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SUPERSEDING
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MILITARY SPECIFICATION

TANKS, POTABLE HOT WATER STORAGE

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

1. SCOPE

1.1 Scope. This specification covers potable hot water storage tanks.

1.2 Classification. The tanks shall be of the following types, classes, styles, sizes, and capacities, as specified:

- Type II - Cement or siliceous lined steel.
- Type III - Copper-silicon alloy.
- Type IV - Glass-lined steel.
- Type VI - Copper-lined steel.
- Type VII - Nickel-copper alloy.
- Type VIII - Copper tank.
- Type IX - Stainless steel
- Type X - Copper-nickel alloy.
- Type XI - Electroless nickel plated steel overcoated with fluorocarbon-based polymer.
- Type XII - Steel overcoated with fluorocarbon based polymer.
- Class 1 - 85 pounds per square inch gage (psig) working pressure.
- Class 2 - 100 psig working pressure.
- Class 3 - 125 psig working pressure.
- Class 4 - 150 psig working pressure.
- Style A - Horizontal.
- Style B - Vertical.
- Size and capacity (see 3.9).

FSC 4520

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Mobility Equipment Research and Development Command, ATTN: DRDME-DS, Fort Belvoir, VA 22060 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

- | | |
|-------------|---|
| W-H-196 | - Heater, Water, Electric and Gas Fired, Residential. |
| SS-C-1960 | - Cement and Pozzolan, General Requirements for. |
| SS-C-1960/3 | - Cement, Portland. |
| PPP-B-601 | - Boxes, Wood, Cleated-Plywood. |
| PPP-B-621 | - Box, Wood, Nailed and Lock-Corner. |

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| MIL-P-116 | - Preservation - Packaging, Methods of. |
| MIL-C-3774 | - Crates, Wood; Open, 12,000- and 16,000-Pound Capacity. |
| MIL-C-52950 | - Crates, Wood, Open and Covered. |

STANDARDS

FEDERAL

- | | |
|-------------|--|
| FED-STD-H28 | - Screw-Thread Standards for Federal Services. |
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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-130 | - Identification Marking of US Military Property. |
| MIL-STD-1186 | - Cushioning, Anchoring, Bracing, Blocking, and Waterproofing; with Appropriate Test Methods. |
| MIL-STD-1188 | - Commercial Packaging of Supplies and Equipment. |

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

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2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ANSI/ASTM A240 - Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Fusion-Welded Unfired Pressure Vessels.

ANSI/ASTM B96 - Standard Specification for Copper-Silicon Alloy Plate and Sheet for Pressure Vessels.

ANSI/ASTM B107 - Standard Specification for Magnesium-Alloy Extruded Bars, Rods, Shapes, Tubes, and Wire.

ANSI/ASTM B122 - Standard Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip, and Rolled Bar.

ANSI/ASTM B127 - Standard Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip.

ANSI/ASTM B152 - Standard Specification for Copper Sheet, Strip, and Rolled Bar.

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

AMERICAN IRON AND STEEL INSTITUTE (AISI)

Steel Products Manual - AISI Sheet Steel

(Application for copies should be addressed to the American Iron and Steel Institute, 150 East 42nd Street, New York, NY 10017.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers.

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 WELDING SOCIETY (AWS)

AWS D1.1 Structural Welding Code, Section 5, Qualifications.

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(Application for copies should be addressed to American Welding Society, 2501 Northwest Seventh Street, Miami, FL 33125.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Description. The tanks shall be of the specified type, class, style and size (see 1.2, 3.1.1, 3.1.2, 3.9 and 6.2), and shall consist of welded cylindrical shells provided with heads, tappings and openings.

3.1.1 Style A, horizontal. When a horizontal (Style A) tank is specified (see 1.2 and 6.2), the tank shall be fabricated as shown in figure 1. Unless otherwise specified (see 6.2) the tanks shall be fabricated with plus heads.

3.1.2 Style B, vertical. When a vertical (Style B) tank is specified (see 1.2 and 6.2) the tank shall be fabricated as shown in figure 2. Unless otherwise specified (see 6.2), the tank shall be fabricated with a plus bottomhead.

3.2 Standard product. The tanks delivered under this specification shall be the manufacturer's standard commercial product (see 6.9.1), except for any changes necessary to comply with the requirements of this specification. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product shall be included in the tanks being furnished. All tanks of one type, class, style and size furnished under this specification for any one contract, including parts, components and assemblies thereof shall be interchangeable (see 6.9.2).

3.3 First article (preproduction model(s)). When specified (see 6.2, 6.4 and 6.8), the contractor shall furnish one or more tanks for examination and testing within the time frame specified (see 6.2) to prove, prior to starting production, that his production methods and choice of design detail will produce tanks which comply with the requirements of this specification. Examination and tests shall be as specified in Section 4 of this specification and shall be subject to surveillance and approval by the Government.

3.4 Code compliance. The hot water storage tanks shall be constructed, tested and marked in accordance with the applicable requirements of ASME Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Heating Boilers, and as specified herein. The presence of the ASME Official Code HLW - symbol stamped or marked on the tank and the furnishing of a copy of the applicable ASME REQUIRED Manufacturers' Master Data Report will be accepted as evidence that the tanks conform to the ASME Rules for Construction of Heating Boilers.

3.5 Materials. Materials shall be as specified herein. Recycled and recovered raw materials should be used to the maximum extent possible in lieu of

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virgin raw materials as long as these materials do not jeopardize the intended use and fully comply with all contract requirements. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. None of the above shall be interpreted to mean that the use of used or rebuilt products will be allowed.

3.5.1 Steel. Steel for fabrication of the water storage tank shall be of the type recommended in the ASME Boiler and Pressure Vessel Code or AISI Steel Products Manual as suitable for storage of service hot water of temperatures as high as 200° F. The steel shall also be suitable for application of lining material. Tanks with glass linings shall be fabricated of commercial quality sheet or plate, chemically constituted and processed to adapt the steel for application of glass linings. Steel tanks shall be constructed of sheet steel with welded seams. Tanks constructed for U-tube insertion type heating elements using steam or hot water as a heating medium shall be equipped with a neck and a heating element support. The neck for U-tube insertion shall be constructed of the same material as the tank. For types II, III, IV, VI, XI and XII tanks the heating element supports shall be constructed of copper-silicon. For types VII, VIII, IX and X, the heating element supports shall be constructed of the same material as the tank.

3.6 Safety. Nonfunctional sharp edges, projecting points, welding burrs, and protruding lengths more than two full threads of tappings, handhole or manhole yokes, or fastening devices shall be avoided. Materials in contact with potable water shall be nontoxic, and shall not impart odor, color, or taste to the contained water.

3.7 Tappings and openings. Unless otherwise specified (see 6.2), tappings and openings shall be provided in the tanks as shown in figures 1 and 2, except that the location of the tappings in the top of the horizontal glass-lined tanks may be located where necessary to eliminate interference with the magnesium anodic rod. The tappings shall have tapered pipe threads conforming to FED-STD-H28 and shall be equipped with plugs or caps of the same material alloy as the tapping itself. Manhole and handhole openings shall be equipped with pressure-type, yoked, covers and gasketed rims. Tappings and fittings for cement/siliceous-lined, glass-lined, and fluorocarbon based polymer overcoated tanks shall be of the same base material as the tank with all surfaces exposed to storage water protected with the same lining/coating as the tank. Fittings and tappings for copper and copper-lined tanks shall be brass, copper-silicon, or tin or brass-plated steel. For copper-silicon tanks the tappings and fittings shall be of the same material as the tank. For copper-nickel, nickel-copper, and stainless-steel tanks the tappings and fittings shall be copper-silicon, stainless steel or the same material as the tank.

3.8 Tank supports. Tank supports shall be the manufacturer's standard supports, except when tank supports as shown in figure 3 or 4 are specified (see 6.2). Angle legs and base rings shall be welded to the storage tank before

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shipment. Cradles for horizontal tanks shall be shipped loose. When specified (see 6.2), threaded bosses for pipe legs shall be provided on the supports.

3.9 Sizes and capacities. The diameters, overall lengths, and rated capacities shall be as shown in tables I and II. The storage capacity of each tank shall be within plus or minus 5 percent of rated capacity.

TABLE I. Sizes and Capacities (U.S. gallons) of type II, III, VI, VII, VIII, IX, and X tanks.

Overall Tank Length (in. max.)	Outside diameter of shell (in. max.)											
	24	30	36	42	48	54	60	66	72	84	96	
48	84	127	-	-	-	-	-	-	-	-	-	-
60	107	163	232	-	-	-	-	-	-	-	-	-
72	130	199	284	379	490	-	-	-	-	-	-	-
84	153	235	335	450	-	-	-	-	-	-	-	-
96	176	270	387	520	675	844	1030	1281	-	-	-	-
108	-	306	439	591	765	-	-	-	-	-	-	-
120	222	342	490	661	860	1077	1320	1632	1864	2490	3193	-
144	-	-	594	802	1045	1311	1609	1983	2281	3038	3935	-
168	-	-	697	943	1230	1546	1899	2334	2699	3626	4677	-
192	-	-	-	1084	1415	1780	2188	2685	3116	4195	5419	-
216	-	-	-	-	1600	2014	2478	3036	3533	4763	6162	-
240	-	-	-	-	-	2248	2768	3387	3950	5331	6904	-
264	-	-	-	-	-	-	-	-	-	5899	7646	-
288	-	-	-	-	-	-	3347	4089	4784	6467	8388	-
312	-	-	-	-	-	-	-	-	-	7035	9131	-
336	-	-	-	-	-	-	-	-	-	7603	9873	-
360	-	-	-	-	-	-	4215	5141	6036	8171	10615	-
384	-	-	-	-	-	-	-	-	-	-	11357	-
408	-	-	-	-	-	-	-	-	-	-	12100	-

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TABLE II. Sizes and capacities of type IV, XI and XII Tanks.

Capacity	Inside diameter (maximum)	Tank length (maximum)
<u>U. S. Gallons</u>	<u>Inches</u>	<u>Inches</u>
80	20	65.25
140	24.5	77.5
200	30	78
350	36	95
500	42	81
750	48	97
1,000	54	99

3.10 Identification marking. When specified (see 6.2) each tank shall be identified in accordance with MIL-STD-130. Normally the manufacturer's standard commercial markings are acceptable.

3.11 Treatment and painting. Unless otherwise specified (see 6.2), all exterior and exposed metal parts shall be cleaned, treated, and painted in accordance with the manufacturer's commercial practice. Unless otherwise specified (see 6.2), color shall be manufacturer's commercial color.

3.12 Tank preparation. When a lined tank is specified (see 1.2 and 6.2) interior surfaces of tanks shall be cleaned prior to the application of the linings. The interior surfaces of tanks, including welds, manhole and handhole covers when applicable, shall be prepared for coating by sand blasting, grit blasting or by pickling in an acid bath. When specified (see 6.2 and 6.5) for tanks scheduled to receive cement or siliceous lining, wire brushing and hand scraping may be employed.

3.13 Type II, cement or siliceous lined steel tanks.

3.13.1 Cement lining. Unless otherwise specified (see 6.2), the cement lining shall be a low-soluble hydraulic cement lining material containing not more than 35 percent calcium oxide and not less than 25 percent silica. The remaining dry aggregate shall be cement conforming to SS-C-1960 and SS-C-1960/3, type optional. The lining material shall be applied in one or two coats. When two coats are used, the first coat shall be 0.375 to 0.5 inch thick and the second coat shall be 0.125 to 0.25 inch thick to provide a uniform thickness of 0.625 inch. Both coats shall be applied the same day. Curing time of the first coat shall only be sufficient to insure a good bond between the lining and the steel surface of the tank, but shall not affect the bond between the two coats of lining. The lining material shall be cured and shall adhere firmly to and cover the interior of the tank. The joint between lining and tank at the tappings shall be sealed to prevent corrosion in back of the lining. The water absorption of the lining shall be not more than 17 percent of the dry weight

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(see 6.5). The material when combined and mixed with water shall make a low soluble material which shall have, when set, a coefficient of expansion approximately the same as steel.

3.13.2 Siliceous lining. Unless otherwise specified (see 6.2) siliceous lining shall be composed of commercial grade silica aggregate of 100-mesh and 325-mesh particle size, a cementitious binder material, calcium hydroxide, water repellents, and hygroscopic salts. The materials when combined and mixed with water shall make a low soluble material which shall have, when set, a coefficient of expansion approximately the same as the steel. The materials when mixed with water shall form a plastic mixture showing no unwetted particles. The materials shall not contaminate hot or cold water with odors or toxic matter and shall contain no greases, resins, stearates, stearic acid derivative, sand, mica, or pumice. Materials that will deteriorate when continually immersed in hot or cold potable water under the normal pressures maintained in public utilities shall not be used. The materials shall have a weight loss less than 4.0 percent after being immersed in a carbon dioxide solution for a continuous period of 72 hours. The materials shall have a weight loss of less than 3.0 percent after being immersed in a saline solution for a continuous period of 72 hours. The lining material shall be applied in two coats to steel tank surfaces with a stiff brush, trowels, or other handtools. The first coat shall be not less than 0.125 inch thick and the second coat shall be 0.25 to 0.375 inch thick to provide a uniform thickness of 0.375 to 0.5 inch. The first coat shall be thinned to the consistency of heavy cream and shall be applied with a stiff brush. The first coat shall be cured sufficiently to insure bond with the tank steel surfaces but shall not be allowed to dry out to affect the quality of the bond between the two coats of lining. The lining material shall be cured and shall adhere firmly to and cover the interior of the tank. The joint between lining and tank at the tapings shall be sealed to prevent corrosion in back of the lining. Only enough siliceous materials shall be mixed at one time that can be applied and finished in 30 minutes. No tempering of the mixture with water shall be permitted. Immediately after the application of the lining material, all openings of the tank shall be closed and secured by pressure sealing and the tank shall be permitted to stand without water for a minimum of 24 hours. Drying or curing of the lining by a fan or other forced methods shall not be permitted. The water absorption of the lining shall be not more than 17 percent of the dry weight (see 6.5).

3.14 Type III, copper-silicon alloy tanks. The copper-silicon alloy tanks shall be fabricated of material conforming to ASTM B96, Copper Alloy UNS No. C65500.

3.15 Type IV, glass-lined steel tank. Glass lining formulation shall contain not less than 70 percent of refractory oxides such as silicon oxide, aluminum oxide, calcium oxide, magnesium oxide, titanium oxide, or zirconium oxide. The proportion of silicon oxide shall be not less than 70 percent of the refractory oxides and shall be not less than 49 percent of the total quantity of the components in the glass lining formulation. The glass lining shall be fused to the steel base by firing at not less than 1500° F. The glass lining shall be continuous over the entire interior surface of the tank including handhole and manhole covers when applicable. The lining may be applied with a primer coat.

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The type IV tanks shall conform to the following requirements:

- (a) Thickness. The thickness of the glass lining shall be not less than 0.006 inch and not greater than 0.020 inch.
- (b) Discontinuities. Discontinuities shall be not less than 0.025 square inch per square foot of internal surface, excluding edges, fittings and welded areas, after applying the glass lining. No single defect shall be greater than 0.125 inch in diameter.
- (c) Edges and fittings. All edges and fittings shall be coated with glass lining. Where sharp edges cannot be avoided, a slight "burn-off" of the lining that does not extend more than 0.062 inch back from the sharp edge will be allowed. All fittings that are welded to the tank shall be coated with the lining on those areas that are exposed to the water except for threads and small areas immediately adjacent to them.
- (d) Welds. Removal of the glass lining due to welding or mating of parts after glass lining shall not result in exposed base metal in excess of 0.025 square inch per gallon of storage capacity.
- (e) Glass lining solubility. The weight loss of the glass lining shall not exceed 15 milligrams per square inch.

3.16 Type VI, copper-lined steel tank. Copper lining shall be continuous over the entire interior surface of the tank. All seams in the lining shall be welded to form solid, permanent joints between the copper sheets as well as the tank steel. The copper lining shall be welded to extra heavy copper silicon reinforcements at all threaded openings which in turn shall be welded to the steel shell. The manhole or handhole covers shall be solid bronze. When specified (see 6.2), the area between the shell and lining shall retain a vacuum of 6 inches Hg for a period of 12 hours. After the 12 hour period, the vacuum tapping shall be sealed while retaining the 6 inches Hg between the shell and lining. Material for copper lining shall be copper sheet, hot-rolled, not less than 0.0647 inch nominal thickness conforming to ASTM B152, Alloy UNS No. C10200, C10400, C10500, C10700, C12200, or C12300.

3.17 Type VII, nickel-copper alloy tank. Nickel-copper alloy shall conform to ASTM B127, Alloy UNS No. N04400.

3.18 Type VIII, copper tank. Copper shall conform to ASTM B152, cold-rolled, Temper H00, UNS Alloy C10200, C10400, C10500, C10700, C12200 or C12300.

3.19 Type IX, stainless steel tank. Stainless steel shall conform to ASTM A240, No. 1 Finish, composition UNS 30400, 30403, 31600, S31603, or S43035.

3.20 Type X, copper-nickel alloy tank. Copper-nickel alloy shall conform to ASTM B122, alloy UNS C70600, Temper OS035.

3.21 Type XI - Electroless nickel-plated steel overcoated with fluorocarbon based polymer. The steel tank shall be internally electroless nickel-coated as specified in MIL-C-26074, class 2, grade A. After complete fabrication, the tank shall be lined over the electroless nickel with three separate applications of polymerized fluorocarbon with individual curing cycles at a temperature of a minimum of 450° F and a maximum of 460° F. The thickness of the lining shall not

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be less than 0.006 inch. Discontinuities shall be not more than 0.025 square inch per square foot of internal surface. No single defect shall be greater than 0.125 inch in diameter. The weight loss due to solubility of the fluorocarbon polymerized lining shall not exceed 15 milligrams per square inch.

3.22 Type XII - Steel overcoated with fluorocarbon based polymer. The steel tank, after complete fabrication, shall be lined with three separate applications of polymerized fluorocarbon with individual curing cycles at a temperature of a minimum of 450° F and a maximum of 460° F. The thickness of the lining shall not be less than 0.006 inch. Discontinuities shall be not more than 0.025 square inch per square foot of internal surface. No single defect shall be greater than 0.125 inch in diameter. The weight loss due to solubility of the fluorocarbon polymerized lining shall not exceed 15 milligrams per square inch.

3.23 Cathodic protection. Unless otherwise specified (see 6.2), type IV, heater shall be provided with magnesium anodes for cathodic protection. The anode shall be located so as to insure protection to all interior parts of the vessel. An electrical connection shall be established and maintained between the anode and the metal tank (heater) shell. Anode or anodes shall be located in a vertical position and shall extend to within 4 inches of the bottom of the tank.

3.23.1 Magnesium anode. The magnesium anode shall be fabricated from material conforming to ASTM B107, composition USN No. N11311 with the following exceptions:

<u>Material</u>	<u>Maximum percent</u>
Copper	0.04
Nickel	0.001
Iron	0.002

Shapes of anodes shall be as applicable, and anodes shall be reinforced with steel wire not less than 0.091 inch in diameter. The weight of the anode in each tank shall be not less than 25 grams per square foot of surface within the tank shell.

3.23.2 Other anodes. The tank (heater) wall potential for any anode used shall not be more positive than -0.85 volts.

3.24 Workmanship. The general construction and assembly of the hot water storage tank shall be of a neat and workman-like character with parts well fitted and bolts and other fasteners correctly torqued to give rigidity.

3.24.1 Castings and forgings. All parts, components, and assemblies of the tank which include castings and forgings shall be clean of harmful extraneous material such as sand, dirt, pits, sprues, scale, and flux. Rework shall be limited to procedures which do not reduce strength or affect function.

3.24.2 Metal fabrication. Flame cutting, using tips suitable for the thickness of the steel may be employed instead of shearing and sawing. All

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bends shall be made with controlled means to insure uniformity of size and shape. Corners shall be square and true. Precaution shall be taken to avoid overheating. Heated steel shall be allowed to cool slowly. External surfaces shall be free of burrs, sharp edges and corners, except when sharp edges or corners are required or where they are not detrimental to safety.

3.24.3 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 tank 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 0.187 inch, unless appropriate bridging techniques are used. Unless otherwise specified the welding process used in fabrication of the tanks shall be at the option of the contractor.

3.24.3.1 Welders. Any welder assigned to manual welding work covered by this specification shall be certified by the contractor to the contracting officer 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 and that such qualification is effective as defined by the particular code:

AWS D1.1 Structural Welding Code, Section 5, Qualifications.

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

Contractors who only make horizontal welds need not qualify welders for "all position welding". Subject to approval by the Government, contractor's standard welder qualification may be substituted in lieu of the above codes provided that the contractor's procedure is equivalent to the above codes. The contractor shall be responsible for determining that automatic welder equipment operators are capable of producing quality welds.

QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract 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 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.

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4.2 Classification of inspection. Inspection shall be classified as follows:

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

4.3 Preproduction inspection.

4.3.1 Examination. The preproduction tank 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 tank shall be tested as specified in table III. Failure of any test shall be cause for rejection.

TABLE III. Test schedule 1/

Type of inspection		Examination or test	Type of tank	Inspection paragraph	Requirement paragraph
Preproduction	Quality Conf.				
1	2	3	4	5	6
X	-	Capacity test	All	4.5.2.1	3.9
X	-	Cement/Siliceous lining thickness test	II	4.5.2.2	3.13.1
X	-	Cement/Siliceous lining absorption test	II	4.5.2.3	3.13.1
X	-	Organic materials test	II	4.5.2.4.1	3.13.2
X	-	Stearates or stearic acid derivatives test	II	4.5.2.4.2	3.13.2
X	-	Hygroscopic salts test	II	4.5.2.4.3	3.13.2
X	-	Solubility in carbon dioxide test	II	4.5.2.4.4	3.13.2
X	-	Saline resistance test	II	4.5.2.4.5	3.13.2
X	-	Glass lining tests	IV	4.5.2.5	3.15
X	X	Copper lining tests	VI	4.5.2.6	3.16
X	-	Electroless nickel-plated steel overcoated with fluorocarbon-based polymerized lining tests	XI	4.5.2.7	3.21
X	-	Steel overcoated with fluorocarbon-based polymerized lining tests	XII	4.5.2.8	3.22
X	-	Cathodic protection test	II IV	4.5.2.10	3.23

1/ Perform inspection marked "X".

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4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination shall be in accordance with MIL-STD-105, inspection level S-2.

4.4.2 Examination. Samples selected in accordance with 4.4.1 shall be examined as specified in 4.5.1. AQL shall be 2.5 percent defective for major defects and 4.0 percent defective for minor defects.

4.4.3. Tests. Each type VI tank shall be tested as specified in table III. Failure of any test shall be cause for rejection.

4.5 Inspection procedure.

4.5.1 Examination. The tanks shall be examined for the following defects:

Major

101. Materials not as specified.
102. Tappings and openings not provided or not as specified.
103. Tank supports not as specified.
104. Components comprising glass, cement or siliceous lining material not as specified.
105. Dimensions not as specified.
106. Tank lining not as specified.
107. ASME stamp not as specified.

Minor

201. Treatment and painting not as specified.
202. Area of no coating, coating not dry, evidence of rust or corrosion, and runs or sags.
203. Missing or incorrect identification markings.
204. Color of coating not as specified.
205. Sharp edges, points, or corners, welding burrs, excessively long tappings, yokes and fastening devices.

4.5.2 Tests.

4.5.2.1 Capacity. If tank dimensions are different from those specified in tables I and II determine the storage capacity of the tank by weighing the empty tank and then fill the tank with water and reweigh. Convert the liquid capacity of the tank to U. S. gallons. Nonconformance to the capacity rating specified shall constitute failure of this test.

4.5.2.2 Cement and siliceous lining thickness. Determine the thickness of the lining by spear measurements with a hardened steel point not larger than 0.063 inch in diameter. Take not less than three measurements at random locations immediately after application of each coat and before the lining has set. Nonconformance of any measurement to 3.13.1 or 3.13.2 shall constitute failure of this test.

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4.5.2.3 Cement and siliceous lining absorption. Determine the water absorption of lining materials by immersing dry specimens of the materials in water and comparing the weights of the specimens before and after the immersion. The test specimens shall be approximately 4-inch squares of clean, dry tank steel lined on one side with cement or siliceous lining that is identical in mix, thickness, method of application, and curing process to the linings used. Determine and record the weight of each steel square before the lining is applied. Determine the dry weight of the lining material as follows: Heat the lined test specimens at a temperature of not less than 230° F for a period of not less than 2 hours, cool to room temperature, and weigh. The difference between the weights of corresponding unlined steel squares and the heated specimens is the dry weight of the lining material. Determine the water absorption of the lining in the following manner. Immediately after heating and weighing, immerse the test specimens for a period of not less than 5 hours in distilled water that is maintained at a temperature of 180° F to 190° F. At the end of this period, cool the specimens in water to room temperature, remove from the water, wipe dry, and immediately weigh. The difference between the weights of the test specimens before and after immersion is the weight of the water absorbed and shall be reported as a percentage of the dry weight of the lining material. Use the mean value of at least two specimens to determine the weight of the water absorbed. A water absorption of more than 17 percent of the dry weight shall constitute failure of this test.

4.5.2.4 Siliceous lining materials.

4.5.2.4.1 Organic materials. Prepare a specimen of material, and after mixing, let stand for 5 minutes. Remix the specimen and trowel on bright tinned plate. Allow to dry 2 hours at room temperature. Bonding of material to the tinned plate indicates the presence of organic binder and shall constitute failure of this test.

4.5.2.4.2 Stearates or stearic acid derivatives. Place 100 milliliters of the dry materials in a 250 milliliter beaker and add an equal amount of water. Do not stir the mixture. The powder should repel the wetting action of the water for 5 seconds. Then mix the powder and water and let stand for a period of 10 minutes. Any formation of scum floating on the surface indicates the presence of stearates or stearic acid derivatives and shall constitute failure of this test.

4.5.2.4.3 Hygroscopic salts. Mix 2 grams of the materials with 20 milliliters of water and allow to stand for a period of 30 minutes. Filter the supernatant liquid and make slightly acid with nitric acid (1:5). Add 5 milliliters of silver nitrate. Any evidence of a white precipitate (silver chloride) indicates the presence of chloride and shall constitute failure of this test.

4.5.2.4.4 Solubility in carbondioxide. Determine the loss of weight of materials by immersing cured specimens in a carbon dioxide solution and comparing the weights of the specimens before and after the immersion. Mix specimens of powdered material to a workable consistency and cast in 2-inch by

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3-inch by 0.5 inch molds (a total of six molds). Remove test specimens from molds and cure at room temperature and a relative humidity of 95 percent plus or minus 2 percent for a period of 12 hours. After completion of the 12-hour curing period, immerse the test specimens in tap water at room temperature then increase temperature of water to 140° F plus or minus 5° F and maintain this temperature for a period of 4 hours. After completion of the 4 hour curing period, remove the test specimens and immerse in tap water at room temperature for a period of 24 hours. After the test specimens have been cured, remove specimens from the curing water, wipe surfaces with a clean damp cloth, and weigh immediately to the nearest 0.01 grams. Immerse test specimens in a closed vessel containing tap water saturated with carbon dioxide. Raise temperature of water to 200° F plus or minus 5° F and maintain this condition for a period of 72 hours. Care should be taken to resaturate the water with carbon dioxide every 12 hours. After completion of the 72 hour soaking period, remove the test specimens from the solution, wipe with a damp cloth, and weigh immediately. This shall constitute one test cycle. Repeat the test for an additional two cycles for a total of three cycles. Calculate the weight loss utilizing the following formula:

$$W_L = \frac{W_S - W_A}{W_S} \times 100$$

where W_L = Weight loss, percentage by weight.

W_S = Weight before saturation in carbon dioxide for 72 hours.

W_A = Weight after saturation in carbon dioxide for 72 hours.

Use the mean value of at least two specimens to determine the weight loss. The following shall constitute failure of this test:

- (a) Weight loss in excess of 3.0 percent after the first cycle.
- (b) A total weight loss in excess of 4.0 percent after the second cycle.
- (c) Any weight loss after the third cycle.

4.5.2.4.5 Saline resistance. Test specimens of the material after being mixed, cast, cured as specified in 4.5.2.4.4 and of the same quantity shall be used in this test. Remove test specimens from curing water and wipe surfaces with a clean damp cloth and weigh. Immerse test specimens in a closed vessel containing sea water. Raise temperature of water to 195° F plus or minus 5° F and maintain this condition for a period of 72 hours, reweigh specimens. Calculate the weight loss utilizing the formula specified in 4.5.2.4.4. Use the mean value of at least two specimens to determine the weight loss. A weight loss in excess of 3.0 percent shall constitute failure of this test.

4.5.2.5 Glass lining tests. Type IV glass (porcelain enamel) linings shall be inspected and tested as follows for coverage, thickness, and solubility. Upon approval of the contracting officer, the manufacturer may furnish a certification of compliance as part of the first article. The certification shall provide data necessary to evaluate compliance with the coverage, thickness, and solubility requirements of 3.15. Nonconformance with 3.15 shall constitute failure of this test.

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4.5.2.5.1 Lining coverage. A glass lined tank that has not been subjected to test pressure greater than 150 pounds per square inch gage (psig) shall be cut into four or more segments using a band saw, bayonet saw, or other suitable mechanical cutting device. Each segment shall be visually inspected for the presence of areas of exposed metals except that cracked and spalled areas of lining caused by the cutting operation shall not be considered. Exposed areas of metal shall be measured with a low powered microscope with a calibrated eyepiece. Nonconformance to 3.15(b) and 3.15(c) shall constitute failure of this test.

4.5.2.5.2 Thickness of glass lining. Thickness measurements shall be taken at not less than 10 representative points on the shell and heads of the tank using a calibrated magnetic or similar thickness gauge. Nonconformance to 3.15(a) shall constitute failure of this test.

4.5.2.5.3 Solubility of glass lining.

- (a) Apparatus. The apparatus illustrated in figure 1 shall be used for determining the solubility of the glass lining. The cylinder assembly shall be constructed of 16 gage, type 304 stainless steel; the ends shall be ground so as to conform with the curvature of the tank to be tested. The gaskets shall be made of neoprene rubber. The cell shall be heated with a small gas burner or a small electric heater placed immediately below the cylinder assembly midway between the ends.
- (b) Test specimens. The test specimens for this test shall consist of four 3-1/2 inch by 3-1/2 inch sections cut from the outer wall (not the center flue) of the tank approximately midway between the ends. These specimens may be taken from the center segments cut in 4.6.1.8.2.
- (c) Preparation of specimens. The specimens shall be buffed with a rubbing stone or suitable abrasive paper around the entire perimeter of the panel to completely remove rough edges and glass lining fragments. The specimens shall then be scrubbed on both sides using a nylon brush and a mildly abrasive detergent cleaner powder, rinsed with distilled water, dried for 1 hour in a drying oven at 225° F [107° Celsius (C)] and placed in a desiccator while hot.
- (d) Initial weight measurements. The specimens after cooling to room temperature, shall be weighed to the closest 1/10 milligram.
- (e) Calibration of test cell. Because of small variations in cell dimensions and configuration, each test cell must be calibrated before it is used. The procedure is as follows:
 - (1) Assemble the cell as it is to be operated.
 - (2) Fill with water to just below where the condenser tube is welded into the cylinder (see figure 1).
 - (3) Adjust the input of the heat source to give a slow, rolling boil. If water rises in the condenser, remove small amounts of water until the cell will operate without surging.
 - (4) Remove from the heat and check to see if water level is completely covering the panels.

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- (5) Cool to room temperature, then measure the volume of water contained in the cell.
 - (6) Record this volume in the cell and use this amount of test solution in all subsequent tests.
- (f) Test solution. The test solution used for each exposure cycle shall consist of 400 milligrams of reagent grade sodium bicarbonate dissolved in 1 liter of distilled water.
- (g) Test procedure.
- (1) Assemble the test cell using weighed specimens from the same tank on each end of the test cell.
 - (2) Pour the correct volume of test solution into the cell.
 - (3) Adjust the input of the heater to give a consistent slow, rolling boil.
 - (4) After 18 hours boil time, dismantle the cell and discard the used test solution.
 - (5) Clean the specimens using a soft cloth wetted with a solution of 1 percent trisodium phosphate to remove loosely adhering deposits, wipe dry and store in desiccator between solution treatment.
 - (6) After 8 cycles of 18 hours each, clean specimens as above, rinse with distilled water and dry at 225° F (107° C) for 1 hour. Place the specimens in a desiccator while hot and after cooling to room temperature, weigh to the closest 1/10 milligram.
- (h) Calculation of results. The exposed area of each specimen shall be calculated from the average diameter of the test spot, measured to the closed 0.015 inch (3.96mm) taken in three different locations. The solubility of the lining shall be calculated by dividing the weight loss in milligrams by the exposed area in square inches.
- (i) Interpretation of results. Nonconformance with 3.15(e) shall constitute failure of this test.

4.5.2.6 Copper lining. When specified (see 6.2), evacuate the area between the shell and copper lining to a negative pressure of 6 inches Hg. Stop the evacuating device and after a 12 hour period determine the negative pressure in the area between the shell and copper lining. A negative pressure of less than 6 inches Hg shall constitute failure of this test.

4.5.2.7 Electroless nickel-plated steel overcoated with fluorocarbon-based polymerized lining test. Type XI electroless nickel-plated steel overcoated with fluorocarbon-base polymer linings shall be inspected and tested as follows for plating thickness, plating adhesion, lining coverage, lining thickness and lining solubility. Upon approval of the contracting officer, the manufacturer may furnish a certification of compliance as part of the first article. The certification shall provide data necessary to evaluate compliance with plating and lining requirements in 3.21. Nonconformance with 3.21 shall constitute failure of this test.

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- (a) Compliance with the plating requirement shall be determined in accordance with MIL-C-26074.
- (b) Compliance with the plating adhesion requirement shall be determined in accordance with MIL-C-26074.
- (c) Compliance with the lining coverage requirement shall be determined in accordance with 4.5.2.5.1 except that nonconformance with 3.21 shall constitute failure of the test.
- (d) Compliance with the lining thickness requirement shall be determined in accordance with 4.5.2.5.2 except that nonconformance with 3.21 shall constitute failure of the test.
- (e) Compliance with the lining solubility requirement shall be determined in accordance with 4.5.2.5.3 except that nonconformance with 3.21 shall constitute failure of the test.

4.5.2.8 Steel overcoated with fluorocarbon-based polymerized lining test.

Type XII steel overcoated with fluorocarbon-base polymer linings shall be inspected and tested as follows for lining coverage, lining thickness and lining solubility. Upon approval of the contracting officer, the manufacturer may furnish a certification of compliance as part of the first article. The certification shall provide data necessary to evaluate compliance with plating and lining requirements in 3.22. Nonconformance with 3.22 shall constitute failure of this test.

- (a) Compliance with the lining coverage requirement shall be determined in accordance with 4.5.2.5.1 except that nonconformance with 3.22 shall constitute failure of the test.
- (b) Compliance with the lining thickness requirement shall be determined in accordance with 4.5.2.5.2 except that nonconformance with 3.22 shall constitute failure of the test.
- (c) Compliance with the lining solubility requirement shall be determined in accordance with 4.5.2.5.3 except that nonconformance with 3.22 shall constitute failure of the test.

4.5.2.9 Toxicity, odor, color and taste. A certification of compliance with the ASME Code as required by 3.4 will be accepted as evidence that materials in contact with potable water are nontoxic and do not impart objectionable odor, color or taste to the water.

4.5.2.10 Cathodic protection. Measure the tank wall potential relative to a standard copper sulphate half cell before and after installation of the anode or anodes. Locate the copper sulphate half cell inside the tank adjacent to the tank shell at maximum distance from the anode or anodes. Use a portable potentiometer or high-resistance voltmeter to measure the potential. Nonconformance to 3.23 shall constitute failure of this test.

4.6 Inspection of packaging.

4.6.1 Preproduction pack inspection.

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4.6.1.1 Examination. The preproduction pack shall be examined for the defects listed in 4.6.2.3. Presence of one or more defects shall be cause for rejection of the preproduction pack.

4.6.1.2 Tests. The preproduction pack for level A shall be subjected to the guided-impact test (railroad-car) in Appendix A to MIL-STD-1186. The test car shall strike a string of five empty cars with draft gear extended and brakes set, at a speed of not less than 10 miles per hour and not more than 11 miles per hour. When it is impractical to test in accordance with the railroad-car method, the incline-impact test or the pendulum-impact test in Appendix A to MIL-STD-1186, may be substituted.

4.6.1.3 Basis for rejection. Any shifting of contents, visible damage to the contents, or any loose, broken, or displaced anchoring, blocking, or bracing within the container shall be cause for rejection.

4.6.2 Quality conformance inspection of pack.

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

4.6.2.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.6.2.3 Examination. Samples selected in accordance with 4.6.2.2 shall be examined for the following defects. AQL shall be 2.5 percent defective.

- 108. Materials not as specified for level A.
- 109. Unprotected metal surfaces not coated with preservative as specified for level A.
- 110. Preservative applied to surfaces that will contact the water for level A.
- 111. Consolidation not as specified for level A.
- 112. Limitations imposed by crate specifications exceeded for level A.
- 113. Contents not secured in accordance with the reference standard for level A.
- 114. Marking illegible, incorrect, incomplete, or missing for level A.

5. PACKAGING

5.1 Preproduction pack. The contractor shall furnish a preproduction pack for examination and test within the time frame specified (see 6.2), to prove prior to starting production preservation and packing, that the applied preservation, packing, and marking comply with the packaging requirements of this specification. Examination and tests shall be those specified in Section 4 and shall be subject to surveillance and approval by the Government (see 6.7).

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

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5.2.1 Level A. Unpainted exterior surfaces of the tanks, tank supports, tapping plugs, caps, or any other exterior surfaces of the tanks requiring the application of a contact preservative in accordance with MIL-P-116 shall be coated with type P-1 preservative. The preservative shall conform to the applicable specification listed in and shall be applied in accordance with MIL-P-116. Preservative shall not be applied to the interior surfaces of the tanks or to any component that will come in contact with the water.

5.2.1.1 Consolidation. Components that are not attached to the tank shall be secured to the base of the shipping container or placed in a close-fitting box conforming to PP-B-621, class 1, style optional, or PPP-B-601, domestic type, style optional. Strapping shall not be required.

5.2.2 Commercial. Commercial preservation shall be in accordance with MIL-STD-1188.

5.3 Packing. Packing shall be level A or commercial as specified (see 6.2).

5.3.1 Level A. Each tank and the consolidated components shall be packed in a crate conforming to MIL-C-52950, style A, type as applicable for the weight and dimension of the tank. Tanks exceeding the limitations of the above crate shall be packed in a crate conforming to MIL-C-3774, skid base, nailed assembly. The contents shall be anchored to the base in accordance with MIL-STD-1186. Closure and strapping shall be in accordance with the appendix to the applicable specification. Strapping shall be zinc coated.

5.3.2 Commercial. Commercial packing shall be in accordance with MIL-STD-1188.

5.4 Marking. Level A marking shall be in accordance with MIL-STD-129. Commercial marking shall be in accordance with MIL-STD-1188.

6. NOTES

6.1 Intended use. The tanks are intended for storing potable service hot water.

6.2 Ordering data. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type, class, style, size, and capacity required (see 1.2, 3.1, 3.1.1, 3.1.2, 3.9 and 3.12).
- (c) When a first article is required, number of first article tanks required and time frame required for submission of first article tank(s) when required (see 3.3).
- (d) Tappings and openings required if other than as specified (see 3.7).
- (e) Tank supports required if other than contractor's commercial design (see 3.8, figure 3, and figure 4).
- (f) When threaded pipe leg bosses are required in tank supports (see 3.8 and figure 4).

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- (g) When identification marking is to be other than manufacturer's standard commercial marking and in accordance with MIL-STD-130 (see 3.10).
- (h) When treatment and painting or color of exterior surfaces shall be other than as specified (see 3.11).
- (i) Cleaning, painting and color required if other than as specified (see 3.11).
- (j) Whether tank fabrication shall be other than as specified (see 3.1.1 and 3.1.2).
- (k) When wire brushing and hand scraping may be employed (see 3.12 and 6.5).
- (l) When lining other than as specified is required (see 3.13.1, 3.13.2 and 6.5).
- (m) When vacuum test of copper lined tanks is required (see 3.16 and 4.5.2.7).
- (n) When cathodic protection shall be other than as specified (see 3.23).
- (o) Time frame required for submittal of preproduction pack (see 5.1).
- (p) Degree of preservation and degree of packing required (see 5.2 and 5.3).

6.3 Classification changes. Changes in classification of the tanks between this revision of the specification and previous "C" and "D" revisions is as follows:

<u>Old Designation</u>	<u>New Designation</u>
Type II cement-lined steel	Type II cement or siliceous lined steel
Type V	No longer required
None	Type VII nickel-copper alloy
None	Type VIII copper tank
None	Type IX stainless steel
None	Type X copper-nickel alloy
None	Type XI electroless nickel plated steel overcoated with fluorocarbon-based polymer
None	Type XII steel overcoated with fluorocarbon based polymer

6.4 First article tank. When first article tanks are specified, any changes or deviations of production tanks from the first article tanks during production will be subject to the approval of the contracting officer. Approval of the first article tanks will not relieve the contractor of his obligation to furnish tanks conforming to this specification.

6.5 Lining. It is recommended that, whenever practicable and when recommended by the contractor, cement and siliceous lining be applied by the contractor after the tank is installed. This avoids shipping damages to which these linings are susceptible. If the lining applicator intends to use wire brushing and hand-scraping to clean tank surfaces rather than acid cleaning or sand or grit blasting, it is recommended that the contracting officer obtain a 5 or 10 year unconditional warranty for the lining under the applicable operating

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conditions (i.e. water temperature, location, source of water supply, etc. (see 3.12) with the repair work being done at the location of the tank. This method of cleaning generally applies to tanks which will be lined at the job site.

6.6 Tank construction. Minus heads are generally not available commercially from contractors and should only be specified when a particular need exists. Tank supports should be the contractor's commercial supports and should be used for economic reasons. Specify appropriate supports in figure 3 only when a particular need exists. A 4 inch by 6 inch handhole may be specified in tanks 36 inch or less in diameter when required. In lieu of the tests specified for type II tanks in 4.5.2.3 and 4.5.2.4, the contracting office may elect to accept an appropriate test report covering the lining of an established contractor from an independent test laboratory.

6.7 Preproduction pack. Any changes or deviations of production packs from the approved preproduction pack will be subject to the approval of the contracting officer. Approval of the preproduction pack will not relieve the contractor of his obligation to preserve, pack, and mark the tanks in accordance with this specification.

6.8 First article test. When first article tests are required, appropriate provisions should be included in the contract, to allow the contracting officer to waive completely or in part the first article tests and reduce the bid price accordingly if the successful bidder has previously performed any or all of the first article tests in recent procurements, or if quantities involved are less than 10. When the contract allows for waiver of first article tests, the contract should require that the successful bidder seeking such a waiver submit satisfactory evidence, including test and inspection reports that the tests have been performed successfully in the past and additional information such as the contract identification, the procuring activity, the date, and other pertinent data deemed necessary by the contracting officer. If the first article tests are desired, the contracting officer will normally elect to have these performed at the manufacturer's plant. He may also elect to have these tests performed at a Government laboratory, or at an independent private test organization. Note that deletion of first article tests does not delete the tests required by Section IV of the ASME Code.

6.9 Definitions.

6.9.1 Manufacturer's standard commercial product. The manufacturer's standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

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6.9.2 Interchangeability. All parts having the same part number shall be functionally and dimensionally interchangeable. Interchangeable parts are defined as two or more like parts possessing such functional and physical characteristics as to be equivalent in performance and durability, and capable of being exchanged one for the other without alteration of the parts themselves or of adjoining parts, except for adjustment, and without selection for fit or performance.

Custodians:

Army - ME
Navy - YD
Air Force - 99

Preparing activity:

Army - ME

Review activities:

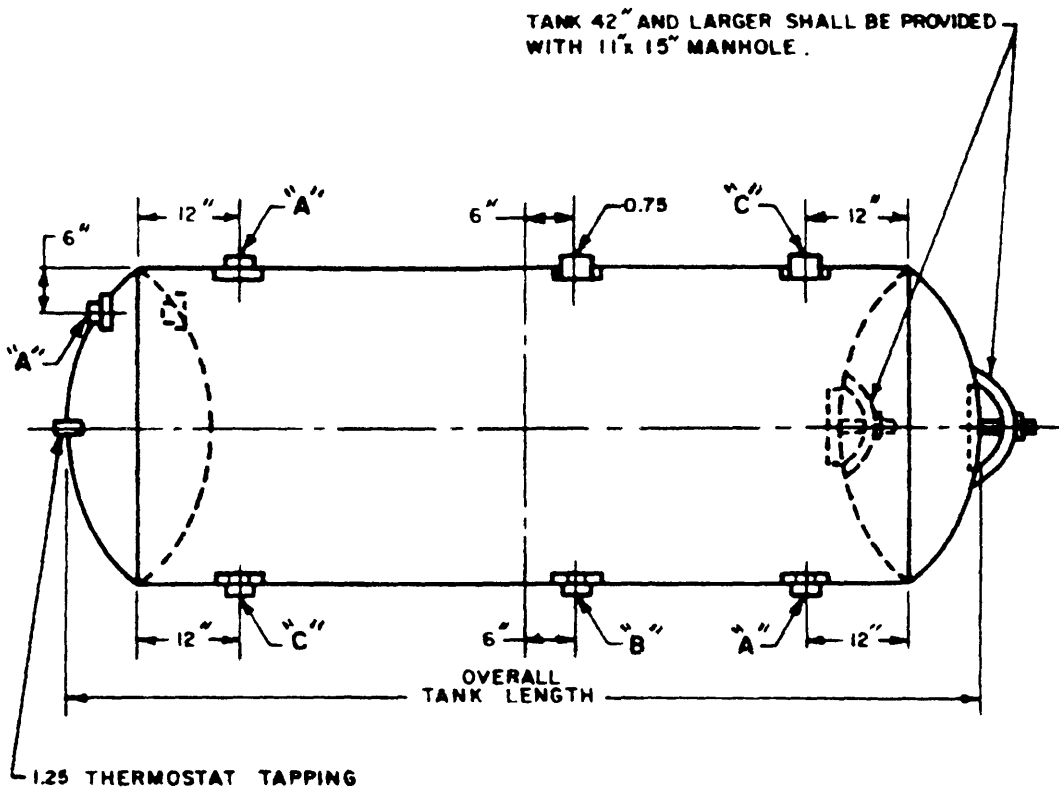
Army - MD, CE

Project 4520-0264

User activities:

Navy - CG, MC

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NOTE:

THERMOSTAT TAPPING FOR STYLE A TANK SHALL BE LOCATED ON THE HORIZONTAL CENTER LINE, RIGHT OR LEFT OF THE VERTICAL CENTER LINE, AT A DISTANCE FROM THE CENTER EQUAL TO ONE THIRD THE TANK DIAMETER.

DIAMETER OF TANK INCHES	TAPPING SIZES INCHES		
	"A"	"B"	"C"
24	1.5	-*	2
30 TO 42 INCL	2	2*	2
48 TO 72 INCL	3	2	3
84 TO 96 INCL	3	2	4**

NOTE:

ALL DIMENSIONS SHALL HAVE TOLERANCE OF ± 0.063 INCH

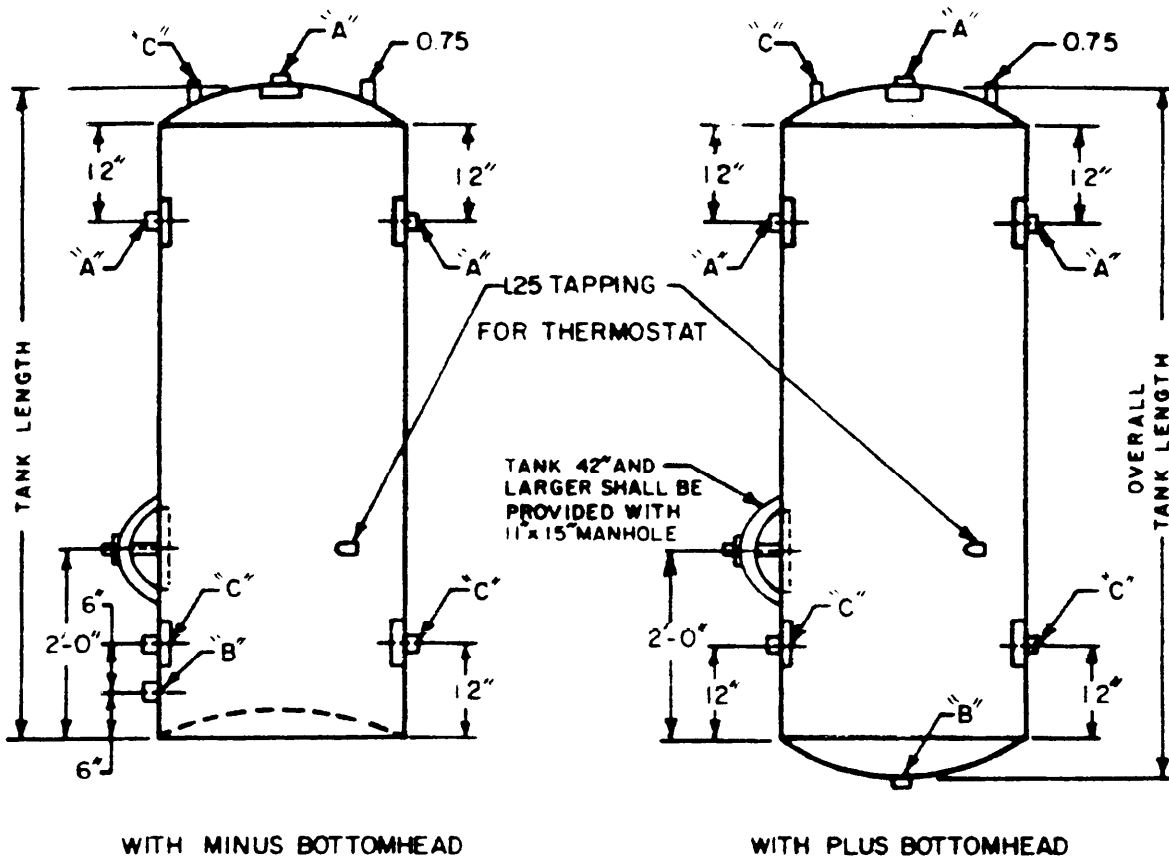
* BLOW-OFF TAPPING IS NOT REQUIRED FOR TANKS 36 INCHES IN DIAMETER OR LESS.

** FLANGED OPENING

**FIGURE 1- Hot water storage tanks horizontal,
style A.**

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NOTE: THERMOSTAT TAPPING FOR STYLE B TANK SHALL BE LOCATED ON THE SIDE OPPOSITE THE HANDHOLE OR MANHOLE OPENING, IN THE HORIZONTAL PLANE OF THE OPENING, AND PARALLEL TO AND ON EITHER SIDE OF THE CENTER LINE THROUGH THE OPENING AT A DISTANCE EQUAL TO ONE THIRD THE TANK DIAMETER.

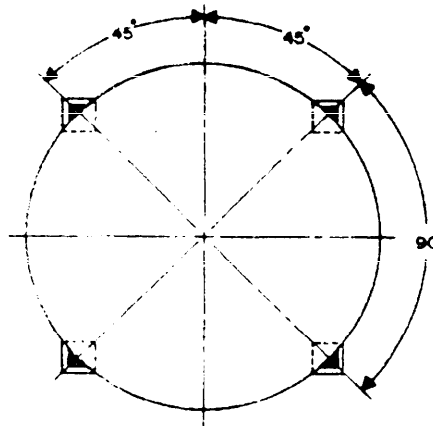
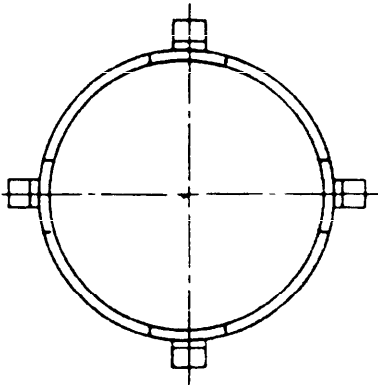
DIAMETER OF TANK INCHES	TAPPING SIZES INCHES		
	A	B	C
24	1.5	- *	2
30 TO 42 INCL.	2	2*	2
48 TO 72 INCL.	3	2	3
84 TO 96 INCL.	3	2	4**

NOTE:
 ALL DIMENSIONS SHALL HAVE TOLERANCE OF $\pm .063$ INCH
 * BLOW OFF TAPPING NOT REQUIRED FOR TANKS 36 INCHES IN DIAMETER OR LESS
 ** FLANGED OPENING

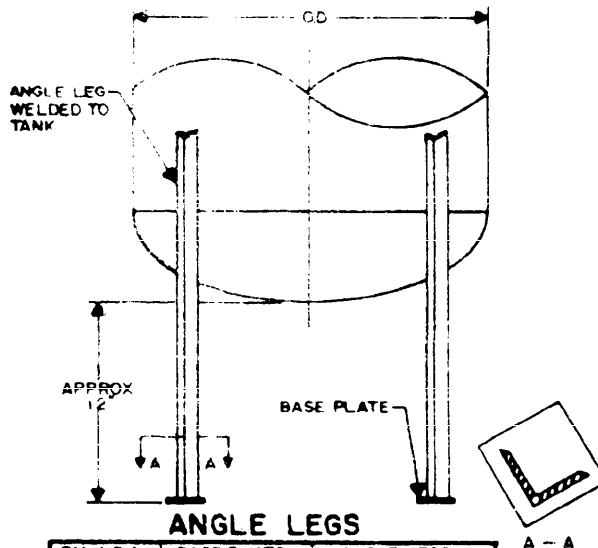
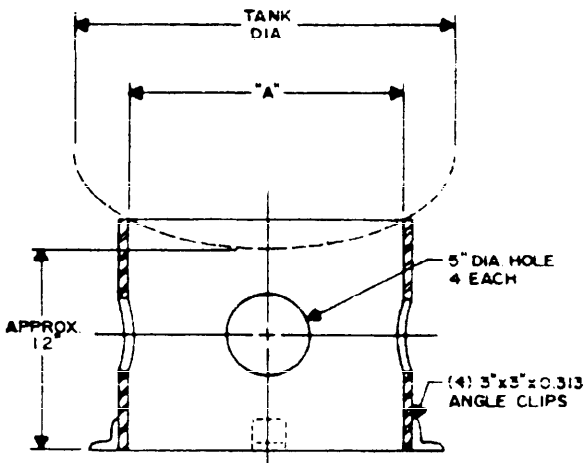
FIGURE 2.- Hot water storage tanks, vertical style B.

X-3711A

MIL-T-127 5-



NOTE:
BASE PLATES OF 4 LEGS ARE NOT FACTORY DRILLED FOR ANCHOR BOLTS; THEY ARE LEFT FOR FIELD DRILLING TO SUIT ACTUAL ANCHOR BOLT MEASUREMENTS



BASE RINGS

TANK DIAMETER	24	30	36	42	48	54	60	66	72	84	96
DIMENSIONS "A"	20	24	30	30	36	42	48	54	60	72	84

ALL DIMENSIONS IN INCHES

ANGLE LEGS

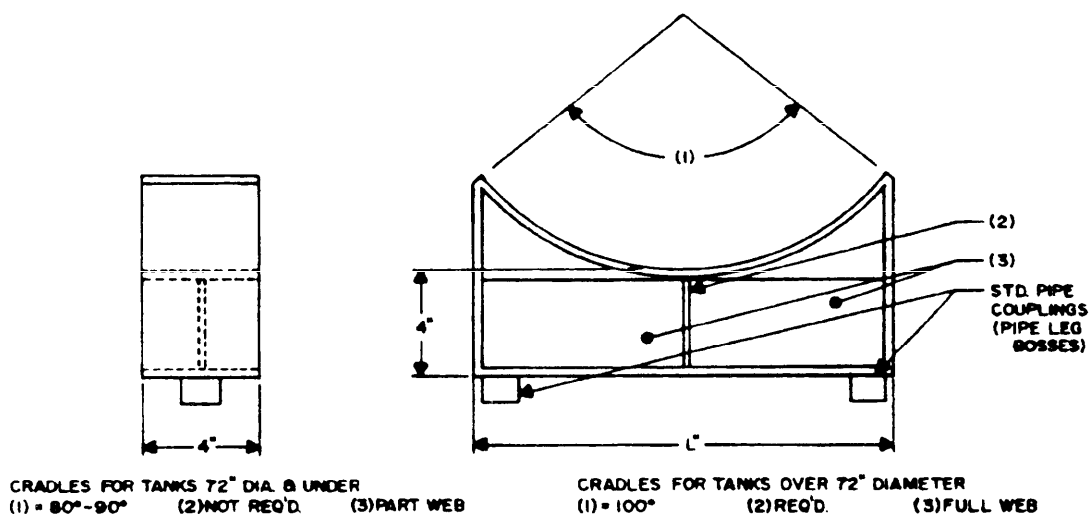
TANK DIA	BASE PLATE	ANGLE LEGS
24"	4" x 4" x 0.313	2" x 2" x 0.25
30"	5" x 5" x 0.375	2.5" x 2.5" x 0.25
36"	5" x 5" x 0.375	2.5" x 2.5" x 0.25
42"	5" x 5" x 0.375	3" x 3" x 0.375
48"	5" x 5" x 0.375	3" x 3" x 0.375
54"	5" x 5" x 0.375	3" x 3" x 0.375
60"	6" x 6" x 0.5	4" x 4" x 0.5
66"	6" x 6" x 0.5	4" x 4" x 0.5
72"	6" x 6" x 0.5	4" x 4" x 0.5
84"	8" x 8" x 0.5	6" x 6" x 0.5
96"	8" x 8" x 0.5	6" x 6" x 0.5

NOTE:
MATERIAL SHALL BE STEEL.

FIGURE 3. SUPPORTS FOR VERTICAL TANKS

X-2448A

MIL-T-12295F



TANK DIA.	L (MIN)	MAT'L. THICK.	E#
24	16	0.25	2
30	19.75	0.25	2.5
36	23	0.25	2.5
42	27.25	0.25	3
48	31.25	0.313	3
54	35.25	0.313	3
60	39.25	0.375	3
72	47.5	0.375	3
84	64.5	0.375	3
96	73.875	0.375	3

ALL DIMENSION IN INCHES

E = NOMINAL PIPE SIZE FOR PIPE LEG BOSSES (STD. PIPE COUPLINGS)
SPECIFY WHEN PIPE LEG BOSSES ARE DESIRED.

NOTES:

1. MATERIAL SHALL BE STEEL.
2. SUPPORT CRADLES (2) SHALL BE LOCATED AT APPROXIMATELY 1/4 POINTS OF TANK OVERALL LENGTH.
3. TANKS OVER 20FT. IN LENGTH SHALL HAVE A MINIMUM OF THREE SUPPORT CRADLES.

FIGURE 4. CRADLE SUPPORTS FOR HORIZONTAL TANKS.

X-2449A

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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NOTE: This form shall not be used to submit requests for waivers, deviations or clarification of specification 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.

DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-T-12295E Tanks, Potable Hot Water Storage

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