

MIL-H-12732E  
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SUPERSEDING  
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MILITARY 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 Government documents.

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

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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by

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AMSC N/A

FSC 4610

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## SPECIFICATIONS

## FEDERAL

L-P-380	Plastic Molding Material Mechacrylate.
L-P-390	Plastic Molding and Extrusion Materials, Polyethylene and Copolymers (Low, Medium and High Density).
V-T-285	Thread, Polyester.
QQ-S-781	Strapping, Steel, and Seals.
WW-F-406	Flanges, Cast-Iron (Classes 125 and 250) and Bronze (Classes 150 and 300).
ZZ-H-601	Hose and Hose Assemblies, Rubber (Yard and Fabric Reinforced) Water Service.
MMM-A-1617	Adhesive, Rubber Base, General Purpose.
PPP-B-601	Boxes, Wood, Cleated-Plywood.
PPP-B-636	Boxes, Shipping, Fiberboard.
PPP-P-40	Packaging and Packing of Hand Tools.

## MILITARY

MIL-P-116	Preservation, Methods of.
MIL-R-196	Repair Parts, Accessories and Kits, Mechanical, Packaging.
MIL-P-514	Plated, Identification, Instruction and Marking, Blank.
MIL-c-538	Comparator, Color.
MIL-T-704	Treatment and Painting of Materiel.
MIL-C-43006	Cloth and Strip Laminated, Vinyl-Nylon High Strength, Flexible.
MIL-C-46168	Coating, Aliphatic Polyurethane, Chemical Agent Resistant.

## STANDARDS

## FEDERAL

FED-STD-H28	- Screw Thread Standards for Federal Services.
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## MILITARY

MIL-STD-105	- Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129	- Marking for Shipment and Storage.
MIL-STD-130	- Identification Marking of US Military Property.
MIL-STD-889	- Dissimilar Metals.
MIL-STD-1186	- Cushioning, Anchoring, Bracing, Blocking and Waterproofing with Appropriate Test Methods.

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(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications . The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B 16.1 Cast Iron Pipe Flanges and Flange Fittings.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 120 - Pipe, Steel , Black and Hot-Dipped Zinc-Coated (Galvanized), Welded and Seamless, for Ordinary Use.
- A 126 - Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- A 569 - Steel, Carbon (0.15 Maximum, Percent), Hot Rolled Sheet and Strip, Commercial Quality.
- B 209 - Aluminum-Alloy Sheet and Plate.
- B 210 - Aluminum-Alloy Drawn Seamless Tubes.
- B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
- D 1248 - Polyethylene Plastics Molding and Extrusion Materials.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.

(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

C-700 - Cold Water Meters, Displacement Type.

(Application for copies should be addressed to the American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235.)

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AMERICAN WELDING SOCIETY (AWS)

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

(Application for copies should be addressed to the American Welding Society, Inc. , 550 NW, LeJeune Road, PO BOX 350140, Miami, FL 33125.)

NATIONAL SANITATION FOUNDATION (NSF)

- NSF STD 14 - Plastic Piping Systems Components and Related Materials.

(Application for copies should be addressed to the National Sanitation Foundation, NSF Building, Ann Arbor, MI 48105.)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

- SAE J492 - Rivets and Riveting.

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which 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 specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede 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.

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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.

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 ZZ-H-601, 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

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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.

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

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 polyvinyl chloride 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 hypochlorite 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 WW-F-406, ANSI B 16.1 or ASTM A 126, 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 L-P-390, 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.

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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 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 hypochlorinator 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 Comparator. When specified (see 6.2), a comparator conforming to MIL-C-538, 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 NPS steel pipe conforming to ASTM A 120, 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 MIL-C-43006, type 1, class 1 shall be furnished to cover the framed unit. The thread used in the fabrication of the cover shall conform to V-T-285, type 1, class 1, subclass B, number size 3, olive Drab No. 7.

3.16 Identification marking. The unit shall be identified in accordance with MIL-STD-130. The marking shall be applied to plates conforming to MIL-P-514,

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type I style I, composition C, of type I, class 1 material. 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 conform to MIL-P-514, type III, composition C, of type III, class 1 material. 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 Sand conforming to MIL-C-46168, type II.

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 B 209 Alloy 6061, Temper O to T6; or Alloy 5052, Temper O to H34 having a nominal thickness of not less than 0.071 inch; or steel conforming to ASTM A 565 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

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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.

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.

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## 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 as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Component and material inspection. The contractor is responsible for insuring 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:

- d. 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 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 MIL-STD-105.

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.

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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. 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.
102. Material not as specified. Certification that selected material shall have no adverse effect on health of personnel not supplied.
103. Materials not resistant to corrosion and deterioration, or treated to be resistant to corrosion and deterioration for the applicable storage and operating environments.
104. Dissimilar metals as defined in MIL-STD-889 are not effectively insulated from each other.
105. Contractor does not have documentation available for identification of material, material finishes, or treatment.
106. Used, rebuilt or remanufactured components, pieces, or parts incorporated in the hydrchlorinator.
107. Assembly incomplete or incorrect.
108. Treatment and painting not as specified. Paint color not as specified.
109. Parts or components do not function, are missing, or damaged.
110. Workmanship not as specified.
111. welding anti weld not as specified.<sup>1/</sup>
112. Welder/welding operator qualification not as specified.
113. castings contain blowholes , porosity shrinkage, or cracks.<sup>1/</sup>
114. Units not completely drained for delivery.

Minor

201. Identification or other markings, or operating and safety instructions incorrect, missing, or illegible,
- 202 1 Presence of buckling, kinks, scribe lines, Or punch marks on complete members.
203. Sharp edges, slivers, burrs, or projections on finished surfaces.

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.

1/ Examination shall be made prior to painting.

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4.5.2.2 Torque. The hypochlorinator shall be disconnected from the water meter and the torque required to turn the shaft of the hypochlorinator 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.

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	42.7 +3	25
B3	15 _+1	25
c1	15 +1	25
C2	8.5 +0.8	25
C3	2 +0.5	25
	-0.0	

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 eievation as the liquid level in the solution container when full.
- f. Remove suction tubing and attach to botton of graduate. Do not immerse tubing in an open top graduate.
- g. Adjust the dosage control to maximum setting.

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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 plus or minus 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 wastewater from diaphragm pump. The volume of wastewater shall not exceed 0.6 gpm (2,270 cubic centimeters per minute [cc/rein]). 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/rein).
  - 9. Divide the pump rate (cc/rein) 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.

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- 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  $\pm$ 2 psig.
- v. Make test run for Condition C1 in same manner as specified in steps j.1 through j.9.
- 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.
- 2. 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  $\pm$ 10 percent or 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 MIL-STD-105.

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4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following characteristics. AQL shall be 1.0 percent defective.

- 115. Unprotected exterior, unfinished, metal surfaces not coated with preservative for level A or B.
- 116. Removed strainers not preserved as specified for level A or B.
- 117. Unit cover not folded and preserved as specified for level A or B.
- 118. Unit cover not installed, secured, and preserved as specified for level C.
- 119. Repair parts not preserved in accordance with the referenced document for level A or B.
- 120. Maintenance tools nor preserved in accordance with the referenced document for level A or B.
- 121. Technical publications not preserved as specified for level A, B, or C.
- 122. Comparator and accessories not preserved as specified for level A, B, or C.
- 123. Consolidation not preserved as specified for level A, B, or C.
- 124. Packing not as specified for level A, B, or C.
- 125. Strapping not as specified for level A, B, or C.
- 126. Marking missing, illegible, incorrect or incomplete.

## 5. PACKAGING

5.1 Preservation. Preservation shall be level A, B, or C as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Hypochlorination. Interior surfaces of the unit shall not require preservation. Before any surfaces are coated with any preservative(s), they shall be cleaned and dried in accordance with MIL-P-116. Exterior unpainted metal surfaces requiring the application of a contact preservative in accordance with MIL-P-116 shall be coated with type P-1 preservative. The provision of MIL-P-116 shall apply when selecting and determining the applicability of preservatives. Preservatives specified herein by "P" numbers shall conform to the applicable specifications listed in MIL-P-116 and shall be applied in accordance with MIL-P-116.

5.1.1.1.1 Strainer. Each strainer removed from a chemical hose shall be preserved in accordance with MIL-P-116, method IC-3.

5.1.1.1.2 Cover. The unit cover shall be neatly and compactly folded and preserved in a close-fitting box conforming to PPP-B-636, W6C or W5C.

5.1.1.1.3 Repair parts. Repair parts shall be preserved in accordance with the level A requirements of MIL-R-196. Parts not specifically mentioned therein shall be preserved as specified for parts of similar design and construction.

5.1.1.1.4 Maintenance tools. Maintenance tools shall be preserved in accordance with PPP-P-40, level A.

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5.1. 1.1.5 Technical publications. Technical publications shall be preserved in accordance with MIL-P-116, method 1C-3 or "Shrink Wrap" method.

5.1.1.1.6 Comparator. The comparator and accessories shall be placed in the carrying case provided and closed tightly. Then, the carrying case shall be preserved in accordance with MIL-P-116, method IA-14. The carrying case shall be considered as the inner container.

5.1.1.1.7 Consolidation. Components that will not fit in the accessory box shall be preserved in accordance with MIL-P-116 together in one or more close fitting boxes conforming to PPP-B-636, W5C or W6C. Box contents shall be cushioned and blocked to prevent movement inside containers.

5.1.2 Level B. Unless otherwise specified (see 6.2 and 6.7), preservation shall be as specified for level A, except items preserved in accordance with MIL-P-116, method IC-3, shall be preserved by method III. However, technical publications shall be preserved as specified for level A. All items contained in fiberboard boxes conforming to PPP-B-636, W5C or W6C, shall be substituted by boxes conforming to PPP-B-636, type CF, class domestic variety SW, grade 125 or 175.

5.1.3 Level C. Each complete unit including all accessory components shall be preserved as necessary to prevent deterioration. The cover shall be installed on the unit and secured. Components which cannot be stowed in the accessory box shall be consolidated in a fiberboard box in accordance with PPP-E-636. Technical publications shall be preserved in accordance with MIL-P-116 method IO-3 or "Shrink Wrap" method.

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

5.2.1 Level A. Each complete hypochlorination unit including separately boxed components preserved as specified in 5.1 shall be packed in a close fitting box conforming to PPP-B-601, overseas type, style optional. Blocking and cushioning in accordance with MIL-STD-1186 shall be used as necessary to prevent movement of contents within the shipping container. Strapping shall be conformed to QQ-S-781, class 1, type I or IV, size as applicable, finish B.

5.2.2 Level B. Each complete hypochlorination unit shall be packed as specified in 5.2.1 for level A, except that boxes shall be domestic type, and strapping shall be finish A.

5.2.3 Level C. Each complete hypochlorination unit preserved as specified in 5.1 shall be packed in a container appropriate for its size and weight.

5.3 Marking. Marking shall be in accordance with MIL-STD-129.

## 6. NOTES

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.

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6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Time frame required for submission of first article model (see 3.2).
- c. When pipe fittings shall be other than brass or bronze (see 3.3.3).
- d. When sight assembly is required (see 3.10).
- e. When comparator is required (see 3.11).
- f. When cover to be other than as specified (see 3.15).
- g. When color shall be other than what is specified (see 3.18).
- h. When welding process is other than contractor's option (see 3.20.3.1).
- i. When less than completely assembled unit is not acceptable for environmental testing (see 4.5.2.4).
- j. Level of preservation and of packing required (see 5.1 and 5.2).

6.3 First article. When a first article inspection is required, the items should be a preproduction model. The first article should consist of one unit. The contracting officer 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 acc as advisor to make the necessary determination on health hazards.

6.5 Data requirements. The contracting officer 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 should include provisioning requirements for repair parts and mainteriance tools as necessary (including any special tools), and instructions regarding shipment of units.

6.7 Level B preservation. Level B preservation (see 5.1.2) has been developed for use by the Army and Air Force for the specific conditions in 6.2. For Navy procurements, detailed level B requirements, when required, shall be developed at time of procurement when all conditions are known.

6.8 Subject term (key word) listing.

Hypochlorination unit  
Hypochlorite  
Hypochlorinator  
Water purification  
Water treatment

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6.9 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians :

Army - ME  
Navy - YD  
Air Force - 99

Preparing activity:

Army - ME

Project 4610-0103

Review activities:

Army - MD  
Air Force - 84  
DLA - CS

User activity:

Army - CE

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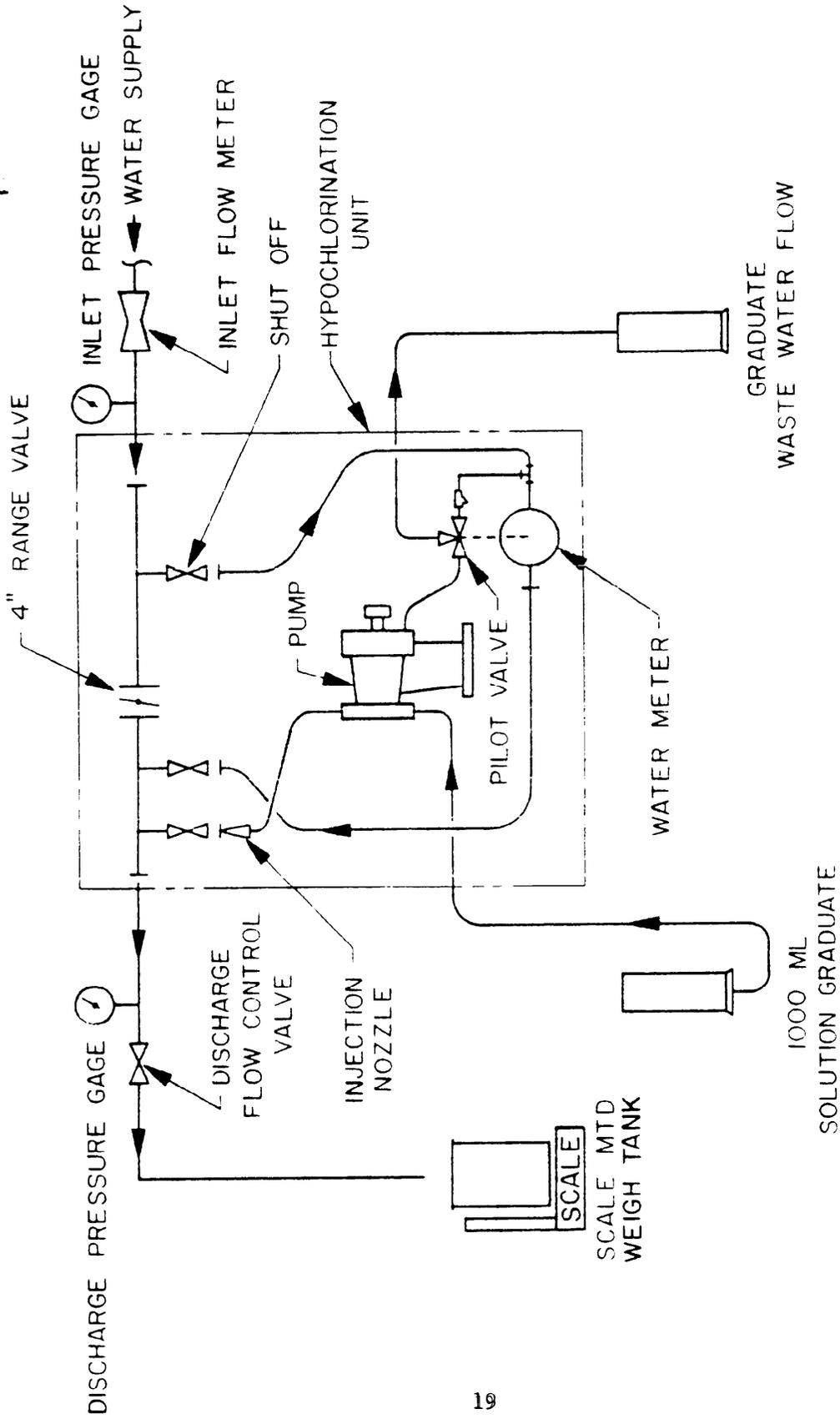


FIGURE 1. Schematic diagram of test equipment, hypochlorination unit 2 to 350 gpm flow.

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CONTRACT NO.									
UNIT SERIAL NO.				UNIT IDENTIFICATION - MODEL					
CONDITION (SEE TABLE II)	RANGE SETTING A			RANGE SETTING B			RANGE SETTING C		
	A1	A2	A3	B1	B2	B3	C1	C2	C3
FLOW RATE NOMINAL (gpm)	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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