W56HZV-10-R-0288

Attachment 1

INCH-POUND
ATPD 2319C
09 March 2010
SUPERSEDING
ATPD 2319B
20-FEB-2003

PURCHASE DESCRIPTION
LOAD HANDLING SYSTEM (LHS)
COMPATIBLE WATER TANKRACK SYSTEM (Hippo)

This specification is approved for use by the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), Research, Development and Engineering Command (RDECOM), Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This purchase description (PD) covers a Load Handling System (LHS) Compatible Water Tankrack System (Hippo) for use on the Heavy Expanded Mobility Tactical Truck-Load Handling System (HEMTT-LHS) and Palletized Load System (PLS) truck and PLS trailer. Capable of rapid deployment and recovery, the Hippo will also be compatible with other military and commercial transport means. The Hippo will have a minimum capacity of 2000 gallons and will allow the transportation of partial water loads. The Hippo will be outfitted with a water pump, hose reel, filling station, and heating device. It will be capable of bulk load and discharge, retail distribution, and bulk storage of potable water. Mobility requirements of the HEMTT-LHS and PLS truck, and PLS trailer will not be affected while transporting the Hippo. The Hippo will meet International Organization for Standardization (ISO) container requirements to allow stacking of tankracks and meet requirements of worldwide intermodal shipping.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of the PD. This section does not include documents cited in other sections of this PD 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 documents cited in sections 3, 4, or 5 of this PD, whether or not they are listed. Unless specified otherwise, only document versions that are current at the time of contract award shall apply to the procurement.

Comments, suggestions, or questions on this document should be addressed to U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-EN/STND/TRANS MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000 or emailed to DAMI_STANDARDIZATION@conus.army.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil.

AMSC N/A FSC 3990

2.2. Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form part of this PD to the extent specified herein. Unless otherwise specified, the issue of these documents shall be those cited in the solicitation or contract (see 6.2).

FEDERAL STANDARDS

FED-STD-595/33446	-	Tan 686
FED-STD-595/34094	-	Green 383

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130	-	Identification Marking for U.S. 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-464	-	Electromagnetic Environmental Effects Requirements for Systems
MIL-STD-810	-	Environmental Engineering Considerations And Laboratory Tests
MIL-STD-814	-	Requirements for Tiedown, Suspension, And Extraction Provisions on Military Materiel For Airdrop
MIL-STD-913	-	Requirements for the Certification of Sling Loaded Military Equipment External Transportation by Department of Defense Helicopters
MIL-STD-1366	-	Transportability Criteria
MIL-STD-1472	-	Human Engineering
MIL-STD-40051-2	-	Preparation of Digital Technical Information for Page-Based Technical Manuals

FEDERAL SPECIFICATIONS

TT-C-490	-	Chemical Conversion Coatings and Pretreatments for Ferrous Surfaces (Base for Organic Coatings)

COMMERCIAL ITEM DESCRIPTIONS

A-A-393	-	Extinguisher, Fire, Dry Chemical (Hand Portable)
A-A-50271	-	Plate, Identification
A-A-52557	-	Fuel Oil, Diesel; For Post, Camps, and Stations
A-A-52624	-	Antifreeze, Multi Engine Type
A-A-59326	-	Coupling Halves, Quick Disconnect, Cam Locking Type

A-A-59566	-	Hose, Rubber, and Hose Assemblies, Rubber, Smooth Bore, Water Suction and Discharge
A-A-59592	-	Can, Fuel, Military: 20-Liter Capacity

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-PRF-2104	-	Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service
MIL-PRF-2105	-	Lubricating oil, Gear, Multipurpose (Metric)
MIL-DTL-5624	-	Turbine Fuel, Aviation, Grades JP-4, JP-5, and JP-5/JP-8 ST
MIL-PRF-10924	-	Grease, Automotive and Artillery
MIL-DTL-12468	-	Decontaminating Agent, STB
MIL-D-16791	-	Detergents, General Purpose (Liquid, Nonionic)
MIL-PRF-46167	-	Lubricating Oil, Internal Combustion Engine, Arctic
MIL-DTL-53072	-	Chemical Agent Resistant Coating System Application Procedures and Quality Control Inspection
MIL-DTL-64159	-	Coating, Water Dispersible Aliphatic Polyurethane, Chemical Agent Resistant
MIL-DTL-83133	-	Turbine Fuels, Aviation, Kerosene types, NATO F-34 (JP-8), NATO F-35, and JP-8+ 8+100

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-454	-	General Guidelines for Electronic Equipment
MIL-HDBK-669	-	Loading Environment and related Requirements for Platform Rigged Airdrop Materiel
MIL-HDBK-1791	-	Designing for Internal Aerial Delivery in Fixed Wing Aircraft

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings and publications. The following other Government documents, drawings and publications form part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation or contract (see 6.2).

U.S. ARMY REGULATIONS

AR 70-38	-	Research, Development, Test, and Evaluation of Materiel for Extreme Climatic Conditions
AR 70-75	-	Survivability of Army Personnel and Materiel

AR 750-1	-	Army Material Maintenance Policy and Retail Maintenance Operations

U.S. ARMY PAMPHLETS

DA Pam 611-21	-	Military Occupational Classification and Structure
DA Pam 750-8	-	The Army Maintenance Management System (TAMMS) Users Manual

U.S. ARMY TECHNICAL MANUALS

TM 10-5430-244-10/	-	Load Handling System (LHS) Compatible Water
TM 10-5430-244-13&P	-	Tank Rack (Hippo)
TM 10-3930-643-10	-	Truck, Forklift, DED Pneumatic Tire, 10,000 lb. Capacity, Rough Terrain, Articulated Frame Steer (M10A)
TM 10-3930-673-10	-	All Terrain Army Lifter System (ATLAS), 10,000 lb. Capacity

U.S. ARMY FIELD MANUALS

FM 3-11.4	-	Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, And Chemical (Nbc) Protection
FM 3-11.5	-	Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination

U.S. ARMY TECHNICAL BULLETINS

TB MED 577	-	Sanitary Control and Surveillance of Field Water Supplies

(Copies of U.S. Army pamphlets, regulations, technical manuals, field manuals, and technical bulletins are available from http://www.usapa.army.mil or U.S. Army Tank-automotive and Armaments Command, RDTA-DP MS 110, Warren, MI 48397-5000.)

U.S. ARMY TACOM PURCHASE DESCRIPTIONS

ATPD 2206	-	Batteries, Storage: Lead-Acid, Maintenance Free
ATPD 2304	-	Off-Road family of Vehicles (11 Ton to 16.5 Ton Payloads) and Heavy Expanded Mobility Tactical Truck (HEMTT) Extended Service Program (ESP)

(Copies of this document are available from DAMI_STANDARDIZATION@conus.army.mil or U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-EN/STND/TRANS MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000.)

U.S. ARMY DRAWINGS

11674728	-	Vehicle Receptacle Assembly, NATO Intervehicle Power

(Copies of these drawings are available from DAMI_STANDARDIZATION@conus.army.mil or U.S. Army RDECOM, Tank Automotive Research, Development and Engineering Center, ATTN: RDTA-EN/STND/TRANS MS #268, 6501 E. 11 Mile Road, Warren, MI 48397-5000.)

CODE OF FEDERAL REGULATIONS (CFR)

29CFR1910	-	Occupational Safety and Health Standards (OSHA)
40CFR89	-	Control of Emissions from New and In-Use Non-Road Compression-Ignition Engines
49CFR	-	Department of Transportation

(Copies of this document are available from www.gpoaccess.gov/cfr/index.html or U.S. Government Printing Office, P.O. Box 979050, St. Louis, MO 63197-9000.)

NORTH ATLANTIC TREATY ORGANIZATION (NATO) MILITARY AGENCY FOR STANDARDIZATION (MAS)

STANAG 2413	-	Demountable Load Carrying Platforms
STANAG 4074	-	Auxiliary Power Unit Connections for Steering Wheeled Transport Vehicles
AVTP 03-160W	-	Dynamic Stability dtd Sept 1991

(Copies of these documents are available from North Atlantic Treaty Organization (NATO), Military Agency for Standardization (MAS), 1110 Brussels, Belgium or at http://www.ihserc.com.)

2.3 Non-Government publications. The following documents form 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 (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ANSI/NSF	-	Standard 14 Plastic Piping Components and related Materials
ANSI/NSF	-	Standard 61 Drinking water System Components - Health effects

(Copies of NSF documents are available from www.nsf.org or NSF International, P.O. Box 130140, 789 N. Dixboro Road, Ann Arbor, MI 48113-0140; Copies of ANSI documents are available from www.ansi.org or ANSI Customer Service Department, 25 W. 43rd Street, 4th Floor, New York, NY 10036.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME BPVC	-	Boiler and Pressure Vessel Code 1998

(Copies of this document are available online at http://www.asme.org or from American Society of Mechanical Engineers, ASME Information Central Orders/Inquiries, PO Box 2300, Fairfield, NJ 07007-2300.)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	-	Structural Welding Code - Steel
AWS D1.2	-	Structural Welding Code Aluminum
AWS D1.3	-	Structural Welding Code - Sheet Steel
AWS D1.6	-	Structural Welding Code - Stainless Steel

(Copies of these documents are available from www.aws.org or American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.)

ASTM INTERNATIONAL

ASTM E84	-	Surface Burning Characteristics of Building Materials
ASTM A240	-	Standard Specification for Steel, Stainless, Plate, Sheet and Strip for pressure Vessels, Heat-Resisting Chromium and Chromium-Nickel
ASTM A270	-	Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing.
ASTM A380	-	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
ASTM A967	-	Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts
ASTM D975	-	Standard Specification for Diesel Fuel Oils
ASTM D1171	-	Standard Test Method For rubber Deterioration
ASTM D1655	-	Standard Specification for Aviation Turbine Fuels

(Copies of these documents are available from www.astm.org or ASTM International, P.O. Box C700, West Conshohocken, PA 19428-2959.)

DEUTSCHES INSTITUT FUR NORMUNG E.V. (DIN)

DIN 30722-1	-	Roller contact tipper vehicles, roller containers - Part 1: Roller contact tipper vehicles up to 26 t, roller containers type 1570 made from steel

(Copies of this document are available from http://www.din.de or DIN Deutsches Institut für Normung e. V., Burggrafenstraße 6, 10787 Berlin, Germany.)

EUROPEAN STANDARDS

EN 10028-7	-	Flat products made of steel for pressure purposes - Part 7: stainless steels

(Copies of this document are available from AFNOR - Association Francaise de Normalisation, Cedex 7, Paris-La-Defense, France 92080 or at http://www.ihserc.com.)

GENERAL MOTORS CORPORATION (GM)

GM 9540P	-	Accelerated Corrosion Test

(Copies are available from Global Engineering Documents, An IHS GROUP Company, 15 Inverness Way East, Englewood, Colorado 80112.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 668	-	Series 1 Freight Containers – Classification External Dimensions and Ratings
ISO 1161	-	Specifications for Corner Fittings For Series 1 Freight Containers
ISO 1496-3	-	Series 1 Freight Containers – Specifications and Testing – Part 3: Tank Containers for Liquids, Gases, and Pressurized Dry Bulk
ISO 1496-5	-	Series 1 Freight Containers – Specifications and Testing – Part 5: Platform and Platform Based Containers

(Copies of these documents are available from www.iso.org or American National Standards Institute, 11 West 42nd Street, New York, N.Y. 10036.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) (DoD Adopted)

(Copies of this document are available from www.nema.org or National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1752, Rosslyn, VA 22209.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 - National Electric Code

(Copies of this document are available from www.nfpa.org or National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J534 - Lubrication Fittings (DoD Adopted)

(Copies of this document are available from www.sae.org or SAE Customer Service, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

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, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. As written in this PD, minimum acceptable performance threshold requirements are indicated with the word "shall" throughout the text. As applicable, objective capabilities that are not mandatory are indicated with the words "should", "desired", or "desirable". For the purpose of this PD, the LHS water tankrack (Hippo) is described as an ISO compatible system that will provide the ability to transport, store and distribute potable water (both unit and supply point distribution) using the HEMTT-LHS truck (M1120); PLS truck (M1074, M1075); and PLS trailer (M1076) with the HEMMT-LHS truck and the PLS truck (M1074, M1075) as the prime mover. The water tankrack will be capable of performing both wholesale and retail operations. The wholesale capabilities of the tankrack will be utilized for distribution and storage of water, while the retail capabilities of the tankrack will allow supply of potable water to unit-level water trailers and collapsible containers (see Appendix A).

3.2 Testing. The Hippo shall be subjected to first article test, comprising of a combined Production Verification Test (PVT) and Operational Test (OT), in accordance with (IAW) section 4 of this PD.

3.3 Materials. All materials selected for use on the Hippo shall be as identified, and shall be capable of meeting all applicable requirements as specified in this PD.

3.3.1 Materials approved for potable water use. Unless specified otherwise, all materials which contact the Hippo's potable water payload shall conform to ANSI/NSF 14 and ANSI/NSF 61 for potable water contact. All materials shall be capable of withstanding the long-term effects of holding and/or circulating a potable water payload with a pH ranging from 5-9, containing up to 1000 milligrams per liter (mg/L) total dissolved solids (TDS), at a temperature up to 160 degrees Fahrenheit (°F). All materials shall be capable of withstanding the long-term effects of contact with Reverse Osmosis (RO) purified water payloads with free available chlorine (FAC) residuals of up to 5 mg/L, and shall withstand the effects of sanitizing with 100 mg/L FAC solution for 60 minutes of contact time in accordance with the requirements of 3.5.18.

3.3.1.1 Tank material. The material selected for the water tank shall be 316L stainless steel IAW ASTM A240, or 316Ti stainless steel IAW ASTM A240 or EN 10028-7. Filler metal for all welds shall be 316L stainless steel IAW AWS standards.

3.3.1.2 Stainless steel piping and fittings. Stainless steel tubing used on the Hippo shall be 316L and conform to ASTM A270. Welded tubing assemblies shall utilize 316L stainless steel filler metal IAW AWS standards. Sanitary fittings shall be used at joints between separate sub-assemblies.

3.3.1.3 Internal tank surface requirements. All internal surfaces of the Hippo water tank and all other wetted components shall be thoroughly clean, and free of dirt, dust, rust, or other solid, surface or liquid contaminants. All internal tank surfaces shall have a No. 4 sheet finish, as defined by the Specialty Steel Industry of North America (SSINA), and shall be smooth and pit free. Internal tank surfaces shall be finish ground with a 120 or higher mesh (grit) abrasive. The resultant steel finish shall be bright with visible grain, but without mirror reflection, and shall have an RMS reading of 25 micro-inches or less, and be uniform with no scratches, or major directional markings. Heat discoloration shall be removed from weld zones, and a No. 4 finish applied to the welds to blend with the grain and texture of the tank base metal. After grinding, polishing, and re-finishing, the entire tank interior shall be chemically pickled and passivated per ASTM A380 and/or ASTM A967. After passivation, absence of free iron from the tank shall be confirmed per ASTM A967.

3.3.1.4 Internal tank components. Steel components mounted or installed inside the water tank shall be made of 316, 316Ti or 316Lgrade stainless steel. However, components with welds shall be made of 316Ti or 316L grade stainless only. Component design and method of installation shall not create an environment that promotes microbial growth or the development of crevice corrosion.

3.3.2 Resistance to fuel. Materials used for Hippo components shall be inherently resistant to, and shall not absorb, any fuels referenced in this PD.

3.3.3 Resistance to fungus. Materials that are used for the Hippo shall be fungus inert or permanently rendered inert with a fungicide. See MIL-HDBK-454 for guidance. Fungicides shall not be carcinogenic (see 3.3.4).

3.3.4 Hazardous materials. Asbestos, beryllium, radioactive materials, hexavalent chromium, cadmium, mercury, or other highly toxic or carcinogenic materials, as defined in 29CFR1910.1200, with the exception of the Chemical Agent Resistant Coating (CARC), shall not be used in the manufacture, assembly, operation or sustainment of this system without prior approval from the Government. Approval will only be granted when valid technical justification is provided. Hazardous materials requirements shall apply to any components/parts purchased through a subcontractor/vendor or OEM parts, as well as manufactured parts.

3.3.4.1 Ozone Depleting Substances. Class I and Class II Ozone Depleting Substances as specified by the EPA shall not be used.

3.3.4.2 Lead. Lead shall not be used without prior approval of the Government. The use of lead solder may be approved for electrical components where a suitable alternative is not available. Lead-acid batteries may be used without approval from the Government.

3.3.5 Deterioration prevention and control. Hippo components shall be fabricated from compatible materials, and shall be inherently corrosion resistant or treated to provide protection against corrosion and deterioration when stored and operated in accordance with the requirements of this PD.

3.3.6 Corrosion control performance. The Hippo shall be capable of withstanding extended or repeated exposure to corrosive environments involving one or more of the following: high humidity, salt water and spray, road de-icing agents, gravel impingement, atmospheric contamination, and temperature extremes. Only normal washing, scheduled maintenance (inclusive of paint touch-up) and repair of accidentally damaged areas (not as a result of intended use, deficiency in design, materials, manufacturing or normal wear) shall be necessary to keep external corrosion prevention in effect. Additionally, all internal, wetted surfaces shall be capable of meeting the exposure requirements of paragraph 3.3.1 without suffering damage or degradation. Only routine cleaning and disinfecting, in accordance with the procedures described in paragraph 3.5.18, shall be necessary to keep internal corrosion prevention in effect. Internal, wetted surfaces shall also be capable of maintaining corrosion resistance during periods of non-use while empty.

3.3.7 Corrosion during service life. During the specified service life (ref 3.5.42.7), external surface corrosion shall be limited to a maximum 5% red rust or corrosion coverage on the surface of any component. Internal corrosion shall likewise be limited to a maximum .02% red rust or corrosion coverage on any internal, wetted surface, as having developed between routine cleanings when operated and maintained in accordance with approved TM procedures. Over the specified service life, base metal shall remain sound with no loss of original thickness greater than 5% or .010 inch, whichever is less. There shall be no effect on form, fit, or function.

The design of and materials used on the Hippo shall be such that maintenance required to correct the effects of corrosion does not increase significantly over the service life of the system.

3.3.8 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other except to complete an electrical circuit, or protect against galvanic corrosion through use of a sacrificial anode.

3.3.9 Recycled, recovered or environmentally preferable materials. The components incorporated into the Hippo shall be newly fabricated. Used, rebuilt or remanufactured components, pieces and parts shall not be incorporated into the Hippo.

3.4 Reserved.

3.5 Design and operating requirements.

3.5.1 Prime mover compatibility. The Hippo shall be compatible with the HEMTT-LHS and PLS as defined in ATPD 2304. The Hippo shall be capable of being safely transported throughout the mission profiles of the HEMTT-LHS, PLS truck, and PLS trailer systems. The current level of HEMTT-LHS, PLS truck, and PLS trailer mobility and stability shall be maintained when transporting the Hippo, regardless of water payload.

3.5.1.1 LHS compatibility. The Hippo shall meet the LHS interface requirements of DIN 30722-1 and STANAG 2413. When carrying any water payload ranging from 0 gallons to 2000 +0/-100 gallons, it shall be capable of being loaded on and unloaded from the HEMTT-LHS, PLS truck, and PLS trailer using only the HEMTT-LHS and PLS load handling system. It shall be equipped with removable rollers, and provisions to securely stow the rollers when not in use.

3.5.1.2 Weight. The maximum gross weight of the Hippo, fully loaded with water and all associated components, shall not exceed 26,000 pounds.

3.5.2 Reserved.

3.5.3 ISO compatibility. The tankrack shall conform dimensionally to the requirements of Table 2 of ISO 668 as a 1CX twenty (20) foot container. The container frame shall have corner fitting locations that conform to ISO 668 for a 1CX container. Upper and lower corner castings shall conform to ISO 1161. When stowed for transport, all accessories and components, including add-on items as applicable, shall fit within the ISO interface dimensions. The Hippo shall be designed for and capable of being lifted from the four top corner fittings, four bottom corner fittings, meeting the stacking requirements, external restraint (longitudinal), and transverse and longitudinal rigidity requirements of ISO 1496-3. Contractor shall obtain ISO certification prior to AI&T.

3.5.3.1 CSC certification. The Hippo shall have a current Conventions for Safe Containers (CSC) certification issued by an approved authority, designated as such by the United States Coast Guard, in accordance with 49CFR450-453.

3.5.4 Forklift compatibility. The Hippo shall have forklift pockets conforming to ISO 1496-5 for unloaded containers only. The Hippo - when empty - shall be safely transportable by the following standard U.S. Army forklifts utilizing 6-foot tines: All Terrain Lifter Army System (ATLAS) (ref. TM 10-3930-673-10) and the M10A (ref. TM 10-3930-643-10). Hippo components shall be protected from accidental piercing by the forklift tines both when the tines are inserted and removed from the fork pockets, and while the system is being transported. All Hippo components shall be located within the physical envelope of the ISO frame to avoid contact with the forklift carriage.

3.5.5 Potability maintenance. The Hippo shall be able to maintain the potability of its water load over its Operational Mode Summary and Mission Profile (OMS/MP). This shall be accomplished with a recirculatory capability driven by the Hippo's integrated pump and manual rechlorination (by the operator) using chlorine compounds currently available in the supply system. The Hippo design shall allow no trapped or freestanding pocketing of water when drained, and shall not provide an environment that favors microbial growth.

3.5.6 Reserved.

3.5.7 Operation. The operator shall be capable of safely conducting all Hippo loading, dispensing, and recirculation operations while the Hippo is mounted on the HEMTT-LHS, PLS truck, PLS trailer, and, while it is sitting on the ground.

3.5.8 External pump operability. In the event of an on-board pump failure, the Hippo shall be capable of interfacing with an external standard Army 125 gallon per minute (gal/min) pump or with the pump of a functional Hippo, and retain full fill, circulation, and dispense/discharge capabilities without requiring the removal or replacement of the disabled pump. All adapters, reducers, hose segments, etc. required to meet this requirement shall be included with the Hippo Basic Issue Items (BII).

3.5.9 Set-up/tear-down. One operator shall be capable of setting up the Hippo (when mounted on a prime mover) within 10 minutes, to full operational status, when deployed in hot and basic climate conditions. Similar set-up in cold weather conditions, with the Hippo equalized at -25 °F, shall be accomplished within 30 minutes time. Set-up includes such things as deploying an operator platform, performing pre-operative checks and services, the pre-heating of components (cold weather only), the deployment and connecting of hose, etc., to achieve full operational status. One operator shall similarly accomplish tear down of the Hippo, in preparation for transport, within 10 minutes in hot and basic climate conditions, and within 20 minutes in cold weather environments. Tear down includes such tasks as purging or evacuating components of water, stowing and securing of hardware, etc.

3.5.10 Failsafe structure. The Hippo shall be free standing, such that stacking loads on the ISO frame are not carried by the water tank. Failure of the Hippo's bailbar shall not result in a rupture of the tank. The tank shall be protected from accidental puncture by the LHS hook when engaging the bailbar. The Hippo base/frame shall protect components from damage during operation and transport, and from normal use/abuse in the military environment.

3.5.11 Equipment compartment. The Hippo shall be equipped with at least one insulated compartment(s) to house the engine, pump, hose reel, and other hardware necessary to operate the Hippo. The compartment shall protect components from theft, corrosion, and other damage, and shall reduce noise signature during operation. The compartment shall in no way inhibit cooling of the engine such that excessive temperatures are reached under any operating condition specified in this PD. The compartment shall not allow the buildup of air pressure, and shall be equipped with drains to prevent the retention of fluid. The compartment shall be equipped with sufficient stowage provisions to organize and safely secure all BII supplied with the system, including tools, fittings, adapters, accessories, and technical manuals. All equipment contained in the compartment(s) shall be easily and safely accessible by the user.

3.5.11.1 Compartment access. All compartment and stowage box access doors shall be equipped with seals that minimize the entry of wind driven rain, snow, sand, and dust into the compartment to the extent necessary to meet all requirements herein. Compartment doors shall be self-supporting in the open position, and shall be labeled to indicate items accessible through them. Access door latches shall be suitable for repeated use and prevent the doors from opening unintentionally during operation. Latches shall utilize quick release mechanisms for closing. Latches shall be manufactured of corrosion-resistant metal or be suitably surface treated to inhibit corrosion. Latches shall be flush mounted with minimal catch surfaces. Door latches shall be non-key locking, and not require the use of tools for operation. Access doors shall require a maximum of two latches to adequately secure them. All compartment access doors shall include hasps to allow locking with a pad-lock.

3.5.12 Chlorine stowage. The Hippo shall be equipped with separate dedicated provisions for the safe, secure storage of up to five pounds of solid chlorine compound, such as calcium hypochlorite, or five gallons of bleach. The stowage provision shall be made of materials inert to chlorine, and shall be vented to atmosphere to prevent the buildup of chlorine gas. Chemical stowage on the Hippo shall be IAW existing Hazardous Material (HAZMAT) regulations.

3.5.13 Cam-locking fittings. Unless explicitly specified otherwise, all cam-lock fittings and coupling halves, adapters, reducers, dust caps, and dust plugs required by this PD shall be in accordance with A-A-59326. Class A anodized aluminum alloy fittings may be used provided they are also nickel acetate sealed.

3.5.14 Thermal and sound-insulating material. All thermal and sound insulating material shall be free from perceptible odors and noxious fumes; fire retardant (flame spread classification of 25 or less by ASTM E84); unaffected by battery electrolyte or petroleum derivatives; capable of maintaining its shape, position, and consistency inherently or by suitable

retaining methods. The material shall be protected from tearing, dislodgment and inadvertent hole punching during operation, transport, or maintenance. The material shall not absorb or retain any liquids or shall be protected from doing so.

3.5.15 Tank capacity. The tank capacity shall be a minimum of 2000 gallons of usable potable water. The amount of usable water is defined as the amount of water that can be extracted from the tank through the discharge ports with the Hippo sitting level utilizing gravity flow.

3.5.16 Pressure relief. The Hippo water tank shall be equipped with pressure relief valves to prevent the occurrence of oil-canning of the tank structure and conditions of reduced flow from vacuum or pressure build-ups, under all loading, unloading, and operating conditions specified herein. When not equalizing pressure, relief valves shall not allow the flow of liquids or dust and dirt into the tank. Relief valves shall restrict evaporative loss, and be automatic in operation. When filled by an external pump, no permanent damage to the Hippo shall occur if it is over filled. If the flow rate (gal/min) of the pump is equal to or less than that of the Hippo's internal pump, opening of the manhole (ref. 3.5.19) prior to filling shall not be required to meet the requirements of this paragraph.

3.5.17 Load stabilization. The tank shall be equipped with permanent tank baffling, surge plates, or other provisions to minimize longitudinal, lateral, and vertical sloshing of fluid during transport of partial loads to the extent required to meet the requirements of this PD.

3.5.18 Cleaning. In accordance with TB MED 577 and Technical Manual guidelines (ref. TM 10-5430-244-10/TM 10-5430-244-13&P), the Hippo shall be capable of being fully cleaned and sanitized utilizing approved procedures. When sitting level, Hippo components shall be capable of being easily cleaned, rinsed and completely drained, unassisted, of all water without requiring disassembly or the use of special tools or equipment. The Hippo shall be capable of being cleaned and sanitized as described herein without suffering damage or degradation. Internal baffles or load stabilization provisions shall not restrict access by personnel to any part of the tank.

3.5.19 Manhole/spill box. The tank shall be equipped with a hinged manhole cover. The manhole shall be designed so that no water spillage occurs when loading or unloading the Hippo, regardless of payload level, from or to the LHS or PLS truck or trailer. The opening for the manhole shall be raised above the level of the top of the tank a minimum of 2 inches. The manhole shall be located within a covered, lockable spill box. Drain tubes shall allow drainage of the spill box to the ground. Access to the inside of the tank shall allow 5th to 95th percentile soldiers to ingress and egress the inside of the tank. Solider safety shall be considered when designing method of access.

3.5.20 Water level indicator. The Hippo shall be equipped with a water level indicator, viewable by a soldier standing on the ground. Graduations on the indicator shall be in 500-gallon or smaller increments. Regardless of payload, the level indicator shall be accurate within ± 20 gallons with the Hippo sitting level. The indicator shall accurately measure payload level during

the conduct of dispensing and fill operations. If power is required to take a reading, a switch shall be provided to provide temporary battery power to the indicator when the Hippo engine is not running.

3.5.21 Pump. The Hippo shall be equipped with a self priming pump. If the pump body includes its own reservoir, it shall be equipped with a valve to facilitate draining.

3.5.22 Engine. The Hippo shall be equipped with an engine of suitable capacity capable of providing enough power to meet all performance requirements specified in this PD. It shall be capable of starting and operating in all environmental conditions referenced in section 3.8, and shall be capable of operating on all fuels specified in section 3.7.1. It shall also be equipped with an integral recharging capability to maintain sufficient battery charge during all modes of operation as specified in this PD.

3.5.22.1 EPA compliant engine. The engine provided shall be of the latest engine technology that will meet all the performance requirements specified in this PD while operating on fuel in accordance with MIL-DTL-83133 (JP-8) as the primary fuel (or MIL-DTL-5624 (JP-5)), which may have up to 3,000 parts per million (ppm) sulfur, and military lubricants (see 3.7.1). The engine supplied shall be compliant with EPA Tier 2 (40CFR89) non-road exhaust emission standards. Pollution control technologies that are impacted by the sulfur level of the JP-8 fuel either in maintenance or life expectancy shall not be used, e.g., externally cooled Exhaust Gas Recirculation (EGR), NOX traps, catalytic converters, etc. Externally cooled EGR is defined as an engine emissions control subsystem that removes portion of the exhaust gas from the exhaust system and then cools this exhaust gas through some type of heat exchanger, and last, introduces this cooled exhaust gas back into the engine induction system. In addition, lubricity canisters/filters shall not be required for proper engine operations (objective). See further directions in the Scope of Work (SOW).

3.5.22.2 Starting system. The Hippo engine shall be equipped with an electric start capability. It is desired the engine also be equipped with a manual starting capability.

3.5.23 Piping system. The Hippo piping/plumbing system shall allow easy access to all components for inspection, maintenance, repair and operation. The piping system shall be designed to prevent contact or cross contamination between potable water and other Hippo operating fluids. A flange-mounted shut-off valve shall be provided at all tank/piping system interfaces to allow the stoppage of flow to and from the tank. All valves or valve controls used in the Hippo piping system shall be easily accessible to the operator.

3.5.24 Sampling port. A conveniently located sampling port shall be provided to allow sampling of the Hippo water supply for chlorine residual and/or contamination testing purposes. Port design shall allow sampling to be carried out without leakage or spillage of water.

3.5.25 Bottom fill/discharge ports. The Hippo shall be equipped with a minimum of two 2-inch bottom discharge/suction ports located on each side (right/left) of the rear face. The ports shall be capable of facilitating gravity and pumped discharge, filling of the Hippo tank, and

feeding of the filling station. The ports shall be equipped with 2- inch male cam-lock fittings and tethered dust caps. The ports shall also be equipped with shut-off valves. All ports shall be located within the Hippo ISO structure.

3.5.26 Top loading port. The tank shall be capable of top loading through a port equipped with a four-inch (4) male cam-lock fitting and tethered cap. The fitting shall meet the dimensional requirements of A-A-59326, and be made from the same material as used for the tank. The port shall be located within the Hippo's spill box. Easy and safe access to the top loading port shall be possible from the catwalk specified in 3.5.37 without requiring stepping or walking on the tank.

3.5.27 Hose. All potable water hose used on or supplied with the Hippo shall be IAW A-A-59566. All other hose used on the hippo shall be appropriately labeled by its manufacturer and used IAW its commercially rated environment.

3.5.27.1 Hose reel. The Hippo shall be equipped with a manually retractable hose reel, capable of holding 70 feet of 2-inch hose. The hose reel shall be located within the Hippos equipment storage compartment (ref. 3.5.11), and be easily accessible to the operator. The hose reel shall be lockable in position during transport. The hose reel shall be equipped with three hose segments of the following lengths: 35 feet, 20 feet, and 15 feet. All segments shall include a ±6 inch tolerance on length. Both ends of each segment shall be equipped with a two-inch cam-lock coupling half (a male on one end and a female on the other end), allowing all segments to be connected and used together, or disconnected from the reel and used elsewhere. A cap and plug shall also be provided for each hose segment. A quick-release dispensing nozzle, with 2-inch female cam-lock fitting and tethered plug on the feed side, and tethered dust cap on the dispensing side, shall also be supplied with the Hippo. Dedicated space shall be provided to allow secure storage of the caps, plugs, and nozzle in the Hippo's equipment storage compartment.

3.5.28 Filling station. The Hippo shall be equipped with a deployable filling station, capable of filling up to five 5 gallon water cans or canteens at once. Supply of water to the fill station shall be via segments of 2-inch hose and discharge port (ref. 3.5.25). Each spigot shall incorporate an automatic shut-off, and be equipped with a tethered cap or plug. Two hoses, with caps or plugs, shall be provided that attach to the spigots for filling 5 gallon water cans sitting on the ground. The spigots on the filling station shall be located a minimum of 3 feet above the ground. The filling station shall be stable, regardless of orientation, on slopes up to 5%. Hippo shall be equipped with provisions to securely stow the fill station during transport.

3.5.29 Temperature gauge. A water payload temperature gauge shall be included with the Hippo. Temperature readout shall be provided on the control panel. With the Hippo sitting level, the gauge shall indicate temperature of any payload volume equal to or greater than 100 gallons. The gauge shall not incur any damage or loss of function when operated, transported, and stored in accordance with the requirements of this PD. The gauge shall have a minimum scale range of 25 to 110 °F, be accurate to within ±4 °F of actual temperature, and shall not require maintenance or calibration to retain its accuracy.

3.5.30 Freeze prevention operation. Operation of the Hippos freeze prevention hardware and all associated components shall be in accordance with currently accepted commercial safety practice and environmental regulations. Safety features integral to heater operation shall be automatic in operation and protect against fire, damage, and injury to personnel to the maximum extent practical. All freeze prevention related components shall be located such that the operator will not accidentally come into contact with a hot or electrically charged item creating a burn or shock hazard. However, to the fullest extent practical, such hardware shall be easy to inspect, service, remove and install. The Hippo shall retain full operational capability if freeze prevention hardware is not required and removed. Use of the freeze prevention system shall in no way affect the potability of the Hippos water supply. If a fuel fired heater is used, it shall be capable of operating with the fuels referenced in paragraph 3.7.1.

3.5.30.1 Heat exchangers. If heat exchangers are utilized on Hippo that involve thermal transfer between a potable fluid and non-potable fluid, they shall be constructed in accordance with currently accepted industry manufacturing and safety standards. They shall not be of single wall construction or allow single leak cross-contamination. Heat exchanger design shall be such that class 3 or greater leaks, or evidence thereof, shall be conspicuous to the operator or maintenance personnel to the fullest extent possible.

3.5.31 Control panel. The Hippo shall be equipped with an integrated control panel containing all necessary controls required to operate the Hippo. The panel shall contain controls that are easy to read, understand, and use. Sufficient gauges and indicators shall be provided to inform the user via true positive feedback of operating status at all times, under both conditions of normal operation and activation of system cutouts. The control panel shall also include an indicator for monitoring engine operating hours, water payload temperature, storage compartment temperature, and system voltage. The control panel shall also be equipped with an emergency stop that, when activated, shall shut down all Hippo components. The control panel shall meet the requirements for NEMA 250 Type 4X enclosures to protect against severe environmental conditions. Controls, gauges, and indicators shall be readable in direct sunlight. Control panel lighting shall comply with paragraphs 3.5.32 – 3.5.32.2.

3.5.32 Lighting. The Hippo control panel, and equipment compartment(s), shall be effectively lit to allow operation in reduced visibility, nighttime, and blackout conditions.

3.5.32.1 Non-tactical conditions. Permanent lighting shall be provided to ensure safe operation of the Hippo control panel in darkness and periods of reduced visibility. Lighting shall allow the reading of dials and gauges, the reading of item identifications, instructions, and warnings, and the operation of switches and controls, etc. Control panel illumination shall not require dark adaptation by the user.

3.5.32.2 Tactical/blackout operations. The Hippo's lighting shall allow for system operation in black-out conditions. Tactical/blackout lighting provisions shall meet the following requirements:

a. Such lighting shall be dimmable to 0.05 foot-Lamberts (fL) or less.

b. Unless specified otherwise, all tactical light sources shall be controllable from the control panel, including the override or deactivation of dedicated non-tactical lighting.
c. As applicable, the visual CO alarm provided IAW 3.7.5 shall not be overridden or deactivated when operating under blackout conditions.

3.5.33 Modularity. To simplify troubleshooting and maintenance, the Hippo shall utilize commercially available modular-based components to the maximum extent practical.

3.5.34 Operational fault controls. In addition to the emergency stop, the following operational fault cutouts shall be incorporated into the Hippo to prevent system damage or minimize hazard to personnel as a result of:

a. High engine temperature;
b. Low engine oil pressure;
c. Low water level/run-dry operation (when dispensing water with on-board pump);
d. Water tank overfill condition (when filling the Hippo with on-board pump);
e. Water leak in equipment compartment;

When a cutout is activated, sufficient indication of the condition(s) shall be provided to the operator via the control panel. After the condition, which caused activation of the cutout, is resolved, the system shall be capable of resetting to normal operating status. As applicable, manual override of cutouts shall be provided.

3.5.35 Cam-locking type adapters and reducers. The following quantity adapters and reducers shall be provided with the Hippo to allow interfacing with existing Army water storage and distribution equipment:

a. Qty (2) 2-inch female to 2-inch female cam-lock adapter
b. Qty (2) 2-inch male to 2-inch male cam-lock adapter
c. Qty (1) 4-inch female x 2-inch male cam-lock reducer
d. Qty (1) 4-inch male x 2-inch female cam-lock reducer

3.5.36 Operator platform. The Hippo shall be equipped with an operator platform that, when deployed, shall allow for safe access to, departure from, and operation of the Hippo when the tankrack is loaded on the truck or trailer. The platform shall be stowed such that it can be accessed, deployed, and secured for transport by a single person standing on the ground.

3.5.37 Catwalk. The Hippo shall be equipped with a catwalk above or on the top of the tank to allow access to the manhole and top filling port. Access to the manhole or fill port shall not require personnel to step onto the tank.

3.5.37.1 Catwalk access. The Hippo shall have permanent provisions to allow easy access to the catwalk on top of the tankrack, when the module is both mounted and demounted from its prime carrier. Handrails shall be provided at the location of the Hippo catwalk access and along the catwalk to minimize the likelihood of accidental falls. The handrails shall be

foldable or collapsible in place to facilitate stacking and transport of the Hippo, however the stowed handrails shall be within the ISO envelope. Ease of deployment of the handrails and strength requirements to access the top of the Hippo shall be considered when designing the deployment mechanism and methods for the handrail.

3.5.37.2 Non-skid surfaces. Unless specified otherwise, all catwalks, operating areas, and climbing areas, shall have a non-skid surface. All non-skid surfaces on the Hippo shall be resistant to wear, cracking, chipping, crumbling and peeling, and shall be capable of withstanding the environmental conditions as specified in this PD. Use of adhesive tape type non-skid surface is not acceptable. Both the catwalk and deployable operator platform standing area shall have an inherent, grate-type non-skid surface.

3.5.38 Reserved.

3.5.39 Fire extinguisher. The Hippo shall be equipped with a minimum of one fully charged dry chemical Type 1 extinguisher with a 4A:60B:C rating, 10-pound capacity IAW A-A-393. The fire extinguisher shall be mounted in quick release brackets. The brackets shall hold the fire extinguisher securely during operation and transport of the module in the HEMTT-LHS and PLS mission profile and shall be capable of quick release by soldiers wearing MOPP IV protective clothing and cold weather gear. The extinguisher shall be accessible to personnel standing on the ground during the conduct of operations. Protection from mud, water, ice, and damage during transport shall be provided. Adequate storage box space shall be provided per 3.5.11 to allow alternative stowage.

3.5.40 Electrical. All Hippo wiring shall be properly safeguarded and insulated, waterproof, sealed from the environment, and protected from physical damage. The Hippo shall utilize a 24/28VDC electrical system. However, higher voltage components are allowed for freeze prevention hardware provided the following conditions are met:

a. Associated components and wiring shall be shielded or isolated from operator access to the fullest extent possible;
b. Associated wiring shall be routed separately in dedicated, sealed conduit (not shared with 24/28VDC wiring);
c. Conduit shall be labeled with voltage;
d. GFCI electric shock protection shall be provided;
e. Maximum rated operating voltage of any component shall be 240V;
f. Operator safety shall be maintained through design, selection of materials, and workmanship;

Rubbing and excessive bending of wiring shall be avoided. Electrical fittings shall utilize standard military type connectors, and be waterproof, corrosion resistant, and resistant to disconnection due to vibration. Power connections/receptacles shall be sealed or protected from the environment when disconnected from a power source. All wiring shall be labeled to facilitate maintenance and/or replacement. A re-deployable grounding rod shall be provided as required to meet the requirements of this PD. In addition to meeting the requirements of this PD,

the design and workmanship of all Hippo wiring shall be consistent with guidelines and safe practices as specified in the National Electric Code.

3.5.41 Batteries. Two US Army approved 6TMF batteries, IAW ATPD 2206, shall be supplied with the Hippo. Condition of charge at the time of delivery shall be specified by contract or delivery order. Batteries shall be connected in 24 volt configuration and be readily accessible for service and inspection. Battery cables shall be color-coded (red positive, black negative) and marked to indicate polarity. A similarly color coded non-conductive battery terminal protective cover shall be provided on each battery terminal connector.

3.5.41.1 Battery box. A battery box shall be provided to retain/protect the batteries during operation and transport. The box shall allow for easy installation and removal of the batteries. The box shall protect the batteries from external environmental conditions and shall provide for venting of battery gases to atmosphere. The box shall be constructed of materials resistant to battery electrolyte, or be surface treated with such. If surface treated, the coating shall be wear, scratch, and gouge resistant. A means shall be provided to allow drainage out of the box.

3.5.42 Performance.

3.5.42.1 Fill and discharge. Utilizing the on-board pump, the Hippo shall be capable of dispensing water through 15 feet of hose connected to a dispensing port at the minimum rate of 110 gal/min with 20 ft developed head. The Hippo shall also be capable of self-loading through 15 feet of hose at the minimum rate of 95 gal/min w/8-foot suction head. With 15 feet of hose deployed (e.g. unwound from hose reel), the Hippo shall be capable of discharging water through the hose reel and nozzle at a minimum rate of 50 gal/min. The Hippo shall be capable of bottom loading through its 2-inch port by interfacing with external pumps rated up to 350 gal/min with 275 feet of head. The Hippo shall be capable of top loading, through its 4-inch port, by interfacing with external pump sources rated up to 600 gal/min with 350 feet of head. Use of cam-lock reducers or adapters may be required to facilitate the interface between external pump sources and the Hippo. When utilizing the on-board pump, Hippo plumbing shall be capable of operating under dead-head conditions in both dispense and fill mode for a minimum of 30 seconds each without experiencing failure. The Hippo shall be capable of meeting all requirements as specified in this paragraph without suffering or developing any leaks, damage, or degradation of performance.

3.5.42.2 Freeze prevention. The Hippo shall be capable of preventing its water payload from freezing while being intra-theater transported (ref. para. 6.2.9) or operated as specified in its OMS/MP, under any combination of environmental conditions as specified in this PD. No damage to Hippo components or restriction in operating capability shall result when operating under any of these conditions.

3.5.42.3 Gravity discharge. The Hippo shall be capable of dispensing a minimum of 99% of the tank volume by gravity flow (no pump assist) while mounted or sitting on flat ground.

3.5.42.4 Structural durability. With varying water payloads, the Hippo shall be capable of withstanding repeated loading/unloading operations to and from the HEMTT-LHS, PLS truck, PLS trailers, and capable of being transported as defined in this document without spilling water, developing leaks, or incurring damage, deformation or degradation of the tankrack or components. All external tankrack dimensions shall be maintained within the allowable tolerances of ISO 668.

3.5.42.5 Fuel supply. The Hippo shall have an integral fuel supply capacity sufficient to allow no less than 6 hours of operation under maximum load. It is desired the Hippo also be provided with provisions allowing operation from an external fuel source, such as a 20-liter fuel can IAW A-A-59592. The Hippo shall have a designated position and means to secure such a 20-liter fuel can, full, during transportation and operation. If free straps are required to secure the can, they shall be included as BII.

3.5.42.6 Starting, operation and stopping.

3.5.42.6.1 Starting. The Hippo's engine shall be capable of starting per 3.5.22, within 5 minutes under any of the environmental conditions specified in 3.8. The Hippo shall be capable of starting three times at -25 °F within a 1-hour period, with a minimum 5-minute run period and 15-minute wait between starts. The Hippo shall be capable of starting and operating on inclines in any direction or angle up to +/- 15 degrees from horizontal.

3.5.42.6.2 Operation. The Hippo shall be capable operating as specified in this PD in complete stand-alone mode. It shall be capable of operating on demand under any condition or combination of conditions under 3.8. No leakage, contamination, or damage to the Hippo shall result when operated or transported as specified herein.

3.5.42.6.3 Stopping. As required, Hippo shall be equipped with an emergency stop to completely shut the system down within 15 seconds after activation.

3.5.42.7 Service and storage life. The Hippo shall have a service life of not less than 20 years, excluding hoses, gaskets and other elastometric materials, when operated under the operational and environmental conditions specified in this PD. The Hippo shall have a repeatable storage life of not less than 5 years from date of manufacture under the environmental conditions specified in this PD.

3.6 Transportability. The Hippo shall be capable of being transported by highway, rail, marine and air modes worldwide without disassembly. The transportability criteria shall be as specified in MIL-STD-1366. The Hippo shall be equipped with tiedown and slinging provisions. The Hippo shall be capable of withstanding the impact forces encountered during transport without suffering damage or permanent deformation.

3.6.1 Slinging/tie-down provisions. In accordance with receiving Convention for Safe Containers (CSC) certification (ref. 3.5.3.1), the Hippo's corner castings shall be suitable for use as tie-down and lift sling attachment provisions. The Hippo shall also be equipped with shackle

type tie-down provisions capable of meeting the performance requirements of MIL-STD-209. The corner castings and tie-down shackles shall be labeled "LIFT TIEDOWN" and "TIE-DOWN", respectively, in 1-in. (2.54 cm) high letters. The corner castings and tie-down provisions shall be capable of restraining the Hippo as described in this purchase description, during all modes of transport, without experiencing damage or permanent deformation.

3.6.2 Transportation configurations.

3.6.2.1 Air transport, fixed-wing (cargo aircraft). The Hippo, in both empty and full payload conditions, shall be capable of being transported without restriction on C-130 and larger aircraft using 463L pallets. MIL-HDBK-1791 may be used for guidance. Successful passage of Air Force approved testing, as specified in 4.6.2.1, shall be required prior to receiving system transport certification.

3.6.2.2 Air transport, rotary-wing. The Hippo, when empty, shall be capable of being transported externally by CH47D helicopters (below 2000 feet, 70 °F, for 30 nautical miles IAW MIL-STD-1366). Provisions for Helicopter Sling Lift (HSL) shall be in accordance with MIL-STD-913.

3.6.2.3 Low Velocity Air Drop (LVAD). It is desired the Hippo, when full, be capable of Low Velocity Air Drop from C-130, C141, C-5, and C-17 aircraft. Parachute suspension and tiedown provisions shall be provided in accordance with MIL-STD-814. MIL-HDBK-669 and MIL-HDBK-1791 may be used for guidance.

3.6.2.4 Rail transportability. The Hippo, when empty, shall be rail transportable in the U.S. and North Atlantic Treaty Organization (NATO) countries as a Container on Flat Car (COFC) without restriction, and shall have a dimensional profile within the Gabarit International de Chargement (GIC) outline diagram (see MIL-STD-1366). Physical damage or reduction in performance or service life as the result of rail shipment, or railroad car impacts as specified in MIL-STD-810 is prohibited. It is desired the Hippo be capable of unrestricted transport by rail when full.

3.6.2.5 Highway transport. The Hippo when mounted full or empty on the HEMTT-LHS truck, PLS truck, and PLS trailer, shall be capable of unrestricted highway transport in the Continental United States (CONUS) and North Atlantic Treaty Organization (NATO) member countries IAW MIL-STD-1366.

3.6.2.6 Marine transport. The Hippo shall be transportable by commercial ships and barges, Army landing craft and barges, the Logistics Support Vessel (LSV) and Landing Craft Utility (LCU).

3.7 Ownership and support requirements.

3.7.1 Fuel. The Hippo components shall be capable of operating on all military and commercial kerosene based fuels conforming to, as a minimum, those listed below without restrictions or kits. JP-8 shall be the designated primary fuel for the Hippo.

a. MIL-DTL-83133 (JP-8)(NATO F-34)
b. ASTM D975 (Diesel-US commercial)
c. MIL-DTL-5624 (JP-5)(NATO F-44)
d. A-A-52557 (diesel – military, including NATO F-54)
e. ASTM D1655 (Jet A-1)(NATO F-35)

3.7.2 Lubricants. Hippo lubricating oil requirements shall be satisfied by using one or more of the following depending on the ambient temperature: MIL-PRF-2104 and MIL-PRF-46167. Gear oil, if required, shall conform to MIL-PRF-2105 and grease to MIL-PRF-10924. Means of lubrication shall be provided for all Hippo components requiring routine lubrication. Lubrication fittings shall conform to SAE J534. Antifreeze, if required, shall conform to A-A-52624, type I and IP (Arctic).

3.7.3 NATO intervehicle receptacle. A receptacle conforming to NATO STANAG 4074 Type 1 (reference: US Army TACOM drawing 11674728) with cover shall be provided in a protected position. This shall allow the Hippo Pumping Assembly to accept electrical power from another 28 VDC military vehicle through a NATO Intervehicle Connector and Cable Assembly, for starting the Hippo power source, and as applicable, operating under emergency conditions. The receptacle shall be labeled "28 VOLTS." Receptacle shall operate without damage.

3.7.4 Reserved.

3.7.5 Safety. The Hippo shall be designed and constructed with the safety of the operator and maintainer in mind. All electrical wiring, rotating, and reciprocating parts shall be electrically and physically safe, and shall be guarded so as not to be a hazard to operating personnel and to minimize the hazard of fire in the event of a fuel spillage or leakage from hoses and connections. The design and workmanship of Hippo wiring shall be consistent with guidelines and good practice as specified in the National Electric Code. All electrical terminals shall be completely enclosed or insulated to prevent inadvertent contact by personnel or equipment that may cause arcing to occur. All electrical wiring shall be shielded or protected from sun, fuel, oil, and environmental exposure, and shall not be stretched or kinked, nor be exposed to rubbing or excessive bending. As required by 3.5.40, an electric shock protection device, e.g. ground fault circuit interrupter, shall be incorporated on the Hippo to protect the user in the event of accidental electric shock. An emergency shutoff device shall be provided as specified herein to allow instant and complete interruption of power to Hippo components, and shut down the Hippo's engine, in case of accident, malfunction, or potential safety hazard(s). Exposed surfaces that are subject to high operating temperatures (140 °F for momentary contact and 120 °F for extended contact) shall be shielded. Any equipment compartment large enough to allow operator entry shall be equipped with a visual alarm to detect and warn of the presence of CO gas. The risk of accidental fall when climbing onto and off of the Hippo's catwalk shall be

minimized through use of strategically placed hand holds and deployable hand rails. Danger or caution signs, labels and markings shall be used to warn of potential or specific hazards. Sharp edges, sharp points, "head bangers," "shin bangers" and pinch points shall be avoided.

3.7.6 Human factors engineering. Human engineering criteria, principles, and practices shall be considered as part of unit construction. MIL-STD-1472 or commercial equivalent standards may be used as guidance for human factor engineering. Valves and all pump and engine controls shall be easily accessible by the operator in all climatic conditions. Valves and controls shall be permanently labeled as to their function and be marked with a valve number, as applicable, consistent with the operating instruction plate (ref. 3.9.1). All features of the Hippo shall be operable by the 95th percentile male to 5th percentile female. All equipment and controls shall be designed and located such that they can be operable by soldiers wearing protective clothing including Cold Weather and Mission Orientated Protective Posture (MOPP IV) (see 6.6.2). Operation of one control while wearing protective clothing shall not accidentally activate another control. All individual Hippo components requiring set-up by personnel shall not exceed 37 lb.

3.7.7 Personnel integration (MANPRINT) requirements. As designated by DA Pam 611-21, the Hippo shall be operable by one MOS 92W (Water Treatment Specialist) and be maintainable by one MOS 91J (Quartermaster and Chemical Equipment Repairer).

3.7.8 Environmental hazard prevention. The Hippo shall be designed to prevent inadvertent product discharge or leakage during operation, storage and maintenance IAW all US HAZMAT, 29CFR1910 OHSA, safety, and transportation requirements regardless of mode.

3.7.9 Durability. The Hippo shall be ruggedly constructed and capable of withstanding the high levels of shock and vibration typically encountered in the military environment. The Hippo shall be capable of being transported over the terrain types specified in the OMS/MP (regardless of water payload) without developing leaks, cracks or tears in base material, developing cracks in or near welds or seams, or developing any component failure or degradation in system performance. Cumulative mileage shall be IAW the movement terrain percentages as specified in the Hippo OMS/MP (Reference Annex C).

3.7.10 Reliability. The Hippo mean time between hardware essential function failure (MTBHEFF) shall be not less than 200 hours at an 80% Lower Confidence Limit when tested in accordance with the OMS/MP.

3.7.11 Maintainability. All lubrication fittings shall be accessible without removal of major components. Electrical fittings shall be waterproof, corrosion resistant and resistant to disconnection due to vibration. All electrical components shall be identified and permanently marked adjacent to their mounting on the inside surface of the control panel. Electrical components mounted inside other electrical junction boxes shall be similarly identified and marked. Engine oil shall be drainable without flowing onto other components. The total maintenance ratio shall not exceed 0.01 maintenance man-hours/operating hours.

3.7.11.1 Time to repair. The median time to repair shall not exceed one hour. The maximum time to repair shall not exceed 1.5 hours for 90% of Essential Unscheduled Maintenance Demands (EUMD).

3.7.11.2 Ease of maintenance. The Hippo design shall provide for easy access to components requiring routine maintenance or adjustment. It shall also facilitate repair of the system, to the fullest extent possible, in the event battle damage is incurred.

3.7.12 Materiel Availability (Ao). The Hippo shall achieve an Operational Availability (Ao) of at least 0.91. For calculation of Ao, an average Administrative and Logistics Downtime (ALDT) of 48 hours is assumed.

3.7.13 Servicing, operation and maintenance. The Hippo shall be supportable by the standard military supply and maintenance system. The Army maintenance system consists of two levels: field (Unit/Direct Support) and Sustainment (General Support/Depot). The Hippo support concept shall conform to the requirements and guidance according to AR 750-1, and DA Pam 750-8. The Hippo shall be designed to reduce or eliminate as many tools, special tools, and test equipment as possible. Maximum utilization of existing DOD and US Army tools and support equipment is required.

3.7.13.1 Field level. All tools and test equipment required to perform Field-level Preventive Maintenance Checks and Services (PMCS), which may require the operator assemble, disassemble, adjust, maintain, diagnose, and repair or report the condition of the Hippo, shall be provided as BII. Sufficient stowage space shall be provided allowing these items to be secured for storage and transport.

3.7.13.2 Sustainment level. Tools and test equipment required for higher levels of repair that are not already available to the upper level echelon repair organization that would normally provide these services to the unit shall be provided by the contractor. Examples of currently available tools include, but are not limited to, the Army's General Mechanics Tool Kit (NSN 5180-01-548-7634).

3.8 Environmental requirements. Design of the Hippo shall preclude contamination of the water by environmental affects. The Hippo shall not require any specific weather, oceanographic, or geophysical support. The Hippo shall be capable of being stored, transported, and operated under the environmental conditions specified below. AR 70-38 may be used for guidance regarding consideration of hot, basic, and basic-cold climatic conditions. In addition, exposure to wind, either naturally occurring, resulting from exposure during transport, or a combination of both, shall be considered, along with their combined effect with other environmental conditions, such as cold temperature.

3.8.1 Temperature. The Hippo shall be capable of being operated, being transported, or stored as defined herein within the following minimum ambient temperature ranges:

a. Operating – General, to include required freeze prevention both during intra-theater transport and operation IAW the Hippo OMS/MP: -25 to 120 °F.
b. Storage temperature. The Hippo, when stored for two (2) years in an open environment or four (4) years in a warehouse environment, shall not be damaged by any ambient temperature from – 50 °F to +160 °F.
c. Inter-Theater Transport (ref. para. 6.6.8): -28 °F to +160 °F

Note: the above temperature range for intra-theater transport and operation applies only to altitudes of 4,000 feet or less. When fielded at altitudes between 4,001 and 7,500 feet, the Hippo shall be capable of unrestricted operation in naturally occurring ambient temperatures greater than or equal to -25 °F.

3.8.2 Sand. The Hippo shall perform as specified herein in a blowing sand environment when subjected to a minimum sand concentration of 0.0623 ± 0.015 grams per cubic foot (g/ft^3) at a minimum wind velocity of 3,540 feet per minute (ft/min).

3.8.3 Dust. The Hippo shall perform as specified herein in a blowing dust environment when subjected to a minimum dust concentration of 0.3 ± 0.2 g/ft^3 at a minimum wind velocity of 3,540 ft/min.

3.8.4 Humidity. The Hippo shall perform as specified under relative humidity of up to 95% in saturation.

3.8.5 Solar radiation. The Hippo shall perform as specified with up to 355 British thermal units (BTUs) per square foot per hour of solar radiation.

3.8.6 Rain. The Hippo shall perform as specified herein with blowing rain of up to 4 inches per hour impinging on the system at 40 miles per hour (mi/hr).

3.8.7 Salt fog. The Hippo shall withstand damage from being exposed to salt fog.

3.8.8 Noise limits. Steady-state noise produced by the Hippo shall not exceed 85 dB(A) at the operator's position and at occasionally occupied positions, IAW 4.8.8. If noise levels are between 85 and 90 dB(A), or if procedures for noise suppression have been pursued and documented to the satisfaction of the procuring activity and written permission to exceed the 85 dB(A) limit obtained, noise hazard signs shall be prominently displayed on the equipment. Signs shall state:

DANGER
HEARING PROTECTION REQUIRED
WITHIN XX FEET

The word DANGER shall be on the first line and shall be white lettering on a red oval background, which is inside a black rectangular panel in flat or lusterless colors. Other lettering shall be in black on a white background in lusterless colors. FED-STD-595 may be used for

guidance. All lettering shall be readable at the maximum distance at which a noise level of 85 dB(A) is measured IAW 4.8.8 and this distance shall be inserted for XX.

3.8.9 Electromagnetic Interference (EMI). The electromagnetic radiated interference and susceptibility characteristics of the Hippo shall not exceed the limits specified in MIL-STD-461 for Army ground equipment or systems when operated as specified in this PD.

3.8.10 Exposure to HAEMP/ESD/NSL. The Hippo shall not exhibit any malfunction or degradation of performance when subjected to default free-field High Altitude Electromagnetic Pulse (HAEMP), Electrostatic Discharge (Personnel and Helicopter), and Near Strike Lightning environments IAW MIL-STD-464.

3.8.11 Altitude. In addition to meeting other requirements and conditions as specified in this PD, the Hippo, when empty, shall be capable of withstanding low pressure environments equivalent to 40,000 ft above sea level and less. The Hippo shall also be capable of operating as specified in this PD at altitudes up to and including 7,500 feet above sea level.

3.8.12 Ozone. All rubber components used on the Hippo shall be ozone resistant as tested IAW ASTM D1171.

3.9 Identification, marking and information. As applicable, all data plates and markings specified herein shall be in accordance with MIL-STD-130.

3.9.1 Data plates. The Hippo shall be equipped with operating instruction, identification, cautions, warnings, and shipping data plates that contain all necessary information for safe operation of the Hippo as described in this PD. Data plates shall be provided describing procedures for preparing the Hippo for transport in any of the modes described in 3.6.1, and identify HSL lift provisions. Item Unique Identification (IUID), ISO, and CSC certification data plates shall also be provided. Unless specified otherwise, all data plates shall be in accordance with A-A-50271. All data plates shall be permanently attached to the Hippo. All data plates shall be located in positions that are visible and accessible, but protected from damage during operation, movement, and handling.

3.9.2 Markings. The following markings shall be applied to the Hippo. Markings shall be black lusterless paint, in accordance with MIL-DTL-53072:

a. "NO STEP" shall be stenciled on the top of the tank adjacent to and readable from the catwalk, in 2-inch block letters.
b. Each side of the Hippos tank shall be stenciled with the following in an area of unobstructed visibility: POTABLE WATER ONLY" in 6-inch block letters.
c. The following messages shall be stenciled in 2-inch block letters adjacent to the forklift pockets: FORK LIFT EMPTY ONLY
d. The following shall be stenciled in plain view on or near the man-hole cover:
   "DANGER - Confined Space, Do Not Enter"
   "Refer to Technical Manual" "Permit Required"

Markings (d) shall be in accordance with Occupational Health and Safety Administration (OSHA) 29CFR1910.146. When opened, the man-hole cover shall in no way obscure the marking from view.

e. The following shall be stenciled in 2-inch block letters on the Hippo fuel tank: JP-8.

3.10 CBRN survivability. The Hippo shall be Chemical, Biological, Radiological, and Nuclear (CBRN) survivable, able to withstand the damaging effects of CBRN contaminants and subsequent decontamination effort. It shall also be operable and maintainable by personnel wearing full CBRN protection (MOPP IV) IAW FM 3-11.4, and be decontaminable to negligible risk levels, of AR 70-75 criteria, IAW FM 3-11.5 to reduce subsequent hazard to personnel operating and maintaining the system. Typical decontamination agents are Supertropical Bleach (MIL-DTL-12468) and Detergent, General Purpose, Liquid (MIL-D-16791, Type 1). Consumable items such as gaskets, seals, etc., can be replaced and do not need to be decontaminable. Corrosion control methods and material selection shall be compatible with CBRN decontamination procedures. Interior and exterior fluid traps shall be avoided. The Hippo shall also be capable of withstanding initial nuclear weapon effects of blast, thermal radiation, and nuclear radiation to the same level that a sufficient percentage of operators remain combat effective long enough to execute the mission.

3.11 Treatment and painting.

3.11.1 External surfaces. Unless otherwise specified (see 6.2), all external surfaces of the Hippo except as noted below, regardless of the material selected, shall have a finish coat of MIL-DTL-64159, Type II, chemical agent resistant coating (CARC) paint IAW MIL DTL 53072 and a primer conforming to MIL-P-53030 or MIL-P-53022 applied IAW MIL-DTL-53072. Prior to priming, all bare metal surfaces shall be cleaned IAW TT-C-490 Section 1.2.1, and pre-treated with a chromate-free, low VOC pre-treatment/conversion coating. NCP Coatings N-8237-2.5 A/B (or equivalent) is recommended for pre-treatment. Finish coat color shall be determined at the time of purchase and either be Green 383, chip number 34094 or Tan 686, chip number 33446, per FED-STD-595.

3.11.2 Other surfaces. All other surfaces, to include those within a housing, and behind insulation material (if used), shall have a finish coat IAW MIL-DTL-53072. Metal surfaces shall be cleaned and pre-treated as specified in 3.11.1. Finish coat color shall be Green 383 (chip number 34094 per FED-STD-595), Tan 686 (chip number 33446 per FED-STD-595), or the manufacturers' standard color if approved by the Government.

3.11.3 Unpainted surfaces. The following items shall not be painted: terminal wiring connections, instruction diagrams and plates, instrumentation, rubber, lubrication fittings, hoses, nozzles and all other parts whose operation or function would be adversely affected by paint. Insulation material shall be painted unless the sound absorbing characteristics of the material are compromised.

3.12 Construction/welding. As applicable, all welding shall be IAW welding codes AWS D1.1 – Structural Welding Code – Steel, AWS D1.2 - Structural Welding Code -

Aluminum, AWS D1.3 - Structural Welding Code - Sheet Steel, and AWS D1.6 - Structural Welding Code - Stainless Steel. The water storage vessel (tank) shall be constructed in accordance with ASME BPVC Sec. VIII, Div. 1.

3.13 Manuals and special instructions. The Hippo will be supported by 2-level, Field and Sustainment maintenance. Department of the Army technical manuals and other special instructions shall be created in accordance with MIL-STD-40051-2, and shall be included as part of the end-item as specified by contract or Section 6 of this PD.

3.14 Tools, special tools and test equipment. When specified by contract or Section 6 of this PD, tools and test equipment shall be included as part of the end-item in addition to those required to meet the requirements of 3.7.12 through 3.7.12.2.

3.15 Basic issue items (BII). Each Hippo shall be provided with BII and stowage space for the BII. BII is defined as any support items that the operator of the Hippo shall require in order to put in operation, operate, perform emergency repairs, and operator/unit level repairs.

3.16 Load and packaging plans and instructions. When specified by the contract, scope of work, or Section 5 of this PD, load and packaging plans and instructions shall be required for each of the Camel II movement modes and configurations (see 3.6.2) as well as long and short-term storage. These plans and instructions shall provide protection for the equipment from damage or reduction in all operation capabilities, and shall comply with the design and safe operational limitations of the required aircraft, vehicles, trailers, and pallets.

4. VERIFICATION.

4.1 Classification of tests, inspections, and general criteria. Hippo production units will be tested to verify they meet the requirements specified in Section 3 of this PD. The verification process will consist of the First Article Test (FAT) and Acceptance, Inspection, and Test (AI&T). Nonconformance or non-performance to any requirement of this PD shall constitute failure of the test.

4.1.1 First article test (FAT). The Hippo FAT consists of a combined Production Verification Test (PVT) and Operational Test (OT). Low Rate Initial Production (LRIP) units of the same configuration will be used for FAT.

4.1.1.1 Production verification testing (PVT). The PVT is a series of Government tests conducted under controlled conditions. The tests will be used to verify the Hippo meets the requirements specified in Section 3 of the PD.

4.1.1.2 Operational test (OT). The OT is a series of Government tests conducted under realistic operational conditions. Test personnel designated to operate and maintain the system will be representative of those expected to operate and maintain the Hippo once it is fielded. The OT will verify the system's operational effectiveness, suitability, and survivability for use by soldiers in typical field environments and combat service support situations.

4.1.1.3 Post Test Operational Check (PTOC). An operation and inspection check may be required after the Hippo has been subjected to a series of test conditions to ensure the unit has not been damaged or degraded beyond its baseline condition. During the conduct of this check, the Hippo may be thoroughly inspected, filled and drained of water as required, set up and tore down, and operated in accordance with system operating manuals. Valves, switches, controls, vents, etc. may be actuated or cycled and all subsystems (including freeze prevention) operated during the check to ensure proper system performance. Any damage, degradation of hardware, or reduced performance below baseline conditions constitutes failure of test.

4.1.2 Acceptance Inspection and Test. (AI&T). As specified in Table 1, an AI&T is required on all complete Hippo production units and shall be performed by the contractor and Government QAR prior to Government acceptance. The AI&T shall include visual, dimensional, and operational tests to ensure each Hippo system conforms to acceptable operational standards.

4.1.3 Certificates of Conformance (CoC). As specified herein, CoC's shall be provided for each complete Hippo production unit. All CoC's shall be in contractor format - unless specified otherwise - and include sufficient supporting technical information to insure adequate evaluation by the Government.

4.1.4 Pre-test inspection/test. Prior to start of FAT, each Hippo test unit shall be examined and tested for system completeness, uniform configuration, and operational readiness. Failure of any units to pass the inspection/test could delay the start of Government-conducted testing.

4.2 Payload test fluid. The basic payload fluid for all Hippo testing will be potable water in accordance with TB MED 577.

TABLE I. Test methods.

Test Description		Section 3	Section 4	CoC	AI&T		FAT	
					Demo	Visual	Demo	Visual
101.	Materials	3.3	4.3	X				
102.	Materials for Potable Water Use	3.3.1	4.3.1	X			X	X
103.	Tank material	3.3.1.1	4.3.1.1	X				
104.	Stainless steel piping/fittings	3.3.1.2	4.3.1.2	X				
105.	Internal tank surface req.s	3.3.1.3	4.3.1.3	X		X		X
106.	Internal tank components	3.3.1.4	4.3.1.4	X		X		X
107.	Resistance to Fuel	3.3.2	4.3.2	X				X
108.	Resistance to Fungus	3.3.3	4.3.3	X			X	X
109.	Hazardous Materials	3.3.4	4.3.4	X				

Test Description		Section 3	Section 4	CoC	AI&T		FAT	
					Demo	Visual	Demo	Visual
110.	Deterioration Prevention & Con	3.3.5	4.3.5	X			X	X
111.	Corrosion control performance	3.3.6	4.3.6	X			X	X
112.	Corrosion during service life	3.3.7	4.3.7	X				X
113.	Dissimilar Metals	3.3.8	4.3.8	X				X
114.	Recycled Materials	3.3.9	4.3.9	X				
115.	Reserved	3.4	4.4					
116.	Design & Operating Reqs	3.5	4.5	X				
117.	Prime mover Compatibility	3.5.1	4.5.1	X		O	X	X
118.	LHS compatibility	3.5.1.1	4.5.1.1	X		O	X	X
119.	Weight	3.5.1.2	4.5.1.2	X			X	
120.	Reserved	3.5.2	4.5.2					
121.	ISO compatibility	3.5.3	4.5.3	X		O	X	X
122.	CSC certification	3.5.3.1	4.5.3.1	X				
123.	Forklift compatibility	3.5.4	4.5.4	X	O	X	X	X
124.	Potability maintenance	3.5.5	4.5.5	X			X	X
125.	Reserved	3.5.6	4.5.6					
126.	Operation	3.5.7	4.5.7	X	X	X	X	X
127.	External pump operability	3.5.8	4.5.8	O		O	X	X
128.	Set-up/Tear-down	3.5.9	4.5.9	X			X	X
129.	Failsafe structure	3.5.10	4.5.10	X		O	X	X
130.	Equipment compartment	3.5.11	3.5.11	X		X	X	X
131.	Compartment access	3.5.11.1	4.5.11.1	X	X	X	X	X
132.	Chlorine stowage	3.5.12	4.5.12	X		X	X	X
133.	Cam-Lock fittings	3.5.13	4.5.13	X		X		
134.	Thermal & sound insulation	3.5.14	4.5.14	X		X	X	X
135.	Tank capacity	3.5.15	4.5.15	X	X		X	X
136.	Pressure relief	3.5.16	4.5.16	X	X		X	X
137.	Load stabilization	3.5.17	4.5.17	X		O	X	X
138.	Cleaning	3.5.18	4.5.18	X	O	X	X	X
139.	Manhole/spill box	3.5.19	4.5.19	X	O		X	X
140.	Water level indicator	3.5.20	4.5.20	X	X	X	X	X
141.	Pump	3.5.21	4.5.21	X	X		X	X
142.	Engine	3.5.22	4.5.22	X	X	X	X	X
143.	EPA compliance	3.5.22.1	4.5.22.1	X				
144.	Starting system	3.5.22.2	4.5.22.2	X	X	X	X	X
145.	Piping system	3.5.23	4.5.23	X	X	X	X	X

Test Description		Section 3	Section 4	CoC	AI&T		FAT	
					Demo	Visual	Demo	Visual
146.	Sampling port	3.5.24	4.5.24	X	X	X	X	X
147.	Bottom fill/discharge ports	3.5.25	4.5.25	X	X	X	X	X
148.	Top loading port	3.5.26	4.5.26	X		X	X	
149.	Hose	3.5.27	4.5.27	X				
150.	Hose reel	3.5.27.1	4.5.27.1	X	O	X	X	X
151.	Filling station	3.5.28	4.5.28	X	O	X	X	X
152.	Temperature gauge	3.5.29	4.5.29	X	O	X	X	X
153.	Freeze prevention operation	3.5.30	4.5.29	X	X	X	X	X
154.	Heat exchangers	3.5.30.1	4.5.30.1	X		X	X	X
155.	Control panel	3.5.31	4.5.31	X	X	X	X	X
156.	Lighting	3.5.32	4.5.32	X	X	X	X	X
157.	Non-tactical	3.5.32.1	4.5.32.1	X	X	X	X	X
158.	Tactical/blackout	3.5.32.2	4.5.32.2	X	X	X	X	X
159.	Modularity	3.5.33	4.5.33	X			X	X
160.	Operational fault controls	3.5.34	4.5.34	X	X	X	X	X
161.	Adapters	3.5.35	4.5.35	X		X	X	X
162.	Operator platform	3.5.36	4.5.36	X	O	X	X	X
163.	Catwalk	3.5.37	4.5.37	X		X	X	X
164.	Catwalk access	3.5.37.1	4.5.37.1	X		X	X	X
165.	Non-skid surfaces	3.5.37.2	4.5.37.2	X		X	X	X
166.	Reserved	3.5.38	4.5.38					
167.	Fire extinguisher	3.5.39	4.5.39	X		X	X	X
168.	Electrical	3.5.40	4.5.40	X	X	X	X	X
169.	Batteries	3.5.41	4.5.41	X		X		X
170.	Battery box	3.5.41.1	4.5.41.1	X		X	X	X
171.	Performance	3.5.42	4.5.42					
172.	Fill and discharge	3.5.42.1	4.5.42.1	X	X		X	
173.	Freeze prevention	3.5.42.2	4.5.42.2	X	X		X	
174.	Gravity discharge	3.5.42.3	4.5.42.3	X	X		X	
175.	Structural durability	3.5.42.4	4.5.42.4	X			X	
176.	Fuel supply	3.5.42.5	4.5.42.5	X	O		X	
177.	Start, operate, stop	3.5.42.6	4.5.42.6	X	X		X	
178.	Service and storage life	3.5.42.7	4.5.42.7	X				
179.	Transportability	3.6	4.6					
180.	Sling/tiedown provisions	3.6.1	4.6.1	X		X	X	X
181.	Transportation configurations	3.6.2	4.6.2	X			X	X
182.	Air, fixed wing	3.6.2.1	4.6.2.1	X			X	X
183.	Air, rotary wing	3.6.2.2	4.6.2.2	X			X	X

Test Description		Section 3	Section 4	CoC	AI&T		FAT	
					Demo	Visual	Demo	Visual
184.	Low Velocity Airdrop	3.6.2.3	4.6.2.3	X			X	X
185.	Rail Transportability	3.6.2.4	4.6.2.4	X			X	X
186.	Rail impact	3.6.2.4.1	4.6.2.4.1					
187.	Highway Transport	3.6.2.5	4.6.2.5	X			X	X
188.	Marine Transport	3.6.2.6	4.6.2.6	X			X	X
189.	Ownership & Support	3.7	4.7					
190.	Fuel	3.7.1	4.7.1	X			X	X
191.	Lubricants	3.7.2	4.7.2	X		X	X	X
192.	NATO receptacle	3.7.3	4.7.3	X		X	X	X
193.	Reserved	3.7.4	4.7.4					
194.	Safety	3.7.5	4.7.5	X	X	X	X	X
195.	Human factors	3.7.6	4.7.6	X		X	X	X
196.	MANPRINT	3.7.7	4.7.7	X			X	X
197.	Environmental hazard prev.	3.7.8	4.7.8	X				
198.	Durability	3.7.9	4.7.9	X			X	X
199.	Reliability	3.7.10	4.7.10	X			X	X
200.	Maintainability	3.7.11	4.7.611	X			X	X
201.	Time to repair	3.7.11.1	4.7.11.1	X			X	X
202.	Ease of maintenance	3.7.11.2	4.7.11.2	X			X	X
203.	Materiel Availability	3.7.12	4.7.12	X			X	
204.	Service, Operation & Maintenance	3.7.13	4.7.13	X			X	X
205.	Field level	3.7.13.1	4.7.13.1	X			X	X
206.	Sustainment level	3.7.13.2	4.7.13.2	X			X	X
207.	Environmental	3.8	4.8	X			X	X
208.	Temperature	3.8.1	4.8.1 - 4.8.1.2	X			X	X
209.	Sand	3.8.2	4.8.2	X			X	X
210.	Dust	3.8.3	4.8.3	X			X	X
211.	Humidity	3.8.4	4.8.4	X			X	X
212.	Solar Radiation	3.8.5	4.8.5	X			X	X
213.	Rain	3.8.6	4.8.6	X			X	X
214.	Salt Fog	3.8.7	4.8.7	X			X	X
215.	Noise	3.8.8	4.8.8	X			X	X
216.	Electromagnetic Interference	3.8.9	4.8.9	X			X	X
217.	Exposure to HAEMP/ESD/NSL	3.8.10	4.8.10	X			X	X
218.	Altitude	3.8.11	4.8.11	X			X	X
219.	Ozone	3.8.12	4.8.12	X				

Test Description		Section 3	Section 4	CoC	AI&T		FAT	
					Demo	Visual	Demo	Visual
220.	Identification, Marking, & Info	3.9	4.9	X				
221.	Data plates	3.9.1	4.9.1	X		X		X
222.	Markings	3.9.2	4.9.2	X		X		X
223.	CBRN survivability	3.10	4.10	X			X	X
224.	Treatment & Painting	3.11	4.11	X		X	X	X
225.	Construction/welding	3.12	4.12-4.12.2	X		O		X
226.	Manuals & Special Instructions	3.13	4.13	X		X	X	X
227.	Reserved	3.14	4.14					
228.	Basic Issue Items	3.15	4.15	X		X	X	X
229.	Loading & Packaging Plans & Instructions	3.16	4.18 - 4.18.2	X		X	X	X

Legend: X = 100% inspection/test
O = control inspection/test (1 of 10 or other freq as determined by DCMA QAR)

4.3 Materials. The requirements of 3.3 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, and by actual observation and test during PVT. Any failure to meet the requirements of 3.3 shall constitute failure of test.

4.3.1 Materials approved for potable water use. The requirements of 3.3.1 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, and by actual observation and test during PVT. Evidence of material degradation or deterioration resulting from use as described in 3.3.1 shall constitute failure of test.

4.3.1.1 Tank material. The requirements of 3.3.1.1 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications.

4.3.1.2 Stainless steel piping and fittings. The requirements of 3.3.1.2 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications.

4.3.1.3 Internal tank surface requirements. The requirements of 3.3.1.3 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, and by actual observation during PVT.

4.3.1.4 Internal tank components. The requirements of 3.3.1.4 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, and by actual observation during PVT.

4.3.2 Resistance to fuel. The requirements of 3.3.2 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications.

4.3.3 Resistance to fungus. The requirements of 3.3.2 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, and by actual observation and test during PVT in accordance with Method 508 of MIL-STD-810. Failure to meet the requirements of 3.3.3 shall constitute failure of test.

4.3.4 Hazardous materials. The requirements of 3.3.4, 3.3.4.1, and 3.3.4.2 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications.

4.3.5 Deterioration prevention and control. The requirements of 3.3.5 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, by actual observation and test during PVT testing in all required operating configurations and environments. During test, hardware shall be continuously evaluated for compliance, and results included in the Final Test Report. Any failure to meet the requirements of 3.3.5 shall constitute failure of test.

4.3.6 Corrosion control performance. The requirements of 3.3.6 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, by actual observation and test during PVT testing in all required operating configurations and environments. During test, hardware shall be continuously evaluated for compliance, and results included in the Final Test Report. Any failure to meet the requirements of 3.3.6 shall constitute failure of test.

4.3.7 Corrosion during service life. The requirements of 3.3.7 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, by actual observation and test during PVT testing in all required operating configurations and environments. During test, hardware shall be continuously evaluated for compliance, and results included in the Final Test Report. Any failure to meet the requirements of 3.3.7 shall constitute failure of test.

4.3.8 Dissimilar metals. The requirements of 3.3.2 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications, and by actual observation during PVT. Any evidence of corrosion resulting from dissimilar metal contact shall be considered a failure of test.

4.3.9 Recycled, recovered, or environmentally preferable materials. The requirements of 3.3.7 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications.

4.4 Reserved.

4.5 Design and operating requirements.

4.5.1 Prime mover compatibility. The requirements of 3.5.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating

configurations and environments. In addition, stability and brake performance of the prime movers, with and without trailer in tow, carrying Hippos at 0%, 25%, 50%, 75%, and 100% fill, shall be verified by: 1) performing the NATO Lane Test IAW AVTP 03-160W at 40 mi/hr without tire lift, 2) longitudinal slope testing of 60% by prime mover alone and 30% by prime mover and trailer combination, and traversal of a 30% side slope in a sinusoidal pattern in both directions without tire lift, 3) 40° approach and 60° departure angles, and 4) braking tests IAW AVTP 2306 performance requirements. Baffles, surge plates, or other load stabilization provisions, valves, and seals shall be visually inspected prior to and at the completion of each test phase, with varying water load, to ensure no damage has occurred. Failure to meet the requirements of 3.5.1 shall constitute failure of test.

4.5.1.1 LHS compatibility. The requirements of 3.5.1.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.1.1 shall constitute failure of test.

4.5.1.2 Weight. The requirements of 3.5.1.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.1.2 shall constitute failure of test.

4.5.2 Reserved.

4.5.3 ISO compatibility. The requirements of 3.5.3 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.3 shall constitute failure of test.

4.5.3.1 CSC certification. The requirements of 3.5.3.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance.

4.5.4 Forklift compatibility. The requirements of 3.5.4 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.4 shall constitute failure of test.

4.5.5 Potability maintenance. The requirements of 3.5.5 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT in all required operating configurations and environments. During PVT, the Hippo's water payload will be routinely chlorinated in accordance with the guidelines of TB MED 577. At least one sanitizing will be conducted in accordance with contractor developed procedures. Failure to meet the requirements of 3.5.5 shall constitute failure of test.

4.5.6 Reserved.

4.5.7 Operation. The requirements of 3.5.7 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.7 shall constitute failure of test.

4.5.8 External pump operability. The requirements of 3.5.8 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.8 shall constitute failure of test.

4.5.9 Set-up/tear-down. The requirements of 3.5.9 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.9 shall constitute failure of test.

4.5.10 Failsafe structure. The requirements of 3.5.10 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.10 shall constitute failure of test.

4.5.11 Equipment compartment. The requirements of 3.5.11 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.11 shall constitute failure of test.

4.5.11.1 Compartment access. The requirements of 3.5.11.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.11.1 shall constitute failure of test.

4.5.12 Chlorine stowage. The requirements of 3.5.12 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.12 shall constitute failure of test.

4.5.13 Cam-lock fittings. The requirements of 3.5.13 shall be verified by contractor CoC, including supporting subcontractor documentation/certifications.

4.5.14 Thermal and sound insulating material. The requirements of 3.5.13 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to

demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.13 shall constitute failure of test.

4.5.15 Tank capacity. The requirements of 3.5.15 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.15 shall constitute failure of test.

4.5.16 Pressure relief. The requirements of 3.5.16 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.16 shall constitute failure of test.

4.5.17 Load stabilization. The requirements of 3.5.17 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.17 shall constitute failure of test.

4.5.18 Cleaning. The requirements of 3.5.18 and shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Contractor developed procedures shall be used to verify compliance. Failure to meet the requirements of 3.5.18 shall constitute failure of test.

4.5.19 Manhole/spillbox. The requirements of 3.5.19 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.19 shall constitute failure of test.

4.5.20 Water level indicator. The requirements of 3.5.20 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.20 shall constitute failure of test.

4.5.21 Pump. The requirements of 3.5.21 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.21 shall constitute failure of test.

4.5.22 Engine. The requirements of 3.5.22 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.22 shall constitute failure of test.

4.5.22.1 EPA compliant engine. The requirements of 3.5.22.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance. Failure to meet the requirements of 3.5.22.1 shall constitute failure of test.

4.5.22.2 Starting system. The requirements of 3.5.22.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.22.2 shall constitute failure of test.

4.5.23 Piping system. The requirements of 3.5.23 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.23 shall constitute failure of test.

4.5.24 Sampling port. The requirements of 3.5.24 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.24 shall constitute failure of test.

4.5.25 Bottom fill/discharge ports. The requirements of 3.5.25 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.25 shall constitute failure of test.

4.5.26 Top loading port. The requirements of 3.5.26 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.26 shall constitute failure of test.

4.5.27 Hose. The requirements of 3.5.27 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. A separate CoC from the hose manufacturer shall be provided to verify compliance and suitability for intended use. All hose markings shall be observed and recorded. Failure to meet the requirements of 3.5.27 shall constitute failure of test.

4.5.27.1 Hose reel. The requirements of 3.5.27.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.27.1 shall constitute failure of test.

4.5.28 Filling station. The requirements of 3.5.28 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and

by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.28 shall constitute failure of test.

4.5.29 Temperature gauge. The requirements of 3.5.29 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.29 shall constitute failure of test.

4.5.30 Freeze prevention operation. The requirements of 3.5.30 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.30 shall constitute failure of test.

4.5.30.1 Heat exchangers. The requirements of 3.5.30.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and, as applicable, by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.30.1 shall constitute failure of test.

4.5.31 Control panel. The requirements of 3.5.31 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. MOPP IV and Arctic gloves shall be used to verify operation of controls under unusual conditions. Failure to meet the requirements of 3.5.31 shall constitute failure of test.

4.5.32 Lighting. The requirements of 3.5.32 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.32 shall constitute failure of test.

4.5.32.1 Non-tactical conditions. The requirements of 3.5.32.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.32.1 shall constitute failure of test.

4.5.32.2 Tactical/blackout operations. The requirements of 3.5.32.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.32.2 shall constitute failure of test.

4.5.33 Modularity. The requirements of 3.5.33 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.33 shall constitute failure of test.

4.5.34 Operational fault controls. The requirements of 3.5.34 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and, where applicable, by actual observation and test during PVT testing in all required operating configurations and environments. If induced faults are used for verification purposes, the contractor will be notified prior to the conduct of the test. Failure to meet the requirements of 3.5.34 shall constitute failure of test.

4.5.35 Adapters. The requirements of 3.5.35 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.35 shall constitute failure of test.

4.5.36 Operator platform. The requirements of 3.5.36 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.36 shall constitute failure of test.

4.5.37 Catwalk. The requirements of 3.5.37 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.37 shall constitute failure of test.

4.5.37.1 Catwalk access. The requirements of 3.5.37.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.37.1 shall constitute failure of test.

4.5.37.2 Non-skid surfaces. The requirements of 3.5.37.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.37.2 shall constitute failure of test.

4.5 38 Reserved.

4.5.39 Fire extinguisher. The requirements of 3.5.39 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. In addition, the manufacturer identification, location, mounting, marking, color, rating/marking, accessibility and operability, and suitability for intended use shall be observed and recorded. Failure to meet the requirements of 3.5.39 shall constitute failure of test.

4.5.40 Electrical. The requirements of 3.5.40 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. In addition, detail regarding the type and construction of components shall be observed and recorded. Failure to meet the requirements of 3.5.40 shall constitute failure of test.

4.5.41 Batteries. The requirements of 3.5.41 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Unless approved otherwise, specific and credible supporting documentation shall be supplied to the Government that the battery manufacturer supplier for the Hippo has completed Government-approved testing in accordance with ATPD 2206 and are presently supplying or qualified to supply the 6TMF battery to the US Government. Failure to meet the requirements of 3.5.41 shall constitute failure of test.

4.5.41.1 Battery box. The requirements of 3.5.41.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.41.1 shall constitute failure of test.

4.5.42 Performance.

4.5.42.1 Fill and discharge. The requirements of 3.5.42.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.42.1 shall constitute failure of test.

4.5.42.2 Freeze prevention. The requirements of 3.5.42.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. The Low Temperature Test (ref 4.8.1.1) will be used either in whole or in part to verify this requirement. Failure to meet the requirements of 3.5.42.2 shall constitute failure of test.

4.5.42.3 Gravity discharge. The requirements of 3.5.42.3 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.42.3 shall constitute failure of test.

4.5.42.4 Structural durability. The requirements of 3.5.42.4 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.5.42.4 shall constitute failure of test.

4.5.42.5 Fuel supply. The requirements of 3.5.42.5 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.42.5 shall constitute failure of test.

4.5.42.6 Starting, operation, and stopping. The requirements of 3.5.42.6 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.5.42.6 shall constitute failure of test.

4.5.42.7 Service and storage life. The requirements of 3.5.42.7 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance. As this is a "design to" requirement and no test or simulation is economically feasible to verify compliance, the CoC must provide sufficient design and technical analysis to allow adequate Government evaluation and estimation of technical compliance.

4.6 Transportability. The requirements of 3.6.1 through 3.6.2.8 shall be verified as specified herein. Any failure to meet the requirements of 3.6.1 through 3.6.2.8 shall constitute failure of test.

4.6.1 Slinging/tie-down provisions. The requirements of 3.6.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation during PVT in all required operating configurations and environments. In addition, the location, mounting condition, marking, signs, instructions and procedures, and suitability for intended use shall be observed and recorded. Failure to meet the requirements as specified in 3.6.1 shall constitute failure of this test.

4.6.2 Transportation configurations.

4.6.2.1 Air transport, fixed wing. The requirements of 3.6.2.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. In addition, the following tests shall be conducted for the purpose of receiving certification from the U.S. Air Force to transport the Hippo with full water payload. Such testing shall be conducted on one of the Durability test units (ref 4.7.4) after all miles have been accrued. Any observed damage to equipment or water leakage at a rate greater than 4 drops per minute either during or after the test shall constitute failure of test. In addition, upon completion of each specified test, the Hippo shall be inspected and operated IAW 4.1.1.3.

a. Structural Integrity Test. The Hippo water tank shall be filled with water, pressurized to 12.5 pounds per square inch (lb/in^2), and held unassisted for a minimum of ten (10) minutes. Ideally, pressurization shall occur as rapidly as possible, to within 0.1 seconds. Upon returning to ambient pressure, a vacuum of 2.5 lb/in^2 will be applied and held unassisted for a minimum of ten (10) seconds.

b. Tip Test. The Hippo, with full water payload and in air transport configuration, will be tipped at sixty (60) degrees in the front, back, and side directions.
c. Thermal Expansion Test. The Hippo water tank will be filled with water conditioned to a temperature necessary to achieve a tank-stabilized temperature of 39 °F, and prepped to air transport configuration. The Hippo will then be placed into a chamber maintained at 120 °F, and held for twelve (12) hours once the chamber temperature re-stabilizes.
d. Successful passage of rail impact testing with full water payload (see 4.6.1.6.1) is also required for air transport certification.

Prior to any actual testing, the Hippo shall be certified as safely transportable by all the aircraft types specified in 3.6.1.3 by NATICK (and/or MTMC) through the use of MIL-STD-1366 and recommendations in MIL-HDBK-1791, as applicable, design analysis, examinations and test, modeling and simulation and observations. Failure to safely meet the requirements as specified in 3.6.1.3 or pass the verification process as specified herein shall constitute failure of this test

4.6.2.2 Air transport, rotary wing. The requirements of 3.6.2.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Prior to any actual testing, the Hippo shall be certified as safely transportable by all the aircraft types specified in 3.6.2.2 by NATICK (and/or MTMC) in accordance with MIL-STD-1366 and MIL-STD-913, as well as, where applicable, design analysis, examination and test, modeling and simulation, and observation. Failure to safely meet the requirements as specified in 3.6.2.2 shall constitute failure of this test. In addition, upon completion of test, the Hippo shall be inspected and operated IAW 4.1.1.3.

4.6.2.3 Low Velocity Air Drop (LVAD). Pursuant to system capability, the desired elements of 3.6.1.5 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Prior to any actual testing, the Hippo shall be certified by NATICK (and/or MTMC) as safely transportable and air-drop qualified by all the aircraft types specified in 3.6.2.1 through the use of MIL-STD-1366 and recommendations in MIL-HDBK-1791, as applicable, design analysis, examinations and test, modeling and simulation and observations. Prior to the start of the LVAD verification test, a contractor-generated packaging/loading plan shall be provided to the PCO, NATICK, and the designated test site in order to develop the required packaging/loading to safely conduct this testing. This test(s) is Government-unique and must be conducted at the only approved facility for the conduct or simulation of this test is US Army Yuma Proving Grounds (YPG), Yuma, AZ.

4.6.2.4 Rail transportability. The requirements of 3.6.2.4 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. In addition, failure to safely meet the requirements as specified in 3.6.2.4 without the use of additional kits or special tools shall constitute failure of this test. The requirements of 3.6.2.4 shall be verified when the Hippo is properly stored in its

rail shipment configuration. In addition, upon completion of test, the Hippo shall be inspected and operated IAW 4.1.1.3.

4.6.2.4.1 Rail impact. The Hippo, when properly configured in its rail shipment mode, shall be tested in accordance with MIL-STD-810, Method 526. A series of four impacts shall be performed in each direction, at speeds described in Method 526. In addition, upon completion of the test, the test unit shall transported over cross-country terrain for a minimum of 20 miles, and then inspected and operated IAW para 4.1.1.3.

4.6.2.5 Highway transport. The requirements of 3.6.2.5 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. In addition, failure to safely meet the requirements as specified in 3.6.2.5 shall constitute failure of this test.

4.6.2.6 Marine transport. The requirements of 3.6.2.6 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. In addition, failure to safely meet the requirements as specified in 3.6.2.6 shall constitute failure of this test.

4.7 Ownership and support requirements.

4.7.1 Fuel. The requirements of 3.7.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.7.1 shall constitute failure of test.

4.7.2 Lubricants. The requirements of 3.7.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.7.2 shall constitute failure of test.

4.7.3 NATO intervehicle receptacle. The requirements of 3.7.3 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.7.3 shall constitute failure of test.

4.7.4 Reserved.

4.7.5 Safety. The requirements of 3.7.5 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Actual performance and compliance during the PVT shall be monitored continuously. In

accordance with the terms of the solicitation/contract/SOW, and prior to any actual Government conducted or sponsored testing, the contractor must complete and submit for Government approval the Safety Analysis Report (SAR). Failure to meet the requirements of 3.7.5 shall constitute failure of test.

4.7.6 Human factors engineering. The requirements of 3.7.6 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating configurations and environments. Failure to meet the requirements of 3.7.6 shall constitute failure of test.

4.7.7 Personnel integration (MANPRINT) requirements. The test samples shall be continuously evaluated for compliance to the requirements of 3.7.7. Failure to meet the MOS requirements of 3.7.7 shall constitute failure of test.

4.7.8 Environmental hazard prevention. The requirements of 3.7.8 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance. Failure to meet the requirements of 3.7.8 shall constitute failure of test.

4.7.9 Durability. The requirements of 3.7.9 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in all required operating conditions and environments. Not less than 6000 road miles shall be accumulated on each of three minimum test samples. Accrued mileage shall follow the terrain percentage profile provided in the OMS/MP. Both during, and upon completion of testing, the Hippo shall be operated and inspected IAW 4.1.1.3. Failure to meet the requirements of 3.7.9 shall constitute failure of test.

4.7.10 Reliability. The requirements of 3.7.10 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating conditions and environments. The number of PVT test samples to be evaluated, and the total number of operating hours and/or mileage to be accrued during the test are yet to be determined. This information will be provided in the PVT test plan. However, mileage and operating profiles shall be in accordance with the OMS/MP. Scoring criteria and definition of terms will be published in a separate document called the Hippo Failure Definition and Scoring Criteria (FDSC). Failure to meet the required level of reliability shall constitute failure of test.

4.7.11 Maintainability. The requirements of section 3.7.11 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating conditions and environments. Actual performance and compliance during the PVT, to include total maintenance man-hours (broken out by scheduled and unscheduled maintenance actions) and total number of unscheduled maintenance actions, shall be monitored and reported. Failure to meet the requirements of 3.7.11 shall constitute failure of test.

4.7.11.1 Time to repair. The requirements of section 3.7.11.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating conditions and environments. Actual performance and compliance during the PVT, to include total maintenance man-hours shall be monitored and reported. Failure to meet the requirements of 3.7.11.1 shall constitute failure of test.

4.7.11.2 Ease of maintenance. The requirements of section 3.7.11.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT in all required operating conditions and environments. Failure to meet the requirements of 3.7.11.2 shall constitute failure of test.

4.7.12 Materiel Availability (Ao). The requirements of 3.7.12 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by test data analysis and calculations from actual observation and test during PVT in all required operating conditions and environments. Failure to meet the prescribed Ao shall constitute failure of test.

4.7.13 Servicing, operation, and maintenance. The requirements of 3.7.12 through shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in all required operating conditions and environments. This requirement shall be continuously evaluated during the PVT by the test site/activity. Failure to meet the requirements of 3.7.12 shall constitute failure of test. In addition, missing or damaged support items, or degradation of performance capability due to inability to maintain or repair at the prescribed level(s), or insufficient tools or types of tools to complete required maintenance activities or repairs, shall constitute failure of this test.

4.7.13.1 Field level. The requirements of 3.7.12.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in all required operating conditions and environments. Missing or damaged support items, or degradation of performance capability due to inability to maintain or repair at the prescribed level(s), or insufficient tools or types of tools to complete required maintenance activities or repairs, shall constitute failure of this test.

4.7.13.2 Sustainment level. The requirements of 3.7.12.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in all required operating conditions and environments. Missing or damaged support items, or degradation of performance capability due to inability to maintain or repair at the prescribed level(s), or insufficient tools or types of tools to complete required maintenance activities or repairs, shall constitute failure of this test.

4.8 Environmental requirements.

4.8.1 Temperature. The requirements of 3.8.1 shall be verified by testing the Hippo in temperature environments according to Procedure I (Storage), Procedure II (Operation), and Procedure III (Manipulation) of Test Methods 501.4 (High Temperature) and 502.4 (Low Temperature). Temperature sensors shall be placed in all locations and in all operational fluids that may be harmed by high and low temperatures. Component temperatures shall be monitored and recorded at regular intervals. Ambient test temperatures shall be within the ranges as specified in 3.8.1.

4.8.1.1 Low temperature. To verify cold weather storage and operation, the Hippo will be cold soaked and equalized at -50 °F for a minimum of 24 hours. The chamber temperature will then be raised to -25 °F, and the system soaked again for a minimum of 24 hours. After completing the soak at -25 °F, the system will be filled with 34-degree water, and operated for a minimum of 24 hours IAW system operating procedures. During the conduct of this test segment, the Hippo shall be able to fill and dispense water at the rates specified in 3.5.42.1. Ambient test chamber temperature shall be maintained at -25 °F during this segment. The system shall also be subjected to a wind velocity of 20 miles per hour (mi/hr) for a minimum cumulative period of 14 hours, and likewise, be subjected to no wind for a minimum cumulative period of 9 hours. During the test, the Hippo will be checked periodically for operational capability. The Hippo's engine and freeze prevention hardware can remain operational during this test segment. All water added or recycled for use during the test shall be done so at 34 °F. During the last 6-hours of the test segment, the Hippo's payload level shall be held at approximately 1000 gallons. Upon completion of the 24-hour segment, the Hippo's payload will be reduced to 400 gallons, the pump and plumbing drained of water, and the engine and freeze prevention hardware turned off. The system will then be held at -25F with 20 mi/hr wind for a minimum of two hours. Upon completion of the two hour hold, the system shall be capable of starting and resuming operation without damage or degradation. The system will then be completely drained tore down. Throughout the conduct of this test, the Hippo shall perform as required without any degradation in performance, and shall be capable of meeting flow rate and water quality standards. No formation of ice within the water tank shall be allowed during the test. At the conclusion of the test, the unit shall be transported over cross-country terrain for a minimum of 20 miles, and then inspected and operated IAW 4.1.1.3.

4.8.1.2 High temperature. To verify hot weather storage and operation, the Hippo will be equalized and hot soaked at 160 °F for a minimum of 24 hours. The temperature will then be lowered to 125 °F, and the system soaked again for a minimum of 24 hours. After completing the soak at 125 °F, the system will be set up for operation, filled with 125 °F water, and operated IAW system operating procedures for a minimum of 24 hours. During the conduct of this test segment, ambient test temperature shall be maintained at 125 °F, and the full payload of water dispensed from the system incrementally. Upon completion of this test segment, the system will be tore down, drained of any remaining payload, and re-soaked at 125 °F for a minimum of 8 hours. Upon completion of this soak, the system will be filled with 160 °F water, and operated for a minimum period of 4 hours IAW system operating procedures. During the conduct of this test segment, the ambient test temperature shall be maintained at 125 °F, and approximately 1000 gallons of water dispensed from the system incrementally. Throughout the conduct of this test, the Hippo shall demonstrate the capability to operate IAW Section 3 of the PD, without

deterioration or degradation in performance. Upon completion of the test, the test unit shall be transported over cross-country terrain for a minimum of 20 miles, and then inspected and operated IAW 4.1.1.3.

4.8.2 Sand. The requirements of 3.8.2 shall be verified by testing the Hippo IAW Test Method 510.4, Procedure II (Blowing Sand). The Hippo, set up in dispensing mode, shall be subjected to blowing sand for a minimum total of 360 minutes, 90 minutes per side. The blowing sand concentration shall be maintained at 0.0623 ± 0.015g/ft3. The air velocity shall be maintained at 40 mi/hr. Following the test, the test unit shall be inspected and operated IAW 4.1.1.3.

4.8.3 Dust. The requirements of 3.8.3 shall be verified by testing the Hippo IAW Test Method 510.4, Procedure I (Blowing Dust). The Hippo, set up in dispensing mode, shall be subjected to blowing dust for a minimum of six hours. The blowing dust concentration shall be maintained at 0.3 ± 0.2 g/ft^3. The air velocity shall be maintained at 40 mi/hr. Following the test, the test unit shall be inspected and operated IAW 4.1.1.3.

4.8.4 Humidity. The requirements of 3.8.4 shall be verified by testing the Hippo IAW Test Method 507.4. The test shall comprise of 5 aggravated humidity-temperature cycles, each in accordance with figure 507.4 -1. During the test, the Hippo shall be set up in dispensing mode, but be empty. Following the test, the test unit shall be inspected and operated IAW 4.1.1.3. Evidence of corrosion or other condition of material degradation shall constitute failure of the test.

4.8.5 Solar radiation. The requirements of 3.8.5 shall be verified by testing the Hippo IAW Test Method 505.4, Procedure I - Cycling (Heating Effects). Diurnal cycle A1 shall be used for this test. Test duration shall be not less than 5 cycles of 24 hours each. During the test, the Hippo shall be set up in dispensing mode, however, the following payload conditions shall apply: the 1st, 2nd, 3rd, and 4th cycles conducted empty, the 5th cycle full. Temperature sensors shall be located in critical areas where temperature can be expected to be the highest. Upon completion of the test the test unit shall be transported over cross-country terrain for a minimum of 20 miles, and then inspected and operated IAW 4.1.1.3.

4.8.6 Rain. The requirements of 3.8.6 shall be verified by testing the Hippo IAW Test Method 506.4, Procedure I (Rain and Blowing Rain). A wind velocity of up to 40 miles per hour shall be used for this test. During the test, the Hippo shall be set up in dispensing mode, but be empty. Following the test, the test unit shall be inspected and operated IAW 4.1.1.3.

4.8.7 Salt fog. The requirements of 3.8.7 shall be verified by testing the Hippo IAW Test Method 509.4. During the test, the Hippo shall be set up in dispensing mode, but be empty. Duration of this test shall be four 24-hour periods. Following the test, the Hippo shall be inspected and operated IAW 4.1.1.3. All electrical components shall be examined closely for damage, and shall be operated to demonstrate full capability without degradation in performance. In addition, no visible surface corrosion of any metal parts is permitted.

4.8.8 Noise limits. As required by system configuration, the requirements of 3.8.8 shall be verified by testing IAW Test Method 515.5 Acoustic Noise. Failure to meet the requirements of 3.8.8 shall constitute failure of test.

4.8.9 Electromagnetic Interference (EMI). The requirements of 3.8.9 shall be verified by testing the Hippo for electromagnetic interference in accordance with MIL-STD-461. Test procedures shall include CE-102, CS-101, CS-114, CS-115, CS-116, RE-102 and RS-103. Standard test conditions shall apply. As appropriate, the Hippo shall be examined for damage and operated after each phase of testing to demonstrate hardware operational capability without degradation in performance IAW 4.1.1.3.

4.8.10 Exposure to HAEMP/ESD/NSL. The requirements of 3.8.10 shall be verified by testing the Hippo IAW MIL-STD-464. Following each phase of the test, the Hippo shall be examined for damage and operated to demonstrate hardware operational capability without degradation in performance IAW 4.1.1.3.

4.8.11 Altitude. The requirements of 3.8.11 shall be verified by testing the Hippo IAW Method 500.4, Procedure I (Storage/Air Transport) and Procedure II (Operation/Air Carriage). With the Hippo in storage configuration, Procedure I shall be conducted for not less than one hour at an equivalent altitude of not less than 40,000 feet above sea level. Procedure II shall be conducted at an equivalent altitude of not less than 7,500 feet above sea level with the Hippo operating IAW Section 3 of this PD for not less than two hours. Following each phase of the test, the test unit shall be examined for damage and operated to demonstrate hardware operational capability without degradation in performance IAW 4.1.1.3.

4.8.12 Ozone. To verify conformance to 3.8.12 rubber components shall have a CoC provided stating testing has been completed with acceptable results per ASTM D1171, Method A, utilizing Ozone-Exposure Method B.

4.9 Identification, marking, and information. The requirements of 3.9 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance. Failure to meet the requirements of 3.9 shall constitute failure of test.

4.9.1 Data plates. The requirements of 3.9.1 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.9.1 shall constitute failure of test.

4.9.2 Markings. The requirements of 3.9.2 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance and by actual observation and test during PVT testing in all required operating configurations and environments. Failure to meet the requirements of 3.9.2 shall constitute failure of test.

4.10 CBRN survivability. The requirements of 3.10 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and

by actual observation and test during PVT testing in the required operating configurations and environments. The Final Test Report shall identify and list each component that cannot be decontaminated with current procedures. Upon completion of the test the Hippo shall be operated at ambient temperature to demonstrate hardware operational capability without degradation in performance IAW 4.1.1.3. Failure to meet the requirements of 3.10 shall constitute failure of test.

4.11 Treatment and painting. The requirements of 3.11 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in the required operating configurations and environments. Treatment and coating type, color conformance (see 6.2 or contract delivery order), visual and tactile observation of workmanship and finish, separate CoC of materials and processes, and any additional related contractual requirements shall be observed and recorded. Failure to meet the requirements of 3.11 shall constitute failure of test.

4.12 Construction/welding. The requirements of 3.12 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in the required operating configurations and environments. The Edition (year) of applicable welding codes shall be those in effect at time of contract solicitation release date.

4.12.1 Quality of construction and welding. Both prior to and during the fabrication and assembly process, objective quality evidence shall be obtained, recorded, and retained by the contractor to verify all welding and materials, workmanship, and documentation are in compliance with applicable specifications. Prior to manufacturing Hippo systems, the Contractor shall develop and submit welding procedures to the procuring activity for approval. Repair welding of defective parts shall require a written procedure identifying proper technique and approach to correct defective product, and, prior Government approval.

4.12.2 Independent certification. The water storage vessel (tank) shall be certified by separate contractor CoC IAW the ASME BPVC. To verify integrity of the vessel(s), the preferred method shall be testing for leaks at a pressure of at least 3 lb/in^2 by air pressure, soap bubble method. The vessel(s) shall be leak tested prior to the start and at the conclusion of PVT Durability testing (ref 4.7.9), and after any test in which it's suspected that sufficient physical forces have been applied to the system that might induce a fluid leak, and when visual observation indicates that a loss of fluid has occurred. Any evidence of leaks shall constitute failure of test.

4.13 Manuals and special instructions. The requirements of 3.13 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in the required operating configurations and environments. As required by Scope of Work or contract, an inspection for count, condition, packaging, and placement/location of manuals and instructions shall be made to verify compliance. Failure to meet the requirements of 3.13 shall constitute failure of test.

4.14 Reserved.

4.15 Basic Issue Items (BII). The requirements of 3.15 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in the required operating configurations and environments. In addition, the test site/activity shall observe and record the specific identity/type and location, quantities, and suitability for intended use in the quantities and types supplied for all BII/MIE/AAI and similar items as part of the PVT. Failure to meet the requirements of 3.15 shall constitute failure of test.

4.16 Load and packaging plans and instructions. The requirements of 3.16 shall be verified by contractor CoC including supporting subcontractor documentation/certifications to demonstrate compliance, and by actual observation and test during PVT testing in the required operating configurations and environments. In addition, the test site/activity shall observe and record the specific identity/type and location, quantities, and suitability for intended use in the quantities and types supplied for all plans and instructions. This evaluation, including any additions, deficiencies, and corrective actions shall be included in the Final Test Report.

5. PACKAGING.

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order. When actual packaging of material 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 U.S. Army Tank-Automotive and Armaments Command. Packaging data retrieval is available from the managing Military Department 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 LHS Potable Water Hippo is intended to transport water to remote locations using the HEMTT-LHS, PLS truck and PLS trailer. The Hippo will use its onboard pump to distribute the water to stationary and portable tanks. The onboard pump can also be used to fill the tank from an external water source and is capable of accepting water from an external pumping source. The water Hippo shall operate from the brigade to echelons above brigade.

6.2 Acquisition requirements. Acquisition documents should specify the following:

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

b. If required, the specific issue of individual documents referenced (see 2.2 and 2.3).
c. When a first article inspection is required (see 3.2 and 4.1.1).

6.3 Definitions. The following definitions apply for this specification.

6.3.1 Recovered materials. Recovered materials are those materials that have been collected from solid waste and reprocessed to become a source of raw materials as distinguished from virgin raw materials.

6.3.2 Mission Orientated Protective Posture (MOPP). MOPP IV protection consists of a two-piece protective overgarment, protective mask with hood, overboots and rubber gloves with cotton liners. The overgarment is closed and hood is pulled down and adjusted (Field manual FM-3-100).

6.3.3 Special tools and test equipment. Special tools and test equipment are defined as those not found in the Army's General Mechanics tool kit (NSN 5180-01-548-7634), tool kit Supplement #1 (NSN 4910-00-754-0653), and U.S. Army Supply Catalogs 4910-95-A73 and 4910-95-A74. The SKO Supply Catalog website is "http://158.2.5.50/codebase/index.html". These kits and other tool kits/sets (US Army) are managed by USA TACOM-Rock Island, AMSTA-AC-CTTS, Rock Island, IL, 61299.

6.3.4 BII. BII is defined as any support items that the operator of the system will require in order to put in operation, operate, and to perform emergency repairs.

6.3.5 Highway transport. The 4-meter height restriction is based on STANAG 2154.

6.3.6 Maintenance ratio. The maintenance ratio is defined as the ratio of the total active maintenance in man-hours required (scheduled and unscheduled) to the total operating time (see 3.7.6). It does not include Preventive Maintenance Checks and Services (PMCS), which is performed to keep the system in operating condition.

6.3.7 Hardware Essential Function Failure (EFF). EFF is defined as any malfunction of contractor furnished hardware that causes the inability of the Hippo to store water, dispense water, re-circulate water, or thermal regulation essential functions. Also, any event that causes the use of the system to be discontinued including those events posing threat of serious injury to personnel or equipment will constitute an EFF. Any Army Class 3 leak that cannot be immediately corrected by the operator (within 5 minutes) will constitute an EFF. Any malfunction of the Hippo that prevents the transporting of the Hippo will constitute an EFF. Any malfunction of the Hippo that renders the payload water non-potable will constitute an EFF".

Note: Scoring criteria and definition of terms is published in a separate document called the Hippo Failure Definition and Scoring Criteria (FDSC).

6.3.8 Inter-theater transport. The system, prepped for operation but empty, is transported by air, sea, or land from CONUS to an OCONUS location, or between two OCONUS locations in separate theaters.

6.3.9 Intra-theater transport. The system, prepped for operation and with payload from empty to full, is transportable by appropriate air, sea, or land means between locations in the same theater or operational area.

6.3.10 Class 3 leak. A class 3 leak is defined as leakage of a fluid great enough to form drops that would fall from the leaking item.

6.3.11 Materiel Availability (Ao). Ao is used to denote system availability, and is expressed as the ratio of (up time)/(total time).

6.4 Corrosion control:

a. Corrosion control can be achieved by a combination of design features (as in TACOM Design Guidelines for Prevention of Corrosion in Combat and Tactical Vehicles, March 1988), material selection (e.g. composites, corrosion resistant metal, galvanized steel), organic and inorganic coatings (e.g. zinc phosphate pre-treatment, corrosion resistant plating, E-coat, powder coating) and production techniques (e.g. coil coating, process controls, inspection and documentation).
b. Corrosion protection for low-carbon sheet steel can be achieved by hot dip galvanizing IAW ASTM A123, or electro-galvanized .75 mil minimum thickness IAW ASTM B633 (or a minimum coating thickness of .75 mil on pre-galvanized sheet .063 in. or less) with zinc phosphate pre-treatment, epoxy prime and CARC top coat. Alternate designs may be evaluated by comparison to a galvanic sample (as described above) using ASTM D522 Mandrel Bend Test and Accelerated Corrosion Test GM 9540P, Method B, 120 cycles. Failure constitutes a defect such as extensive corrosion at scribe or significant penetration of base material (per ASTM D3359).
c. Due to changes in climatic conditions and the development of newer materials and processes, all accelerated corrosion tests undergo a continuous adjustment to reflect these conditions. Therefore, modifications to the testing are to be expected over time.

6.5 Trade associations. Reference to the following trade association is provided for guidance purposes only:

Specialty Steel Association of North America (SSINA)
3050 K Street N.W.
Washington D.C. 20007
http://www.ssina.com

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APPENDIX A

MISSION PROFILE

A.1 SCOPE

A.1.1 Scope. This appendix provides guidance as to the operational mode and mission profile of the HIPPO.

A.2 OPERATIONAL MODE SUMMARY AND MISSION PROFILE

A.2.1 PLS mission profile. The mission profile for the PLS can be found in table A-I.

TABLE A-I. PLS mission profile.

Terrain	% of Cycle	Typical Speed
Hard Surface	25	55
Hilly secondary road	25	45
Level secondary road	25	45
Hilly trail	10	30
Level trails	10	30
Hilly rough Trails	2 ½	15
Level rough trails	2 ½	15

A.2.1.1 Primary roads. Two or more lanes, all weather, maintained, hard surface (paved) roads with good driving visibility used for heavy and high density traffic. These roads have lanes with a minimum width of 108 inches (2.75 M), road crown to 20 degrees and the legal maximum GVW/GCW for the country or state is assured for all bridges. These roads are surfaces having Root Mean Square (RMS) value of 0.1 inch (2.54 mm).

A.2.1.2 Secondary roads. Two lanes, all weather, occasionally maintained, hard or loose surface (e.g. large rock, paved, crushed rock, gravel) intended for medium-weight, low-density traffic. These roads have lanes with minimum width of 98.5 inches (2.5 m) and no guarantee that the legal maximum GVW/GCW for the country or state is assured for all bridges. These roads are surfaces having a RMS value varying between 0.3 inch (7.63 mm) - 0.6 inch (15.24 mm).

A.2.1.3 Trails. One lane, dry weather, unimproved, seldom maintained loose surface roads, intended for low-density traffic. Trails have a minimum width of 98.5 inches (2.5 M), no large obstacles (boulders, logs, and stumps) and no bridging. These are surfaces having a RMS value varying between 0.5 inches (12.7 mm) - 1.5 inches (38.1 mm).

A.2.2 LHS mission profile. The mission profile for the LHS can be found in table A-II.

TABLE A-II. LHS mission profile, mission I, II, III, IV, VA and VC vehicles - threshold

%	Terrain	Max Safe Speed Up To	Miles (per interval)
15	Hard Surface	55 mi/hr	150
75	Secondary Road	45 mi/hr	750
5	Cross Country - Level	30 mi/hr	50
5	Cross Country - Hilly	15 mi/hr	50

A.2.3 Hippo water distribution profile. The Hippo water distribution profile can be found in table A-III.

TABLE A-III. Hippo water distribution.

Kilometers (KM) traveled	Pump minutes for water upload (125 gal/min)	Pump minutes for water distribution (gal/min varies)	Daily Total
64 KM round trip/mission	16 min/mission	30 min/mission	256 KM 184-Min Pump Operation
4 missions/day	4 missions/day	4 missions/day	
Total 256 KM/day	Total 64 min/day	Total 120 min/day	

A.2.3.1 Hippo water distribution mission. A typical retail water distribution mission for a Hippo is depicted below:

a. Load water into Hippo(s) (via external or system pump, Hippo(s) may be mounted or dismounted).
b. Load Hippo(s) onto HEMTT-LHS vehicle/PLS truck or trailer if not already mounted (via LHS/PLS Load Handling System).
c. Travel to water distribution point.
d. Distribute water to unit water trailers and individuals.
e. Travel to next resupply point.
f. Distribute water to unit water trailers and individuals.
g. Repeat events e-f as dictated by customer demand/remaining water.
h. Return to water supply point.
i. Off-load empty Hippo(s).
j. Load full Hippo(s) onto HEMTT-LHS vehicle/PLS truck and trailer.

A.2.4 Hippo dry point water distribution profile. The hippo dry point water distribution profile can be found in table A-IV.

TABLE A-IV. Hippo dry point water distribution

Kilometers (KM) traveled	Pump minutes for water upload (125 gal/min)	Pump minutes for water distribution (gal/min varies)	Daily Total
64 KM round trip/mission	16 min/mission	45 min/mission	64 KM 61 Min Pump Operation
1 mission/day	1 mission/day	1 mission/day	
1.1 Total 64 KM/day	1.1.1 Total 16 min/day	1.1.2 Total 45 min/day	

A.2.4.1 Hippo dry point water distribution mission. A typical dry point water distribution mission is described below:

a. Load water into HIPPO(s) (via external or system pump).
b. Load HIPPO(s) onto HEMTT-LHS or similar vehicle/PLS and trailer (via HEMTT-LHS/PLS Load Handling System).
c. Travel to dry point.
d. Off-load HIPPO(s) via HEMTT-LHS or similar vehicle/PLS Load Handling System.
e. Distribute water as dictated by customer demand/remaining water.
f. When empty, load HIPPO(s) on HEMTT-LHS or similar vehicle/PLS and trailer (via HEMTT-LHS/PLS Load Handling System).
g. Return to water supply point.
h. Off-load empty HIPPO(s) from HEMTT-LHS or similar vehicle/PLS truck and trailer or refill and begin next mission.

A.2.5 Hippo movement terrain. The hippo movement terrain profile can be found in table A-V.

TABLE A-V. Hippo movement terrain.

Terrain	Usage
Primary Roads	15%
Secondary Roads	25%
Trail	50%
Cross Country	10%

Custodians:
Army – AT

Preparing activity:
Army – AT

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at http://assist.daps.dla.mil.