be picked up with the 108 inch dimension lateral to the forks (perpendicular to centerline of forklift). The following features shall be included:

- a. Each conveyor shall securely attach to each fork and shall remain securely attached during all pallet loading and unloading operations.
- b. Each conveyor shall have two rows of rollers (one row on each side of the fork tine).
- c. The rollers shall be sized, located, and spaced so that the conveyor provides lateral and longitudinal support to the pallet described in (see 3.3.9.18), without pallet damage or excessive wear, during loading and unloading.
- d. Each conveyor roller shall be of adequate diameter, width, and wall thickness to support the transfer of the loaded pallet specified in (see 3.3.9.18).
- e. A quick attach/detach reversible, dual purpose "toe" shall be incorporated on the leading edge of each unit between the longitudinal rows of rollers. The one edge of the "toe", when exposed for use, shall provide a nonmetallic bumper to prevent metal contact with the aircraft. The other edge of the "toe", when exposed for use, shall provide a wedge, equipped with varying diameter rollers, to permit sliding of the conveyorized forks beneath a loaded pallet resting on the ground.

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- f. An area on the forklift shall be provided to store the conveyORIZED attachments.

3.3.9.19 Parking block. The forklift shall be equipped with the means of securing four parking blocks. The blocks should be easily accessible. The dimensions of each block are 5.50 X 7.50 X 20.00 inches (see Figure 3).

3.3.9.20 Air compressor. When specified (see 6.2), the forklift shall be equipped with an auxiliary air compressor equal to or better than the electrical air compressor from Gast Manufacturing Co., Model 3HBB-19-M323 (see link listed below). The compressor shall be equipped with a universal air coupler.

<http://www.gastmfg.com/pdf/piston/specsht/3h31.pdf>

3.3.9.21 NATO plug. The forklift shall be equipped with a NATO Plug equivalent to NSN 5935-01-044-8382.

3.3.9.22 Crew protection kit (CPK). When specified (see 6.2), the Crew Protection Kit (CPK) conformance testing shall be completed. When specified (see 6.2), the manufacturer shall provide a field installed CPK in container. When specified (see 6.2), the manufacturer shall install the field installed CPK on the forklift prior to delivery.

3.3.9.22.1 CPK description. The CPK will provide protection against direct small arms fire and improvised explosive devices (IED). The CPK shall not only protect from the direct and indirect fire but also include protection from secondary projectiles. The CPK consists of all items that remain on the machine in all configurations, the part removed for transport configurations and any forklift modifications required to accept the armor package (e.g. armored floor panel, suspension and tire changes due to the increased weight of the armor kit, etc.). To facilitate the removal and installation of the CPK for transport configuration, electrical connections that must be separated for cab removal shall be the quick-disconnect type.

3.3.9.22.1.1 CPK armor. The armor CPK shall be easily installed and maximize commonality of attaching hardware with no special tools required for maintenance. Operator's visibility shall not be impeded to the point of not being able to safely operate the forklift. The left hand door shall have a combat lock to provide security for the operator. Means shall be provided to prevent accidental closure when parked on an incline thereby reducing the risk of injury to personnel. Operation of the egress shall be capable of being accomplished internally by the driver or externally by rescue personnel without tools. However, the use of a wrench to unlock the combat lock shall be the same combat rescue wrench use for the other armored vehicles (e.g. HMMWV, Material Handling Equipment and Construction Equipment). The CPK shall be equipped with a heater, air conditioner, two exterior mirrors and rear camera.

3.3.9.22.1.2 CPK emergency egress. The CPK shall be equipped with a separate emergency egress. The emergency egress shall allow escape in the event that the cab door is inaccessible or inoperable. The emergency egress shall be operable from the interior without the use of tools. An override shall be provided so that emergency personnel outside the cab can open the emergency egress. The override shall consist of square headed shafts that have 5/8-inch across

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flats dimension, which when rotated from the outside, will allow the emergency egress to be opened. A roof emergency egress hatch shall provide a round opening of not less than 28" in diameter.

**3.3.9.22.2 CPK armor EPA exemption.** Pollution control technologies that are affected by the sulfur level of JP-8 fuel either in maintenance or life expectancy shall not be used, e.g., Exhaust Gas Recirculation (EGR), NOx traps, catalytic converters, etc. The forklift is not subject to EPA nonroad emissions standards since the forklift contains permanent revisions for the application of Armor. This determination is in accordance with 40CFR, sections 89.908 and 1068.225. The contractor shall ensure National Security Exemption labeling requirements are met in accordance with EPA regulations.

**3.3.9.22.3 Forklift performance with CPK.** Some degradation in machine performance is allowed when the CPK is installed. With the CPK installed, the "lateral stability travel" stability requirement of ANSI/ITSDF B56.6-2005 for fixed boom length forklifts is reduced. A side slope inclinometer indicating the reduced slope operational limit shall be installed inside the CPK clearly visible to the operator. Some restrictions in visibility are acceptable. Rear visibility is improved with the installed rear camera system. When the CPK is installed, the forklift must meet the testing requirements of roll over protective structure (ROPS) per ISO 3471 but will not be certified to ISO 3471. If the machine exceeds 126 in height with the CPK installed, the actual height will be noted on the CPK data plate.

**3.3.9.22.4 Removeable CPK.** If the CPK must be removed to meet transportability requirements, and a separate lifting asset is required to raise or lower the optional CPK. The lifting asset shall be provided by the manufacturer with the CPK, and the lifting capacity shall be the noted on the CPK data plate.

**3.3.9.22.5 CPK transportation and storage.** The CPK shall be delivered and stored in a container that is new, weatherproof, non-collapsible, lockable, repairable, and suitable for repeated use. The container shall be configured such that all components of the armor kit are protected during shipment, and to facilitate quick inventory of the contents. When the armor kit is installed on the forklift, the container shall store all items removed from the forklift to facilitate armor installation. The container shall have forklift pockets that conform to STANAG 2828 that allow the container to be fork lifted from all four sides. The containers shall be capable of being transported by military and commercial vehicles, trailers, trains, marine vessels, aircraft, dolly sets and shall withstand the impact forces encountered in shipment without damage or permanent deformation. The containers shall be capable of being transported by C-130, C-5, and C-17 with or without supporting equipment existing in the DoD system. The container shall be painted the same color as the armor kit contained within.

**3.3.9.22.6 CPK data plate.** There shall be a separate permanently installed, corrosion resistant, metal plate that shows the center of gravity location in the air-transport mode and tie-down instructions for all aircraft pertaining to this specification (see 1.1). The following information shall also be on the plate:

Vehicle curb weight of machine with CPK (lbs)

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Gross weight of Machine with CPK, max (lbs)  
 CPK Asset NSN Number  
 Machine height in operational mode  
 Lifting Capacity for CPK C-kit Removal

3.3.9.23 Aircraft loading fork attachment. The forklift shall be equipped with an aircraft loading fork attachment to be used for positioning fixed tongue, rolling stock of no more than 2 fixed axles, 2000 lbs tongue weight, and 10,000 lbs gross weight when measured with horizontal tongue.

3.3.9.23.1 Aircraft loading operations. Use of the aircraft loading attachment is limited to operations that support loading rolling stock into and out of cargo aircraft including but not limited to the C-5 and C-17. The aircraft loading ramp must be no steeper than the forward kneeled, aft ramp of the C-5 with a sufficient loading envelope to allow the forklift to enter the aircraft in operational mode, (see 3.6.1). Operations are limited to hard paved surfaces with level terrain with the forklift in first gear. The operator, without leaving his seat and while maintaining full control of the forklift, shall be able to see the pintle on the ALFA during all operations. The aircraft loading attachment shall be retained using MIL-DTL-25959 qualified tiedown adjusters and the associated MIL-DTL-6458 qualified chain connected to the aircraft loading fork attachment. The Aircraft Loading Fork Attachment must be removed to meet air-transport mode requirements (see 3.6.3.1). The aircraft loading fork attachment is not approved for any other operations. The following features shall be included:

- a. Two steel D-ring devices with a minimum inside diameter of 2.0 inches and not more than 0.75 inches thick allowing secure retention on the forks / fork carriage and to remain securely attached to the forklift during all aircraft loading operations. The devices shall have a safety factor of at least 2 when the rated load is equally applied to both devices.
- b. A pintle type, towing hitch shall be located at the center, end of the aircraft loading attachment opposite the fork insertion pockets.
- c. The aircraft loading attachment shall be of adequate length, width, height and strength to support aircraft loading operations as specified (see 3.3.9.23.1)
- d. Unless otherwise specified (see 6.2), the final paint (see 3.3.1.4) and markings (see 3.3.2) shall be consistent with the colors of the forklift on which the aircraft loading attachment is attached. The top of the aircraft loading attachment shall have "10,000 LBS" stenciled in 1-1/2 inch high letters with paint.
- e. Storage devices to allow the aircraft loading fork attachment to be stored on the forklift without modification to the forklift.

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3.3.9.24 Non-slip coating. Floor plates and step surfaces shall be coated with a non-slip coating compound, or be furnished with a non-slip metal or tread plate surface.

3.3.9.25 Backup alarm. An audible backup alarm shall be furnished. The alarm shall automatically activate when the transmission selector is placed in reverse. The backup alarm must conform to SAE J994.

### 3.4 Environmental conditions.

3.4.1 Operating temperature range. The forklift shall be capable of operating in ambient temperatures ranging from -25° F to +125° F. When specified (see 6.2), the forklift shall be furnished with type A winterization and shall be capable of operating in ambient temperatures ranging from -65° F to +125° F.

3.4.2 Storage temperature range. The forklift shall be capable of being stored in ambient temperatures ranging from -25° F to +125° F. When specified (see 6.2), the forklift shall be furnished with type A winterization and shall be capable of being stored in ambient temperatures ranging from -65° F to +140° F.

### 3.4.3 Winterization. (Minimum Requirements).

3.4.3.1 Type C winterization. The forklift, at a minimum, shall be furnished with Type C winterization that shall protect to -25° F and shall consist of the following:

3.4.3.1.1 Starting aid. Glow plug(s) or a measure shot ether injection system shall be furnished.

3.4.3.1.2 Cab. The cab shall meet the requirements of (see 3.3.9.12), and shall also contain thermal insulation, if necessary, to meet the heating requirements of (see 3.4.3.1.3).

3.4.3.1.3 Cab heater and defroster. The heater shall have sufficient capacity to maintain a temperature of at least +40° F at cab floor level in an ambient temperature of -20° F.

3.4.3.1.4 Anti-freeze engine. To protect the engine from freezing, the coolant system shall be protected to -25° F with antifreeze.

3.4.3.2 Type A winterization. When specified (see 6.2), the forklift shall be furnished with Type A winterization that shall protect to -65° F and shall consist of the following:

3.4.3.2.1 Power plant heaters. Engine coolant, engine oil and battery heaters shall be provided. All heaters shall operate on either (110 volts @ 60 Hz) or (220 volts @ 50 Hz) alternating current. A three wire, 25 feet long weatherproof cable of adequate capacity for all heaters being used simultaneously shall be provided. The cable shall be able to connect to NATO and American connectors. A stowage place shall be provided on the forklift to keep the cable when not in use. The heaters shall be as follows:

- a. The coolant heater shall be installed in the engine block or lower coolant inlet hose.

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- A coolant circulating pump, driven by a 110 volt or 220 volt alternating current motor shall be provided when a coolant inlet hose heater is furnished. The heater shall have adequate capacity to maintain engine coolant at a temperature of 10° F in an ambient temperature of -65° F. It shall be controlled to limit engine coolant to not more than 150° F.
- b. An engine oil heater with adequate capacity to maintain engine oil at a temperature of at least +10° F in an ambient temperature of -65° F shall be furnished. It shall be controlled to limit engine oil temperature to not more than 150° F.
  - c. A battery heater shall be provided. It shall have adequate capacity to maintain battery electrolyte at a temperature of at least +10° F in an ambient temperature of -65° F, and shall have a thermostat to limit temperature of the electrolyte to not more than +80° F.

3.4.3.2.2 Cab. The cab shall meet the requirements of (see 3.3.9.12), and shall also contain thermal insulation, if necessary, to meet the heating requirements of (see 3.4.3.2.3).

3.4.3.2.3 Heater and defroster. The heater shall be of sufficient capacity to maintain temperature of +40° F at cab floor level in an ambient temperature of -40° F.

3.4.3.2.4 Cold starting aid. A measured shot ether system or glow plug(s) shall be provided to assist in engine cold temperature starting.

3.4.3.2.5 Anti-freeze engine. To protect the engine from freezing, the coolant system shall be protected to -65° F with antifreeze.

#### 3.4.4 Precipitation.

3.4.4.1 Rain. The forklift shall be capable of storage and operation during rainfall of 5-inches per hour for three consecutive hours and 10-inches per hour for 10 consecutive minutes, with winds of up to 35 knots; and with 6-inches of rain per hour impinging on the forklift at angles from vertical to 45°.

3.4.4.2 Snow. The forklift shall be capable of storage and operation during accretion of wet snow up to 2-inches per hour for at least 12 hours.

3.4.4.3 Ice. The forklift shall be capable of storage and operation with ice accretion up to 1.5-inches on exposed horizontal surfaces. An operator may use an ice scraper for five minutes during the start-up process.

3.4.5 Solar radiation. The forklift shall not be adversely affected by full time exposure to solar radiation, such as those conditions encountered in desert environments.

3.4.6 Fungus. All materials used in the forklift shall be fungus resistant or shall be suitably treated to resist fungus. Materials treated for fungus resistance shall retain their original electronic and physical properties, shall not present toxic hazards, and treatment shall last for the



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entire service life of the part. The forklift shall be suitable for operation and storage in conditions encountered in a tropical environment.

3.4.7 Salt fog. The forklift shall be capable of storage and operation in high temperature, high humidity, salt laden, sea coast environments without damage or deterioration of performance.

3.4.8 Sand and dust. The forklift shall be capable of storage and operation during exposure to wind-blown sand or dust without damage or deterioration of performance.

### 3.5 Weight and dimensions.

3.5.1 Overall weight and dimensions. Overall forklift weight and dimensions shall not exceed:

Weight in air-transport mode	13,000 pounds on each axle.
Length, including forks	26.5 feet for Type I, 28.0 feet for Type II.
Width	102 inches.
Height in operational mode	126 inches.
Height in air-transport mode	102 inches.

3.5.2 Forks and fork carriage assembly. The forks and fork carriage shall have the following dimensions and restrictions:

Length of forks	72 ± 1 inches
Width of forks	8 inches (maximum)
Thickness of forks	2.5 inches maximum, except bend in forks heel may exceed 2.5 inches.
Fork tip thickness	0.5 inches (maximum)
Bottom taper of forks	30 inches (minimum), from tip of forks rearward
Fork carrier assembly width	Shall be less than the overall width of the forklift

### 3.6 Transportability.

3.6.1 Operational mode. The operational mode shall be as the forklift is configured to meet the performance requirements of this document, including cab and counterweights.

3.6.2 Surface transportability. The forklift shall be transportable via all modes of surface shipment (highway, rail, and water) in accordance with MIL-STD-1366, and shall be capable of withstanding the mechanical shock and vibration characteristics of highway, rail, and water transport, except that design for rail impact testing (see 5.2.5 of MIL-STD-1366) is not required.

3.6.3 Air transportability. The forklift shall be transportable on C-5, C-17, and C-130 aircraft. Design criteria can be found in MIL-HDBK-1791. In all air transport configurations, the forklift shall be capable of being restrained and withstanding, without loss of serviceability, 2.0 G up and 4.5 G down accelerations, and shall be capable of being restrained and withstanding, without loss of structural integrity, 3.0 G forward, 1.5 G aft, and 1.5 G lateral accelerations. The forklift shall be equipped with pressure relief devices or configured for air transport to prevent any part from



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becoming a projectile in the event of catastrophic loss of aircraft cabin pressure. The forklift shall drive on and off the aircraft, negotiating the required maximum ramp angles without shoring.

3.6.3.1 Air-transport mode. The air-transport mode shall be the fully operational forklift with only the following items removed, if necessary. To meet the air transportability requirements, refer to MIL-HDBK-1791 as a guide only:

- a. Cab (see 3.3.9.12)
- b. Conveyorized fork attachment (see 3.3.9.18)
- c. Counterweight(s) (see 3.6.3.6)
- d. Cab lifting device (see 3.3.9.12.1).
- e. Operator's seat may be removed or partially removed, but shall comply with requirements specified in (see 3.6.3.7)
- f. Crew Protection Kit (see 3.3.9.22)
- g. Aircraft loading fork attachment (see 3.3.9.23)

3.6.3.2 Shoring. The forklift shall be air transportable without shoring.

3.6.3.3 Axle weight. Axle weight shall not exceed 13,000 pounds.

3.6.3.4 Tire pressure. Tire pressure shall not exceed 100 pounds per square inch (psi) and shall not be reduced for air transport.

3.6.3.5 Conversion to and from air-transport mode. Conversion from operational to air-transport and from air-transport to operational mode shall take not more than 90 minutes each, using five people and only common hand tools (wrenches, screwdrivers, etc) with no damage to forklift or components. No other equipment or vehicle (cranes, other forklifts, etc) shall be required for the conversion to or from the air-transport mode. As a guide only refer to MIL-HDBK-1791.

3.6.3.6 Counterweight(s). If it is necessary to remove counterweight(s) to reduce the axle weights to 13,000 pounds, they shall be removed and installed by a furnished crane or hoist, and individual weights shall weigh not more than 900 pounds. Five men are the maximum number of personnel allowed to assist in the removal of the counterweight(s). Remember, safety should always be the top priority. An optional method shall be to remove and install the counterweights by a system on the forklift that uses its own power to lower and raise counterweight(s) to and from installed position, to and from ground level. In this case, the 900 pound maximum weight does not apply.

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3.6.3.7 Operation in air-transport mode. The operator must be able to drive the forklift onto and off of all aircraft listed (see 1.1) for this specification. This will require that the operator be at, or below, the height specified in (see 3.5.1) and still be able to safely control the forklift.

3.6.4 Tiedowns. The forklift shall be symmetrically restrained during air and ground transport. Tiedown points shall be rated at a minimum of 25,000 pounds, marked for capacity, marked as a "TIEDOWN" in paint in the color specified in 3.3.2, with a clear opening compatible with MIL-DTL-25959 tiedown devices. All tiedown points should be easily accessible and minimize the need to crawl under the vehicle when securing it. The tiedown points shall have a safety factor of 2.3, based on static load. Each end of each tiedown device shall terminate at a tiedown point and not pass through any other tiedown point. There shall be no interference between tiedown devices and the forklift. The tiedown provisions shall be in accordance with 4.1 through 4.12 of MIL-STD-209. There shall be a permanently installed, corrosion resistant, metal plate that shows the center of gravity location in the air-transport mode, and tie-down instructions for all aircraft pertaining to this specification (see 3.3.3.2). Refer to MIL-HDBK-1791 as a guide only.

3.6.5 Lifting provisions. The forklift shall be equipped with sufficient attachment points so located that it can be lifted by crane in its normal travel position. Each attachment point shall be marked "Lift Point" in painted letters in the color specified in 3.3.2. All lift points should be easily accessible and minimize the need to crawl under the vehicle when securing it. The lifting provisions shall be in accordance with 5.1 through 5.1.4 of MIL-STD-209.

3.7 Maintainability. The forklift shall be designed for maintainability in accordance with 5.9 through 5.9.18 of MIL-STD-1472; forces shall not exceed those specified for both males and females. The forklift shall be capable of being mechanically maintained by one person not to exceed 1 hour using common tools except where otherwise specified. The following items are provided as examples:

- a. Remove, replace and adjust all engine-driven belts - 3/4 hour.
- b. Remove and replace alternator - 3/4 hour.
- c. Remove and replace all hydraulic system filters, screens, and strainers - 1 hour.
- d. Remove and replace engine coolant system hoses - 1 hour.
- e. Drain engine oil, remove and replace engine oil filter, and refill crankcase - 1/2 hour.
- f. Remove and replace fuel filter elements - 1/2 hour.
- g. Remove, replace and connect battery - 1/2 hour.
- h. Drain transmission fluid, remove and replace all transmission filters and refill transmission in 1 hour.

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- 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 floodlights and taillight bulbs - 1/4 hour each bulb.
- l. Lubricate all lubrication fittings with 2 strokes per fitting - 1 hour.

3.7.1 Service. The following items shall be easily accessible for inspection and servicing with the engine at operating temperature, without subjecting personnel to injury or burns. The items shall be in a covered area(s) that can be accessed (opened and closed) by one person without the need for tools:

- a. Engine oil dipstick, oil filler, oil drain plug and fuel filter.
- b. Transmission fluid level indicator and filler tube.
- c. Radiator or engine coolant filler cap.
- d. Hydraulic fluid reservoir level indicator and filler.
- e. Battery for inspection, jumper cable attachment and removal.
- f. Power steering reservoir (if provided).

3.7.2 Special tools. The design of the item shall minimize the requirement for special tools (see 6.3.2). All special tools shall be provided with, and stored on, each forklift.

3.7.3 Diagnostic software. A copy of any diagnostic software required or recommended for maintaining the forklift shall be provided with each forklift on CD-ROM or DVD-ROM.

### 3.8 Performance.

3.8.1 Lifting speed. The forks with rated load shall be able to raise at a speed of not less than 40 feet per minute (fpm) over the entire distance from ground level to maximum lift height. With the engine idling at engine manufacturer's idle speed, the unloaded forks shall be able to raise at a speed of not less than 5 fpm over the entire lift range. Maximum fork lift speed for unloaded or rated load shall not exceed 60 fpm.

3.8.2 Lowering speed. The lowering speed of the forks with rated load shall be no less than 40 fpm (not to exceed 65 fpm). The lowering speed of the unloaded forks shall be no less than 20 fpm (not to exceed 65 fpm). The forks, either unloaded or with rated load, shall lower at a controlled rate, that is, no free-fall, uncontrolled operation, jerking, or condition which could cause damage to the lift system or forklift is permitted.

3.8.3 Travel speed. The travel speed with rated load shall be at least 15 miles per hour (mph) in

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forward direction, and not less than 9 mph in reverse.

3.8.4 Lift height. The lift height, with rated load on the forks and the forks horizontal, shall be not less than 75 inches when measured from ground to top surfaces of level forks.

3.8.5 Longitudinal slope operation. The forklift, with rated load, shall be capable of ascending and descending a 20% slope ( $11.3^\circ$ ) at a minimum of 2 mph when the load is in the uphill direction during both ascent and decent. It shall also be capable of accelerating upslope from a complete stop to at least 2 mph on a 20% slope ( $11.3^\circ$ ).

3.8.6 Lateral slope operation. With rated load on the forks, the forklift shall be capable of full circle operation, in both directions, at maximum steer angle, at a speed of not less than 2 mph, on a 15% slope ( $8.5^\circ$ ).

3.8.7 Drift. The lift assembly shall be capable of holding the rated load at maximum lift height for 60 minutes with not more than 0.5 inch of vertical drift, when the hydraulic fluid is initially at ambient temperature.

3.8.8 Turning radius. The maximum turning radius of the forklift, measured to outside of the tires, shall be 20 feet for the Type I, and 26 feet for the Type II.

3.8.9 Fork tilt. With no load on the forks, the minimum rearward tilt shall be  $20^\circ$ , and the minimum forward tilt shall be  $10^\circ$ . Tilting the forks from the maximum rearward tilt position to the horizontal position with rated load on the forks shall take at least 4 seconds.

3.8.10 Fork tine operation. As the forks are raised from the lowest position to maximum lift height, and lowered back to lowest position, the forks shall remain at their initial fork tilt ( $\pm 2^\circ$ ), with no change to the tilt control lever. The initial fork tilt can be any tilt that the forklift is capable of, not just horizontal. This applies to both forks, both empty and fully loaded.

3.8.11 Ground clearance. Ground clearance, with rated load on the forks, shall be a minimum 12 inches.

3.8.12 Stability. The forklift shall meet the “longitudinal stability stacking”, “longitudinal stability travel”, “lateral stability stacking”, and “lateral stability travel” stability requirements of ANSI/ITSDF B56.6-2005.

3.8.13 Service brakes. The service brakes shall stop the forklift with rated load, within the distance specified in the Stopping Distance Method of ANSI/ITSDF B56.6-2005, with not more than 80 pounds of force on the brake pedal. The service brakes shall meet the Drawbar Drag Method of ANSI/ITSDF B56.6-2005, except a drawbar drag equal to 25% of forklift gross weight shall be produced with not more than 80 pounds of force on the brake pedal.

3.8.14 Parking brake. The parking brake shall be capable of holding the fully loaded forklift, on a minimum 20% grade, in both up and down slope directions. The force required to fully set the parking brake shall be not more than 70 pounds, if hand actuate, or 150 pounds if foot activated.

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3.8.15 Fork lateral spacing. The forks shall be capable of spreading to at least 60 inches when measured between the centerline of the forks. They shall be capable of closing to not more than 18 inches, again measured between centerlines of the forks.

3.8.16 Fork side shifting. The forks on rigid frame type forklifts shall be capable of side shifting at least 4 inches off center, in both directions, throughout the fork spread specified in 3.8.15.

3.8.17 Fork visibility. The operator, without leaving his seat and while maintaining full control of the forklift, shall be able to see at least one fork tip at any fork height, fork tilt, or fork spacing when there is no load on the forks. In addition, the forklift shall meet the forklift visibility requirements shown in Figure 1. Using Figure 2 as an example, Figure 1 was based on the users need for improved visibility. Since every vehicle has different design configurations, generic drawings were required. The reference plane B should provide an unobstructed view. Note: Most manufacturers have a range of data points for the drivers' eye point. This is due to seat physical differences (5th percentile female through the 95th percentile male). It would be acceptable to show the "best" and the "worst" sight lines.

3.9 Engine and related equipment. The forklift shall be powered by a standard, commercial, diesel engine. Horsepower and torque shall be sufficient to provide the performance specified herein. The engine shall start within five minutes in any ambient temperature (and with the forklift initially stabilized at ambient temperature) from  $-25^{\circ}\text{F}$  to  $+125^{\circ}\text{F}$ . Glow plugs 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 vehicle may be used.

3.9.1 Fuel system.

3.9.1.1 Diesel fuel. The engine shall operate on diesel fuel in accordance with A-A-52557 without detrimental effects on the engine, or its performance.

3.9.1.2 Alternate fuel. Either the engine or forklift manufacturer shall certify that the engine is capable of operating on JP-8 conforming to MIL-DTL-83133 for 400 hours, during normal commercial or military situations, without detrimental effect on the engine. Some power loss is expected, but the forklift shall be able to perform normal operations. A certification letter should be included in the first article test report.

3.9.1.3 Fuel tank. The fuel tank shall be of sufficient capacity to allow a minimum 8 hours of continuous operation without refueling. The tank filler neck shall be designed to operate with an OPW ([www.opwglobal.com](http://www.opwglobal.com)) fuel nozzle model 295AF. The dimensions for the OPW 295AF are available on their web site, [https://www.opwglobal.com/product\\_detail.aspx?pid=181](https://www.opwglobal.com/product_detail.aspx?pid=181).

3.9.1.4 Drain plug. The fuel tank shall be equipped with a drain plug at the lowest point of the tank and located, or a drain line provided, so that any 5 gallon container (preferably a container that can be sealed) can be positioned to take the draining fuel. The drain plug shall be protected by its location or by a guard.

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**3.9.2 Power train.** The transmission shall be the full torque, power-shift type in combination with a torque converter. The transmission shall provide at least two forward and two reverse speeds. Selective forward and reverse directional controls activated by the operator's foot are not acceptable. The transmission shall provide for positive inching or declutch control throughout the entire engine rpm range, in both forward and reverse directions. The inching or declutch control shall permit lifting of rated load, at maximum engine speed, while the transmission is in a forward or reverse gear, with no vehicle motion. If the forklift is a rigid frame model it shall have operator selected 2-wheel/ 4-wheel drive. If the forklift is an articulated model, it shall have a rear axle disconnect unless there is negligible difference in the path of travel of the front and rear wheels while negotiating turns.

**3.9.3 Engine starting system.**

**3.9.3.1 Engine starting aids.** The engine shall start within 15 seconds cranking in any ambient temperature within the required operating range of the forklift. Internal engine starting aids, fluid starting aids, and heat from the winterization system (see 3.4.3) may be used prior to and during the start period to facilitate engine starting under the following conditions:

TABLE II. Engine starting aids.

Temperature Range	Starting Aids Permitted
0° F through 125° F	None
-25° F through 0° F	Glow plugs, fluid starting aids, and heat from the winterization system

**3.9.4 Engine lubrication system.** The engine lubrication system shall be designed so that the forklift can be operated on a 20% incline in any plane. Lubrication means shall be provided for all moving parts that require periodic lubrication. Grease lubrication fittings shall conform to SAE J534.

**3.9.5 Exhaust system.** The exhaust system shall be constructed of stainless steel. The muffler(s) shall be constructed of aluminized steel or stainless steel. Exhaust system outlet(s) shall be directed away from personnel accessing any control panel or equipment compartment and the engine air intake, and shall not be directed toward the ground. A means shall be furnished to prevent rain water intrusion into the exhaust system.

**3.10 Electrical system.** The electrical system shall consist of all electrical components necessary for operation of the forklift. The forklift shall have sufficient electrical grounding to prevent static discharge.

**3.10.1 Starter switch.** The starter switch shall not activate the engine starter while the engine is running, nor when the engine is not running and the transmission is in any forward or reverse gear.

**3.10.2 Lighting.** There shall be at least two forward and two rearward directed floodlights and at least one additional floodlight that is adjustable from the operator's compartment. Tail light(s), and brake stop light(s) shall be installed. All lights shall be protected by location or guards.

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Individual operator controlled switches shall be provided for the front lights, the rear lights, and the adjustable light. If a rotary switch provides all possible options that the individual switches provide, then the rotary switch is acceptable. When specified (see 6.2), the forklift shall be equipped with a rotating beacon light.

### 3.10.3 Batteries and battery compartment.

3.10.3.1 Batteries. Except when Type A Winterization is specified (see 3.4.3.2), batteries shall be of the commercial maintenance-free sealed lead acid, starved electrolyte, gas recombination, spiral wrapped, absorbent gas mat (AGM), top post type in accordance with MIL-B-18013/1.

3.10.3.2 Battery compartment. The batteries shall be enclosed in a corrosion-resistant, weatherproof box or compartment and shall be readily accessible.

3.10.3.3 Battery cables. The battery cables shall be sized to handle the system voltage and current levels, be clearly identified with "+" and "-" or red and black markings, and shall not be spliced.

3.10.4 Alternator. The alternator shall have sufficient output at normal engine operating RPM to supply full electrical operating load, including all lights, and still provide electrical current to charge the battery. When specified (see 6.2), the forklift shall be equipped with a heavy-duty alternator.

3.10.5 Master switch. A keyless master switch, with an identification plate, shall be installed in a convenient location to permit disconnect of the battery from all electrical load.

### 3.10.6 Wiring schematic.

3.10.6.1 Metal plate. A corrosion resistant metal plate containing the electrical schematic of the forklift shall be installed in an area where normal usage will cause it no damage. The plate may be located behind a panel that can be opened by hand.

3.10.6.2 Durable material. If the wiring schematic could be provided on a durable material, it would be acceptable to store it in the cab. For example: A book with hard plastic pages (tear resistant & smear resistant).

3.10.7 Electrical accessories wiring. When specified (see 6.2), the forklift shall be equipped with a 12V converter, an outlet, and all associated wiring.

3.10.8 Radio preparation package. When specified (see 6.2), the forklift shall be equipped with mounting hardware and all associated wiring necessary to install a radio.

3.11 Hydraulic system. The hydraulic system shall consist of all hydraulic components necessary for operation of the forklift, including a filter. All hydraulic hoses shall have a working pressure equal to or greater than the hydraulic system maximum relief valve setting.



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The hydraulic fluid fill point shall be properly labeled. The hydraulic fluid shall comply with the requirements of MIL-PRF-83282.

3.11.1 Hydraulic reservoir. The hydraulic reservoir filler shall be of sufficient inside diameter to accept a filler tube of at least 1.56 inches outside diameter.

3.11.2 Fail-safe hydraulic lift system. The forklift shall be equipped with a fail-safe hydraulic lift system which will automatically prevent load lowering and fork forward tilting in the event of electrical, hydraulic or pneumatic failure; hydraulic or pneumatic failure includes any component, line or hose. Check valves have been used in the past to prevent load lowering. Pressure relief valves or regulators shall be provided in the hydraulic and pneumatic systems to prevent overpressure. In addition, a means shall be provided to manually override the system to allow safe and slow lowering (not more than 10 feet per minute) of loaded or unloaded forks.

3.11.3 Hydraulic schematic.

3.11.3.1 Metal Plate. A corrosion resistant plate containing the hydraulic schematic of the forklift shall be permanently installed in an area where normal usage will cause it no damage. The plate may be located behind a panel that can be opened by hand.

3.11.3.2 Durable Material. If the hydraulic schematic could be provided on a durable material, it would be acceptable to store it in the cab. For example: A book with hard plastic pages (tear resistant & smear resistant).

3.12 Workmanship. The forklift, including all parts and accessories, shall be constructed and finished in a thoroughly workmanlike manner. Workmanship objectives shall include freedom from blemishes, defects, burrs and sharp corners and edges; accuracy of dimensions, surface finish, and radii of fillets; thoroughness of welding, painting, and riveting; marking of parts and assemblies; and proper alignment of parts and tightness of assembly fasteners. The workmanship shall be high quality when compared to industry standards. All welds shall be smooth and continuous. The contractor's welders and procedures shall be qualified to meet the applicable welding codes of American Welding Society (AWS), especially AWS D14.1/D14.1M, or American Society of Mechanical Engineers (ASME).

3.12.1 Bolted connections. Bolt holes shall be accurately punched or drilled and shall be deburred. Threaded fasteners shall be tight and shall not work loose during testing or service usage.

3.12.2 Riveted connections. Rivet holes shall be accurately punched or drilled and shall be deburred. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the component.

3.12.3 Gear and lever assemblies. Gear and lever assemblies shall be properly aligned and meshed and shall be operable without interference, tight spots, loose spots, or other irregularities. Where required for accurate adjustment, gear assemblies shall be free of excessive backlash.



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3.12.4 Cleaning. The forklift shall be thoroughly cleaned. Loose, spattered, or excess solder; welding slag; stray bolts, nuts, and washers; rust; metal particles; pipe compound; and other foreign matter shall be removed during and after final assembly.

#### 4. VERIFICATION

The products provided shall meet the salient characteristics of this specification, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The Government reserves the right to require proof of such conformance.

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

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 First article inspection. The first article forklift shall be subjected to the analyses, demonstrations, examinations, and tests described in 4.5.1 through 4.5.31. The contractor shall provide or arrange for all test equipment and facilities. The forklift shall be a pre-production unit that shall be identical to all forklifts produced on this contract. If the contractor determines it is necessary to make configuration changes during production, pre-approval must be obtained from WR-ALC. All testing shall be observed and approved by Government representatives. The approved first article forklift shall be refurbished to a like new condition and delivered as soon as possible.

4.2.1 First article report. The first article inspection report shall include a detailed description of the inspection (see 4.2). All deficiencies encountered and actions taken to correct the deficiencies shall be included in the report. Approval of the first article test report shall not relieve the contractor of their responsibility to furnish forklifts that meet the requirements of this document.

4.3 Conformance inspection. Each production forklift shall be subjected to the examination described in 4.5.1.

4.4 Inspection requirements.

4.4.1 General inspection requirements. Apparatus used in conjunction with the inspections specified herein shall be laboratory precision type, calibrated at proper intervals to ensure laboratory accuracy.

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4.4.2 Data. During all testing specified herein, at least the following data, unless not applicable, shall be recorded at intervals not to exceed 30 minutes. Additional data or shorter intervals shall be provided as appropriate for any specific test.

- a. Date.
- b. Time started.
- c. Time finished.
- d. Ambient temperature.
- e. Ambient humidity.

4.4.3 Test rejection criteria. Throughout all tests specified herein, the forklift shall be closely observed for the following conditions, which shall be cause for rejection:

- a. Failure to conform to design or performance requirements specified herein or in the contractor's technical proposal.
- b. Leakage of water, transmission fluid, engine oil, fuel, lubrications, hydraulic fluid, etc, in excess of Class 3, for dust free conditions and Class 3D for dusty conditions in accordance with SAE J1176.
- c. Structural failure of any component, including permanent deformation, or evidence of impending failure.
- d. Evidence of excessive wear, galling, gouging, or other material removal. If excessive wear is suspected, the original equipment manufacturer's (OEM's) specifications or tolerances shall be utilized for making a determination.
- e. Interference between the forklift components or between the forklift, the ground, and all required obstacles, with the exception of normal contact by the tires.
- f. Misalignment of components.
- g. Evidence of undesirable roadability characteristics, including instability in handling during cornering, braking, and while traversing all required terrain.
- h. Conditions that present a safety hazard to personnel during operation, servicing, or maintenance.
- i. Evidence of corrosion or deterioration.

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- j. Malfunctions, including over-heating, binding, jerking, or uneven operation of any component or system.
- k. Any wearing, galling, gouging or other material removal.
- l. Any unsafe operation that jeopardizes the operator or forklift.

4.5 Test methods.

4.5.1 Examination of product. Each forklift shall be examined to verify compliance with the requirements herein prior to accomplishing any other demonstrations or tests listed in 4.5. A contractor-generated, Government-approved checklist shall be used to identify each requirement not verified by an analysis, certification, demonstration, or test, and shall be used to document the examination results. Particular attention shall be given to materials, workmanship, dimensions, surface finishes, protective coatings and sealants and their application, welding, fastening, and markings. Proper operation of each function shall be verified. Certifications and analyses shall be provided in accordance with TABLE III. Each production forklift shall be inspected to a Government-approved reduced version of the checklist.

TABLE III. Certifications and analyses.

<b>Paragraph</b>	<b>Required Certifications and Analyses</b>
3.4.4.2 <u>Snow.</u>	Contractor analysis of the snow load requirement (see 4.5.4.3.2).
3.4.5 <u>Solar radiation.</u>	Contractor certification that the forklift performance is not adversely affected by full time exposure to solar radiation, such as those conditions encountered in desert environments.
3.4.6 <u>Fungus.</u>	Contractor certification that the materials used in construction of the forklift are fungus resistant or suitably treated to resist fungus.
3.6.2 <u>Surface transportability.</u>	Contractor surface transportability analysis (see 4.5.6.1.1) and certification that the forklift is transportable via all modes of surface shipment (highway, rail, and water) in accordance with MIL-STD-1366, and shall be capable of withstanding the mechanical shock and vibration characteristics of highway, rail, and water transport.
3.6.3 <u>Air transportability.</u>	Contractor air transportability analysis (see 4.5.6.2).
3.6.4 <u>Tiedowns.</u>	Contractor tiedown provision analysis (see 4.5.6.4.1).

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Paragraph	Required Certifications and Analyses
3.6.5 <u>Lifting provisions.</u>	Contractor lifting provision analysis (see 4.5.6.5.1).
3.8 <u>Engine and related equipment.</u> , 3.9.1 <u>Fuel system.</u> , and 3.9.4 <u>Engine lubrication system.</u>	Engine manufacturer certification that the engine is in accordance with all applicable requirements, including exhaust emissions standards and fuels. Engine manufacturer application approval for the engine and its installation, including cooling system, lubrication system, and mounting system.

4.5.1.1 Production forklifts inspection. All forklifts produced by the contractor shall be inspected and subjected to the tests contained in (see 4.5.1.2, 4.5.1.3, and 4.5.1.4). Occurrence of any of the conditions listed in (see 4.4.3) shall be cause for rejection.

4.5.1.2 Examination of product. The forklift shall be examined to determine compliance with this document. Examination shall include but not be limited to testing all controls for compliance with 3.3.9.11, and visually inspecting that the non-slip coatings are provided (see 3.3.9.24).

4.5.1.3 Travel. The forklift shall be driven at least 1.0 miles at varying speeds, including maximum speed. At least five right and five left turns shall be made at maximum turn angle, and operate horn, windshield wipers, lights, heater, defroster, and other components during this one mile drive. Additionally, the forks shall be fully lowered and the forklift operated in reverse for at least 0.1 mile. Once placed in reverse, verify that the backup alarm (see 3.3.9.25) is activated. No damage or degradation to the fork tines, their attachment(s), or any other component part of the forklift or load shall result. Occurrence of any conditions listed in (see 4.4.3) shall be cause for rejection.

4.5.1.4 Material handling. With rated load on forks, raise forks to maximum lift height, then lower at maximum lowering speed and quickly stop at one to two feet above ground level. Repeat at least five times. If the forklift has side shift capability, side shift rated load from one extreme to the other and back to original position. Repeat at least five times. With no load, move forks from minimum to maximum fork spread, and back to minimum. Repeat at least five times. Occurrence of any conditions listed in (see 4.4.3) shall be cause for rejection.

4.5.2 Sound level test. Measure noise level at operator's ear with the engine operating at maximum rpm and while lifting rated load. Nonconformance with 3.3.4.4 shall be cause for rejection. If noise level is between 84 and 93 dB (A), the noise warning plate (see 3.3.4.4) shall be on all forklifts delivered on this contract.

4.5.3 Electromagnetic interference test. A first article forklift shall be tested in accordance with MIL-STD-461: RE 102 and RS 103 to demonstrate compliance with 3.3.5.

4.5.4 Environmental testing.

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4.5.4.1 High temperature storage and operation test. A first article forklift shall be tested in accordance with MIL-STD-810, Method 501.5, Procedures I and II, to demonstrate compliance with the high temperature operating and storage requirements of 3.4.1 and 3.4.2. Test duration shall be one 24-hour cycle for each procedure.

4.5.4.2 Low temperature storage and operation test. A first article forklift shall be tested in accordance with MIL-STD-810, Method 502.5, Procedures I and II, to demonstrate compliance with the low temperature operating and storage requirements of 3.4.1 and 3.4.2, as well as the engine starting requirement of 3.9.3 and the alternator charging requirement of 3.10.4. Test duration shall be one 24-hour cycle for each procedure. Additionally, the winterization requirements of 3.4.3 (and subsequent paragraphs of 3.4.3) should be taken into consideration when preparing the test procedure and performing the test.

4.5.4.3 Precipitation.

4.5.4.3.1 Rain test. A first article forklift shall be tested in accordance with MIL-STD-810, Method 506.5, Procedure I, to demonstrate compliance with 3.4.4.1.

4.5.4.3.2 Snow load analysis. An engineering analysis shall be performed to demonstrate compliance with the snow load requirement of 3.4.4.2, using a specific gravity of snow of 0.1 (Ref. 4.3 of MIL-STD-810).

4.5.4.3.3 Ice accretion test. A first article forklift shall be tested in accordance with MIL-STD-810, Method 521.3 with an ice thickness of 1.5-inches to demonstrate compliance with the ice accretion requirement of 3.4.4.3. The contractor shall identify those areas of the forklift where ice removal is required prior to operation.

4.5.4.4 Salt fog test. A first article forklift shall be tested in accordance with MIL-STD-810, Method 509.5, to demonstrate compliance with 3.4.7. Test duration shall be alternating 24-hour periods of salt fog exposure and drying conditions for 24-hour periods (two wet and two dry).

4.5.4.5 Sand and dust test. A first article forklift shall be tested in accordance with MIL-STD-810, Method 510.5, Procedures I (12 hours) and II (90 minutes per side), to demonstrate compliance with 3.4.8.

4.5.5 Weight and dimension tests.

4.5.5.1 Weight and center of gravity test. The weight, center of gravity, and axle weights of a first article forklift shall be measured to demonstrate compliance with the weight requirement of 3.4 and the axle weight requirement of 3.5.1.

4.5.5.2 Dimension measurement. A first article forklift shall be measured to demonstrate compliance with the dimensional requirements of 3.5.1.

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4.5.5.3 Fork and fork carriage. Measure both forks length, width, thickness, thickness at tip, and bottom taper. If applicable, side shift forks to extreme right, and then to extreme left positions, ensuring that the fork carriage does not exceed the overall width of the forklift in either case. Nonconformance with 3.5.2 shall be cause for rejection.

4.5.5.4 Ground clearance. Place the forklift with rated load at load carry position on a level surface. Measure distance from ground to lowest point on the forklift as specified (see 3.8.11). Nonconformance with 3.8.11 shall be cause for rejection.

4.5.6 Transportability verification.

4.5.6.1 Surface transportability verification.

4.5.6.1.1 Surface transportability analysis. An engineering analysis shall be performed to demonstrate compliance with 3.6.2. The engineering analysis shall utilize the data for road transportation in accordance with MIL-STD-810, Method 514.6, Table 514.6C-II.

4.5.6.2 Air transportability analysis. An engineering analysis shall be performed to demonstrate compliance with the air transportability requirements of 3.6.3 and all sub paragraphs. The analysis shall include the tiedowns and all major components and their ability to withstand the accelerations specified in 3.6.3. The evaluation shall also include a dimensional analysis for the forklift while traversing the ramp aboard C-5, C-17, and C-130 aircraft.

4.5.6.3 Equipment removal and reconfiguration demonstration. A first article forklift shall be configured for transport on C-5, C-17, and C-130 aircraft and then reconfigured for operation to demonstrate compliance with 3.6.3.7. It shall be demonstrated that the forces required do not exceed those allowed in MIL-STD-1472.

4.5.6.4 Conversion to air-transport mode. With forklift in operational mode (see 3.6.1), convert to air-transport mode (see 3.6.3.1) within the time frame, and using only the personnel and equipment specified in 3.6.3.5. Verify that the counterweight(s) can be removed, and meet the requirements, as specified in 3.6.3.6. Verify that the cab can be removed, and meet the requirements, as specified in 3.3.9.12.1. Nonconformance with 3.6.3.5, 3.6.3.6, or 3.3.9.12 shall be cause for rejection.

4.5.6.5 Air transportability verification. With the forklift in the air transport mode, verify that it can meet all air transport requirements. For reference only refer to MIL-HDBK-1791, including all dimensional and weight limitations of 3.5.1. Inability to meet all of these requirements shall be cause for rejection.

4.5.6.6 Conversion to operational mode. With the forklift in air-transport mode, convert to operational mode within the time frame, and using only the personnel and equipment specified in 3.6.3.5. Verify that the counterweight(s) can be reinstalled and meet the requirements, as specified in 3.6.3.6. Verify that the cab can be reinstalled, and meet the requirements, as specified in 3.3.9.12. Nonconformance with 3.6.3.5, 3.6.3.6, or 3.3.9.12 shall be cause for rejection.

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#### 4.5.6.7 Tiedown provision verification.

4.5.6.7.1 Tiedown provision analysis. An engineering analysis shall be performed to demonstrate compliance with the tiedown provision requirements of 3.6.4.

4.5.6.7.2 Tiedown provision test. A first article forklift shall be tested to demonstrate compliance with the tiedown provision requirements of 3.6.4.

#### 4.5.6.8 Lifting provision verification.

4.5.6.8.1 Lifting provision analysis. An engineering analysis shall be performed to demonstrate compliance with the lifting provision requirements of 3.6.5.

4.5.6.8.2 Lifting provision test. A first article forklift shall be tested to demonstrate compliance with the lifting provision requirements of 3.6.5.

4.5.7 Maintainability demonstration. Perform the maintenance functions described in 3.7. Inability to perform any function in the time specified and number of personnel specified shall be cause for rejection. Additionally it should be demonstrated that all servicing items are easily accessible for inspection and servicing with the engine at operating temperature and without subjecting personnel to injury or burns.

4.5.8 Loading. There are two different loading conditions required for testing and demonstrations.

4.5.8.1 Rated load. The rated load for the Type I shall be a 10,000 pound (+200, -0) pound cube, 96 inches on each side, with a center of gravity located at the geometrical center of the cube. For Type II, the rated load shall weigh 13,000 (+200, -0) pounds, and be 108 x 108 inches horizontally, by 96 inches vertically, with the center of gravity located at the geometrical center of the block.

4.5.8.2 Test load. The test load for the Type I shall be a 5,000 pound (+200, -0) pound cube, 96 inches on each side, with a center of gravity located at the geometrical center of the cube. For Type II, the test load shall weight 6,500 (+200, -0) pounds, and be 108 x 108 inches horizontally, by 96 inches vertically, with the center of gravity located at the geometrical center of the block.

4.5.9 Maximum fork lift height. With rated load on the forks, with forks level and at their maximum lift height, measure from ground to top surface of one fork to determine maximum lift height as specified (see 3.8.4). Nonconformance with 3.8.4 shall be cause for rejection.

4.5.10 Lifting and lowering speed. Measure distance from ground to top surface of forks in fully lowered position. Measure time required to raise rated load from ground to maximum lift height. Subtract distance from ground to top surface of forks from maximum lift height, and calculate lifting speed. Lower rated load, at maximum lowering speed (fully open lowering control) and abruptly stop the load at 1 to 2 foot height. Record this time. Measure distance from ground to



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top surface of one fork. Subtract this figure from the maximum lift height and calculate loaded lowering speed. Remove load and raise forks to maximum lift height. Measure time required to lower forks to ground level. Calculate the unloaded fork lowering speed. Nonconformance with 3.8.1 or 3.8.2 shall be cause for rejection.

4.5.11 Travel speed. Operate the forklift at maximum speed in both forward and reverse directions with rated load in load carry position. Inability to obtain the speed specified in 3.8.3 shall be cause for rejection.

4.5.12 Longitudinal slope operation. Drive the forklift forward with rated load in uphill position onto a ramp, hill, or other suitable surface with a slope specified in 3.8.5. Stop the forklift on the slope, and then accelerate up the slope reaching a steady measured speed. The forklift shall descend the slope, with the load in the uphill position, at a safe, measured speed. Inability to reach the speeds specified in 3.8.5 shall be cause for rejection.

4.5.13 Lateral slope operation. Operate the forklift in clockwise direction, full circle operation, with rated load, on a slope and at the speed specified in 3.8.6. Operate the same except in counterclockwise direction. Any tire losing contact with the ground, or any unsafe operation shall be cause for rejection.

4.5.14 Drift. Raise rated load to maximum lift height, with hydraulic fluid at ambient temperature. Place forks in horizontal position and shut off engine. Measure from the ground to the top surface of one fork. Let forklift sit for time specified in 3.8.7. Using the same fork and reference points, measure from the ground to the top surface of the fork. Nonconformance with 3.8.7 shall be cause for rejection.

4.5.15 Turning radius. With rated load on forks, operate forklift in clockwise direction, at maximum steering angle, for at least one complete full circle. Determine turning radius by measuring to outside of tires. Repeat in counterclockwise direction. Nonconformance with 3.8.8 shall be cause for rejection.

4.5.16 Fork tilt. On a level surface, raise unloaded forks to approximately 4 feet above ground level. As specified (see 3.8.9) tilt forks to full rearward position and measure tilt angle then tilt forks full forward and measure angle of tilt. Nonconformance with 3.8.9 shall be cause for rejection.

4.5.17 Fork tine operation. Position unloaded forks horizontal and approximately 3 to 5 inches above ground level. Measure fork tilt. Without touching the tilt control lever, raise forks to maximum fork height, then lower to original position. Verify that the forks maintain the same tilt, within the tolerances specified in 3.8.10 while being raised and lowered. Repeat with rated load on forks and forks at approximately five degrees rear tilt. Again verify that forks maintain the tolerance specified in 3.8.10 throughout total movement. Inability to maintain the fork tilt within tolerance specified in 3.8.10 while raising and lowering empty or loaded forks shall be cause for rejection.



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4.5.18 Stability. Conduct the “longitudinal stability stacking”, “longitudinal stability travel”, “lateral stability stacking”, and “lateral stability travel” tilting platform tests of ANSI/ITSDF B56.6-2005. Failure to meet the minimum tilting requirements specified in 3.8.12, which comes from ANSI/ITSDF B56.6-2005, shall be cause for rejection.

4.5.19 Service brakes. Demonstrate that the service brakes can stop the forklift with rated load, and can meet the drawbar drag test, as specified in 3.3.9.8 and 3.8.13. Failure to meet all requirements of 3.3.9.8 and 3.8.13 shall be cause for rejection.

4.5.20 Parking brake. Demonstrate that the parking brake can hold the forklift, with rated load on the forks, in both forward and reverse directions, on the slope specified in 3.3.9.9 and 3.8.14, for at least three minutes. Measure the force required to apply the parking brake. Nonconformance with all requirements of 3.3.9.9 and 3.8.14 shall be cause for rejection.

4.5.21 Fork visibility. Position unloaded forks at various lift heights, tilts, and spacing to verify that the visibility requirements of 3.8.17 can be met. Failure to meet 3.8.17 shall be cause for rejection.

4.5.22 Starter disconnect switch. Start the engine and let it run for at least 10 seconds. Energize the starter switch (move to “off” then “on” position if applicable) while the engine is running. Any evidence of starter engagement while the engine is running shall be cause for rejection. With the engine not running, place transmission selector in the lowest forward gear and energize the starter switch. Repeat for all forward and reverse gears. Any evidence of starter engagement while transmission is in any gear shall be cause for rejection.

4.5.23 Overload. Perform a stress analysis of the forklift to determine all critical stress points. Apply strain gauges or other suitable instrumentation at all these critical stress points to measure strain, which will be used to determine stress, during this test. Place forklift on level surface and position supports under the frame or front axle to relieve load on front tires. Secure the rear of the forklift to compensate for the additional test load. Raise forks at least 24 inches above ground level with the forks centered on the carriage. Use three times the test load, as determined in 3.3.9.2. Apply this load to the forks. The center of gravity of the load shall be located at the same place as the load center for the forklift (48 inches for Type I, and 54 inches for Type II). Let this overload remain on the forks for at least 10 minutes. Remove the load and inspect forklift structure, frame, mast or boom assembly, and hydraulic system for deformation, cracks, broken welds, hydraulic fluid leaks, etc. Inspect forks a minimum of 6 inches on either side of heel by magnetic particle or dye penetrant method. Record readings from strain gauges and convert to, and record, the corresponding stresses. Failure to meet these requirements shall be cause for rejection.

4.5.24 Fail-safe hydraulic lift system. Raise the rated load to maximum lift height with forks level. Measure vertical distance from ground to top surface of one fork. No personnel shall be under or in front of the load during the next step. Disconnect hydraulic line(s) that supply pressure to the lift system. Remeasure vertical distance from ground to same point on fork surface. A drop of more than 0.5 inch shall be cause for rejection. Measure fork tilt. Disconnect hydraulic line(s) that supply pressure to prevent forward tilting. Remeasure fork tilt. A change

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of more than  $\pm 2^\circ$  of tilt shall be cause for rejection. Use the over-ride provided to lower rated load to ground at not more than speed specified in 3.11.2.

4.5.25 Fork lifting mechanism. Raise the rated load from ground level to maximum lift height and lower back to ground. This shall be considered one cycle. Repeat until 100 cycles have been completed. This is a severe test of the hydraulic system so raising and lowering may be stopped after every 10 cycles for a 5 minute cooling period of the hydraulic system. Inability to complete the test, binding or erratic movement, any failure of the lifting system, or overheating of the hydraulic fluid shall be cause for rejection.

4.5.26 Fork spacing and side shift mechanism. The forks on rigid frame forklifts shall be side shifted with the rated load from extreme left to extreme right position, and back to extreme left. This shall be considered one cycle. Repeat until 100 cycles have been completed. This is an extreme test of the hydraulic system and side shifting may be stopped after 20 cycles for not more than 30 mins to allow cooling of the hydraulic fluid. For both rigid and articulated frame forklifts, with no load on the forks, the forks shall be adjusted from their most closed position to most open position and then returned to most closed position. This shall be considered one cycle. Repeat until 100 cycles have been completed. Verify compliance with 3.3.9.4, 3.8.15, and 3.8.16. For both side shifting and fork spacing, any binding, erratic movements, inability to complete either test, failure of either system, or overheating of the hydraulic fluid shall be cause for rejection.

4.5.27 Load backrest restraints. Apply a forward, horizontal force of 3.0 times rated load to load restraint devices for 10 minutes (see 3.3.9.5). The test load may be applied to all devices at once, or 3.0 times the proportional share of the load may be applied to each device. Remove load and inspect restraint devices, welds and supporting structure for deformation, cracks, broken welds, etc, which shall be cause for rejection.

4.5.28 Conveyorized fork attachment. Place one conveyorized fork attachment on each fork and secure in place using the means provided. The test load shall be a pallet loaded to 1.5 times the rated load, with dimensions of 88 by 108 inches. Place pallet lower surface on blocks, 4.0 inches above ground; so that forklift will pick up pallet as described in 3.3.9.18. Drive forklift forward and fully engage conveyorized fork attachment under pallet. If necessary, raise forks to just contact pallet. Ensure that forks and attachment are fully engaged with pallet, if not, this shall be cause for rejection. Back out forklift to completely disengage pallet. Raise forks above ground to a level that allows transfer of the loaded pallet onto and off of the fork attachment. Provide some means to allow the fully loaded pallet to smoothly transfer to and from the fork attachment. Transfer pallet to conveyorized fork attachment ensuring pallet is moved until it contacts load backrest. Ensure pallet moves completely over by conveyorized attachment during the transfer. Then transfer pallet back to original position off the forks. This shall be considered one cycle. Repeat until 25 cycles have been completed. Any longitudinal movement of the attachment, in relation to the forks, in excess of 0.5 inch shall be cause for rejection. Remove test load after final cycle and inspect attachment. Any deformation, cracks, or other structural failure, or any loosening or separation of components of the attachment shall be cause for rejection.

4.5.29 Forklift operations. Operate the forklift for a total of 40 hours. No failures shall occur

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during the 40 hours of operation. A failure for this test is considered as any malfunction that cannot be corrected within 30 minutes by adjustment, repair, or replacement, which may cause cessation of operation, degradation of performance capability below levels specified in this document, damage to forklift that would result from continued operation of the forklift, personnel safety hazard, or any condition specified in 4.4.3. Failure to complete this test as specified, or occurrence of any failure (see 4.4.3) shall be cause for rejection.

4.5.30 Crew protection kit (CPK). Install the optional CPK on the machine. Place the base machine cab in the CPK storage container. The installation of the CPK will be evaluated for compliance to 3.3.9.22. Inability to meet the requirements of 3.3.9.22 shall constitute failure of this verification procedure.

4.5.30.1 Forklift performance with CPK. Manufacturer must certify the forklift's capability to meet all applicable performance requirements included in sec 4.4.3 including any degraded performance needing documentation (see 3.3.9.22.3), review and approval by WR-ALC.

4.5.30.2 CPK armor. Transparent and opaque armor will be tested to assure that seams, angles, fasteners, and interfaces have no degradation below the ballistic characteristics of the parent material (see 3.3.9.22.1.1). Test Results will be reviewable for compliance by WR-ALC.

4.5.30.3 CPK transportation and storage. The physical dimension and weight of the container will be evaluated for form, fit and function to determine compliance with the requirements of 3.3.9.22.5. Inability to meet the requirements of 3.3.9.22.5 shall constitute failure of this demonstration. Additionally, if the CPK is required to be removed to meet air transportability requirements, then the compliance with 3.3.9.22.4 shall be verified.

4.5.31 Aircraft loading fork attachment. Perform a stress analysis of the forklift and aircraft loading fork attachment to determine all critical stress points. Apply strain gauges or other suitable instrumentation to measure critical data during this test. Place instrumented aircraft loading fork attachment on the forks and secure in place using the means specified. Demonstrate operations for aircraft loading of rolling stock as specified (see 3.3.9.23) by

- a. connecting to the rolling stock
- b. loading it onto forward kneeled, aft ramp of the C-5 aircraft
- c. unloading it from forward kneeled, aft ramp of the C-5 aircraft
- d. returning it to the original location and disconnecting from the rolling stock.

This shall be considered one cycle. Demonstrating operations includes 2 cycles for C-5 where the second cycle demonstrates positioning a second rolling stock into the aircraft with the initial rolling stock in place. Demonstration to be on hard paved surfaces with level terrain. Remove aircraft loading fork attachment after final operations and inspect attachment. Any deformation, cracks, or other structural failure, or any loosening or separation of components of the attachment shall be cause for rejection. Record instrument readings and convert to the

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corresponding stresses. Attachment and forklift design should be capable of 2 times factor of safety based on critical data measured.

4.5.32 Human Engineering. Demonstrate that all operational, inspection, maintenance and service requirements can still be met in accordance with MIL-STD-1472 (see 3.3.6). All levers, buttons, or other control functional devices must individually controlled with MOPP Level 4 Chemical Warfare Gear or arctic mittens. Inability to operate individual controls safely shall be cause for rejection.

5. PACKAGING. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended Use. The forklift will be used primarily to load and unload palletized cargo to and from military aircraft. It will also be used to handle loads of various sizes and weights, up to the rated load. The forklift will operate on hard paved surfaces, soft soil, mud, snow, and sand, on level and hilly terrain.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Classification (see 1.2)
- c. First article (see 3.1)
- d. Tropical rust proofing (see 3.3.1.2)
- e. Finish (see 3.3.1.4)
- f. Instruments (see 3.3.9.7)
- g. Cab (see 3.3.9.12)
- h. Tires (see 3.3.9.16)

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- i. Air compressor (see 3.3.9.20)
- j. Crew protection kit – testing (see 3.3.9.22)
- k. Crew protection kit – field installed (see 3.3.9.22)
- l. Crew protection kit – manufacturer installed (see 3.3.9.22)
- m. Aircraft loading operations – attachment color (see 3.3.9.23.1.d)
- n. Type A winterization (see 3.4.1, 3.4.2, and 3.4.3.2)
- o. Lighting (see 3.10.2)
- p. Alternator (see 3.10.4)
- q. Electrical accessories wiring (see 3.10.7)
- r. Radio preparation package (see 3.10.8)
- s. Packaging (see 5)

### 6.3 Definitions.

6.3.1 Common hand tool. A non-powered tool that is likely to be found in a typical mechanic's toolbox. Common hand tools include open end, boxed end, combination, socket (both 6- and 12-point in both standard and deep-well), and hex key wrenches, in SAE sizes up to and including 1-inch and metric sizes up to and including 25-mm; ratchet handles, extensions, and swivels; slotted and Phillips-head screwdrivers; regular and snap-ring pliers; and a ball-peen hammer.

6.3.2 Special tool. A tool that is not commercially and readily available from a source other than the forklift contractor.

### 6.4 Key words.

Diesel engine driven  
Material handling  
463L system

6.5 International standardization agreement implementation. This specification implements STANAG 2828, Military Pallets, Packages, and Containers. When amendment, revision, or cancellation of this specification is proposed, the preparing activity must coordinate the action with the U.S. National Point of Contact for the international standardization agreement, as identified in the ASSIST database at <https://assist.daps.dla.mil>.

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

The diagram illustrates the visibility model for a forklift. It shows a side profile of a forklift with a driver's eye point (EP) at the top of the mast. Two sight lines are shown: one from EP to a spotter (S) on the left, and another from EP to a load master (L) on the right. The ground is represented by a hatched line. Key dimensions are labeled:  $x_1$  and  $x_2$  are horizontal distances from the front face of the fork tines to the load master and spotter, respectively.  $L_1$ ,  $L_2$ ,  $L_3$ , and  $L_4$  are horizontal distances between various points along the ground.  $z_1$  is the height of the spotter and load master, and  $z_2$  is the height of the driver's eye point. A dashed line indicates the driver's line of sight. Labels include SPOTTER, DRIVER'S EYE POINT, ABOVE THIS LINE PASSES, EP, -B-, -A-, GROUND, FORK TINES, and LOAD MASTER.

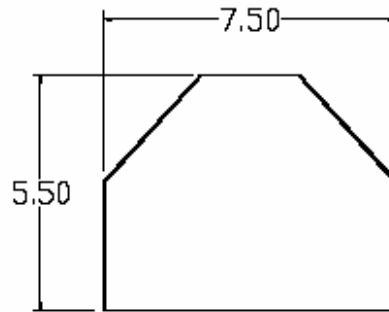
$x_1 = 430.00$   
 $x_2 = 330.00$   
 $z_1 = 0$   
 $z_2 = 81.00$   
 $L_1 = L_2 = L_3 = L_4 = \text{VARIABLE (MANUFACTURER DETERMINED)}$

1. DATUM A - FRONT FACE OF FORK TINES
2. DATUM B - REARMOIST PLANE OF FORKLIFT
3. SIGHT LINES MUST BE CLEAR FROM OBSTRUCTIONS
4. THE OPERATOR MUST BE ABLE TO SEE POINTS S&L
5. FOR DISPLAY PURPOSES, A SPOTTER AND LOAD MASTER ARE SHOWN EVEN THOUGH  $z_1=0$
6. ALL UNITS ARE INCHES

A side-view schematic of a wheel loader. A horizontal green line with arrows at both ends is positioned below the vehicle. Two points on this line are marked with vertical green ticks. The distance between these two ticks is labeled 'L3'. From the rightmost tick, a horizontal green line segment extends to the right, ending at a vertical green line. This segment is labeled 'L1'. A magenta rectangle is drawn with its bottom edge on the horizontal line, its left edge at the rightmost tick, and its right edge at the end of the 'L1' segment. The loader's body is positioned such that its front end is to the left of the first tick, its rear end is between the two ticks, and its bucket is to the right of the second tick, partially overlapping the magenta rectangle.

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Figure 3. Parking block cross-section.



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