

MIL-T-15301D(SHIPS)  
15 April 1968

SUPERSEDING  
MIL-T-15301C(SHIPS)  
12 October 1964  
(See 6.2)

MILITARY SPECIFICATION

# TANKS, PRESSURE, 600 P. S. I. GAGE WORKING PRESSURE,  
NAVAL SHIPBOARD USE

1. SCOPE

# 1.1 Scope. This specification covers pressure tanks for air starting diesel engines and for air compressor accumulator tanks on Naval ships.

1.2 Classification. The tanks shall be of the following classes, as specified (see 6.1):

- Class 1 - Suitable for working pressures over 400 pounds per square inch gage (p.s.i.g.).
- Class 2 - Suitable for working pressures not exceeding 400 p.s.i.g.

2. APPLICABLE DOCUMENTS

# 2.1 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

- FF-B-571 - Bolts, Nuts, Studs, and Tap Rivets (and Material for Same).
- QQ-S-691 - Steel Plate, Carbon-Silicon, Carbon Molybdenum and Manganese-Molybdenum Alloys Hot Rolled, (Marine Boiler Quality).
- WW-P-404 - Pipe, Steel, (Seamless and Welded, Black and Zinc-Coated (Galvanized)).
- PPP-B-636 - Box, Fiberboard.

MILITARY

- MIL-P-116 - Preservation, Methods of.
- MIL-B-857 - Bolts, Nuts, and Studs.
- MIL-S-890 - Steel: Forgings and Bars for Hulls, Engines, and Ordnance (Heat Treated).
- MIL-A-17472 - Asbestos Sheet, Compressed (Gasket Material).
- MIL-Z-17871 - Zinc-Coating, (Hot-Dip Galvanizing).
- MIL-F-20C42 - Flanges, Pipe, Bronze (Silver Brazing).
- MIL-S-2040 - Steel, Forgings for Welding.
- MIL-T-20157 - Tube and Pipe, Carbon Steel, Seamless.

STANDARDS

MILITARY

- MIL-STD-271 - Nondestructive Testing Requirements for Metals.
- MIL-STD-278 - Fabrication, Welding and Inspection of Machinery, Piping and Pressure Vessels for Ships of the United States Navy. ' ' "

(Copies of specification, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

# 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.

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Application for copies should be addressed to the Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606,)

MIL-T-15301D(SHIPS)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- Low and Intermediate Tensile Strength Carbon-Steel Plates of Flange and Firebox Qualities for Pressure Vessels (Plates 2 in. and Under in Thickness).

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

## UNITED STATES OF AMERICA STANDARDS INSTITUTE (USAS)

B16.5 - Steel Pipe Flanges and Flanged Fittings.

(Application for copies should be addressed to the United States of America Standards Institute, 10 East 40th Street, New York, N. Y. 10016.)

## THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Section VIII - Unfired Pressure Vessels

(Application for copies should be addressed to The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N. Y. 10017.)

## NATIONAL BUREAU OF STANDARDS

Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

(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 Materials. The materials shall be in accordance with table I.

Table I - Material.

Part	Material	Applicable document
Shell	Steel boiler plate	QQ-S-691, class B ASTM A-285, grade B
	Seamless steel tubing	MIL-T-20157, type E
	Pipe, steel, electric-resistance welded	WW-P-404, grade B
Heads	Steel boiler plate	QQ-S-691, class B ASTM A-285, grade B
Handhole plates and yokes	Steel boiler plate	QQ-S-691, class B ASTM A-285, grade B
	Steel forgings	MIL-S-890, class B
Pipe connections	Steel forgings	MIL-S-890, class B MIL-S-20140
Studding pads	Steel boiler plate	QQ-S-691, class B
Handhole bolts	Steel bolts	MIL-B-857, type II National coarse threads FF-B-571, class B National coarse threads
Handhole gasket	Compressed asbestos	MIL-A-17472

3.2 Design.

3.2.1 Dimensions. Dimensions shall be as specified to best meet the volumetric requirements and space limitations (see 6.1).

3.2.2 Mounting. Tanks shall be horizontally or vertically mounted as specified (see 6.1).

# 3.2.3 Working pressure. Tanks shall be suitable for continuous working pressure as specified (see 6.1). In addition, tanks shall be capable of safe operation at the system design pressure, which is the setting of relief valves, or a maximum of 112 percent of the working pressure.

MIL-T-15301D(SHIPS)

3.2.4 Shell thickness,

3.2.4.1 Class 1 tanks. The shell thickness of class 1 tanks shall be determined by the following formula:

$$T = \frac{WR}{13750 + W}$$

where:

T = Thickness of shell plate in inches.  
 W = Working pressure p.s.i.g.  
 R = One half the outside diameter in inches,

3.2.4.2 Class 2 tanks. The shell thickness of class 2 tanks shall be determined by the following formula :

$$T = \frac{WR}{12000 + W}$$

where:

T = Thickness of shell plate in inches.  
 w = Working pressure p.s.i.g.  
 R = One half the outside diameter in inches.

3.2.5 Connections (tank). Piping connections on the tank shall be separate as specified and shall be as follows:

Air inlet  
 Air outlet  
 Relief valve  
 Drain  
 Gage

The sizes and locations of the above connections shall be as specified (see 6.1). A pad with 2-inch diameter opening and suitable pad and plate closure shall be provided to permit draining of interior of tank after galvanizing. This pad shall be so located that other piping connection openings may be used as vents during drain-off process.

3.2.6 Head thickness. The thickness of the heads shall be determined by the following formula:

$$t = \frac{WD}{2SE - 0.2 P} \qquad W = \frac{2SEt}{D + 0.2 t}$$

where:

t = Minimum required thickness of head after forming in inches. (Exclusive of corrosion allowance.)  
 W = Working pressure, p.s.i.g.  
 D = Inside length of the major axis.  
 s = Maximum allowable stress value, p.s.i.g. = 13,750.  
 E = Lowest efficiency of any joint in the head,

3.3 Construction.

3.3.1 The tanks shall consist of a cylindrical shell, closed by convex heads, and shall be all welded.

3.3.2 The nominal plate thickness for heads and shell shall be plus or minus 1/32 inch of the calculated thickness. The thinning down of the head due to forming shall be not more than 10 percent of the calculated thickness.

3.3.3 Longitudinal seams and girth seams shall be welded. External surfaces of plates at welded joints shall not be offset from each other. When head skirts are thicker than the shell plate, they shall be reduced at the joint to approximately the thickness of the shell plate. Forming, including Straightening and matching of plate edges, if done cold, shall be done by steady pressure. Forming by blows may be done at forging temperature only and shall not damage the surface.

3.3.4 Tank shell. The tank shell shall be made of seamless steel tubing or of steel plate with welded longitudinal seams (see 3.1), The difference between the largest diameter and smallest diameter of a shell in any section shall not be greater than 1 percent of the nominal outside diameter.

3.3.5 Heads. Heads shall be convex and shall be made of steel plate as specified in 3.1. Heads shall be the manufacturer's standard semi-ellipsoidal form, conforming to ASME Boiler and Pressure Vessel

MIL-T-15301D(SHIPS)

Code, section VIII, in which half the minor axis (inside depth of the head minus the skirt) equals one-fourth of the inside diameter of the head skirt. All heads shall have a skirt prepared for butt welding to the shell. The minimum skirt length shall be three times the head thickness or 1-1/2 inches, whichever is less.

3.3.6 Piping connections. Sizes, locations and details of piping connections shall be as specified (see 6.1).

3.3.6.1 Class 1 tanks. For class 1 tanks where connecting piping is nonferrous, piping connections shall be 6 inch long steel pipe nipples, type E, in accordance with MIL-T-20157.

3.3.6.2 Class 2 tanks. "For class 2 tanks where connecting piping is nonferrous, studding pads shall be in accordance with figure 1, except that drilling and facing shall be in accordance with MIL-F-20042.

3.3.6.3 Studding pads in accordance with figure 1 shall be used where ferrous connecting piping incorporates steel flanges in accordance with, USAS B16.5.

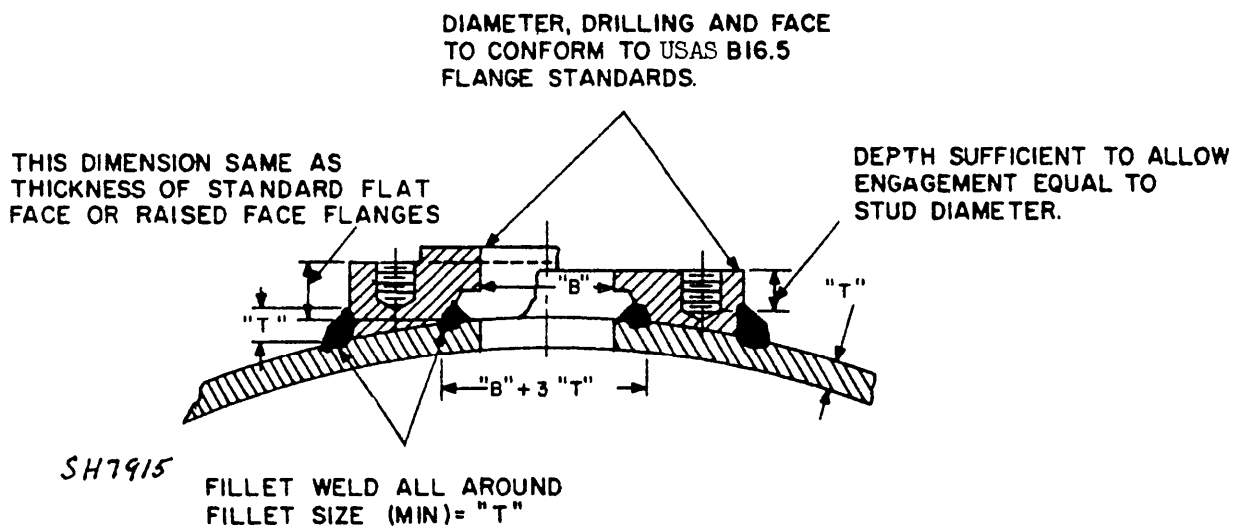


Figure 1. Detail section of studding pads.

3.3.7 Handhole. Unless otherwise specified (see 6.1), each head shall have a 4 by 6-inch handhole flued inward as shown on figure 2. The minimum depth of flange of the flued opening shall be three times the required head thickness. The handhole fluing radius shall be 7/8-inch for heads 1-1/8 inches thick and under. For thicker heads, the radius shall be increased proportionately,

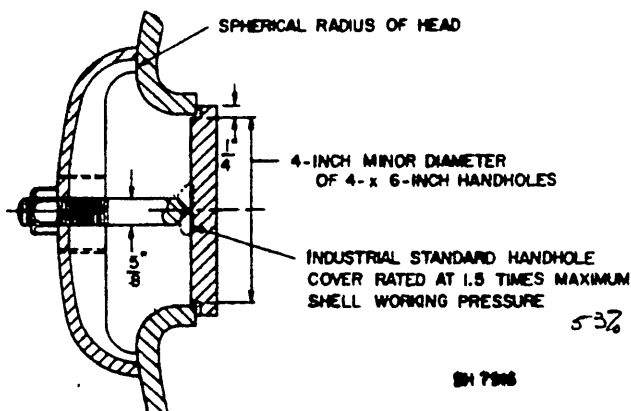


Figure 2. Handhole cover.

MIL-T-15301D(SHIPS)

3.3.9 Welding. Welding, preparation of joints and stress relieving, shall be in accordance with MIL-STD-278.

# 3.3.9 Galvanizing. The tanks shall be galvanized inside and outside after fabrication and testing. The galvanizing shall be in accordance with MIL-Z-17871. Threaded holes shall be protected while galvanizing by the insertion of mating bolts. Bolts shall be removed after galvanizing and hole threads cleaned of any residual coating. All gasket mating surfaces finish machined prior to galvanizing shall be protected with a suitable coating of "stop-off" material. All gasket surfaces not protected with a coating of galvanizing stop-off material shall be finished after galvanizing. Threads shall be in accordance with Handbook H28.

3.3.10 Handhole covers, bolts, and yokes shall be in accordance with figure 2.

3.3.11 Gaskets. "One set of industrial handhole gaskets 1/16 inch thick shall be furnished on each tank.

3.4 stamping. All tanks shall be plainly stamped (indented) on each head, about 3 inches in from the outside circumference with the name of the manufacturer, the number and date (month and year) of this specification, class, and the working pressure in p.s.i.g. in letters not less than 3/8 inch nor more than 1/2 inch high.

3.5 Onboard repair parts. One complete set of gaskets 1/16 inch thick and one handhole cover shall be furnished with each tank,

# 3.6 Drawings. Drawings shall be type II, category A, form 2 in accordance with MIL-D-1000/2, Drawings shall be approved by the Naval Ship Engineering Center (Auxiliary Equipment Branch). Only drawings which have not previously been approved, or have been revised by changes in material or design, shall be submitted for approval.

# 3.6.1 Drawings shall show overall dimensions, size and location of connections, shell and head thickness, materials, welding details weight, volume, working pressure, and test pressure.

3.7 Workmanship. The workmanship and finish shall be first class in every respect.

#### 4. QUALITY ASSURANCE PROVISIONS

# 4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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.

#### 4.2 Quality conformance inspection,

4.2.1 Examination. Each tank offered for delivery shall be subjected to examination to determine compliance with the requirements of this specification that do not involve tests. Examination shall be conducted as specified in table II.

Table II - Classification of defects.

Categories	Defects
Critical:	None defined.
Major:	
101	Not class specified.
102	Evidence of unauthorized material or repairs.
103	Tank not complete; parts missing; evidence of reclaimed, used, salvaged parts and material.
104	Shell diameter and length proportions not as specified.
105	Heads not convexed and flanged as specified; corner radius non-conforming.
106	Evidence that plate edge forming by impact not done at forging temperature.
107	Weld joint preparation nonconforming; not type groove required.
108	Tank not welded as specified; longitudinal seams, girth seams and piping connections not free of cold cracks, non-fusion, slag inclusion, heavy porosity and heavy undercut.

MIL-T-15301D(SHIPS)

Table II - Classification of defects. (Continued)

Categories	Defects
Major:	
109	Shell thickness does not conform to calculated dimension from applicable formula.
110	Head plate thickness not thinning at flange; shell plate thickness not within allowed limits.
111	Piping connections not size specified; number and location nonconforming.
112	Galvanize drainage pad not diameter, not location specified; pad and plate closure not provided.
113	Studding pads for connections not provided; not welded to shell; weld fillet, relation of bore to flange size; depth, diameter, threaded holes; gasket seat finish nonconforming.
114	Handhole (if required) not depth required by formula; flanging radius not within specified limits.
115	Handhole cover thickness diameter, clearance nonconforming; bolt not welded to or integral with cover.
116	Evidence that yoke not adequate strength; gaskets not furnished, not required size.
117	Tank not hot dip galvanized (as required); threads and finish surfaces not free of galvanizing.
118	Threads not size and fit specified; torn, broken, stripped.
119	Tank not free of dents, rough edges, rough seams, irregular seams, peeled galvanize; finished pad surfaces not smooth, clean; evidence of rust, corrosion, internally and externally.
120	Tank weight not comparable to average for all tanks made to same drawing.
121	Tank not cleaned after heat treatment to remove scale.
Minor:	
201	Identification data not stamped, not located as required; data incomplete; not legible; not permanent.
202	Handhole cover (as applicable) and gaskets not furnished as required.

4.2.1.1 Each tank shall be weighed. Any tank made to the same drawing which is unusually heavy or light when compared with other tanks made to the same drawing shall not be offered for delivery.

#### 4.2.2 Tests.

4.2.2.1 Hydrostatic test. Each tank shall be subjected to a hydrostatic test before galvanizing. The hydrostatic test pressure shall equal twice the designed working pressure, and shall be held for a period long enough to allow a thorough inspection of the-tank and the-welded joint.

4.2.2.2 Each class 1 tank shall be subjected to 100 percent radiographic inspection in accordance with MIL-STD-271.

4.2.2.3 Possible test failures, Possible test failures are defined as follows:

- (a) Hydrostatic test (under specified hydrostatic test conditions):
  - (1) Evidence of distortion.
  - (2) Not free of leaks of seams, joints, connection pads.
  - (3) Tank not cleaned prior to galvanizing.
- (b) Radiographic inspection (class 1 tanks only):
  - (1) Radiographs show evidence of cracks, non-fusion, slag inclusions, heavy porosity in welds,

#### 5\* PREPARATION FOR DELIVERY

# (The preparation for delivery requirements specified herein apply only for direct Government procurements. Preparation for delivery requirements of referenced documents listed in section 2 do not apply unless specifically stated in the contract or order. Preparation for delivery requirements for products procured by contractors shall be specified in the individual order.)

MIL-T-15301D(SHIPS)

5.1 Domestic shipment and early equipment installation and for storage of onboard repair parts.5.1.1 Tank.

# 5.1.1.1 Preservation and packaging. Preservation and packaging which may be the suppliers commercial practices shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

# 5.1.1.2 Packing. Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules or other carrier regulations as applicable to the mode of transportation and may conform to the suppliers commercial practice.

5.1.1.3 Marking. Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractors commercial practice. The information shall include nomenclature, Federal stock number or manufacturers part number, contract or order number, contractors name and destination.

5.1.2 Onboard repair parts.

5.1.2.1 Packaging. The gaskets shall be packaged in accordance with method IC of MIL-P-116. The handhole cover shall be packaged in accordance with method III of MIL-P-116.

# 5.1.2.2 Packing. The repair parts shall be packed in fiberboard boxes conforming to either type CF or SF, domestic class, of PPP-B-636.

# 5.2 Domestic shipment and storage or overseas shipment. The requirements and levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.1).

## 6. NOTES

# 6.1 Ordering data. Procurement documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Class required (see 1.2),
- (c) The nominal outside diameter and volume of tank required (see 3.2.1).
- (d) Type of mounting required (see 3.2.2).
- (e) Working pressure required (see 3.2.3).
- (f) Sizes, locations and details of tank and piping connections (see 3.2.5 and 3.3.6).
- (g) Whether handholes are required (see 3.3.7).
- (h) Preservation, packaging, packing and marking requirements other than those specified in 5.1 (see 5.2).

6.2 CHANGES FROM PREVIOUS ISSUE. THE OUTSIDE MARGINS OF THIS DOCUMENT HAVE BEEN MARKED "#" TO INDICATE WHERE CHANGES (DELETIONS, ADDITIONS, ETC.) FROM THE PREVIOUS ISSUE HAVE BEEN MADE, THIS HAS BEEN DONE AS A CONVENIENCE ONLY AND THE GOVERNMENT ASSUMES NO LIABILITY WHATSOEVER FOR ANY INACCURACIES IN THESE NOTATIONS. BIDDERS AND CONTRACTORS ARE CAUTIONED TO EVALUATE THE REQUIREMENTS OF THIS DOCUMENT BASED ON THE ENTIRE CONTENT AS WRITTEN IRRESPECTIVE OF THE MARGINAL NOTATIONS AND RELATIONSHIP TO THE LAST PREVIOUS ISSUE.

Preparing activity:  
Navy - SH  
(Project 4310-N018)





SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<u>INSTRUCTIONS</u>		
This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).		
SPECIFICATION		
ORGANIZATION (of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT \$
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE? A. GIVE PARAGRAPH NUMBER AND WORDING.		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE? <input type="checkbox"/> YES <input type="checkbox"/> NO IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED BY (Printed or typed name and activity)		DATE

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