

INCH-POUND
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SUPERSEDING
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PERFORMANCE SPECIFICATION

HYPOCHLORINATION UNIT, WATER PURIFICATION, FRAME MOUNTED, AUTOMATICALLY CONTROLLED 2 TO 350 GPM FLOW

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

1. SCOPE

1.1 Scope. This specification covers a frame-mounted, automatically controlled, hypochlorination unit for treating water flowing through a pressure main.

2. APPLICABLE DOCUMENTS

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

2.2 Government documents.

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

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

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FEDERAL SPECIFICATIONS

- L-P-380 - Plastic Molding Material Methacrylate
- MMM-A-1617 - Adhesive, Rubber Base, General Purpose
- A-A-50271 - Plate, Identification
- A-A-55308 - Cloth and Strip, Laminated or Coated, Vinyl Nylon or Polyester, High Strength, Flexible
- A-A-59567 - Hose and Hose Assemblies, Rubber, (Yarn or Fabric Reinforced) Water Service

FEDERAL STANDARDS

- FED-STD-H28 - Screw Thread Standards for Federal Services
- FED-STD-595/33446 - Yellow, Flat or Lusterless

DEPARTMENT OF DEFENSE SPECIFICATIONS

- MIL-T-704 - Treatment and painting of Materiel
- MIL-DTL-32072 - Thread, Polyester
- MIL-DTL-53072 - Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection

DEPARTMENT OF DEFENSE STANDARDS

- MIL-STD-130 - Identification Marking of US Military Property
- MIL-STD-889 - Dissimilar Metals

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

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI/ASQ Z1.4 - Procedures, Sampling and Tables for Inspection by Attributes

(Copies of these documents are available from www.ansi.org or ANSI Customer Service Department, 25 W. 43rd Street, 4th Floor, New York, NY 10036.)

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AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.1 - Pipe, Cast Iron, Flanges and Flanged Fittings
Boiler and Pressure Vessel Code, Section IX, Welding Qualifications

(Copies of these documents are available online at <http://www.asme.org> or from American Society of Mechanical Engineers, Orders/Inquiries, P.O. Box 2300, Fairfield, NJ 07007-2300.)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C-700 - Cold Water Meters, Displacement Type

(Copies of this document are available from www.awwa.org or AWWA Bookstore, 6666 W. Quincy Ave., Denver, CO 80235.)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 - Structural Welding Code, Steel - Section 5, Qualification
AWS D1.2 - Structural Welding Code - Aluminum

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

ASTM INTERNATIONAL

ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
ASTM A126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings
ASTM B209 - Aluminum-Alloy Sheet and Plate
ASTM B210 - Aluminum-Alloy Drawn Seamless Tubes
ASTM B221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Structural, High-Strength Low-Alloy with Improved Formability, Standard and Ultra-High Strength
ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials
ASTM D4976 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials

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

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NATIONAL SANITATION FOUNDATION (NSF)

- NSF STD 14 - Plastic Piping Systems Components and Related Materials
- NSF STD 61 - Components, Drinking Water System – Health Effect

(Copies of this document are available from www.nsf.org or NSF International, P.O. Box 130140, 789 N. Dixboro Road, Ann Arbor, MI 48113-0140.)

SAE INTERNATIONAL

- SAE J492 - Rivets and Riveting

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

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. The hypochlorination unit, hereinafter called "unit", shall consist of a hydraulically operated hypochlorinator, a water meter, a manual range-adjusting valve, a hypochlorite solution reservoir, guard frame, pipe and pipe fittings. The chlorination shall be obtained from a prepared calcium hypochlorite solution.

3.2 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspection (see 4.3 and 6.3). Any changes or deviations of the hypochlorination unit from the approved first article during production will be subject to the approval of the contracting officer. Approval of the first article will not relieve the contractor of his obligation to furnish hypochlorination units conforming to this specification.

3.2.1 First article components. Prior to being installed in the first article model, the unit components shall be tested as specified herein.

3.3 Material. Material shall be as specified herein. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification (see 6.7). The material selected shall have no adverse effect on health of personnel when used for its intended purpose. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate medical service who will act as an advisor to the procuring activity (see 6.4). Plastic piping system components and related materials shall conform to NSF STD 14. All materials in contact with liquid that will contact drinking water shall conform to NSF STD 61.

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3.3.1 Material deterioration prevention and control. The hypochlorinator 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 hypochlorinator 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.

3.3.1.2. Identification of materials and finishes. The contractor shall identify the specific material, material finish or treatment for use with component and subcomponent, and shall make information available upon request to the contracting officer or designated representative.

3.3.2 Tubing.

3.3.2.1 Aluminum tubing. Aluminum tubing shall conform to ASTM B 210 or B 221.

3.3.2.2 Plastic tubing. All plastic tubing sections between water supply, hypochlorite solution reservoir, and hypochlorinator shall be nominal 3/8-inch inside diameter (ID) by 5/8-inch outside diameter (OD) or 5/16-inch ID by 9/16-inch OD, lengths as required. The tubing shall be clear PVC and shall be reinforced with open mesh embedded nylon braid and shall have a working pressure of 180 pounds per square inch (psi), at +70±5 °F (21±3 °C).

3.3.3 Pipe, tubing and pipe fittings. Metal pipe and tubings shall be of copper or brass. Unless otherwise specified (see 6.2), pipe fittings shall be of brass or bronze. All metal pipe and tubing shall withstand a hydrostatic pressure of not less than 100 pounds per square inch gage (psig).

3.3.4 Rubber hose. The wastewater drain hose shall be nominal 3/4-inch ID by 1-inch OD, length 10 feet ±3 inches. The drain hose and other hoses connecting the water treating duct to the water meter shall conform to A-A-59567, grade 3, class 2.

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

3.4 Threads. Threads shall be in accordance with FED-STD-H28.

3.5 Environmental conditions.

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3.5.1 Storage. The unit shall not be damaged by storage under the following conditions (see 4.5.2.4):

Air temperature

High: +160 °F (+71 °C), time period 4 hours.

Low: -30 °F (-34 °C), time period 6 hours, no solar radiation.

3.5.2 Operating. The hypochlorinator shall perform as specified herein in any ambient temperature from 120 °F to 32 °F. The unit shall function properly when operated in desert environment conditions, especially blowing sand.

3.6 Hypochlorinator. The hypochlorinator shall consist of a hydraulically operated balanced diaphragm or single acting diaphragm with spring return, chemical feed pump, automatically controlled by connection to a water meter. The load placed on the water meter shall not exceed 8 inch-ounces, and no inaccuracy of metering shall result from the connection to the hypochlorinator. The diaphragm shall be Hypalon or Viton and the pumping chamber shall be poly-vinylchloride or Tyril. The suction and discharge valves shall be the poppet type and shall be corrosion-resisting metal, plastic, Teflon, polyvinylchloride, or Viton. A manual dosage adjustment shall be provided for varying the hypo-chlorite solution treated water ratio over a maximum 5:1 range. Water for operating the hypochlorinator shall be taken from the water being treated at a rate not to exceed 0.6 gallons per minute (gpm). A range-adjusting valve shall be located in the main water line. A drain nipple for attaching a 3/4-inch plastic tube shall be provided in the overflow chamber for disposing wastewater. The unit shall operate against line pressures up to 100 psig and shall treat flows of 2 to 350 gpm. The hypochlorinator shall automatically proportion the pumping rate to within ± 10 percent for any one setting of the range-adjusting valve. The main inlet and outlet connection for the water being treated shall be fitted with standard 4-inch NPT class 125 cast iron companion flanges in accordance with ASME B16.1 or ASTM A126, class B material.

3.7 Hypochlorite-solution reservoir. The hypochlorite-solution reservoir shall be a frame-mounted tank having a capacity of 6 gallons, ± 1 pint. The material shall be polyethylene conforming to ASTM D 1248, type-I, class A, category 2, or ASTM D4976, type I, class H, grade 3, rated for continuous service at 180 °F (82 °C). The dimensions shall be 18 inches long by 4 inches wide by 18 inches deep.

3.8 Range-adjusting valve. The range-adjusting valve shall be a butterfly valve and shall be installed in the water-treating conduit for the purpose of creating sufficient pressure drop to operate the water meter. Manual adjustment of this valve shall serve to shift the automatic range of the hypochlorinator to one of the three required range positions. The range valve handle shall be held in position at required settings by means of a secured quick-release pin engaging a fixed portion of the valve to the body. The valve shall be provided with labels describing the function of the valve and the location and function of each valve setting.

3.9 Water meter. A 1-inch bronze-disk, frostproof type water meter, conforming to AWWA-C-700, shall be connected into the water-treating conduit across the range-adjusting

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valve. The water meter shall be connected to the hypochlorinator in such a manner that the hypochlorinator will pump hypochlorite solution into the water under treatment at a rate which is governed by the speed of the meter. The water meter shall be provided with a 1/4-inch NPT opening in its lower chamber to permit draining. A bronze shutoff cock shall be installed in the meter drain opening.

3.10 Sight assembly. When specified (see 6.2), a methacrylate plastic sight assembly shall be provided in the hose connection between the reservoir and hypo-chlorinator for visual checking of the hypochlorite solution during operation of the hypochlorinator. The methacrylate plastic material shall conform to L-P-380, type I, class 1.

3.11 Chlorine photometer and test strips. When specified (see 6.2), a Chlorine Photometer (NSN 6850-01-487-8812) and Chlorine Test Strips (NSN 6640-01-490-7587), for the determination of residual chlorine, shall be furnished.

3.12 Strainer. A removable, chemically resistant, plastic strainer shall be attached to the reservoir end of the connection between the hypochlorite solution reservoir and the automatic hypochlorinator. The strainer shall have a plastic frame covered with polypropylene chloride screening, 1024 openings per square inch, diameter of filament 0.012 ± 0.002 inch.

3.13 Frame. The entire unit shall be mounted in a frame fabricated from aluminum tubing conforming to ASTM B 210 or B 221, Alloy 6061, Temper T4 or T6, 1-1/4-inch OD and 0.125-inch wall thickness, or 3/4-inch nominal pipe size (NPS) steel pipe conforming to ASTM A53/53M, standard weight, black.

3.14 Dimensions and weight. The unit shall be not more than 31 inches high, 30 inches wide with reservoir in place, and 33 inches long. The maximum net weight of the unit shall be not more than 235 pounds.

3.15 Cover. Unless otherwise specified (see 6.2), a cloth cover made of material conforming to A-A-55308, type I, class 1 shall be furnished to cover the framed unit. The thread used in the fabrication of the cover shall conform to MIL-DTL-32072 type I, class 1, subclass B, Tex size 210. The color of the cloth and thread shall closely match Tan 686A, Color #33446, from FED-STD-595.

3.16 Identification marking. The unit shall be identified in accordance with MIL-STD-130. The marking shall be applied to plates conforming to A-A-50271, composition C. Plates shall be attached by screws, bolts, rivets, or adhesive conforming to MMM-A-1617, type II or III, in a conspicuous protected location.

3.17 Instruction plates.

3.17.1 Hypochlorination unit. Each unit shall be equipped with instruction plates or diagrams, including warnings and cautions, describing any special or important procedures to be followed in assembling, operating, or servicing the hypochlorinator. Instruction plates shall

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conform to A-A-50271, composition C. Plates shall be attached by screws, bolts or rivets, whenever possible. When not possible or practical, warning and cautions may be attached with adhesive conforming to MMM-A-1617, type II or III, in a conspicuous protected location.

3.18 Treatment and painting. The portions of the hypochlorination unit normally painted internally and externally shall be cleaned, treated, and painted in accordance with MIL-T-704, type F or G, as applicable. Unless otherwise specified (see 6.2), top coat color shall be Tan 686A, #33446 of FED-STD-595 conforming to MIL-DTL-53072.

3.19 Accessory box. The equipment shall be provided with an accessory box 10 inches by 7 inches by 7 inches, fabricated from aluminum conforming to ASTM B209, Alloy 6061, Temper 0 to T6; or Alloy 5052, Temper 0 to H34 having a nominal thickness of not less than 0.071 inch; or steel conforming to ASTM A1011/A1011M having a nominal thickness of no less than 0.075 inch. The accessory box shall have a hinged lid and a lockable lid latch of a type that will keep the lid closed when subjected to vibration or rough handling. The accessory box shall be securely fastened to the equipment.

3.20 Workmanship.

3.20.1 Fabrication. Metal used in the fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the materials to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to ensure uniformity of size and shape.

3.20.2 Castings. Castings shall be sound and free from patching, misplaced coring, warping, porosity, blowholes, or other defects which might render the casting unsound for its intended use.

3.20.3 Welding and welders.

3.20.3.1 Welding. The surfaces of parts to be welded shall be free from rust, scale, paint, grease, mill scale that can be removed by chipping and wire brushing, and other foreign matter. Welds shall transmit stress without permanent deformation or failure when the parts connected by the welds are subjected to proof and service loading. Parent materials, weld filler metals, and fabrication techniques shall be as required to enable the unit to conform to the examination and test requirements specified in section 4. Parts to be joined by fillet welds shall be brought into as close contact as possible and in no event shall be separated by more than 0.1875 inch unless appropriate bridging techniques are used. Weldments, including weld beads, shall be of homogeneous appearance and form without spattering or other irregularities, complying with the size, configuration and other dimensional requirements to develop the full strength of the parts joined by the welds. No cracks of any type are permitted. All welding is to be produced by either AWS or ASME code qualified welders, and welds shall be in accordance with the same code. Unless otherwise specified (see 6.2), the welding process used in fabrication of the unit shall be at the option of the contractor.

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3.20.3.2 Welders. Before assigning any welder or welding operator to welding work covered by this specification, the contractor shall obtain certification that the welder has passed qualification tests as prescribed by either of the following listed codes for the type of welding operations to be performed by that particular welder or welding operator and that such qualifications is effective as defined by the particular code:

ANSI/AWS D1.1, Structural Welding Code, Steel
 ANSI/AWS D1.2, Structural Welding Code, Aluminum
 ANSI/ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications

Contractors who make only horizontal welds need not qualify welders for "all position welding." The certification shall be made available for review upon request by the contracting officer or the contracting officer's representative. The Government reserves the right to request the recertification of any welder or welding operator.

3.20.4 Bolted connections. Boltholes shall be accurately formed and shall have the burrs removed. Washers or lockwashers shall be provided where necessary. All fasteners shall be correctly torqued and shall have full thread engagements. Bolts shall protrude at least 2 full threads and not more than 4 full threads past the mating nut or female threaded part.

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

3.20.6 Diagrams, charts, and plates. Diagrams, charts, and plates should be attached as specified in 3.17.1. Labels, as required for components, requiring adhesive shall be applied to give a surface free of wrinkles, bubbles, or other defects that may cause the plates or labels to become loose or damaged.

3.20.7 Cleaning. The unit shall be thoroughly cleaned of all cutting oil, residue of test, grease, dirt, metal scrap, and other contaminants. Cleaning shall be accomplished in a manner that will not leave a residue or otherwise make the unit unsuitable for its intended use.

4. VERIFICATION

4.1 Reserved.

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.

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4.3.1 Examination. The unit shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.2 Tests. The unit shall be tested as specified in 4.5.2.1 through 4.5.2.4. Failure of any *test* shall be cause for rejection.

4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination shall be in accordance with ANSI/ASQ Z1.4.

4.4.2 Examination.

4.4.2.1 Individual. Each unit shall be examined for the major characteristics specified in 4.5.1. Presence of any major defect shall be cause for rejection.

4.4.2.2 Sample. Samples selected in accordance with 4.4.1 shall be examined for the minor characteristics specified in 4.5.1. Acceptable quality level (AQL) shall be 1.0 percent defective.

4.4.3 Tests. Each unit shall be tested as specified in 4.5.2.1 through 4.5.2.3.

4.5 Inspection procedure.

4.5.1 Examination. The unit shall be examined as specified herein for the following characteristics:

Major:

101. Dimensions not as specified (see 3.14).
102. Material not as specified. Certification that selected material shall have no adverse effect on health of personnel not supplied (see 3.3).
103. Materials not resistant to corrosion and deterioration, or treated to be resistant to corrosion and deterioration for 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. Contractor does not have documentation available for identification of material, material finishes, or treatment (see 3.3.1.2).
106. Used, rebuilt or remanufactured components, pieces, or parts incorporated in the hypochlorinator (see 3.3.5).
107. Assembly incomplete or incorrect.
108. Treatment and painting not as specified. Paint color not as specified (see 3.18).
109. Parts or components do not function, are missing, or damaged.
110. Workmanship not as specified (see 3.20).
111. Welding and weld not as specified (see 3.20.3.1). 1/
112. Welder/welding operator qualification not as specified (see 3.20.3.2).

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- 113. Castings contain blowholes, porosity shrinkage, or cracks (see 3.20.2). 1/
- 114. Units not completely drained for delivery (see 4.5.2.3.2).

Minor:

- 201. Identification or other markings, or operating and safety instructions incorrect, missing, or illegible (see 3.16 and 3.17).
- 202. Presence of buckling, kinks, scribe lines, or punch marks on complete members (see 3.20.1).
- 203. Sharp edges, slivers, burrs, or projections on finished surfaces (see 3.20.1).

NOTES: 1/ Examination shall be made prior to painting.

4.5.2 Tests.

4.5.2.1 Hydrostatic. The unit shall be subjected to a hydrostatic test pressure of 100 psig and examined for leaks. Any pipe, tubing or fitting leak, or damage to any component shall constitute failure of this test.

4.5.2.2 Torque. The hypo chlorinator shall be disconnected from the water meter and the torque required to turn the shaft of the hypchlorinator shall be determined with a torque wrench. Measured torque greater than 8 inch-ounces shall constitute failure of this test.

4.5.2.3 Performance.

4.5.2.3.1 Test conditions. The unit shall be connected to test equipment as shown on figure 1 and tested under the conditions given in table I and in accordance with the test procedure outlined in 4.5.2.3.2. Data shall be recorded on a test data sheet as shown on figure 2. One data sheet shall be furnished with each unit. The test equipment shall not be limited to that shown on figure 1.

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TABLE I. Operating flows and pressures.

Condition	Flow rate (gpm)	Discharge pressure (psig)
A1	350±8	100
A2	210±7	100
A3	70±6	100
B1	70±5	25
B2	42.5±3	25
B3	15±1	25
C1	15±1	25
C2	8.5±0.8	25
C3	2+0.5/-0.0	25

4.5.2.3.2 Test setup and procedure. Test setup shall be as follows:

- a. Connect the unit to a source of tap water capable of delivering not less than 350 gpm at 125 psig so that the flow enters the inlet end of the 4-inch line and leaves at the outlet end.
- b. Flow rates shall be set with calibrated rotameters, or the discharge shall be caught in a container of known volume or weighed if desired.
- c. A single adjustment of the range valve shall be made for each of the conditions shown in table I.
- d. Provide a means of measuring total waste flow from the diaphragm pump.
- e. Set up a 1,000 cubic centimeter (cc) graduate (divided every 2 cc) as a solution reservoir and fill with water. Place on a support so that the water level, when full, is at the same elevation as the liquid level in the solution container when full.
- f. Remove suction tubing and attach to bottom of graduate. Do not immerse tubing in an open top graduate.
- g. Adjust the dosage control to maximum setting.

Test procedure shall be as follows:

- h. Adjust range valve to range A position.
- i. Set up Condition A1 (table I) as follows: Open downstream back-pressure valve. Open inlet line valve and adjust backpressure valve until indicated flow rate is 350 gpm with a discharge pressure of 100 psig ±2 psig.
- j. With Condition A1 established, make a test run in the following manner:
 1. Start timing the run, using a stopwatch, just as a suction stroke is completed by the diaphragm pump.
 2. Immediately read the solution graduate and record the data.
 3. During the run, observe the pressure drop across the unit. The pressure drop shall not exceed 18 psig (36.6 inches of mercury [in. Hg]). Also measure total

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wastewater from diaphragm pump. The volume of wastewater shall not exceed 0.6 gpm (2,270 cubic centimeters per minute [cc/min]). Measure water meter flow by use of totalizer on meter and stopwatch. Time for approximately 1 minute. Record water meter flow in gpm.

4. Continue the run until the diaphragm pump has completed 24 strokes. Record the total time in minutes, seconds, and tenths of a second.
 5. Immediately at the end of the run, read the solution graduate and record the data.
 6. Do not change adjustment of range valve.
 7. Divide the number of cc withdrawn from the graduate by the number of strokes (24). The pumpage rate per stroke shall be between 12.0 and 16.5 cc.
 8. Divide the number of cc withdrawn from the graduate by the number of minutes for the run to get a pump rate in cc per minute (cc/min).
 9. Divide the pump rate (cc/min) by the main flow rate (gpm) to secure a solution application rate in cc/gallon. Record this figure.
- k. Set up Condition A2 (table I) in the same manner as above with a flow rate of 210 gpm at a discharge pressure of 100 psig. Do not change range valve or dosage control settings. Repeat steps j.1 through j.9 except a maximum drop of 7 psi (14-1/4 in. Hg) is allowed in step 3.
 - l. Set up Condition A3 (table I) in the same manner with a flow rate of 70 gpm at a discharge pressure of 100 psig. Do not change range valve or dosage control settings. Repeat steps j.1 through j.9, except maximum pressure drop of 7 psi (14-1/4 in Hg) is allowed in step 3.
 - m. Compare the solution application rates for Conditions A1 through A3. They should be alike within a range of 10 percent. Compare the pump rate figures recorded for Conditions A1 through A3. They should be proportional within ± 10 percent.
 - n. Adjust range valve to range B position.
 - o. Set up Condition B1 (table I) by adjusting backpressure valve until indicated flow rate is 70 gpm with a discharge pressure of 25 psig ± 2 psig.
 - p. Make test run for Condition B1 by performing test in same manner as specified in steps j.1 through j.9.
 - q. Set up Condition B2 (table I) in the same manner as above with a flow rate of 42.5 gpm at discharge pressure of 25 psig. Do not change range valve or dosage control settings. Repeat steps j.1 through j.9.
 - r. Set up Condition B3 (table I) in the same manner as above with a flow rate of 15 gpm at a discharge pressure of 25 psig. Do not change range valve or dosage control settings. Repeat steps j.1 through j.9.
 - s. Compare the solution application rates for Conditions B1 through B3. They should be alike within a range of ± 10 percent. Compare the pump rate figures recorded for Conditions B1 through B3. They should be proportional within ± 10 percent.
 - t. Adjust range valve to range C position.
 - u. Set up Condition C1 (table I) by adjusting backpressure valve until indicated flow rate is 15 gpm with a discharge pressure of 25 psig ± 2 psig.
 - v. Make test run for Condition C1 in same manner as specified in steps j.1 through j.9.

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- w. Set up Condition C2 (table I) in the same manner as above with a flow rate of 8.5 gpm at a discharge pressure of 25 psig. Do not change range valve or dosage control settings. Repeat steps j.1 through j.9.
- x. Set up Condition C3 (table I) in the same manner as above with a flow rate of 2 gpm at a discharge pressure of 25 psig. Do not change range or dosage control settings. Repeat steps j.1 through j.9.
- y. Compare the solution application rates for Condition C1 through C3. They should be alike within a range of ± 10 percent. Compare pump rate figures recorded for Conditions C1 through C3. They should be proportional within ± 10 percent.
- z. Disconnect the unit and drain water from all pipes, tubing, hoses and components, with particular attention to assure complete draining of the water meter.

4.5.2.3.3 Failure criteria. A range deviation greater than ± 10 percent on solution application or proportionality shall constitute failure of this test.

4.5.2.4 Environmental. The unit shall be placed in a temperature-controlled chamber and tested for conformance to 3.5.1. The unit shall be drained of all liquid for storage environmental test. Unless otherwise specified (see 6.2), if the completely assembled unit is too large to be placed in an environmental chamber intact, those components agreed upon, whose integrity or performance might be adversely affected by temperature extremes may be subjected to the environmental test individually. Evidence of deformation, deterioration, or other forms of permanent damage, shall constitute failure of this test.

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. Sampling for examination shall be in accordance with ANSI/ASQ Z1.4.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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

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6.1 Intended use. The hypochlorination unit is intended for treating water flowing through a pressure main by inserting the unit in series with the main.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. If required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- c. If first article sample is required and time frame required for submission of first article model (see 3.2 and 6.3).
- d. When pipe fittings shall be other than brass or bronze (see 3.3.3).
- e. When sight assembly is required (see 3.10).
- f. When chlorine photometer and test strips are required (see 3.11).
- g. When cover to be other than as specified (see 3.15).
- h. When color shall be other than what is specified (see 3.18).
- i. When welding process is other than contractor's option (see 3.20.3.1).
- j. Responsibility and location of inspection (see 4.1).
- k. When less than completely assembled unit is not acceptable for environmental testing (see 4.5.2.4).
- l. Packaging requirements (see 5.1).
- m. Specific instructions regarding first articles (see 6.3).
- n. Data requirements (see 6.5).
- o. Provisioning requirements (see 6.6).

6.3 First article. When a first article inspection is required (see 6.2), the items should be a preproduction model. The first article should consist of one unit. The contracting officer (see 6.2) should include specific instructions in acquisition documents regarding arrangements for examinations, tests, and approval of the first article test results and disposition of the first article.

6.4 Health hazards. For Army procurement, the Surgeon General of the Army will act as advisor to make the necessary determination on health hazards.

6.5 Data requirements. The contracting officer (see 6.2) should include requirements for such data as technical publications, instructional materials, illustrated parts lists, and contractor's maintenance and operation manual to be furnished with each unit.

6.6 Provisioning. The contracting officer (see 6.2) should include provisioning requirements for repair parts and maintenance tools as necessary (including any special tools), and instructions regarding shipment of units.

6.7 Subject term (key word) listing.

Hypochlorinator
Pressure Main
Chlorine

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6.8 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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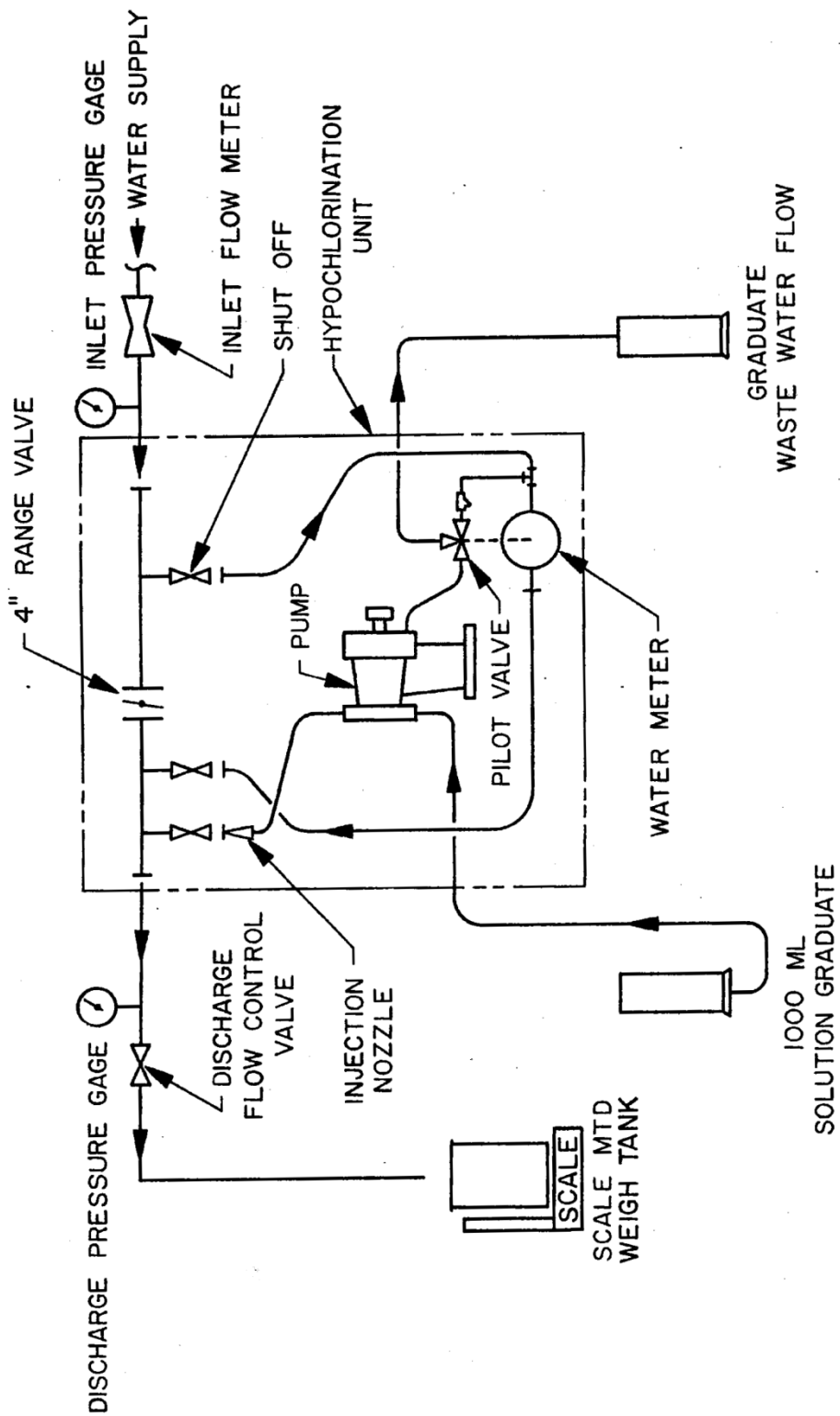


Figure 1. Schematic diagram of test equipment, hypochlorination unit 2 to 350 gpm flow.

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CONTRACT NO.										
UNIT SERIAL NO.				UNIT IDENTIFICATION - MODEL						
CONDITION		RANGE SETTING A			RANGE SETTING B			RANGE SETTING C		
(SEE TABLE I)		A1	A2	A3	B1	B2	B3	C1	C2	C3
FLOW RATE NOMINAL (gmp)		350	210	70	70	42.5	15	15	8.5	2
INLET PRESSURE (psig)										
DISCHARGE PRESSURE (psig)										
PRESSURE DROP ACROSS UNIT (psig)										
METER FLOW (gpm)										
SOLUTION GRADUATE AT START (cc)										
SOLUTION GRADUATE AT FINISH (cc)										
AMOUNT PUMPED (cc)										
TIME OF RUN	MIN-SEC-TENTHS									
	MINUTES									
PUMP RATE (cc/min.)										
PUMP CAPACITY CC/STROKE										
PRINCIPAL – FLOW RATE (gpm)										
AMOUNT OF PRINCIPAL FLOW FOR TIME OF RUN (gallons)										
SOLUTION APPLICATION RATE (cc/gallon)										
HYPOCHLORINATOR WASTE WATER FLOW RATE (cc/min.)										
CONTRACTORS INSPECTOR _____ GOVERNMENT INSPECTOR _____										

FIGURE 2. Test data sheet.

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Custodians:

Army - AT
Navy - YD
Air Force - 99

Preparing activity:

Army - AT

Project 4610-2011-001

Review activities:

Army – MD, CE
Air Force - 84
DLA - CC

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