

INCH-POUND

MIL-W-53047A (ME)

10 March 1995

SUPERSEDING

MIL-W-53047 (ME)

17 August 1984

MILITARY SPECIFICATION

WATER CHILLER, SMALL, MOBILE

DIESEL ENGINE DRIVEN (DED)

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

1. SCOPE

1.1 Scope. This specification covers a skid-mounted, commercial, diesel-engine-driven, water chiller and accessories.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

- | | |
|-----------|---|
| PPP-B-601 | - Boxes, Wood, Cleated-Plywood. |
| PPP-B-636 | - Boxes, Shipping Fiberboard. |
| PPP-T-97 | - Tape, Pressure-Sensitive Adhesive, Filament Reinforced. |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: MOBILITY TECHNOLOGY CENTER - BELVOIR, ATTN AMSTA RBES, 10115 GRIDLEY RD, STE 128, FT BELVOIR VA 22060-5843 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4130

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

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- MIL-P-116 - Preservation, Methods of.
- MIL-T-704 - Treatment and Painting of Materiel.
- MIL-E-10062 - Engines: Preparation for Shipment and Storage of.
- MIL-C-46168 - Coating, Aliphatic, Polyurethane, Chemical Agent Resistant Coating.

STANDARDS

FEDERAL

- FED-STD-595 - Colors Used in Government Procurement.

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-454 - Electronic Equipment, Standard, General Requirements For.
- MIL-STD-810 - Environmental Test Methods.
- MIL-STD-889 - Dissimilar Metals.
- MIL-STD-1472 - Human Engineering Design Criteria for Military Systems Equipment and Facilities.
- MIL-STD-1474 - Noise Limits for Army Materiel.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from: STDZN DCMNT ORDER DESK, BLDG 4D, 700 ROBBINS AVE, PHILADELPHIA PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications.

The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DRAWINGS

ME

- TA13230E5660 - Mounting Kit, Trailer.
- TA13230E5650 - Water Chiller Assembly, Small, Mobile, DED, 40 gph.

(Copies of drawings required by contractors in connection with specific acquisition functions should be obtained from: USA BELVOIR RDE CTR, ATTN SATBE FSQ, 10101 GRIDLEY RD, STE 104, FT BELVOIR VA 22060-5818.)

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CODE OF FEDERAL REGULATIONS (CFR)

Title 21, Part 177 - Food and Drug Additives.

(Application for copies should be addressed to: SUPT OF DCMNTS, GVT PRINTG OFC, WASHINGTON DC 20402.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Standard 14 - Official Plastics Listing.

(Application for copies should be addressed to: AMERCN NATL STANDS INST, 1430 BROADWAY, NEW YORK NY 10018.)

AMERICAN PUBLIC HEALTH ASSOCIATION, INC., (APHA)

Standard Methods for the Examination of Water and Wastewater.

(Application for copies should be addressed to: AMERCN PUB HLTH ASS INC, 1015 18TH STRET, WASHINGTON DC 20036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 3951 - Standard Practice for Commercial Packaging.
- D 3953 - Strapping, Flat Steel and Seals.

(Application for copies should be addressed to: AMERCN SCTY & MTRLS, 1916 RACE STRET, PHILADELPHIA PA 19103.)

AMERICAN WELDING SOCIETY (AWS)

D1.2 - Structural Welding Code - Aluminum.

(Application for copies should be addressed to: AMERCN WELD SCTY, 550 NW LEJEUNE RD, PO BOX 351040, MIAMI FL 33135.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- J 429 - Mechanical and Material Requirements for Externally Threaded Fasteners.

(Application for copies should be addressed to: SCTY OF AUTOMTV ENGRS INC, 400 CMNWLTH DR, WARRENDALE PA 15096.)

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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.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), 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. The small mobile water chiller and accessories, hereinafter referred to as "water chiller" shall be in accordance with TA13230E5650 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 of 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, operation of the water chiller. 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 the designated representative.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 4.3 and 6.3).

3.3 Material. Material shall be as specified herein and on the drawings. Material not specified shall be selected by the contractor and shall be subject to all provisions of this specification.

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

3.3.1.1 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion. Dissimilar metals and methods of protection are defined and detailed in MIL-STD-889.

3.3.2 Potable water components. Materials in contact with potable water shall conform to Code of Federal Regulations, Chapter 21 (CFR), Part 177. All plastic materials that contact with potable

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water shall be tested and listed as acceptable for contact with drinking water by the National Sanitation Foundation under ANSI/NSF 14-1990. The material shall not impart odor to a level higher than Threshold Odor No. 3 when tested in accordance with the American Public Health Association's (APHA's) Standard Methods for the Examination of Water and Wastewater. When tested in accordance with APHA's standard methods, the material contacting potable water shall not impart taste to chlorinated water to a level higher than Flavor Threshold No. 4. Solder and flux used may not have more than two-tenth of a percent lead and pipe and fitting not more than eight percent lead.

3.3.3 Refrigerant. The refrigerant for the refrigeration system of the water chiller shall be R-134a.

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

3.4 Trailer mounting kit. When specified (see 6.2), a trailer mounting kit shall be furnished in accordance with TA13230E5660.

3.5 Performance.

3.5.1 Refrigeration system. The refrigeration system shall not cause liquid refrigerant and slugs of oil to be drawn into the compressor, as evidenced by pounding of the compressor during starting or operating. When tested as specified in 4.5.2.3, the refrigeration system shall show no refrigerant leak and shall withstand pressures of 325 ± 15 psig without permanent deformation of any component. A pressure relief valve located in the condenser header shall relieve the system when the pressure reaches 325 ± 15 psig. Moisture content in the refrigeration system shall not exceed 25 parts per million (ppm), determined by the Karl Fischer method.

3.5.2 System protection.

3.5.2.1 Fault indicators. The water chiller shall be equipped with five visual fault indicators with manual reset capability.

3.5.2.2 High pressure cutout. The water chiller shall have a high-pressure cutout switch shall stop the engine when the condenser pressure reaches 295 ± 5 psig.

3.5.2.3 Low pressure cutout. The water chiller shall have a switch which shall stop the engine when the evaporator pressure drops to 20 ± 5 psig.

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3.5.2.4 Low temperature. The water chiller shall have a switch which shall stop the engine when the incoming water temperature drops to 62 ± 8 °F.

3.5.2.5 High temperature. The water chiller shall have a switch which shall stop the engine when the incoming water temperature reaches $145 - 150$ °F.

3.5.2.6 Low engine oil pressure. The water chiller shall have a switch which shall stop the engine if the engine oil pressure drops below the pressure indicated by the engine manufacturer.

3.5.2.7 Engine fuel cutout. In the event either of the fault detectors are actuated, the solenoid valve shall de-energize and shut off the flow of fuel to the engine and the engine shall stop.

3.5.3 Capacity. Within 5 minutes after start-up in $120 - 122$ °F ambient with $120 - 122$ °F water input at sea level, the water chiller shall be capable of dispensing and continuing to deliver 62 ± 8 °F water at the rate of not less than 40 gallons per hour (gph).

3.5.4 Operating temperatures. The water chiller shall be capable of operating as follows:

- a. Starting and operation at not less than 120 °F ambient with air entering condenser and motor at not less than 120 °F.
- b. Restarting within 30 minutes after six hours full-load operation and shut down at not less than 120 °F ambient.
- c. Maintaining capacity specified in 3.5.3 with engine speed at optimum revolutions per minute (rpm) suggested by the engine manufacturer.

3.5.5 Fuel consumption. When the water chiller is operating as specified in 3.5.3, the maximum fuel consumption shall be not more than specified by the engine manufacturer at optimum rpm.

3.5.6 Pressures. When the water chiller is operating as specified in 3.5.3, the condensing pressure shall not be more than 280 ± 5 pounds per square inch (psig) and the evaporator pressure shall be not less than 25 ± 5 psig (16 psig gauge reading - the compressor construction is such that gauge readings taken at the compressor suction service tapping are 9 ± 3 psig less than actual evaporator pressure).

3.5.7 Storage temperature. The water chiller shall not be damaged and its operation shall not be impaired by storage at an ambient temperature of $155 - 160$ °F for 4 hours each 24 hours (no solar radiation).

3.5.8 Humidity. When tested as specified in 4.5.2.9, the water chiller shall show no evidence of deterioration, corrosion, or change in tolerance limits of any internal or external parts which could prevent the unit from meeting operational, service, or maintenance requirements, and shall show no evidence of peeling of

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paint, malfunctioning, refrigerant leaks, rough operation, damage, electrical shorts, erratic pressure, or other irregular operation.

3.5.9 Rain. When tested as specified in 4.5.2.8, the water chiller shall operate without functional damage or impairment of operation.

3.6 Human engineering. The water chiller shall comply to the applicable design criteria as described in MIL-STD-1472.

3.6.1 Noise limits. The noise level at the operator's position and occasionally occupied positions shall not exceed Category D of MIL-STD-1474. The operator's position shall be defined to be 18 inches from the control panel. Occasionally occupied areas of the set shall be defined to be anywhere within 1 meter from the perimeter of the set at locations other than the operator's position. Noise hazard caution signs shall be provided in accordance with MIL-STD-1474, 4.2, when applicable (see 6.5).

3.7 Safety. All rotating or reciprocating parts and other parts subject to high operational temperature that are of such a nature as to be hazardous to operating personnel, shall be guarded or insulated to the extent necessary to eliminate the hazard.

3.7.1 Fuel tank. The fuel tank (if needed) shall be located in a manner which shall not allow spills or overflows to run onto the engine, exhaust, or electrical system. Fuel lines shall be adequately supported and shall be protected against mechanical damage. Construction and mounting shall be such that neither vibration nor tightening of mounting devices shall cause leaks to develop. The bottom of the fuel tank shall not be lower than the lowest adjacent part of the chassis or body. The filler cap shall not protrude from the body of the system.

3.7.2 Exhaust system. The exhaust system shall be designed and located such that it shall not endanger personnel. No exhaust system components shall be located closer than 2 feet from the fuel tank. Where this is not feasible, shielding and insulation shall be used to attain the required protection.

3.7.3 Electrical system. Electrical system shall meet the criteria set forth in requirement 1 of MIL-STD-454. All electrically energized parts shall be insulated, fully enclosed or guarded. Components shall be located so as not to be adversely affected by engine heat. All electrical components shall be water resistant and designed so that their normal functioning shall not be impaired by heavy rain, road splash, condensation or from water spray resulting from other causes. Wires and cables shall be positioned or protected to avoid contact with rough surfaces. Wires subject to flexing shall be protected to prevent abrasion. Cabling and wiring harnesses shall be anchored to avoid damage to conductors or adjacent parts. There shall be no evidence of burns, abrading or pinch marks in the electrical insulation that could cause short circuits or leakage.

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3.7.4 Batteries. Batteries (if required) shall be securely held in place on carrier trays by removable locking devices and shall be protected against engine and exhaust heat. Adequate room shall be provided for battery maintenance, testing, ventilated and treated against acid fumes and spillage. The battery terminals shall be provided with non-conductive guards/covers to prevent accidental shorting.

3.8 Weight. The net weight of the water chiller excluding housing and support kit shall not exceed 285 pounds. Gross weight including muffler and housing shall not exceed 325 pounds.

3.9 Lubrication. The compressor shall be supplied with a polyester synthetic lubricant as determined by the compressor manufacturer. The engine shall be run-in (broken-in). A tag shall be attached in a conspicuous place to indicate the temperature range and grade of lubricating oil required.

3.10 Treatment and painting. Unless otherwise shown on the drawings, all parts shall be cleaned, treated, and painted in accordance with MIL-T-704, type A or equal with the exception that coils, refrigerant tubing, electrical components, or other components, whose operation shall be impaired by painting, shall not be painted. Unless otherwise specified (see 6.2), the finish shall be tan 686A, color no. 33446, conforming to MIL-C-46168, type II.

3.11 Identification marking. The water chiller shall be identified as specified on the end item drawing.

3.12 Instruction plates. The water chiller shall be furnished with instruction plates as specified on the end item drawing.

3.13 Workmanship.

3.13.1 Metal fabrication. Metal used in fabrication shall be free from kinks and sharp bends. The straightening of material shall be done by methods that shall not cause injury to the material. Corners shall be square and true. All bends shall be made 90 degrees to grain of material and with controlled means to ensure uniformity of size and shape. Precaution shall be taken to avoid overheating. External surfaces shall be free of burrs, sharp edges, and corners, except when sharp edges are not detrimental to safety.

3.13.2 Bolted connections. Boltholes shall be accurately formed and shall have the burrs removed. Washers or lockwashers shall be provided where necessary. Matching thread areas securing bolts conforming to SAE J 429 or capscrews shall be of sufficient strength to withstand the tensile strength of the bolt. All fasteners shall be correctly torqued and shall have full thread engagement. All bolts, after fully torqued, shall extend a minimum 1-1/2 thread beyond the nut.

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3.13.3 Jigs and fixtures. Shop-fabricated components shall be assembled in steel jigs or frames and joined while held in position. Jigs, frames, and sequence of assembly shall be designed to minimize distortion.

3.13.4 Welders and welding.

3.13.4.1 Welders. Before assigning any welder to welding work covered by this specification, the contractor shall develop a certification of welder qualification for the welder or welders (see 6.4).

3.13.4.2 Aluminum welding. Aluminum parts to be welded shall be sheared or sawed. Flame cutting shall not be used. The surfaces of aluminum parts to be welded shall be free from paint, grease, oxide film, and all other foreign matter, which shall be removed using a stainless steel wire brush. The welding shall be done by the inert gas, shielded arc method. Welds may be ground, filed, buffed, or chipped. Welds shall not be hammered. Completed welds shall be free from discontinuities such as base metal cracks adjacent or behind welds, cracks in weld metal, undercutting of base metal, lack of fusion with parent metal or between parts, lack of penetration, lack of prescribed fit, or splatter.

3.13.5 Brazing. During the brazing operation a small amount of non-oxidizing gas, such as dry nitrogen, shall be continuously bled through the refrigerant lines to prevent internal oxide scaling. Care shall be exercised during the brazing to ensure that alloy and flux used shall be no more than that required to make the joint. Flux shall be present in the refrigerant system, and heavy beads and fillets of braze material shall be avoided.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, and unless disapproved by the Government, the contractor's own facilities or any other, suitable for the performance of the inspection requirements specified herein, may be used. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of

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manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Component and material inspection. The contractor or sub-contractor is responsible for ensuring that components and materials used are manufactured, examined, and tested in accordance with referenced specifications and standards, as applicable.

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

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).
- c. Inspection of packaging (see 4.6).

4.3 First article inspection.

4.3.1 First article examination. The first article shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.2 First article tests. The first article shall be subjected to the tests marked "X" in columns 1 and 2 of table I. Failure of any test shall be cause for rejection.

4.4 Quality conformance inspection.

4.4.1 Examination. Each water chiller shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.4.2 Tests. Each water chiller shall be subjected to the tests marked "X" in column 3 of table I in the sequence listed. Failure of any test shall be cause for rejection.

4.5 Examination procedure.

4.5.1 Examination. The water chiller shall be examined as specified herein for the following defects:

101. Components in contact with potable water not as specified (see 3.1 and TA13230E5650).
102. Materials not as specified (see 3.3).
103. Materials not resistant to corrosion and deterioration, or treated to be made resistant to corrosion and deterioration of the applicable storage and operating environments (see 3.3.1).
104. Dissimilar metals as defined in MIL-STD-889 are not effectively insulated from each other (see 3.3.1.1).
105. Water chiller components and accessories not as specified (see 3.3.2).
106. Refrigerant not as specified (see 3.3.3).

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- 107. Used, rebuilt or remanufactured components, pieces, or parts incorporated in the water chiller (see 3.3.4).
- 108. Trailer mounting kit (when required) not as specified (see 3.4).
- 109. Fault indicators not as specified (see 3.5.2.1).
- 110. Failure to comply with safety requirements (see 3.7).
- 111. Total weight of water chiller fully charged, less auxiliary equipment, and ready to operate, exceeds 325 pounds with housing and muffler or 285 pounds without housing and support kit (see 3.8).
- 112. Lubrication not as specified (see 3.9).
- 113. Treatment and painting not as specified (see 3.10).
- 114. Identification marking and instruction plates missing, incomplete or illegible (see 3.11).
- 115. Instruction plates missing or illegible (see 3.12 and TA13230E5650).
- 116. Workmanship not as specified (see 3.13).
- 117. Welders or welding operators not qualified as specified (see 3.13.4.1).

4.5.2 Tests.

4.5.2.1 Test schedule. The following tests shall be performed in the order as specified in table I.

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TABLE I. Test schedule.

First article		Qual. conf.	Test Sequence	Reqmnt Para	Test Para.
Unit 1	Unit 2				
1	2	3	4	5	6
X	-	X	Refrigerant-system pressure and leakage.	3.5.1	4.5.2.3
X	-	X ₂ /	Refrigerant moisture content.	3.5.1	4.5.2.6
X	-	X	Protection devices.	3.5.2	4.5.2.4
X ₁ /	-	X ₁ /3/	Capacity.	3.5.3	4.5.2.5
X ₁ /	-	X ₁ /	Engine speed.	3.5.4	4.5.2.5
X ₁ /	-	-	High temperature operation.	3.5.4	4.5.2.5
X ₁ /	-	-	Fuel consumption.	3.5.5	4.5.2.5
X ₁ /	-	-	Pressure.	3.5.6	4.5.2.5
X	-	-	High temperature storage.	3.5.7	4.5.2.7
X	-	-	Noise limits.	3.6.1	4.5.2.10
X	-	-	Humidity.	3.5.8	4.5.2.9
-	X	-	Rain.	3.5.9	4.5.2.8

- 1/ Capacity, engine speed, high temperature operation, fuel consumption and pressure tests shall be conducted concurrently.
- 2/ Contractor may certify remaining production units if the method for evacuating, dehydrating, and charging of refrigerant system is identical to first article unit. The contractor shall provide the certification (see 6.4) for review upon request of the contracting officer or the contracting officer's representative.
- 3/ Individual quality conformance test may be performed at ambient air temperature.

4.5.2.2 Test conditions. Unless otherwise specified herein, tests shall be conducted on the water chiller as received. No braces, sealing materials, tiedown devices, or other items that are not inherently a part of the operating water chiller shall be employed. Unless otherwise specified herein, no alignment of components, addition of refrigerant, or other servicing shall be performed on the water chiller after testing has been initiated.

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Components subject to atmospheric corrosion shall not be treated with any treatment, such as grease or oil, in order to meet test requirements. Quality conformance tests shall be conducted as specified herein. The testing shall be located within a controlled environment so that the water chiller is not affected by sudden changes in outside climate conditions during a test run.

4.5.2.3 Refrigerant-system pressure and leakage.

4.5.2.3.1 Refrigerant-system pressure. Charge the refrigerant system 300 +5-0 psig with dry nitrogen containing refrigerant gas leak detector suitable for detecting hydrofluorocarbon (HFC) refrigerants. Calibrate the leak detector for the type of gas percentage of mixture employed and set the detector to indicate a leakage rate of one ounce per year. Leak test the compressor shaft seal for leakage. Set the detector to indicate a leakage rate of 0.1 ounce per year. Leak test the entire refrigerant system for leaks. Elevate pressure and observe relief valve to function between 315 and 340 psig. One or more of the following shall constitute failure of the tests:

- a. A refrigerant leak from the compressor shaft seal of one ounce per year or more.
- b. Any refrigerant leak from the refrigerant system (except from the compressor shaft seal) of 0.1 ounce per year or more.
- c. Failure of relief valve to function between 315-340 psig.
- d. Deformation of any component in the refrigerant system.

Upon completion of the pressure test, evacuate and charge the system with refrigerant R-134a.

4.5.2.3.2 Refrigerant-system leakage. Test for leakage at a temperature of not less than 70 °F with a leak detector, suitable for use with HFC refrigerant. Calibrate the leak detector for the type of gas and set the detector to indicate a leakage rate of one ounce per year. Leak test the compressor shaft seal for leakage. Set the detector to indicate a leakage rate of 0.1 ounce per year. Leak test the entire refrigerant system for leaks. One or more of the following shall constitute failure of the tests:

- a. Refrigerant system not fully charged with the refrigerant R-134a (3.75 pounds).
- b. A refrigerant leak from the compressor shaft seal of one ounce per year or more.
- c. Any refrigerant leak from the refrigerant system (except from the compressor shaft seal) of 0.1 ounce per year or more.

4.5.2.4 Protective devices test.

4.5.2.4.1 High pressure cutout. Operate the water chiller with pressure gauges installed on the compressor service ports. Raise the condensing pressure by reducing the condenser airflow. Determine that the water chiller stops when condensing pressure reaches 290-300 psig. Restart the unit in the "RUN" mode when

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discharge and suction pressures equalize (30-minute maximum time required). Failure of the high pressure cutout to stop the engine constitutes failure of the test.

4.5.2.4.2 Low pressure cutout. After deactivating the low temperature cutout control, the unit shall be operated and an approved antifreeze solution recirculated in a small (i.e. 10- to 20-gallon) container from the "recirculate" mode until the unit is shutdown by the low pressure cutout switch at $16 \pm 8 - 4$ psig monitored at the compression suction service port. (The low pressure cutout responds directly to evaporator pressure and is calibrated to cutout at 20 ± 5 psig. The compressor construction is such that gauge readings taken at the compressor suction service tapping are 9 ± 3 psig less than actual evaporator pressure.) Under conditions of this test, actual gauge readings may vary from 12 to 24 psig before low pressure cutout. Failure to shut down at 16 ± 8 psig constitutes failure of the test. The unit shall be restarted after low pressure reaches 70 ± 3 psig. Failure to restart after pressure reaches 70 ± 3 psig constitutes failure of the test.

4.5.2.4.3 Low temperature. Reactivate the low temperature cutout and deactivate the low pressure cutout. Starting with water (or antifreeze solution) above 75°F , recirculate from the "DISPENSE" nozzle to the small (i.e. 10- to 20- gallon) container until the unit is shut down by the low temperature cutout switch when inlet (warm) water reaches $62 \pm 8^{\circ}\text{F}$. Failure to shut down at $62 \pm 8^{\circ}\text{F}$ inlet water temperature constitutes failure of the test. Raise the water temperature to $82 \pm 3 - 0^{\circ}\text{F}$, switch in "START" position and restart engine. After 70 - 75 seconds release switch to "RUN" position. Failure to continue running with $+82^{\circ}\text{F}$ water available after restart constitutes failure of the test. (Drain and flush antifreeze, if used, after tests.)

4.5.2.4.4 Pump high temperature cutout. The pump high temperature is tested in a two step procedure performed as follows:

- a. The bypass valve shall be placed in the "START" position. The water chiller shall be started with supply (warm inlet) water between 120 and 125°F range and the water temperature cutout occurs between 135 and 145°F . Shutdown below 125°F or failure to shutdown above 145°F shall constitute a failure.
- b. The supply water temperature shall then be lowered to $115 \pm 5^{\circ}\text{F}$ and the bypass valve placed in the "RUN" position. The operating switch shall be flip the starter switch to the "START" position and the unit restarted. Failure to continue running constitutes failure of this test.

4.5.2.5 High temperature tests. The following tests shall be performed concurrently with the water chiller in a controlled temperature environment.

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- a. Engine speed.
- b. High temperature operation.
- c. Capacity.
- d. Fuel consumption.
- e. Pressure.

4.5.2.5.1 Procedure. The unit shall be placed in an environmental chamber. A tank filled with water shall be placed in the chamber and connected to the inlet of the test unit. Flow test manifolds shall be connected to the "DISPENSE" and "RECIRCULATE" outlet connections with the dispense nozzle installed. Pressure gauges shall be connected to compressor service ports. The fuel supply tank containing diesel fuel DF2, JP5 and JP8 shall be placed on a scale in the chamber and connected to the unit. A 12- or 24-volt battery shall be connected to the test unit slave receptacle. Thermocouple grids shall be installed at the engine cooling air and condenser cooling air inlets. Thermocouple shall be installed to measure supply water in and chilled water at both outlets. The water in the supply tank and the fuel tank shall be heated to between 120 and 122 °F. The chamber ambient temperature shall be heated to between 120 and 122 °F. The chamber ambient temperature shall be the average value of four thermocouple located at the four corners of the chamber and elevated to the midway height of the test unit. The test unit setup components shall be exposed to between 120 and 122 °F for a minimum period of four hours. The chamber ambient temperature shall be recorded continuously during the exposure period and throughout testing. At the conclusion of the exposure period, all temperatures shall be recorded, the control switch shall be in the normal "RUN" position, and the "START/RUN" valve shall be placed in the "START" position. The fuel primer bulb shall be flexed until pressure buildup is detected and the unit shall be started using the electric starter motor. The "START/RUN" valve shall be placed in the "RUN" position as soon as water flow has been established. The operating switch shall be placed in the "START" position and the engine speed shall be measured. Five minutes after starting, the water scale shall be set at "0" and the flow timer set for three minutes and activated to monitor "recirculation" flow. At the conclusion of the three-minute flow period the water weight shall be recorded and the flow container emptied. Repeat test in "DISPENSE" mode, weighing water from open nozzle. At half-hour intervals during the following six hours, the water flow measurements shall be repeated for a total of 13 measurements for each mode. At the conclusion of the six hour run, the unit shall be shutdown for a period of not less than 15 or more minutes. The 15- to 30-minute shutdown and 15-minute operating cycle shall be repeated two additional times for a total of three cycles. At the conclusion of the third cycle, the unit shall be shutdown for not less than 15 minutes or more than 30 minutes, and then manually restarted with a pull rope. One or more of the following shall constitute failure of high temperature tests:

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- a. Inability of the unit to start (electric or rope) or operate on restart.
- b. Engine speed in excess of 3600 rpm.
- c. Refrigerant condensing pressure in excess of 285 psig.
- d. Evaporator pressure less than 25 psig.
- e. Fuel consumption in excess of the manufacturer's stated value.
- f. Average chilled water delivery below 40 gph.
- g. Average chilled water temperature above 70 °F.

4.5.2.5.2 Formulas.

- a. Water cooling capacity shall be determined using the following formula:

$$\text{GPH} = \frac{W \times 20}{8.3}$$

W - Weight of water (pound) for three-minute flow.

- b. Average water temperature during flow check shall be determined using the following formula:

$$\frac{(T-1) + (T-2)}{2}$$

T-1 = water temperature at start of flow check.
T-2 = water temperature at end of flow check.

Average fuel consumption shall be determined using the following formula:

$$\text{GPH} = \frac{W1 - W2}{\text{WGRT}}$$

W1 = Fuel weight at start of test.
W2 = Fuel weight at end of test.
WG = Fuel weight per gallon.
RT = Total running time in hours.

4.5.2.6 Refrigerant moisture content. After not less than one hour of continuous operation, in an ambient temperature of not less than 95 °F, shut down the water chiller. After an additional period of one hour, withdraw a sample of refrigerant vapor from the low-pressure side and determine the moisture content by one of the approved methods for R-134a. A moisture content of more than 25 parts per million (ppm) constitutes failure of this test.

4.5.2.7 High temperature storage. Subject the water chiller to an ambient temperature of 155 - 160 °F for a period of 4 hours. At the conclusion of the exposure period, examine the water chiller for deterioration, corrosion, or damage. After completion of the examination, allow the water chiller to soak at room ambient temperature of a period of not less than one hour, but not more than

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3 hours. After completion of the soaking period, operate the water chiller for a period of not less than one hour. Inability of the water chiller to start or operate, or any evidence of deterioration corrosion, or damage, such as rupture of tubing, damage to control components, binding of engine, pump, or other mechanical parts, deterioration of gaskets, damage to insulation, breakdown of adhesives, permanent setting of gaskets or packing, or loss of refrigerant, shall constitute failure of this test.

4.5.2.8 Rain. Subject the water chiller to simulated rainfall. Rainfall shall be produced by means of water spray and shall be measured with US Weather Bureau type gauges. Nozzles shall emit droplets having a diameter of not less than 1.5 millimeters. The water supply temperature shall be between 50 and 70 °F. After exposure, operate the water chiller for 15 minutes.

4.5.2.8.1 Free rain. With the water chiller not operating, subject each of the 4 sides and top of the water chiller to a simulated rainfall of 4 inches per hour, ± 1 inch, for 30 minutes each, for a total test duration of not less than 2 hours. Direction of rainfall against each of the 4 sides shall be varied throughout the test from vertical to 45 degrees from vertical. Failure of the unit to start after the test shall constitute failure of the test.

4.5.2.8.2 Blowing rain. With the water chiller operating, subject each of the 4 sides to a simulated rainfall of 1-inch per hour, $\pm 1/2$ -inch, combined with a horizontal wind of 40 ± 5 miles per hour (mph), for a period of 1 hour. Total test duration shall be not less than 4 hours. Failure of the unit to operate properly and without damage during the test shall constitute failure of this test.

4.5.2.9 Humidity. Subject the water chiller to the test as specified in method 507, procedure III of MIL-STD-810. Do not operate the water chiller during exposure, and do not expose the water chiller to extreme temperature prior to test. Prior to this test, and after the exposure period, operate the water chiller in accordance with 4.5.2.4, to determine function of the controls. Nonconformance to 3.5.8 shall constitute failure of this test.

4.5.2.10 Noise level test. Noise levels shall be measured in accordance with MIL-STD-1474 requirements and shall be reported in the format indicated by MIL-STD-1474, figure 11. As a minimum: noise levels shall be measured when equipment is operating at full load. MIL-STD-1474, 5.1.2.1.4 contours shall be taken at not less than 12 equal horizontal arc increments, one increment shall include data from the noisiest position. Additionally, the noise level at the typical operating position shall be provided as dB(A) level. Failure to comply with MIL-STD-1474 and 3.6.1 provisions shall constitute failure of this test.

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4.6 Inspection of packaging.4.6.1 Quality conformance inspection of pack.

4.6.1.1 Unit of product. For the purpose of inspection, a completed pack prepared for shipment shall be considered a unit of product.

4.6.1.2 Sampling. Sample size shall be determined by tables I and IIa of MIL-STD-105. A lot shall be accepted when zero defects are found, and rejected when one or more defects are found.

4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following defects.

- 118. Method of preservation not as specified for level A (see 5.1.1).
- 119. Preservative applied to surfaces that will contact potable water for level A or commercial (see 5.1.1 and 5.1.2).
- 120. Engine not preserved in accordance with the referenced document as specified for level A (see 5.1.1.1).
- 121. Support kit compounds and trailer mounting kit components not placed in box and immobilized as specified for level A (see 5.1.1.2 and 5.1.1.3).
- 122. Boxes containing support kit components and trailer mounting kit components not secured to the water chiller housing as specified for level A (see 5.1.1.2 and 5.1.1.3).
- 123. Technical publications not placed in envelopes and sealed as specified for level A (see 5.1.1.5).
- 124. Preservation and packing not in accordance with the referenced document as specified for commercial (see 5.1.2 and 5.2.3).
- 125. Packing box not as specified for level A, B, or commercial (see 5.2).
- 126. Clearance between barrier and inside of shipping container as specified for level A or B (see 5.2.1 and 5.2.2).
- 127. Bolts not applied through the skids of shipping container as specified for level A or B (see 5.2.1 and 5.2.2).
- 128. Strapping not as specified for level A or B (see 5.2.1 and 5.2.2).
- 129. Marking missing, illegible, incorrect, or incomplete for level A, B, or commercial (see 5.3).

5. PACKAGING

5.1 Preservation. Preservation shall be level A or commercial as specified (see 6.2).

5.1.1 Level A. Each water chiller shall be preserved without disassembly in accordance with MIL-P-116, method IIa. In addition, the water system shall be filled with a nontoxic antifreeze which shall provide freeze-up protection to below -40 °F. After circulation throughout the cooling system the antifreeze, shall be drained to the maximum extent possible and the systems sealed with the attached plugs. (Caution: No preservative other than nontoxic

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antifreeze shall be applied to any surface that contacts potable water.) The water chiller shall be secured through the barrier material by bolting to the base of the box specified in 5.2.1. Prior to enclosing the water chiller in the barrier material the following shall be accomplished:

5.1.1.1 Engine. The engine shall be preserved in accordance with the level A requirements of MIL-E-10062 as specified for type II, method II.

5.1.1.2 Support kit. Components comprising the support kit shall be placed in a close-fitting box conforming to PPP-B-636, W5c, style optional. The components shall be arranged and immobilized within the box in a manner to prevent movement or damage. The box shall be of a size and configuration best suited to be secured to the sides or ends of the water chiller housing and placed on the base of the packing box. Securing of the box to the water chiller shall be accomplished by the use of not less than two bands of tape conforming to PPP-T-97, type optional, completely encircling the box and the water chiller housing.

5.1.1.3 Trailer mounting kit. When specified (see 6.2), components comprising the trailer mounting kit shall be prepared as specified in 5.1.1.2 for the support kit.

5.1.1.4 Technical publications. Technical publications shall be placed in a sealed plastic or other waterproof envelope and secured to the water chiller.

5.1.2 Commercial. Each complete water chiller shall be preserved in accordance with ASTM D 3951. (Caution: No preservative other than nontoxic antifreeze shall be applied to any surface that contacts potable water.)

- a. Remove fuel line from chiller connection after engine run-in or testing. Run engine until it stops from lack of fuel.
- b. While engine is still warm, drain oil from crankcase.
- c. Remove glow plugs, pour one ounce of clean engine oil into each cylinder crank slowly, to distribute oil. Replace glow plugs.

5.2 Packing. Packing shall be level A, B, or commercial as specified (see 6.2).

5.2.1 Level A. Each complete water chiller, preserved as specified in 5.1, shall be packed in a box conforming to PPP-B-601, overseas type A or B. The box shall be large enough to provide a minimum of one-inch clearance between the method II barrier material and the sides, ends, and top of the box. The skids shall be positioned so that the bolts securing the water chiller to the box bottom will pass through the skids. Box closure and strapping shall be in accordance with the appendix to the box specification. Strapping shall conform to ASTM D 3953, type 1, finish B, size 0.015 by 1/2 inch.

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5.2.2 Level B. Packing shall be as specified in 5.2.1 except, boxes shall be domestic type and strapping shall be finish A.

5.2.3 Commercial. Each complete water chiller, preserved as specified in 5.1, shall be packed in accordance with ASTM D 3951.

5.3 Marking.

5.3.1 Military. Marking for military levels of protection (level A or B) shall be in accordance with MIL-STD-129.

5.3.2 Commercial. Commercial marking shall be in accordance with ASTM D 3951. In addition, weight and cube data shall be marked on the shipping container.

5.3.3 Special marking (see 6.2). Shipping containers for all degrees of packing shall have "THIS END UP" with arrows marked on two sides of the container, size and color of marking shall be in accordance with MIL-STD-129.

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 water chiller covered by this specification is intended for use in cooling potable water in storage and transport tanks and containers.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- c. When a first article is required, and the number of units required (see 3.2 and 6.3).
- d. When trailer mounting kit is required (see 3.4).
- e. When color is other than tan and when type of finish is not in accordance with MIL-C-46168, type II (see 3.10).
- f. Level of preservation and packing required (see 5.1 and 5.2).
- g. Any special marking (see 5.3.3).

6.3 First article. When a first article inspection is required, the item(s) should be a preproduction model. The first article should consist of two units. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of the first article test results and disposition of the first articles. Invitation for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence

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with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Description (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DIDs are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DoD Far Supplement 27.475-1 exempts the requirement for a DD Form 1423.

<u>Reference paragraph</u>	<u>DID number</u>	<u>DID title</u>
a. 3.13.5.1	DI-H-24029	Certification welder qualification
b. 4.5.2.1	DI-T-4901	First article inspection procedure
c. 4.5.2.1	DI-T-4902	First article inspection report

The above DIDs were those cleared as of the data of this specification. The current issue of DoD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.5 Noise limits. Where the limit of Category D can be documented as being clearly beyond the state-of-the-art, per MIL-STD-1474, 5.1.1.2, selection of another noise limit should be considered by the procuring activity, as described in MIL-STD-1474, acceptance requirements (5.1.1.3). Particular attention should be given to 5.1.1.2.2.d. When permission is granted to exceed the limits of category D, the procuring activity should ensure that operator and maintenance manuals are prepared in accordance with MIL-STD-1474, manuals requirement (4.3).

6.6 Subject term (key word) listing.

Refrigeration
Potable water
Tank
Water

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

Custodian:
Army - ME

Preparing activity:
Army - ME
Project 4130-A315

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-W-53047A(ME)	2. DOCUMENT DATE (YYMMDD) 950310
3. DOCUMENT TITLE WATER CHILLER, SMALL, MOBILE DIESEL ENGINE DRIVEN (DED)		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (if applicable) (2) DSN	7. DATE SUBMITTED
8. PREPARING ACTIVITY		
a. NAME Carolyn B. Johnson	b. TELEPHONE (Include Area Code) (1) Commercial (2) DSN	
c. ADDRESS (Include Zip Code) MOBILITY TECH CTR - BELVOIR ATTN AMSTA-RBES 10115 GRIDLEY RD STE 128 FT BELVOIR VA 22060-5843	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: DEFNS QLT & STDZN OFC 5203 LEESBURG PIKE STE 1403 FLS CHURCH VA 22041-3466 Telephone (703) 756-2340 DSN 289-2340	