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INCH-POUND

ATPD 2329
Rev E

PURCHASE DESCRIPTION

REVERSE OSMOSIS WATER PURIFICATION UNIT, 600 GPH
600 ROWPU

This purchase description is approved for use by all
Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This purchase description establishes the
requirements and verification methods for the 600 Gallons Per
Hour Reverse Osmosis Water Purification Unit (herein referred to
as "600 ROWPU").

1.2 Classification. The 600 ROWPUs consist of the
following types, as specified (see 6.2):

Type I	- Trailer Mounted.
Type II	- Skid mounted: two fork pocket.
Type III	- Skid mounted: four fork pocket.

Beneficial comments (recommendations, additions, deletions) and
any pertinent data which may be of use in improving this
document should be addressed to: U.S. Army Tank-automotive and
Armaments Command, ATTN: AMSTA-TR-D/210, by letter.

AMSC N/A
FSC 4610

DISTRIBUTION STATEMENT A. Approved for public release;
distribution is unlimited.

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of the purchase description. This section does not include documents cited in other sections of this purchase description 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 and 4 of this purchase description, whether or not they are listed in section 2.

2.2 Government Documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form part of this purchase description to the extent specified herein. Unless otherwise specified, the issue of these documents shall be those listed in the issue of the Department of Defenses Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

MILITARY

A-A-50271	Plates, Identification, Commercial Item Description.
MIL-D-50030	Decontamination Agent, DS2
MIL-D-16791	Detergents, General Purpose (Liquid, Non-ionic)
MIL-DTL-12468	Decontamination Agent, STB
MIL-PRF-64159	Coating, Water Dispersible Aliphatic Polyurethane, Chemical Agent Resistant
MIL-S-40626	Sign Kit, Vehicle Class

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STANDARDS

MILITARY

MIL-HDBK-1791	Designing for Internal Aerial Delivery in Fixed Wing Aircraft.
MIL-HDBK-454	General Guidelines for Electronic Equipment
MIL-HDBK-669	Loading Environment and Related Requirements for Platform Rigged Airdrop Material
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-810	Environmental Engineering Considerations and Laboratory Tests.
MIL-STD-889	Dissimilar Metals.
MIL-STD-1366	Materiel Transportation System Dimensional and Weight Constraints, Definition of.
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipments, and Facilities.
MIL-STD-1474	Noise Limits for Army Materiel.

Unless otherwise indicated, copies of federal and military specifications, and standards are available from the Defense Automated Printing Service, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents. The following other Government documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those in effect on the date of the solicitation.

DRAWINGS

**600 GPH ROWPU
SOLICITATION DAAE07-03-R-T014**

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TA 13222E5235 600 ROWPU, Reverse Osmosis, Trailer Mounted
600 GPH.

TA 13225E8940 600 ROWPU, Reverse Osmosis, Skid Mounted,
Four Fork Pocket, 600 GPH.

TA 13226E0121 600 ROWPU, Reverse Osmosis, Skid Mounted,
Two Fork Pocket, 600 GPH.

(Copies of these drawings are available from the US Army Tank-
automotive and Armaments Command, AMSTA-TR-D/210 Warren, MI
48397-5000.)

CODE OF FEDERAL REGULATIONS (CFR)

Title 21 Federal Food, Drug and Cosmetic, Food Additives.

Title 40 Food and Drugs, Parts 173-189

(Copies of this documents is available from the
Superintendent of Documents, Government Printing Office,
Washington, DC 20402 or [http://www.access.gpo.gov/nara/cfr/.](http://www.access.gpo.gov/nara/cfr/))

FIELD MANUALS

FM 10-500-3 Airdrop of Supplies and Equipment: Rigging
Containers

FM 3-5 NBC Decontamination

FM 3-4 NBC Protection

(Copies of FMs can be found at <http://155.217.58.58/atdls.htm>)

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

AVTP-03-160W Dynamic Stability, dtd Sept 1991

(Copies of the above documents are available from North Atlantic
Treaty Organization (NATO), Military Agency For Standardization
(MAS), 1110 Brussels, Belgium)

TECHNICAL MANUALS

TM 9-2320-272-10 Operators Manual for Truck, 5-ton, 6X6
M939, M939A1 and M939A2 Series Trucks
(Diesel)

TM 55-2320-272-14-1 Transportability Guidance Trucks, 5-
ton, 6X6 M939 Series/M939A Series

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- A5.10 Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes.
- C3.4 Specification for Torch Brazing
- C3.5 Specification for Induction Brazing
- C3.6 Specification for Furnace Brazing

(Copies of these documents are available from The American Welding Society, 550 N.W. LeJeune Road, P.O. Box 351040, Miami, FL 33135.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- SAE-AMS-W-6858 Welding, Resistance: Aluminum, Magnesium, Nonhardening Steels or Alloys, Nickel Alloys, Heat-Resisting Alloys, and Titanium Alloy; Spot and Seam.
- SAE J 429 Mechanical and Material Requirements for Externally, Threaded Fasteners.
- SAE J 492 Rivets and Riveting.
- SAE J184 Qualifying A Sound Data Acquisition System

(Copies of these documents are available from The Society of Automotive Engineers, Department 105, 400 Commonwealth Drive, Warrendale, PA 15086.)

AMERICAN NATIONAL STANDARDS INSTITUTE

- ANSI/ASA S1.4 (DoD Adopted) Specification for Sound Level Meters
- ANSI/ASA S1.11(DoD Adopted) Specification for Octave-Band and Fractional-Octave Band Analogue and Digital Filters

(ANSI S1.4 and S1.11 can be found at The Acoustical Society of America; 120 Wall Street; 32nd floor; New York, NY 10005-299. Individual documents can also be obtained from: ASA, Acoustical Society of America 120 Wall Street; 32nd Floor New York, NY 10005-299, Phone (212)248-0373.)

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(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.4 Order of precedence. The statement of work shall establish the precedence between documents. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. The 600 ROWPUs shall be in accordance with top assembly TA 13222E5235 for type I, top assembly TA 13226E0121 for type II, top assembly TA 13225E8940 for type III, and as specified herein.

3.1.1 Drawings. The drawings forming a part of this specification are end product drawings. No deviation from the prescribed dimensions or tolerances is permissible without prior approval from the contracting officer. Where tolerances could cumulatively result in incorrect fits, the contractor shall provide tolerances within those prescribed on the drawings to ensure correct fit, assembly, and operation of the 600 ROWPU. Any data (e.g., shop drawings, layouts, flow sheets, processing procedures, etc.) prepared by the contractor or obtained from a vendor to support fabrication and manufacture of the production item shall be made available, upon request, for inspection by the contracting officer or designated representative.

3.2 First article. Unless otherwise specified in the contract, three (3) 600 ROWPUs shall be subjected to first article inspection (see 4.2 and 6.3).

3.3 Materials.

3.3.1 Material deterioration prevention and control. The 600 ROWPU shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that may be encountered in any of the applicable operating and storage environments to which the 600 ROWPU may be exposed.

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3.3.2 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 (see MIL-STD-889).

3.3.3 Acceptable materials.

3.3.3.1 Recovered materials. The components, pieces, and parts incorporated in the 600 ROWPU may be newly fabricated from recovered materials(see 6.14) to the maximum extent practicable, provided the 600 ROWPU produced meets all other requirements of this specification. Used, rebuilt, or remanufactured components, pieces, and parts shall not be incorporated in the 600 ROWPU.

3.3.3.2 Safe materials. Materials not specified on applicable drawings shall be selected by the contractor and shall be subject to all provisions of this specification. The material shall have no adverse effect on the health of personnel when used for its intended purpose. The lines and all surfaces that contact potable water shall conform to the Federal Food, Drug and Cosmetic, Food Additives, Title 21, Code of Federal Regulations for contact with food. The compounds listed in sections 177.1020, 177.1030, 177.1040, 177.1050, and 177.1480 of the Federal Food, Drug and Cosmetic, Indirect Food Additives (Chapter 1, Title 21, Code of Federal Regulations), shall not be acceptable materials. Questions pertaining to this effort shall be referred by the contracting officer to the appropriate departmental medical service, which will act as an advisor to the contracting agency (see 6.4).

3.3.3.3 Hazardous Materials. Class I and Class II Ozone Depleting Chemicals (ODCs) (see 40 CFR, Part 82) shall not be used in the 600 ROWPU. The use of hazardous materials shall be eliminated where possible. Where alternative materials are not feasible or practical, the variety and quantity of materials and their effects shall be minimized and isolated. Hazardous materials are defined as anything whose chemical, physical, or biological nature causes a safety, public health, or environmental concern that requires an elevated level of effort to manage. Materials that are flammable, corrosive, toxic, carcinogens or suspected carcinogens, systemic poisons, asphyxiants, or respiratory irritants shall not be used except as part of the purification process where required. Chemicals

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required for the purification of water shall be packaged in accordance with accepted commercial safety practice and environmental regulations. Protective clothing or equipment to assure safe handling shall be included as part of the system BII. Procedures for adding, mixing, measuring, handling, storage, and disposal of such chemicals shall include detailed safety precautions to insure minimum exposure, handling, or spillage. Such procedures shall include any cleaning chemical waste disposal, brine disposal and contaminated filters. Equipment containing electrical, hydraulic or fuel systems shall include fire fighting or fire suppression provisions, type ABC per UL 711, non-Halon equipment, appropriate for the type of fire hazards that may occur. Such fire equipment shall be reasonably and readily available to the operator in all modes of transport and operation.

3.3.4 Standard Military Lubricants. The 600 ROWPU shall operate using standard military lubricants as specified by MIL-PRF-2104.

3.3.5 Fungus and moisture resistance. Materials that are used for the 600 ROWPU shall be fungus inert or permanently rendered inert with a fungicide. See MIL-HDBK-454, guideline 4 for guidance.

3.3.6 Treatment and painting. The exterior surfaces of the 600 ROWPU shall be cleaned, treated, and chemical agent resistant coating (CARC) painted in accordance with MIL-C-53072. The topcoat color may be as specified in MIL-C-53072 or as specified in MIL-DTL-64159(water dispersible). Color shall be as specified by the contracting officer (see 6.2).

3.3.7 Workmanship. All parts, components, and assemblies of the 600 ROWPU including castings, forgings, molded parts, stampings, bearings, seals, machined surfaces, and welded parts shall be clean and free from sand, dirt, fins, pits, spurs, scale, flux, and other harmful extraneous material. All edges shall be rounded or chamfered. The unit shall be free from such defects as misaligned components, incomplete welds, rust, extraneous material, cracks, leaks, and other defects that could impair the operation and accessibility of the unit.

3.3.7.1 Metal fabrication. Metal used in the fabrication shall be free from kinks and sharp bends. The material shall be straightened by methods that will not injure it. Corners shall

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be square and true. Flame-cutting, using tips suitable to the thickness of the steel, may be used instead of shearing and sawing. All bends shall be made with controlled means to ensure uniformity of size and shape. Precautions shall be taken to avoid overheating. Heated steel shall be allowed to cool slowly. External surfaces shall be free of burrs, sharp edges, and corners, except when sharp edges or corners are required or where they are not detrimental to safety.

3.3.7.2 Bolted connections. Bolt holes shall be accurately formed and shall have the burrs removed. Washers or lock washers shall be provided where necessary. Matching thread areas securing bolts conforming to SAE J429 or capscrews shall be of sufficient strength to withstand the tensile strength of the bolt. All fasteners shall be correctly torque and shall have full thread engagement.

3.3.7.3 Riveted connections. Rivets shall fill the holes completely. All rivet heads shall be full, neatly made, and concentric with the rivet holes, and in full contact with the surface of the member and shall be in accordance with SAE J492.

3.3.7.4 Welders, weldments, and welding.

3.3.7.4.1 Weld filler metals. Aluminum filler metal shall be in accordance with AWS A5.10, type ER5356 or ER5556 or ER4043. Steel filler metal shall be in accordance with AWS A5.1, type E7018 or E6011 for carbon steel, type E7018 for high-strength low alloy steel, type E6018 for high-strength low alloy steel to carbon steel, and AWS A5.9, type ER308L for corrosion resisting steel. Copper-nickel alloy filler material shall be in accordance with AWS A5.6 or A5.7.

3.3.7.4.2 Aluminum, copper-nickel, and steel weldments. The surfaces and edges of parts to be welded, including each layer of weld materials when multiple layers are requires, shall be free from oxide scale, paint, lubricant, and other foreign matter. Welds shall transit stress to the heat-affected zone without permanent deformation or failure when the parts connected by the welds are subjected to proof and service loading. All welded parts shall be free from cracks, porosities, and other imperfections that may reduce the effectiveness of the part. Welds involving corrosion-resistant steel shall be passivated and annealed as specified on the applicable drawings.

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3.3.7.4.2.1 Aluminum welding. Aluminum welding, except spot and seam welding, shall be done by the metal inert gas (MIG) method or other methods that will provide equivalent mechanical properties of the filler metal to base metal combinations specified in 3.3.7.4.2. All welds shall be made at a uniform rate of speed. Complete and uniform penetration and fusion of the metals shall be obtained on all welds without metallic or nonmetallic inclusions. Finished aluminum welds may be ground, filed, chipped, or wire-brushed, but shall not be hammered. Preheating for welding is permissible provided the temperature does not exceed 300 °F for a total time not to exceed 30 minutes. No process requiring welding flux shall be used. Work shall be positioned and rigged for flat welding whenever practicable.

3.3.7.4.2.2 Steel welding. Steel welding shall be done by the metal inert gas (MIG) method in accordance with the qualification procedures prescribed in 3.3.7.4.1, or other methods that will provide equivalent mechanical properties of the filler metal to base metal combinations specified in 3.3.7.4.2. Where embrittlement of the joined metal may result the work shall be preheated or annealed or both. Work shall be positioned for flat welding whenever practicable. Complete and uniform penetration and fusion of the metals shall be obtained on all welds.

3.3.7.4.2.3 Copper-nickel alloy welding. Copper-nickel alloy welding shall be done by one of the following methods; shielded metal-arc welding, gas metal arc MIG welding, or gas tungsten arc welding. Flat position welding shall be used unless permission is obtained from the contracting officer for use of horizontal, vertical, or overhead welding. Square butt joints shall not be used.

3.3.7.4.3 Weldment specimens. The contractor shall submit specimens representing each typical weld joint utilized in fabrication of the 600 ROWPU. These specimens shall be furnished at the same time as the first article 600 ROWPU. Weldment specimens shall be submitted by each welder performing weldments on the 600 ROWPU with each welding equipment used. Acceptable specimens shall represent the minimum acceptable weld quality and shall be retained as an inspection standard for evaluation of production weldments.

3.3.7.4.4 Welding procedure. Prior to any welding the contractor shall prepare and submit to the contracting officer for approval a

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written welding procedure defining process and control. The procedure shall include, but is not limited to, the factors listed in table I. Welding procedure changes affecting any of the factors in table I shall be submitted to the contracting officer for approval prior to adoption of the change.

3.3.7.4.5 Rewelding defects. Portions of welded joints that have been rejected on inspection because of defects specified in 3.3.7.4.3 or not conforming to the weldment specimens specified in 3.3.7.4.4 may be repaired only by rewelding. The defective weld shall be removed by chipping or machining. With the exception of steel, flame cutting shall not be used. Before rewelding, the joint shall be inspected to ensure that all of the defective weld has been removed and that the joint is accessible so that the welding operator can obtain full penetration and fusion through the joint. Aluminum shall not be repaired by patching.

3.3.7.4.6 Spot and seam welding. Spot and seam welding shall be in accordance with SAE-AMS-W-6858.

TABLE I. Factors to be included in welding procedures.

Item No.	Factor
1.	Welding process and techniques including shielding medium.
2.	Welding process operation.
3.	Type of current, ac or dc; polarity of dc, if used.
4.	Shielding gas composition.
5.	Joint design.
6.	Method of joint preparation.
7.	Preweld and interpass cleaning.
8.	Preheat or ambient temperature range.
9.	Composition of filler metal.
10.	Filler metal size for all passes.
11.	Number and sequence of passes.
12.	Welding position.
13.	Repair method to be used in removing defects.
14.	Method of inspection used in removing defects.
15.	Method of qualification of welders.
16.	Method of determining capability of automatic equipment and equipment operators.

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17.	Workmanship specimens.
18.	Method of inspection of finished welds.

3.3.7.4.7 Brazing. Brazing of steels, copper alloys, and nickel alloys shall conform to AWS-C3.4, C3.5 and C3.6.

3.3.7.5 Diagrams, charts, and plates. Diagrams, charts, and plates attached to components with adhesive shall have surfaces free of wrinkles, bubbles, or other defects that may cause them to become loose or damaged.

3.3.7.6 Cleaning. The 600 ROWPU shall be thoroughly cleaned of all cutting oil, test residue, grease, dirt, metal scrap, and other contaminants. Cleaning shall be done in a way that will not leave a residue or otherwise make the 600 ROWPU unsuitable for its intended use. Except where moisture is required for preservation during shipment, the unit shall be completely drained before preparation for packaging.

3.4 Operation. The 600 ROWPU shall operate at design capacity without leaks, malfunctions, or permanent deformation. The 600 ROWPU, when operated in accordance with the applicable technical manual, shall have a water production capacity of at least 600 gph on fresh water containing less than 1,500 ppm (mg/L) of total dissolved solids (TDS) at a water temperature of 77 °F. The 600 ROWPU, when operated in accordance with the applicable technical manual, shall have a water production capacity of at least 400 gph on sea water containing less than 35,000 ppm of total dissolved solids at a water temperature of 77 °F. An exception to the flowrate requirements shall be made for source waters containing cyanide, lewisite, arsenic or radioactive iodine. The 600 ROWPU shall purify cyanide, lewisite, arsenic and radioactive iodine contaminated source waters at a reduced flowrate.

3.4.1 Water Quality Standards. Water produced by the 600 ROWPU shall meet the most stringent of the water quality standards set forth in the DoD Tri-Service Field Water Quality Standards in Attachment A, excluding temperature standards, when operating from all surface and ground water sources with TDS concentrations up to 35,000 mg/L and turbidities up to 150 Nephelometric Turbidity Units (NTUs) and water temperatures ranging from 32 to 95 °F.

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3.5 Environmental.

3.5.1 Operating temperature. When tested as specified in 4.6.5, the 600 ROWPU shall perform as specified in any ambient temperature from 120 to -25 °F. Shelter is to be used when the temperature is below 32 °F to provide the required protection for operation down to -25 °F.

3.5.2 Storage and transport temperature. When tested as specified in 4.6.5, the 600 ROWPU shall not be damaged by storage or transport at ambient temperatures from +160 to -28 °F. The reverse osmosis elements and calcium hypochlorite shall be removed from the unit during storage.

3.5.3 Weather and Adverse Environment Factors. The 600 ROWPU shall be capable of meeting the water quality and water production requirements specified in paragraph 3.4 of this Purchase Description with no deleterious effects caused by exposure to varied weather conditions such as blowing rain, sand, and dust (soil).

3.6 Safety and Health Hazards. The 600 ROWPU shall be safe to operate, transport, maintain, and store. A fail-safe design shall be provided for all aspects of the 600 ROWPU that may result in damage to equipment or injury to personnel. Examples of fail-safe design features include vacuum breakers, pressure relief devices, rupture discs, and high/low pressure switches. Hazards which expose personnel or equipment to injury or damage shall be eliminated or controlled. Exposed parts and contact surfaces which are subject to high operating temperatures (defined as 140° F for momentary contact and 120° F for prolonged contact) shall be shielded. Moving or rotating parts that are a hazard to personnel shall be enclosed or guarded. High pressure lines or hoses and exhaust gases shall be vented or routed away from the operator's area.

All pressure vessels used in the 600 ROWPU shall be certifiable to ASME code Section VIII or Section X but do not have to be code stamped. Warning and cautionary placards shall be affixed to the equipment or modules at a prominent location adjacent to identified hazards (i.e. vent outlets, pressure relief outlets, high voltage, heat, toxic vapors, explosion, ceiling panels that cannot hold a soldier's weight or radiation). Instructions, training, and technical manuals shall include clear warnings where appropriate. Protective devices shall not impair

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operating or maintenance functions. Gauges, warning lights, and control indicators shall use commercially accepted or military standard (MIL-STD-1472) safety conventions.

3.6.1 Noise level. Steady state noise levels produced by the 600 ROWPU shall not exceed 90 dB(A) at the operator's position and at occasionally occupied positions defined to be one meter horizontally from any location of the 600 ROWPU at a height of 1.6 meters above the ground. Occasional noise produced by the 600 ROWPU shall not exceed 100 dB at the operator's position and at occasionally occupied positions defined to be one meter horizontally from any location of the 600 ROWPU at a height of 1.6 meters above the ground. The system shall meet the requirements described in MIL-STD 1474. If the system exceeds 85 dB(A), hearing protection shall be required and shall be provided as BII along with appropriate stowage of the BII.

3.7 Reserved

3.8 Reliability. When tested as specified in 4.6.8, the specified mean-time-between-failure (MTBF) of the 600 ROWPU (not including the generator) shall be 150 hours at a 80% lower confidence limit. During reliability testing of the Type I 600 ROWPU, the trailer shall exhibit no failures.

3.9 Maintainability. The 600 ROWPU shall have a maintenance ratio (MR) of not more than 0.08. Maintenance ratio is defined as the ratio of the total active maintenance man-hours required (scheduled and unscheduled) to the total operating time. Man-hours for repair of replaced components and scheduled before-and-after-operation checks are excluded. A maintenance schedule shall be furnished prior to the start of any testing. The generator shall not be included in the maintenance ratio.

3.10 Reserved

3.11 Transportability. The 600 ROWPU shall be capable of being transported by military or commercial trailers, trains, marine vessels, and aircraft, and shall be capable of withstanding the impact forces encountered in shipment without damage, permanent deformation or degradation in performance. The 600 ROWPU shall be equipped with tiedown or slinging provisions.

3.11.1 Tiedown provisions. The tiedown provisions shall conform to MIL-STD-209, type I (see also MIL-HDBK-1791 for

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guidance) for equipment restraint criteria. The tiedown provisions shall satisfactorily complete the pull testing specified in 4.6.11.1 without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural components. Tiedown points shall be labeled "TIE DOWN HERE". Combination lift/tiedown points shall be labeled "LIFT/TIE DOWN HERE". The labels shall conform to MIL-STD-1472.

3.11.2 Slinging provisions. The slinging provisions shall conform to MIL-STD-209, Type I. The provisions shall enable the complete 600 ROWPU to be lifted in the normal operating position. The provisions shall be located so that not less than one inch clearance is maintained between slings and all exterior parts and shall be fastened to members which will withstand stresses in the amount and direction of pull specified for the provisions without weld failure, permanent deformation, cracking, loosening, or breaking of the provision or its connecting structural components when tested as specified in 4.6.11.2. Slinging provisions may also be used a tiedown provisions when such provisions meet the requirements of 3.11.1. Lift points shall be labeled "LIFT HERE".

3.11.3 Air transportability and airdrop. When tested in accordance with 4.6.11.3, the 600 ROWPU shall meet the requirements for air transport and air drop after being rigged in accordance with FM 10-500-3 (see also MIL-HDBK-1791 for guidance). The 600 ROWPU shall be transportable by C-130 or C-141 aircraft and lifted by medium-lift helicopter (CH-47).

3.11.4 Rail transportability. The 600 ROWPU shall be rail transportable in CONUS and NATO countries without restrictions. When loaded on a 50-inch (127 centimeter) high rail car, the 600 ROWPU shall have a dimensional profile within the AAR outline diagram and the Gabarit Internationale de Chargement (GIC), as specified in MIL-STD-1366. When tested as specified in 4.6.11.4, the trailer mounted 600 ROWPU shall in addition withstand rail impact without damage or deformation.

3.11.5 Truck transportability. The 600 ROWPU, when transported by the M939 (5-ton) series trucks (see TM 9-2320-272-10 and TM 55-2320-272-14-1 for guidance), shall be capable of unrestricted movement by highway in the United States and in North Atlantic Treaty Organization (NATO) member countries per MIL-STD-1366. (The M939 tractor requires a 5th wheel for movement). The 600

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ROWPU shall also be as transportable as its prime mover in cross-country movement.

3.11.6 Marine transport The 600 ROWPU shall be transportable by amphibious craft such as the Landing Craft Air Cushion (LCAC) and Landing Craft Utility (LCU). The 600 ROWPU shall be marine transportable by Lighter Amphibious Resupply Cargo (LARC-60). The 600 ROWPU shall also be capable of ocean transport by Breakbulk, Container, Fast Logistic Ship (T-AKR), Fast Sealift Transport (FST), or Large, Medium-Speed Roll-On-Roll-Off (LMSR) ships.

3.12 Trailer electrical system (Type I only). All lights and electrical circuits shall be capable of operation throughout all vehicle operating conditions.

3.13 Trailer brake system (Type I only). The trailer shall be equipped with an automatically engaging service brake which allows the brakes to engage when the hoses between the ROWPU and its prime mover are disconnected.

3.14 Leveling jacks (Type I only). The jacks shall have the capacity to raise and support the ROWPU.

4. VERIFICATION

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

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

4.2 First article inspection.

4.2.1 First article examination. The first article shall be examined as specified in 4.4(EIFIR) in the order shown.

4.2.2 First article tests. Upon successful completion of the examination in 4.2.1, the first article shall be subjected to the tests marked "X" in column 1 of table II.

4.3 Conformance inspection.

4.3.1 Examination. Each 600 ROWPU shall be examined as stated in 4.4 (EIFIR). Components shall meet the specifications of the applicable drawing or purchase description (4.5). Presence of one or more defects or deviations from the drawings shall be cause for rejection.

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4.3.2 Tests. Upon successful completion of the examination in 4.3.1, each 600 ROWPU shall be subjected to the Conformance tests marked "X" in column 2 of table II. Failure of any test shall be cause for rejection.

4.4 End item final inspection requirement (EIFIR). Each 600 ROWPU shall be inspected in accordance with the EIFIR (listed in Appendix B) corresponding to its top assembly drawing (e.g., type I ROWPUs shall be inspected to EF 13222E5235). One copy of the completed EIFIR shall be shipped with each inspected 600 ROWPU (see 6.7.1).

4.5 Component and material inspection. The contractor is responsible for ensuring that components and materials used are manufactured, examined, and tested in accordance with the applicable specifications, standards, and drawings. The government may inspect the 600 ROWPU to verify applicable requirements specified in section 3.

4.6 Inspection schedule.

4.6.1 Test schedule. Tests and inspections shall be in accordance with table II.

4.6.2 Test conditions. Unless otherwise specified in a test, tests shall be performed without shelter and at the environmental conditions existing at the place of test. If the ambient temperature is below 32 °F shelter may be provided to bring the temperature up to 32 °F. The 600 ROWPU shall operate as specified herein without maintenance other than that prescribed by the operator's manual.

TABLE II. Test/inspection schedule.

FAT	Conformance Test	Description	Requirement	Verification
X	X	Drawings	3.1.1	4.5
x		Materials	3.3	4.5, 4.6.3
	X	Operational (6 hours).	3.4	4.6.4
X		Environmental.	3.5	4.6.5
X		Safety.	3.6	4.6.6

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X		Noise level.	3.6.1	4.6.6.1
X		Reliability.	3.8	4.6.8
X		Maintainability.	3.9	4.6.9
x		Transportability.	3.11	4.6.11
X	X	Trailer electrical system (type I only).	3.12	4.6.12
X	X	Trailer brake system (type I only).	3.13	4.6.13
X	X	Leveling Jacks (type I only).	3.14	4.6.14

4.6.3 Materials

4.6.3.1 Humidity Test. The 600 ROWPU shall be tested IAW MIL-STD-810, Method 507, for five 48-hour cycles in its operational mode. Following the 5th cycle, the 600 ROWPU shall be operated IAW the operational test described in 4.6.4. Preventive maintenance before and after the Humidity Test will be limited to routine cleaning, washing, flushing, spot painting, periodic inspection, and repair of accidental or incidental damage. After the Humidity Test, the system will be inspected for indications of corrosion, oxidation, and fungus. The 600 ROWPU will then be subjected to the operational test in paragraph 4.6.4, except that the test duration shall be for 2 hours instead of 6 hours and RO element simulators shall not be used. The 600 ROWPU shall perform without any degradation in performance and meet the product water flow rate and product water quality standards specified in paragraphs 3.4 and 3.4.1 after being subjected to the Humidity Test.

4.6.3.2 Salt Fog Test. The 600 ROWPU shall be tested IAW MIL-STD-810, Method 509, Procedure I. Corrosion preventive maintenance before and after this Salt Fog Test will be limited to routine cleaning, washing, flushing, spot painting, periodic inspection, and repair of accidental or incidental damage. After the Salt Fog Test, the system will be inspected for indications of corrosion, oxidation, and fungus. The 600 ROWPU will then be subjected to the operational test in paragraph 4.6.4, except that the test duration shall be for 2 hours instead of 6 hours and RO element simulators shall not be used. The 600 ROWPU shall perform without any degradation in performance and meet the product water flow rate and product

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water quality standards specified in paragraphs 3.4 and 3.4.1 after being subjected to the Salt Fog Test.

4.6.4 Operational test (6 hours). The 600 ROWPU shall be operated as specified in 4.6.2 and the applicable technical manual for not less than 6 hours. The 600 ROWPU shall be operated on dechlorinated tapwater during this test. This test shall use RO simulators, which shall remain installed, and a part of each 600 ROWPU delivered. Only tools and parts normally provided with the 600 ROWPU, in the quantities normally provided, may be used for maintenance of the 600 ROWPU during the test. After the test is completed, open and leave open all drain and vent valves. Follow the instructions in manual TM10-4610-215-10 for preparation for movement of the 600 ROWPU.

4.6.4.1 Criteria for failure. Evidence of any one of the following conditions shall constitute failure of this test:

- a. Leaks at any welded seam or any other connection.
- b. Lights or any switch fails to operate.
- c. Valves fail to operate properly.
- d. Mechanical or electrical failure of any component or part.

4.6.5 Blowing Rain. The 600 ROWPU shall be exposed to blowing rain to verify that it can withstand adverse weather conditions. The Blowing Rain Test shall be IAW MIL-STD-810, Method 506, Procedure I - Blowing Rain. The wind test shall be conducted at a speed of at least 40 miles per hour. 600 ROWPU will operate for a minimum of 2 hours, 30 minutes per face, during the Blowing Rain Test. The 600 ROWPU shall perform without any degradation in performance and meet the product water flow rate and product water quality standards specified in paragraph 3.4 and 3.4.1 during and after the Blowing Rain Test.

4.6.6 Safety and Health Hazards. The Government will conduct visual inspections and examinations of the 600 ROWPU during all testing to ensure that the 600 ROWPU is safe for the soldiers and marines to operate in each of the configurations. The system shall operate and demonstrate that the fail-safe safety features are activated at their respective set points.

4.6.6.1 Noise level. The 600 ROWPU's noise levels shall be measured at the locations specified in paragraph 3.6.1. For

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exterior noise, measurements shall be made at 12 equal horizontal arc increments, with one increment being the noisiest position. Measurements shall be made when the 600 ROWPU is operating in normal operation (meeting operational flowrate requirements) and in its backwash mode. Data shall be recorded as A-weighted and octave band sound pressure levels. The test site shall be a uniform flat grass surface, free of ice, snow, or vegetation over 0.15m tall; the site shall be free of reflecting surfaces such as buildings, trees, or hillsides within 30 m. When practical, background noise, including wind noise, shall be at least 10 dB below that of the 600 ROWPU operated at full load. A windscreen shall be used at wind velocities of 10 km/h or more; measurements shall not be made at wind velocities of 20 km/h or more. Sound level meters shall conform to requirements for Type 1, as specified by ANSI S1.4. Band filter sets shall conform to requirements for ANSI S1.11. Other noise recording instrumentation or combinations of instrumentation shall conform to SAE J184 and applicable provisions of ANSI S1.4. Sound meter calibration shall be performed any time instrumentation changed and before and after each test sequence. At a minimum, the following data will be recorded: instrumentation record for all equipment, equipment record, date, time, humidity, wind speed, barometric pressure, temperature, cloud cover, instrument set up and locations, and data collector's name and telephone number. Failure to meet the requirements of 3.6.1 shall constitute failure of this test.

4.6.7 Reserved

4.6.8 Reliability. The 600 ROWPU shall be tested for 1,950 hours in accordance with the mission profile cycle in 6.13. At least five hundred hours shall be on salt water as specified in 4.6.8.1. The remaining hours may be on chlorine-free fresh water. The results of this test will be verified against the reliability requirements specified in paragraphs 3.8. During testing, a failure is any malfunction which causes or may cause inability to commence operation, cessation of operation, degradation of performance capability below designated levels, or serious personnel hazards. Any malfunction which the operator can remedy will not be counted provided the repair is authorized or prescribed as an operator function and can be accomplished within 60 minutes using only controls and authorized tools or spare parts incorporated in or carried with the 600 ROWPU. Simultaneous related failures are considered one failure. Generator failures shall not be counted. The trailer

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shall exhibit no failures. If the trailer exhibits one or more failure, the entire 600 ROWPU shall fail the test.

4.6.8.1 Saltwater feed composition. Feedwater shall be in accordance with ASTM D1141, substitute ocean water, section 6 without heavy metals, except the salt shall be dissolved in dechlorinated tap water to provide a solution containing 19,000 ±1000 mg/1 chloride ion. Sodium bisulfite may be used to remove chlorine. (Note: Natural seawater may be substituted for the artificial ocean water with the contracting officer's approval)

4.6.9 Maintainability. The 600 ROWPU maintainability data collection will occur during the reliability testing (4.6.8). Maintenance during testing shall be in accordance with the schedule required by 3.9. The maintainability ratio shall be calculated as specified by 3.9. Nonconformance to 3.9 shall constitute failure of this test.

4.6.10 Reserved

4.6.11 Transportability.

4.6.11.1 Tiedown provisions. The tiedown provisions shall be tested in accordance with MIL-STD-209 to demonstrate conformance to 3.11.1. Inspection of labeling shall also be conducted to verify compliance to 3.11.1. Any weld failure, permanent deformation, cracking, loosening, or breaking of the tiedown provision or its connecting structural components shall be cause for failure of this test.

4.6.11.2 Slinging provisions. The slinging provisions shall be tested in accordance with MIL-STD-209 to demonstrate conformance to 3.11.2. Inspection of labeling shall also be conducted to verify compliance to 3.11.2. Any weld failure, permanent deformation, cracking, loosening, or breaking of the slinging provision or its connecting structural components shall be cause for failure of this test.

4.6.11.3 Reserved

4.6.11.4 Rail transportability. The first article 600 ROWPU shall be tested in accordance with MIL-STD-810, method 516, Procedure VII, Rail Impact. The 600 ROWPU will be evaluated pass/fail based on the analysis of results paragraph (MIL-STD-810, Method 516, Paragraph 4.5.8.4) in this test. The Military

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Traffic Management Command Transportation Engineering Agency (MTMCTEA) shall approve Tiedowns and bracing before the test starts. The 600 ROWPU will then be subjected to the operational test in paragraph 4.6.4, except that the test duration shall be for 2 hours instead of 6 hours and RO element simulators shall not be used. The 600 ROWPU shall perform without any degradation in performance and meet the product water flow rate and product water quality standards specified in paragraphs 3.4 and 3.4.1 after being subjected to the Rail transportability test.

4.6.11.5 Cross-country mobility The 600 ROWPU shall be tested for the ability to withstand transport with the prime mover for 800 miles in accordance with the specified profile (%), at an average speed of 20 mph over improved road (50%), unimproved road (30%), dirt and cross country (20%). The 600 ROWPU will then be subjected to the operational test in paragraph 4.6.4, except that the test duration shall be for 2 hours instead of 6 hours and RO element simulators shall not be used. The 600 ROWPU shall perform without any degradation in performance and meet the product water flow rate and product water quality standards specified in paragraphs 3.4 and 3.4.1 after being subjected to the cross-country mobility test.

4.6.12 Trailer electrical system. Connect the intervehicular cable to a 24-volt power source. All lights shall be checked for proper operation. Nonconformance to 3.12 shall constitute failure of this test.

4.6.13 Trailer brake system. When the trailer is disconnected from an appropriate air source the brakes shall engage and maintain application for not less than 15 minutes. When air in excess of 50 pounds per square inch (gauge) is applied to the emergency intervehicular hose the brakes shall release. When air is applied to the modulating intervehicular hose the brakes shall engage and hold as long as pressure is maintained. Nonconformance to 3.13 shall constitute failure of this test.

4.6.14 Leveling jacks. Each jack shall be individually lowered and raised to support the trailer. Nonconformance to 3.14 shall constitute failure of this test.

5. PACKAGING

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5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). 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 of Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The 600 ROWPU is intended to supply potable water from any fresh, brackish, or sea water source.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type of 600 ROWPU requires (see 1.2).
- c. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents references (see 2.2 and 2.3).
- d. When a first article is not required for or the number of units required (see 3.2).
- e. Color (see 3.3.6).
- f. Government-furnished property
- g. The contract should describe what tests, if any, are to be performed by the contractor and the timeframe required (see 4.1).
- h. Degree of preservation and degree of packing required
- i. When a transportability report is required.

6.3 First article. When a first article inspection is required, the items should be preproduction models. The contracting officer should include specific instruction in acquisition documents regarding arrangements for examinations,

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tests, and approval of the first article test results and disposition of the first articles.

6.4 Medical advisor. The surgeon General of the Army will act as advisor to make any necessary determination on health hazards. Inquiries should be forwarded to Headquarters, Department of the Army, ATTN: DASG-TSP-E, Washington, DC, 20310.

6.5 Noise limits. When the noise level of the 600 ROWPU exceeds the limits of MIL-STD-1474, Category D, the appropriate discussion of the noise hazard in accordance with MIL-STD-1474 (Manuals paragraph) includes: (a) requirement for hearing protection; (b) noise level of the 600 ROWPU; (c) distance from the 600 ROWPU at which 85Db(A) will always be met and (d) what operational situation or system configuration will reduce the level to Category D limits.

6.6 Vehicle weight classification. The contracting officer should arrange to furnish vehicle classification form to the contractor and request the return of the completed forms to the Government. The information thus obtained should be used to determine the weight classification number(s) for the 600 ROWPU. The contractor should then be requested by the contracting officer to apply the weight classification number(s) to the 600 ROWPU.

6.7 Definitions.

6.7.1 End item final inspection requirement (EIFIR). An EIFIR is a check list of quality characteristics prepared by the Government which the contractor must follow during his final inspection of the completed end item to verify complete and functional conformance to contract requirements prior to submission for final acceptance.

6.8 Data requirements. The contracting officer should include requirements for such data as technical publications, instructional manuals, illustrated parts lists, and contractor's maintenance and operation manual to be furnished with each 600 ROWPU.

6.8 Provisioning. The contracting officer should include provisioning requirements for such repair parts and maintenance

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tools as necessary (including any special tools), and instructions on shipment of 600 ROWPUs.

6.9 Government-furnished property. The contracting officer should arrange to furnish the Tech Manual for the 600 ROWPU.

6.10 Rail testing. The contractor must ensure that the tiedown provisions for the rail testing are submitted to MTMCTEA in time to allow adequate review and approval. In addition, at least one week before rail testing begins (see 4.6.11.4), the contracting officer or the Government test engineer should ensure that MTMCTEA has been informed of the test date and location so they may witness the test.

6.11 Decision flow chart. This decision flow chart is to be used only to determine those malfunctions which will be considered in calculation of MTBF and MR (see 3.8 and 3.9).

Decision Flow Chart

Sequence	Question		Classification
1.	Does the incident concern RAM?	No	Non-RAM oriented No Score
	Yes		
2.	Does the incident concern the power source (commercial or generator)?	Yes	No Score
	No		
3.	Was incident detected during initial inspection?	Yes	No Score
	No		
4.	Did incident result from test item abuse, unrealistic operating conditions, accident, or improper maintenance or operating procedures?	Yes	No Score
	No		
5.	Was the incident a kit installation authorized modification, engineer	Yes	No Score

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- evaluation, or
 Manual/Maintenance evaluation?
 No
6. Was the incident detected during an inspection which required only scheduled crew maintenance, if any, or correction?
 Yes No Score
 No
7. Was the incident a scheduled service or replacement?
 Yes Scheduled Maintenance
 No Score
 No
8. Was the incident caused by another incident?
 Yes Unscheduled Maintenance
 No Score
 No
9. Was the incident as incipient malfunction detected during operation for which correction can be deferred to the next scheduled maintenance and corrected at that level?
 Yes Unscheduled Maintenance
 No Score
 No
10. Was the incident as incipient malfunction detected during operation for which correction can be deferred to the next scheduled maintenance and corrected at that level?
 Yes Unscheduled Maintenance
 No Score
 No
11. Was the incident, or could it have been, corrected by the operator within 60 minutes using on equipment maintenance tools and spare parts?
 Yes Unscheduled Maintenance
 No Score
 No
12. Is the incident an actual malfunction for which maintenance can be deferred to the next scheduled maintenance and corrected at that level or deferred to the end of the test?
 Yes Unscheduled Maintenance
 No Score
 No

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13. Could a ten-hour work shift be completed without any degradation to operational mode mission essential functions or critical or catastrophic hazard to personnel on equipment?
 Yes Unscheduled Maintenance
 No No Score
 Failure
 Unscheduled Maintenance

6.12 Subject term (key word) listing.

Water, brackish
 Water, contaminated
 Water, drinkable
 Water, fresh
 Water, potable
 Water, salt

6.13 Mission profile cycle:

<u>Task</u>	<u>Number of Hours</u>	
	<u>*Situation 1</u>	<u>**Situation 2</u>
Produce Potable Water	20	15
Maintenance***	4	4
Tear down	0	2
Relocate	0	1
Set Up	0	2

*Continuous operations during 24-hour period.
 ** Operation with 1 relocation during 24-hour period.
 *** Includes operator checks and or services including membrane cleaning conducted in 12 hour shift

Note: During wartime missions (3 months - 1 year), the mission profile generally will consist of 85% operation under the conditions described for Situation 1 and 15% operation under conditions described for Situation 2.

6.14 Recovered Materials For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials.

ATTACHMENT A

TRI-SERVICE FIELD WATER QUALITY STANDARDS (EXTRACT)

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From Tri-Service Water Standards, 15 L/day(large quantity).

Referenced Standards are for Long Term Consumption (Long Term £ 1yr), except for*
 items - Short term<7 days

Physical Property	15 liters/day Standard (4.0 gallons per day)
Color (color units)	15
Odor (threshold odor number)	3
pH	5 to 9
Temperature (Celsius) or Fahrenheit	15 to 22 °C (59 to 72 °F)
TDS (mg/L)	1000
Turbidity (NTU)	1
Chemical Property (mg/L)	
Arsenic	0.02
Cyanide	2
Chloride	600
Lindane	0.2
Magnesium	30
Sulfate	100
Microbiological Property	
Coliforms (#/100 ml)	0
Chemical Agents	
Hydrogen Cyanide(mg/L)	2
Incapacitants (BZ) (µg/L)*	2.3
Lewisite - Arsenic fraction (µg/L)*	27
Sulfur Mustard (µg/L)*	47

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OP Nerve Agents (mg/L) (overall class)*	4
VX*	5.0
GD*	4.0
GB*	9.3
GA*	46
T-2 Toxins*	8.7
Radiological (mCi/L) Gross α/β	0.05