

NOTICE OF CHANGE
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INCH- POUND
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MIL-STD-777E(SH)  
NOTICE 2  
13 November 1991

## MILITARY STANDARD

SCHEDULE OF PIPING, VALVES, FITTINGS, AND ASSOCIATED  
PIPING COMPONENTS FOR NAVAL SURFACE SHIPS

TO ALL HOLDERS OF MIL-STD-777E(SH):

1. THE FOLLOWING PAGES OF MIL-STD-777E(SH) HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
5a	13 November 1991	5a	17 January 1990
6	13 November 1991	6	17 January 1990
A-1.1	13 November 1991	A-1.1	7 February 1986
A-2.1	13 November 1991	A-2.1	7 February 1986
A-3.1	7 February 1986	A-3.1	REPRINTED WITHOUT CHANGE
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A-4.1	13 November 1991	A-4.1	7 February 1986
A-5.1	13 November 1991	A-5.1	7 February 1986
A-6.1	13 November 1991	A-6.1	7 February 1986
A-7.1	13 November 1991	A-7.1	7 February 1986
A-8.1	13 November 1991	A-8.1	7 February 1986
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E-1.1	7 February 1986	E-1.1	REPRINTED WITHOUT CHANGE
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W-1.1	7 February 1986	W-1.1	REPRINTED WITHOUT CHANGE
Y-1.1	13 November 1991	Y-1.1	7 February 1986
Y-4.1	13 November 1991	Y-4.1	7 February 1986

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-777E(SH) will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or canceled.

Preparing activity:  
Navy - SH  
(Project 4730-N063)

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Paint mixing and issue rooms  
RAST machinery rooms  
Ship service or emergency generator rooms  
Storerooms for gasoline-powered bomb hoists  
TACTAS handling rooms

Silver brazed fittings shall be of the pre-inserted ring type, except as follows:

- (a) In sizes 1/2 nominal pipe size (NPS) and below.
- (b) Fittings without preinserted brazing rings may be used in the refrigeration system (see category Q-1).
- (c) Expanded copper sleeves without preinserted brazing rings may be used in the inner wall of a double-walled gasoline piping system.
- (d) Water closet discharge fittings as shown on figures 6 and 7 of Drawing 810-1385706 may be used without preinserted rings.
- (e) Joints for voice tube and pneumatic tube systems.
- (f) Joints for bellmouth to pipe for tailpipes within tanks.

4.15 Threaded fasteners. In addition to the requirements contained in each category, the following also applies:

- (a) Piping system fasteners shall be of the UNC series with a class 2 or 3 fit.

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- (b) Nuts located within tanks, in the bilge region or inaccessible for examination or routine replacement in service shall be of the self-locking type as specified in section 075 of the ship's specifications.
- (c) Hull integrity piping connections are defined as all flanged joints from the hull up to and including the inboard flange of the hull valve. Included in this category are the bonnet joints of the hull valves and both line flanges and the bonnet joint of the first valve (such as blow-out valve) in branch lines connected to piping between the hull and the hull valve. Connections shall be as follows:
  - (1) Bolted hull integrity piping connections shall be fitted with nickel-copper-aluminum alloy fasteners in accordance with MS18116 except that lot identification is not required and with self-locking nuts, as specified in (e). Nuts may be nickel-copper alloy QQ-N-281 class A or B or nickel-copper-aluminum alloy in accordance with QQ-N-286.
  - (2) For services involving integrity of the hull against the sea, as defined in (f) above, energy absorption shall be provided by making the mounting fasteners essentially constant throughout their length. This may be achieved by threading over the entire length, reducing the non-threaded shank diameter to a dimension that falls between the pitch diameter and the root diameter (usually for cut threads), or maintaining the unthreaded shank diameter the same dimension as the unthreaded blank (usually for rolled threads). For resistance to shear forces, mating surfaces of the fasteners holes shall be beveled.
- (d) Nickel-copper alloy bolting in accordance with class A or B of QQ-N-281 shall be used in the following application:
  - (1) Where subject to sea water spray or submergence.
  - (2) Where not readily accessible for examination or maintenance in service due to their location and carbon steel, alloy steel, or bronze bolting is specified for the rest of the system. Some examples are: bilges, below floor plates, tanks, voids and other hidden areas. Where nickel-copper bolting does not meet the strength requirements of the joint, nickel-copper-aluminum alloy QQ-N-286 shall be used.
- (e) Threaded fasteners in non-ferrous joints where ferrous bolting is specified and located in high condensation areas, such as machinery spaces, scullery, galley, laundry and sanitary spaces shall be either nickel-copper in accordance with QQ-N-281.
- (f) Wherever non-ferrous flanges mate up to ferrous flanges bolting material shall be either nickel-copper in accordance with QQ-N-281.
- (g) Carbon and alloy steel fasteners shall be given protective coating as follows:

Supersedes page 6 of Notice 1 (17 January 1990).

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-1	Steam and steam drains	1500	1000	See note A-1-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Chrome molybdenum alloy steel	ASTM A 335, grade P11 MIL-T-18165, class 1	
Valves	Globe, angle	Chrome molybdenum alloy steel ASTM A 182, grade F-11 or ASTM A 217, grade WC-6	Drawing 803-5184193	Socket weld ends
	Stop check		MIL-V-22052	Butt weld ends
	Lift check			See note A-1-2
	Astern		MIL-V-22682	
	Gate		MIL-V-18110	See note A-1-1
	Swing check		MIL-V-18436	
	Pressure-reducing		MIL-V-17848	Flanged ends only
	Control		MIL-V-18030	
Fittings	Butt welding	Chrome molybdenum alloy steel ASTM A 182, grade F-11 or ASTM A 217, grade WC-6 or ASTM A 234, grade WP-11	ANSI B16.9	
	Socket welding		ANSI B16.11	
	Socket welding laterals		MS18307	
Flanges	Butt welding	Chrome molybdenum alloy steel ASTM A 182, grade F-11	ANSI B16.5	
	Socket welding			
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Through bolting (nuts at both ends)	Alloy steel	ASTM A 193, grade B16	
	Nuts		ASTM A 194, grade 7	

## NOTES:

- A-1-1 Flexible wedge and parallel disc gate valves, with stems located below the horizontal, in steam systems shall have a drain connected to the body neck, except that, where a valve is to be used with flow in one direction, a 1/4-inch hole may be drilled in the upstream side of the disc in lieu of a drain.
- A-1-2 Lift check valves shall be constructed similar to MIL-V-22052 modified for check design.

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A-1.1

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-2	Steam and steam drains	1500	775	See note A-2-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	ASTM A 106, grade B MIL-T-20157, type E	
Valves	Globe, angle	Carbon steel ASTM A 216, grade WCB or ASTM A 105	Drawing 803-5184193	Socket weld ends
	Stop check		MIL-V-22052	Butt weld ends
	Lift check			See note A-2-3
	Gate		MIL-V-18110	See note A-2-2
	Swing check		MIL-V-18436	
	Relief		MIL-V-20065	Flanged ends only
	Pressure-reducing Control		MIL-V-17848 MIL-V-18030	
	Fittings		Butt welding	Carbon steel ASTM A 105, ASTM A 234, class WPB ASTM A 181, class 70
Socket welding		Carbon steel ASTM A 105 or ASTM A 181, class 70	ANSI B16.11	
Socket welding laterals		ASTM A 234, class WPB	MS18307	See note A-2-4
Flanges	Butt welding	Carbon steel	ANSI B16.5	
	Socket welding	ASTM A 105 or ASTM A 181, class 70		
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt-stud	Alloy steel	ASTM A 193, grade B16	
	Nuts	Alloy steel	ASTM A 194, grade 7	

## NOTES:

- A-2-1 Drain nipples shall be schedule 80 pipe thickness.
- A-2-2 Flexible wedge and parallel disc gate valves, with stems located below the horizontal, in steam systems, shall have a drain connected to the body neck, except that, where a valve is to be used with the flow in one direction, a 1/4-inch hole may be drilled in the upstream side of the disc in lieu of a drain.
- A-2-3 Lift check valves shall be constructed similar to MIL-V-22052, modified for check design.
- A-2-4 Modified for carbon steel material.

Supersedes page A-2.1 of 7 February 1986.

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A-2.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-3	Propulsion plant saturated steam and steam drains	600 to 1500	775	See note A-3-1

Item	Types		Material	Applicable documents	Remarks
Pipe	Seamless		Carbon steel	ASTM A 106, grade B MIL-T-20157, type E	
Valves	Gate	4 inches and smaller	Carbon steel  ASTM A 105 or ASTM A 216, grade WCB	MIL-V-18110	Butt weld ends
		5 through 16 inches		Drawing 803-2177518	See note A-3-2
	Globe, angle stop and lift check, 2 inches and smaller			Drawing 803-2177525	Socket or butt weld ends 900 lb/in <sup>2</sup> maximum
	2-1/2 inches			Drawing 803-2177140	Butt weld ends
	3 and 4 inches			Drawing 803-2177141	
	5 and 6 inches			Drawing 803-2177142	
	8 inches and larger			MIL-V-22052	
	3-way by-pass 1/2 to 1 inch			Drawing 803-1385965	Socket or butt weld ends
	Swing check			MIL-V-18436	
	Control			MIL-V-18030	Flanged
	Relief			MIL-V-20065	
	Pressure-reducing			MIL-V-17848	
	Quick closing root valves			MIL-V-24619	See note A-3-4

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A-3.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-3, cont'd	Propulsion plant saturated steam and steam drains	600 to 1500	775	See note A-3-1

Item	Types	Material	Applicable documents	Remarks
Fittings	Flanged	Carbon steel ASTM A 216, grade WCB	ANSI B16.5	
	Butt welding	Carbon steel ASTM A 105, ASTM A 181, class 70 ASTM A 234, class WPB	ANSI B16.9	
	Socket welding	Carbon steel ASTM A 105 or ASTM A 181, class 70	ANSI B16.11	
	Socket welding lateral	ASTM A 234, class WPB	MS18307	See note A-3-3
Flanges	Butt welding	Carbon steel ASTM A 105 or ASTM A 234, class WPB	ANSI B16.5	
	Socket welding	ASTM A 181, class 70		
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt-stud	Alloy steel	ASTM A 193, grade B16	
	Nut	Alloy steel	ASTM A 194, grade 7	

## NOTES:

- A-3-1 This category excludes high pressure steam drain main between each low point trap discharge stop-check valve and the deaerator feed tank (DFT), which shall be in accordance with category A-10 herein.
- A-3-2 Flexible wedge and parallel disc gate valves, in steam systems, shall have a drain connected to the body neck, except that, where a valve is to be used with the flow in one direction, a 1/4-inch hole may be drilled in the upstream side of the disc in lieu of a drain.
- A-3-3 Modified for carbon steel material.
- A-3-4 Valve design proposal in accordance with MIL-V-24619 shall be submitted to NAVSEA for review and approval.



Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-4	Steam and steam drains	600	875	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Chrome molybdenum alloy steel	MIL-T-18165, class I ASTM A 335, grade P-11	
Valves	Gate	Chrome molybdenum alloy steel ASTM A 182, grade F-11 or ASTM A 217, grade WC-6	MIL-V-18110	See note A-4-1
	Globe angle, stop check		MIL-V-22052	Butt weld
	Swing check		Drawing 803-5184193	Socket weld
	Astern		MIL-V-18436	
	Pressure-reducing		MIL-V-22682	
	Control		MIL-V-17848	Flanged ends only
	Relief		MIL-V-18030 MIL-V-20065	
Fittings	Socket welding Butt welding Flanged Socket welding laterals	Chrome molybdenum alloy steel ASTM A 182, grade F-11 or ASTM A 217, grade WC-6 or ASTM A 234, grade WP-11	ANSI B16.11 ANSI B16.9 ANSI B16.5  MS18307	
Flanges	Butt welding	Chrome molybdenum alloy steel ASTM A 182, grade F-11	ANSI B16.5	
	Socket welding			
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt-stud	Alloy steel	ASTM A 193, grade B16	
	Nuts		ASTM A 194, grade 7	

## NOTES:

- A-4-1 Flexible wedge and parallel disc gate valves, with stems located below the horizontal in steam systems, shall have a drain connected to the body neck, except that, where a valve is to be used with the flow in one direction, a 1/4-inch hole may be drilled in the upstream side of the disc in lieu of a drain.

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A-4.1

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-5	Steam and steam drains	600	775	See note A-5-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	MIL-T-20157 ASTM A 106, grade B	
Valves	Globe angle and stop check	Carbon steel ASTM A 216, grade WCB ASTM A 105	Drawing 803-2177525 MIL-V-22052	Socket weld ends Butt weld ends
			MIL-V-22682	
	MIL-V-18110		See note A-5-2	
	MIL-V-18436			
	MIL-V-17848		Flanged ends only	
	MIL-V-20065			
	MIL-V-18030			
Fittings	Butt welding	Carbon steel ASTM A 234, class WPB ASTM A 105, ASTM A 181, class 70	ANSI B16.9	
	Flanged	Carbon steel ASTM A 216, grade WCB	ANSI B16.5	
	Socket welding	Carbon steel ASTM A 105 or ASTM A 181, class 70 ASTM A 234, class WPB	ANSI B16.11 MS18307	See note A-5-3
	Socket welding lateral			
Flanges	Butt welding	Carbon steel ASTM A 105 or ASTM A 234, class WPB	ANSI B16.5	
	Socket welding	ASTM A 181, class 70		
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt-stud	Alloy steel	ASTM A 193, grade B16	
	Nut	Alloy steel	ASTM A 194, grade 7	

## NOTES:

- A-5-1 Drain nipples shall be schedule 80 pipe thickness.
- A-5-2 Flexible wedge and parallel disc gate valves, with stems located below the horizontal, in steam systems shall have a drain connected to the body neck, except that, where a valve is to be used with the flow in one direction, 1/4-inch hole may be drilled in the upstream side of the disc in lieu of a drain.
- A-5-3 Modified for carbon steel material.

Supersedes page A-5.1 of 7 February 1986.

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A-5.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-6	Steam and steam drains	150	775	See notes A-6-1 and A-6-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	MIL-T-20157 ASTM A 106, grade B	
Valves	Gate	Carbon steel ASTM A 105 or ASTM A 216, grade WCB	MIL-V-18110	
	Globe, angle		MIL-V-22052	Butt weld ends
	Stop check		Drawing 803-2177525	
	Lift check		MIL-V-18436	See note A-6-3
	Swing check		MIL-V-18436	
	Pressure-reducing		MIL-V-17848	Flanged ends only
	Control		MIL-V-18030	
	Relief		MIL-V-20065	
	Temperature regulating		MIL-V-19772, type IV	
	Quick closing		MIL-V-24569, type IA	
Fittings	Flanged	Carbon steel ASTM A 216, grade WCB	ANSI B16.5	See note A-6-4
	Socket welding	Carbon steel	ANSI B16.11	
	Socket welding lateral	ASTM A 105 or ASTM A 234, class WPB ASTM A 181, class 70	MS18307	See note A-6-5
	Butt welding	Carbon steel ASTM A 105 or ASTM A 234, class WPB ASTM A 181, class 70	MIL-F-20236 ANSI B16.9	
Flanges	Butt welding	Carbon steel ASTM A 181, class 70	ANSI B16.5	See note A-6-4
	Socket welding	ASTM A 105 or ASTM A 234, class WPB		
Gaskets	Spiral wound	Metallic	MIL-G-21032	
	Sheet	Asbestos	HH-P-46	See note A-6-4
Flange bolting	Bolt-stud	Alloy steel	ASTM A 193, grade B16	
	Nuts	Alloy steel	ASTM A 194, grade 7	

## NOTES:

- A-6-1 The basic ANSI rating for 150 lb/in<sup>2</sup> series components is 150 lb/in<sup>2</sup> at 500°F.  
A-6-2 Drain nipples shall be schedule 80 pipe thickness.  
A-6-3 Lift check valves may be constructed similar to MIL-V-22052 modified for check design.  
A-6-4 Flat face flanges and sheet gaskets may be used for temperatures up to 425°F.  
A-6-5 Modified for carbon steel material.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-7	Steam	100	875	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Chrome molybdenum alloy steel	MIL-T-18165, class 1 ASTM A 335, grade P-11	
Valves	Gate	Chrome molybdenum alloy steel ASTM A 217, grade WC-6 or ASTM A 182, grade F-11	MIL-V-18110	Butt weld ends Socket weld ends See note A-7-1
	Globe, angle		MIL-V-22052	
	Stop check		Drawing 803-5184193	
	Lift check		MIL-V-18436	Flanged ends only
	Swing check		MIL-V-18436	
	Pressure-reducing		MIL-V-17848	
	Control		MIL-V-18030	
Relief	MIL-V-20065			
Fittings	Flanged	Chrome molybdenum alloy steel ASTM A 182, grade F-11 or ASTM A 217, grade WC-6	ANSI B16.5	
	Socket welding		ANSI B16.11	
	Butt welding		ANSI B16.9	
	Socket welding laterals		MS18307	
Flanges	Butt welding	Chrome molybdenum alloy steel ASTM A 182, grade F-11	ANSI B16.5	
	Socket welding			
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt-stud	Alloy steel	ASTM A 193, grade B16	
	Nuts		ASTM A 194, grade 7	

## NOTE:

A-7-1 Lift check valves may be constructed similar to MIL-V-22052, modified for check design.

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A-7.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-8	Steam and steam drains for auxiliary boiler, reboiler and waste heat boiler installation only	150	358 (Sat. temp.)	See note A-8-1 and A-8-3

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper-nickel 90-10	MIL-T-16420	
Valves	Gate	Bronze	Drawing 803-2177917 Drawing 803-1385714 Drawing 803-1385541 Drawing 803-1385623 Drawing 803-4384536	See note A-8-2
	Globe, angle and cross		MIL-V-18030 MIL-V-20065 MIL-V-17848 MIL-V-17547	
	Control			
	Relief			
	Pressure-reducing			
	Check, 2-1/2 inches and above	Bronze	Drawing 803-1385637	
	Swing check, 2 inches and below			
	Quick closing			
	Flanged	Bronze	Drawing 803-1385721	
	Silver-brazing			MIL-V-24569 Drawing 810-1385915
Take-down joints	Welding	Copper-nickel 90-10	MIL-F-1183	
	Bulkhead/deck	Copper-nickel 90-10	Drawing 803-1385880 Drawing 803-1385866	
	Flange	Copper-nickel	Drawing 810-4715319	
	Unions	Bronze	MIL-F-20042 MIL-F-1183	
Gaskets	Sheet	Asbestos	HH-P-46	
	Bolt, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- A-8-1 For other boiler installations, use other applicable category.  
A-8-2 100 lb/in<sup>2</sup> maximum for angle and cross configuration only.  
A-8-3 Use category A-6 for superheated steam application.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
A-9	Steam system overboard discharge, steam generator blowdown	1500 600	650	See note A-9-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Nickel-copper alloy	MIL-T-1368, class A	Schedule 80 minimum
Valves	Globe, angle stop and stop checks	Nickel-copper alloy	Drawing 803-2177525	See note A-9-1 Flanged ends 600 lb/in <sup>2</sup> maximum
			Drawing 803-5184193	See note A-9-1
Fittings	Socket welding	Nickel-copper alloy, QQ-N-281, class A, annealed	ANSI B16.11, bored as required	See note A-9-3
	Butt welding	Nickel-copper alloy, MIL-T-1368, class A	ANSI B16.9	See note A-9-3
	Socket welding laterals	Nickel-copper alloy, QQ-N-281	MS18307	
	Socket welding outlets	Nickel-copper alloy, QQ-N-281, class A, annealed	Commercial	
	Butt welding outlets			
Flanges	Socket welding, 1/4 and 3/8 inch	Nickel-copper alloy, QQ-N-281, class A, annealed	Commercial	1/4 inch, raised face
	Socket welding, 1/2 inch and above		MS18308	600 lb/in <sup>2</sup> maximum See note A-9-3
			Butt welding	ANSI B16.5
Flange bolting	Bolts or bolt-stud	Nickel-copper aluminum	MIL-S-1222, grades 400, 405 or 500	
	Nuts			
Gaskets	Spiral wound	Metallic	MIL-G-21032	

## NOTES:

- A-9-1 Valves of the NAVSEA Drawings 803-5184193 or 803-2177525 type shall be modified to include nickel-copper alloy material with flanged ends in accordance with ANSI B16.5, 1500 or 600 series as applicable. The face to face dimension shall be 15-1/2 inches for the 1-1/2 inch valve and 16-1/4 inches for the 2-inch valve.
- A-9-2 Does not include boiler pressure piping.
- A-9-3 Modified for nickel-copper alloy material.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
C-1	Fresh water, chilled water condensate and electronic fresh water cooling	200	250	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper	MIL-T-24107	0.065 inch minimum wall thickness (see note C-1-1)
		Glass reinforced plastic	MIL-P-24608	150°F maximum (see note C-1-6)
	Seamless or welded	Copper-nickel (90-10)	MIL-T-16420	
Valves	Gate, 2 inches maximum	Bronze	Drawing 803-1385714	
	Globe, 2 inches maximum		Drawing 803-4384536	See note C-1-2
	Check, 2 inches maximum		Drawing 803-1385721	
	Gate, 2-1/2 inches and above		Drawing 803-2177917	
	Globe, 2-1/2 inches and above		Drawing 803-1385623	
	Swing check, 2 inches and above		Drawing 803-1385637	
	Relief		MIL-V-24332	
	Butterfly	Bronze	MIL-V-24624	
	Control	Bronze (nickel-copper alloy trim or 300 series corrosion-resisting steel trim)	MIL-V-18030	100 lb/in <sup>2</sup> maximum
	Ball, 1/4 inch - 2-1/2 inches	Bronze	Drawing 803-5001003	
Ball, 3 inches - 6 inches	Drawing 803-5001004			

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C-1:1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
C-1, cont'd	Fresh water, chilled water condensate and electronic fresh water cooling	200	250	

Item	Types	Material	Applicable documents	Remarks
Fittings	Silver-brazing	Bronze	MIL-F-1183	
	Silver-brazing union			
	Butt welding	Copper-nickel (90-10)	Drawing 803-1385880	
	Welded base by silver brazing end outlet boss	90-10 or 70-30 copper-nickel	Drawing 803-1385912 or commercial	Welded to copper-nickel pipe run
Flanges	Socket (bonded)	Glass reinforced plastic	MIL-P-24608	150°F maximum (see note C-1-6)
	Socket weld	Copper-nickel	Drawing 810-4715319	
	Silver-brazing	Bronze	MIL-F-20042, class plain, 150 and 250 pounds	See notes C-1-3 and C-1-4
Gaskets	Socket bonded	Glass reinforced plastic	Drawing 810-1385892	Special flanges for butterfly valves
	Sheet	Cloth inserted rubber	HH-P-151	150°F maximum (see note C-1-6)
	O-ring	Synthetic rubber	MIL-G-1149	See note C-1-5
Flange bolting	Bolts, studs and nuts	Fluorocarbon	MIL-R-83248, type I, class 1	
		Ni-Cu	MIL-S-1222, grade 400, 405	

Supersedes page C-1.2 of 7 February 1986.



Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
C-2, cont'd	Fresh water, feed water and condensate, including potable	100	250	See notes C-2-1, C-2-2 and C-2-4

Item	Types	Material	Applicable documents	Remarks
Flanges	Silver-brazing	Bronze	MIL-F-20042, class plain Drawing 810-1385892	Special flanges for butterfly valves
	Socket weld	Copper-nickel	Drawing 810-4715319	
	Socket bonded	Glass reinforced plastic	MIL-P-24608	See note C-2-5
Gaskets	Sheet	Cloth inserted rubber	HH-P-151	See note C-2-6
		Synthetic rubber	MIL-G-1149	
	O-ring	Fluorocarbon	MIL-R-83248, type I, class 1	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- C-2-1 The thickness of copper tubing in condensate piping shall be calculated using allowable stresses, for the fully annealed condition.
- C-2-2 The sample connection between the DFT and the sample water cooler shall be CRES composition 304 in accordance with MIL-P-1144. Connection to be as close to DFT as possible.
- C-2-3 Globe valves for shower service shall be in accordance with MIL-S-955 and shall be sized to suit the installation.
- C-2-4 Where copper tubing is used in potable water systems which supplies water to equipment containing carbonated water dispensers, the system shall have double check valves installed.
- C-2-5 Adhesive in accordance with MIL-P-24608 shall be used for joining glass reinforced plastic (GRP) pipe to GRP fittings and flanges.
- C-2-6 Class 4 of HH-P-151 shall be used where service temperature is expected to exceed 200°F.
- C-2-7 Electronics cooling water systems and the chilled water systems serving air conditioning cooling coils classified in the category W and the electronics cooling water systems shall be fabricated of copper-nickel (90-10) piping and fittings with welded joints to the maximum extent practicable.
- C-2-8 For electronic cooling water and gas turbine washdown systems valve gland packing shall be Teflon or equal. All other elastomers shall be compatible with the fluid. Natural rubber products are not permitted.
- C-2-9 Expansion tank valves subject to air pressure shall be soft seated.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
D-1	Sea water, main and secondary drainage, ballast	250	150	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	90-10 or 70-30 copper-nickel	MIL-T-16420	
	Seamless	Glass reinforced plastic	MIL-P-24608	200 lb/in <sup>2</sup> maximum See note D-1-2
Valves	Globe, 2-1/2 inches and above	Bronze	Drawing 803-1385623	
	Globe, angle and stop check 1/4 to 2 inches		Drawing 803-4384536	
	Gate, 2-1/2 inches and above		Drawing 803-2177917	Flanged ends
	Gate, 1/4 to 2 inches		Drawing 803-1385714	
	Swing check, 2-1/2 inches and above		Drawing 803-1385637	Flanged ends
	Swing check, 1/4 to 2 inches		MIL-V-17547, type A, class 2, 250 lb/in <sup>2</sup>	Flanged ends
	Relief		Drawing 803-1385721	
	Pressure-reducing		MIL-V-24332	Flanged or union ends
	Hose		MIL-V-2042	
	Ball, 1/4 inch - 2-1/2 inches		Drawing 803-1385711	
	Ball, 3 inches - 6 inches		Drawing 803-1385712	
	Butterfly		Drawing 803-5001003	
	Drawing 803-5001004			
	MIL-V-24624			

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D-1.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
D-1, cont'd	Sea water	250	150	

Item	Types	Material	Applicable documents	Remarks
Fittings	Silver-brazing (including unions and union end fittings)	Bronze	MIL-F-1183	
	Welding	90-10 copper-nickel	Drawing 803-1385880	200 lb/in <sup>2</sup> maximum
	Welded base by silver-brazing end outlet boss	90-10 or 70-30 copper-nickel	Drawing 810-1385912	Welded to pipe run
	Socket bonded	Glass reinforced plastic	MIL-P-24608	200 lb/in <sup>2</sup> maximum
Flanges	Silver-brazing	Bronze	MIL-F-20042 Drawing 810-1385892	Special flanges for butterfly valves
	Socket bonded	Glass reinforced plastic	MIL-P-24608	200 lb/in <sup>2</sup> maximum
	Butt weld	Copper-nickel	Drawing 810-1385992	
	Socket weld		Drawing 810-4715319	
Gaskets	Sheet	Synthetic rubber Cloth, inserted rubber	MIL-R-21252, MIL-G-1149 HH-P-151	See note D-1-1
	O-ring	Fluorocarbon	MIL-R-83248, type I, class 1	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

NOTES:

D-1-1 For use in piping systems subject to acid flush paths.

D-1-2 Adhesive in accordance with MIL-P-24608 shall be used for joining GRP pipe to GRP fittings and flanges.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
D-2	Sea water missile injection system between fresh water accumulating tank and nozzles, main and secondary drainage, ballast and oily waste transfer	400	150	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	70-30 copper-nickel	MIL-T-16420, class 700	
Valves	Gate, 2-1/2 inches and above	Bronze	MIL-V-1189	Flanged 250 lb/in <sup>2</sup> minimum
	Globe stop, angle stop and globe stop check, 2 inches and below		Drawing 803-2177917	Silbrazo union end, soft seat.
			Drawing 803-4384536	
	Globe stop check, 2-1/2 inches and above			Drawing 803-1385623
Drawing 803-1385541				
MIL-V-24332				
Fittings	Silver-brazing including unions and union end fittings	Bronze	MIL-F-1183	
Flanges	Silver-brazing	Bronze	MIL-F-20042	
	Butt welding	Copper-nickel (70-30)	ANSI B16.5, class 400	Flatface
	Socket welding			

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
D-2, cont'd	Sea water missile injection system between fresh water accumulating tank and nozzles	400	150	

Item	Types	Material	Applicable documents	Remarks
Gaskets	Sheet	Synthetic rubber cloth inserted	HH-P-151	
		Synthetic rubber	MIL-G-1149	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTE:

D-2-1 100 lb/in<sup>2</sup> maximum for angle and cross configuration only. 2-1/2 inch and larger globe and angle, stop and stop check valves for use in systems exceeding 150 lb/in<sup>2</sup> shall be of commercial design as approved by NAVSEA.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
D-3	Sea water	50	150	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	90-10 copper-nickel	MIL-T-16420, class 50	See note D-3-1
		70-30 copper-nickel	MIL-T-16420	See note D-3-5
	Seamless	Glass reinforced plastic	MIL-P-24608	See note D-3-4
Valves	Gate	Bronze	Drawing 803-2177917	
			Drawing 803-1385714	
			Drawing 803-1385541	
	Globe, angle and stop check	Bronze or (90-10) cast copper-nickel, MIL-C-20159	Drawing 803-4384536	
			Drawing 803-1385721 or Drawing 803-1385637	
	Check, swing	Bronze	Drawing 803-5001003	
	Ball, 1/4 - 2-1/2 inches		Drawing 803-5001004	
Ball, 3 inches - 6 inches	MIL-V-24624			
Butterfly	Drawing 810-1385915			
Fittings	Flanged	Bronze	MIL-F-1183	
	Silver-brazing (including unions and union end fittings)			
	Welding	90-10 copper-nickel	Drawing 810-1385880 ANSI B16.9 or ANSI B16.11	
	Welded base by silver-brazing end outlet boss	90-10 or 70-30 copper-nickel	Drawing 810-1385912	Welded to copper-nickel pipe run
	Socket bonded	Glass reinforced plastic	MIL-P-24608	See note D-3-4
	Flanges	Silver-brazing	Bronze	MIL-F-20042 Drawing 810-1385892
Socket weld		Copper-nickel	Drawing 810-4715319	
Slip-on 12 inches and larger		Copper-nickel, 90-10	MIL-C-15726	See note D-3-2
Socket bonded		Glass reinforced plastic	MIL-P-24608	See note D-3-4

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
D-3, cont'd	Sea water	50	150	

Item	Types	Material	Applicable documents	Remarks
Gaskets	O-ring	Fluorocarbon	MIL-R-83248, type I, class 1	
	Sheet	Synthetic rubber	MIL-G-1149	See note D-3-6
			MIL-R-21252	See note D-3-3
		Cloth inserted rubber	HH-P-151	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- D-3-1 For sizes not covered by MIL-T-16420, pipe fabricated from copper-nickel sheet specified in MIL-C-15726 may be used.
- D-3-2 Slip-on flanges shall be bored to suit outside diameter of the tube with flange thickness, drilling and facing in accordance with class 50 lb/in<sup>2</sup> of MIL-F-20042.
- D-3-3 For use in piping systems subject to acid flush path.
- D-3-4 Adhesive in accordance with MIL-P-24608 shall be used for joining GRP pipe to GRP fittings and flanges.
- D-3-5 70-30 copper-nickel alloy shall be used inside of compensated fuel tanks and 90-10 copper-nickel shall be used elsewhere.
- D-3-6 Gasket in accordance with MIL-G-1149 shall not be used for suction side of sea chest which uses steam for blow-up.

Supersedes page D-3.2 of 7 February 1986.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
E-1	Fuel	1200		

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	ASTM A 106, grade B MIL-T-20157, type E	
Valves	Gate, 2-1/2 inches and above	Carbon steel	MIL-V-18110	
	Globe, angle	ASTM A 216 grade WCB or ASTM A 105	MIL-V-22052 Drawing 803-5184193	
	Check		Commercial	Flanged ends, ANSI B16.5
	Control		MIL-V-18030	Flanged ends only
	Needle	Carbon steel	MIL-V-24586	200°F maximum
	Relief		MIL-V-24332	
	Quick closing Vent, drain and sampling	Carbon steel	MIL-V-24569 MIL-V-24586	150°F maximum 200°F maximum
Fittings	Flanged	Carbon steel, ASTM A 216, grade WCB	ANSI B16.5	
	Socket welding	Carbon steel, ASTM A 105 or ASTM A 181, class 70 ASTM A 234, class WPB	ANSI B16.11	
	Butt welding	Carbon steel ASTM A 181 ASTM A 105 or ASTM A 234, class WPB	ANSI B16.9	
Flanges	Socket welding	Carbon steel, ASTM A 105 ASTM A 181, class 70 or ASTM A 234, class WPB	ANSI B16.5	
	Butt welding			
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt-stud	Alloy steel	MIL-S-1222, grade B7	
	Nuts	Carbon steel	MIL-S-1222, grade 2 or 5	

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
E-4	Fuel (gas turbine powered ships)	200	150	See notes E-4-1 and E-4-3

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Corrosion-resisting steel except for special applications	MIL-P-1144, 304L or 316L or ASTM A 312, grade TP316L or TP304L	
	Valves	Gate	MIL-V-18110	Stellite disc
Valves	Globe, angle, 2-1/2 inches and above	Corrosion-resisting steel, ASTM A 351, grade CF-8M; ASTM A 182, F316L or F304L	MIL-V-22052	
	Globe, angle, 2 inches maximum		Drawing 803-2177525	
	Check		Commercial	Flanged ends, ANSI B16.5
	Control		MIL-V-18030	Flanged ends only
Fittings	Relief	Corrosion-resisting steel, ASTM A 351, grade CF-8M	MIL-V-24332	
	Butterfly	Corrosion-resisting steel	MIL-V-24624	Type I
	Flanged	Corrosion-resisting steel, ASTM A 182, F304L or F316L	ANSI B16.5	
Flanges	Socket welding	ASTM A 403, WP304LS or WP316LS	ANSI B16.11	
	Butt welding		ANSI B16.9	
	Butt welding	Corrosion-resisting steel, ASTM A 182, F304L or F316L	ANSI B16.5	
Gaskets	Socket welding	ASTM A 403, WP304LS or WP316LS		See note E-4-2
	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

E-4-1 This category does not include overflows, sounding tubes, vents or air escapes. (See category Y for these items.)

E-4-2 Where required ANSI flanges shall be modified for use with butterfly valves.

E-4-3 Use category U-1 for stripping systems.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
F-1	Lubricating oil	150	250	See note F-1-1

Item	Types	Material	Applicable documents	Remarks		
Pipe	Seamless	Carbon steel	MIL-T-20157, ASTM A 106, grade A or B			
	Valves	Globe, angle and stop check, 2 inches maximum	Carbon steel ASTM A 216, grade WCB or ASTM A 105	MIL-V-22052		
		Globe, angle and stop check, 2-1/2 inches and larger				
		Gate		MIL-V-18110		
		Check		ANSI B16.34, class 150	Flanged end	
		Relief		MIL-V-24332	Flanged ends only	
		Control		MIL-V-18030		
		Pressure-reducing				
		Butterfly		Corrosion-resisting steel	MIL-V-24624	Type 1
		Needle		Carbon steel	MIL-V-24586	200°F maximum
		Ball, 1/4 inch - 2-1/2 inches		Carbon steel	Drawing 803-5001003	
		Vent, drain and sampling		Carbon steel	MIL-V-24586	200°F maximum
		Fittings		Flanged, 1/2 inch and larger	Carbon steel, ASTM A 216, grade WCB	ANSI B16.5, series 150
Socket weld	Carbon steel		ANSI B16.11			
	ASTM A 105 or ASTM A 234, class WPB					
Butt weld	ASTM A 181, class 70		ANSI B16.9 MIL-F-20236			

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
H-1	Gasoline	150	150	Silver-braze restriction See paragraph 4.14

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	Copper-nickel alloy 90-10	MIL-T-16420, class 200	See note H-1-1
	Seamless	Copper	MIL-T-24107	
Valves	Gate	Bronze	Drawing 803-2177917 Drawing 803-1385714 Drawing 803-4384536	
	Globe, angle and cross	90-10 Copper-nickel alloy	Commercial	See note H-1-2
	Swing check		MIL-V-17547	
			Commercial	See note H-1-2
	Butterfly		MIL-V-24624	Type III
	Relief		MIL-V-24332	
	Regulating		Commercial	See note H-1-2
Fittings	Socket welding		Copper-nickel alloy	Drawing 803-1385880
	Butt welding		Commercial	See note H-1-2
	Silver-brazing	Bronze	MIL-F-24227, MIL-F-1183	
Take-down joints	Flanged (silver-brazing)	Bronze	MIL-F-20042, MIL-F-24227 Drawing 810-1385892	Special flange for butterfly valves
	Flanges (butt weld)	Copper-nickel alloy	Drawing 810-1385992	
	Flanges (socket weld)		Drawing 810-4715319	
	Unions (silver-brazing)		MIL-F-1183, MIL-F-24227	
	Unions (welded)	90-10 Copper-nickel alloy	Commercial	See note H-1-2
Gaskets	Flat	Buna-N and cork	MIL-C-6183, class 1, grade C-firm	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- H-1-1 Within gasoline tanks and for salt water compensating system.  
H-1-2 The use of commercial items shall be subject to NAVSEA approval.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
H-2	Cleaning fluid and contaminated aviation lubricating system	100	150	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper	MIL-T-24107	
	Seamless or welded	Copper-nickel, 90-10	MIL-T-16420	See note H-2-1
Valves	Gate	Bronze	Drawing 803-2177917	Type III
	Globe, angle and cross		Drawing 803-1385714	
			Drawing 803-1385541	
	Butterfly		Drawing 803-4384536	
	Swing check		MIL-V-24624	
			MIL-V-17547	
	Relief		Drawing 803-1385721	
	Regulating		MIL-V-24332	
	Ball, 1/4 inch - 2-1/2 inches		MIL-V-15358	
Ball, 3 inches - 6 inches	Drawing 803-5001003			
Fittings	Welding	Copper-nickel alloy	Drawing 803-1385880 or ANSI B16.11	
	Silver-brazing	Bronze	MIL-F-1183 MIL-F-24227	
Take-down joints	Flanged	Bronze	MIL-F-20042 MIL-F-24227	
			Drawing 810-1385892	Special flange for butterfly valves
	Union		MIL-F-1183 MIL-F-24227	
Gaskets	Flat	Buna-N and cork	MIL-C-6183, class 1, grade C-firm	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTE:

H-2-1 Within gasoline tanks and for salt water compensating system.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks	
I-1	JP-5	200	100	Silver-braze restriction See paragraph 4.14 See notes I-1-1 and I-1-2	
Item	Types	Material	Applicable documents	Remarks	
Pipe	Seamless or welded	90-10 copper-nickel alloy	MIL-T-16420, class 200		
	Valves	Gate	Bronze	Drawing 803-2177917	
		Globe, angle and cross		Drawing 803-1385714	
				Drawing 803-1385541	100 lb/in <sup>2</sup> maximum
				Drawing 803-1385623	
				Drawing 803-4384536	
		90-10 copper-nickel alloy	Commercial	See note I-1-3	
		Butterfly	MIL-V-24624	Type III	
		Relief	MIL-V-24332		
		Swing check	Drawing 803-1385637		
	Ball, 1/4 inch - 2-1/2 inches	Drawing 803-5001003			
	Ball, 3 inches - 6 inches	Drawing 803-5001004			
Fittings	Silver-brazing	Bronze	MIL-F-1183 MIL-F-24227		
	Butt welding	90-10 copper-nickel	Commercial	See note I-1-3	
			Drawing 803-1385880		
Take-down joints	Flanges (silver-brazing)	Bronze	MIL-F-20042 MIL-F-24227	Special flange for butterfly valves	
			Drawing 810-1385892		
		Copper-nickel	Drawing 810-1385992		
	Flanges (socket weld)	Copper-nickel	Drawing 810-4715319		
		Bronze	MIL-F-1183 MIL-F-24227		
	Unions (welded)	90-10 copper-nickel alloy	Commercial	See note I-1-3	

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
I-1, cont'd	JP-5	200	100	Silver-braze restriction See paragraph 4.14 See notes I-1-1 and I-1-2

Item	Types	Material	Applicable documents	Remarks
Gaskets	Sheet	Buna-N and cork	MIL-C-6183, class 1, grade C-firm	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- I-1-1 See category U-1 for those sections of tank stripping which discharge overboard.
- I-1-2 This category includes cargo JP-5 systems. The cargo JP-5 piping within convertible cargo tanks (those intended for selective stowage of JP-5 fuel) shall be in accordance with this category.
- I-1-3 The use of commercial items shall be subject to NAVSEA approval.

Supersedes page I-1.2 of Notice 1 (17 January 1990).

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
J-4	Air and nitrogen	200	150	See note J-4-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper	MIL-T-24107, ASTM B 88	See note J-4-3
		Copper-nickel alloy	MIL-T-16420	
		Corrosion-resisting steel	MIL-P-1144, 304L or 316L	
		Glass reinforced plastic	ASTM A 312, TP304L or TP316L MIL-P-24608	
Valves	Gate	Bronze	Drawing 803-1385714	Soft seat design, except needle valve
	Swing check		Drawing 803-1385721	
	Globe, angle, needle, stop check and check		Drawing 803-4384536	
	Pressure-reducing			
	Relief		MIL-V-24384	
	Automatic shut-off		MIL-V-22549 MIL-V-24394	
Fittings	Ball, 1/4 inch - 2-1/2 inches		Drawing 803-5001003	See note J-4-2
	Silver-brazed	Bronze	MIL-F-1183	
	Socket welded	Corrosion-resisting steel, ASTM A 182, F304L, F316L	ANSI B16.11	
	Socket welded end outlet	70-30 copper-nickel, MIL-C-15726	Commercial	
	Socket bonded	Glass reinforced plastic	MIL-P-24608	
Unions	Silver-brazed	Bronze	MIL-F-1183	
	Butt and socket welded	Corrosion-resisting steel or copper-nickel (70-30)	Drawings 803-1385884, 810-1385888	
Flanges	Silver-brazed	Bronze	MIL-F-20042, ANSI B16.24 ANSI B16.5	
	Socket welded	Corrosion-resisting steel ASTM A 182, F304L, F316L	ANSI B16.5, class 150	
	Socket bonded	70-30 copper-nickel Glass reinforced plastic	MIL-P-24608	

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
J-4, cont'd	Air and nitrogen	200	150	See note J-4-1

Item	Types	Material	Applicable documents	Remarks
Flange bolting	Bolts Nuts	Ni-Cu	MIL-S-1222, grade 400, 405	
Gaskets	Sheet	Synthetic rubber	MIL-G-1149	
	O-ring	Fluorocarbon	MIL-R-83248, type I, class 2	

## NOTES:

- J-4-1 Piping and fittings in fire hazardous areas, such as machinery spaces, shall be fabricated of copper-nickel or corrosion-resisting steel. Valves in these spaces shall be welded, flanged, or union ended with copper-nickel or corrosion-resisting steel tail pieces. Silver-brazed joints shall not be used in these spaces.
- J-4-2 Commercial fittings shall be approved by the Supervisor or NAVSEA.
- J-4-3 GRP may be used for L.P. non-vital air system.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
J-8	Air deballast	50	400	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	90-10 copper-nickel	MIL-T-16420, class 200	
Valves	Gate	Bronze	Drawing 803-2177917	
	Globe and angle		Drawing 803-1385714	
	Check, swing		Drawing 803-1385541	
	Butterfly		Drawing 803-4384536	
	Relief		Drawing 803-1385637	
	Control		Drawing 803-1385721	
			MIL-V-24624	See note J-8-2
			MIL-V-20065	
			MIL-V-18030	
Fittings	Silver-brazing	Bronze	MIL-F-1183	
	Butt welding	90-10 copper-nickel	Drawing 803-1385880	
	Socket welding		ANSI B16.11	
	Unions, silver-brazing	Bronze	MIL-F-1183	
Flanges	Silver-brazing	Bronze	MIL-F-20042	
	Butt weld	90-10 copper-nickel, MIL-C-15726	Drawing 810-1385892	Special flanges for butterfly valves
	Slip-on		Drawing 810-1385992	See note J-8-1
Gasket	Sheet	Asbestos	HH-P-46	1/16 inch thick
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTE:

J-8-1 Slip-on flanges shall be bored to suit the outside diameter of the tube with flange thickness, drilling and facing in accordance with MIL-F-20042.

J-8-2 Valve must be suitable for a temperature of 400°F.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
J-9	Air: Gas turbine bleed, anti-icing	250	950	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Corrosion-resisting steel	MIL-P-1144 or ASTM A 312, TP321 or TP347	
	Gate	Corrosion-resisting steel, ASTM A 182, F321 or F347	MIL-V-18110, modified	See note J-9-1
Valves	Globe, lift check		Drawing 803-5184193, MIL-V-22052, modified	
	Swing check		Commercial	
	Ball		Drawing 803-5001003 or commercial	See note J-9-2
Fittings	Socket welded	Corrosion-resisting steel, ASTM A 182, F321 or F347	ANSI B16.11	
	Butt welded		ANSI B16.9	
Take-down joints	Flanges	Corrosion-resisting steel, ASTM A 182, F321 or F347	ANSI B16.5	
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt studs	Alloy steel	MIL-S-1222, grade B16	
	Nuts		MIL-S-1222, grade 4	

NOTE:  
 J-9-1 Composition E: Corrosion-resisting steel F321 or F347 (valve backseat and guide to be HF). This requirement will be part of the classification of MIL-V-18110 and MIL-V-22052.  
 J-9-2 Commercial items shall be approved by the Supervisor or NAVSEA.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
L-1	Cooling, (electronic equipment diesel engine, and so forth) - ethylene glycol, fresh water solution, distilled water transfer	150	150	See note L-1-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	Corrosion-resisting steel	MIL-P-1144, 304L or ASTM A 312, TP304L	
	Globe	Copper-nickel, 90-10	MIL-T-16420	See note L-1-1
Valves	Gate and stop	Bronze	Drawing 803-4384536	
		Corrosion-resisting steel, bronze	Commercial	
		ASTM A 743, grade CF-8	Drawing 803-1355714	
		Bronze		
		Bronze		
		Temperature regulating		
Fittings	Ball, 1/4 inch - 2-1/2 inches	Corrosion-resisting steel, bronze	Drawing 803-5001003	
	Butterfly	Corrosion-resisting steel, bronze	MIL-V-24624	
	Socket weld	Corrosion-resisting steel, ASTM A 182, 304L	ANSI B16.11	
	Butt weld		ANSI B16.9	
Take-down joints	Silver-brazing	Bronze	MIL-F-1183	
	Flanges	Corrosion-resisting steel, ASTM A 182, 304L	ANSI B16.5	
		Bronze	MIL-F-20042	
Gaskets	Unions, silver-brazing	Bronze	MIL-F-1183	
	Flat	Synthetic rubber	MIL-G-1149	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- L-1-1 Copper-nickel shall be used for systems with a corrosion inhibitor added to the ethylene glycol/water solution.
- L-1-2 Electronic cooling water systems which require demineralized water shall use uninhibited ethylene glycol/water solutions and materials in accordance with categories C-1 or C-2.



Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
N-1	Sprinkling system (dry) other than foam	175		

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	90-10 copper-nickel	MIL-T-16420	
Valves	Sprinkling control	Bronze	MIL-V-17501	See note N-1-1
			MIL-V-2187	See note N-1-2
Fittings	Welding	90-10 copper-nickel	Drawing 803-1385880	
		90-10 copper-nickel	ANSI B16.11	
Flanges	Socket welding	90-10 copper-nickel	Drawing 810-4715319	
	Socket welding		Drawing 810-1385992	
	Butt welding		Drawing 803-1385884	
Unions	Welding	90-10 copper-nickel	MIL-G-1149	
Gaskets	Sheet	Synthetic rubber		
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

N-1-1 For automatic or remote manual control.

N-1-2 For local manual control.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
M-1	Sea water-washdown countermeasure system	200	100	See notes M-1-1 and M-1-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	Copper-nickel (90-10)	MIL-T-16420	
		Aluminum	WW-T-700/5	
Valves	Gate	Bronze	Drawing 803-2177917	
	Globe		Drawing 803-4384536	
	Control		MIL-V-17501	
	Ball, 1/4 inch - 2-1/2 inches		Drawing 803-5001003	
	Ball, 3 inches - 6 inches		Drawing 803-5001004	
	Butterfly	Bronze	MIL-V-24624	
Fittings	Silver-brazing	Bronze	MIL-F-1183	
	Butt welding	Aluminum alloy, 5086	ANSI B16.9	
Take-down joints	Flanges	Bronze	MIL-F-20042	Special flanges for butterfly valves
			Drawing 810-1385892	
	Union, silver-brazing		MIL-F-1183	
Gaskets	Full face (flat)	Rubber	MIL-G-1149	
Flange bolting	Bolts, studs, nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- M-1-1 For attachment of type S corrosion-resisting steel spray heads a nickel-copper transition piece in accordance with MIL-T-1368, shall be welded to the head and silver-brazed to a bronze fitting in the piping system. Weld joint design shall be type P-14 of MIL-STD-22 except that the "T" dimension shall be the thickness of the welding socket wall.
- M-1-2 Aluminum pipe and fittings are to be used in areas of aluminum structures only. An aluminum flanged spacer (waster piece) approximately 2 feet in length shall connect the CU-NI piping to the aluminum piping.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
N-2	Magazine sprinkling system (wet)	175		See Drawing 810-1385958

Item	Types	Material	Applicable documents	Remarks	
Pipe	Seamless or welded	Copper-nickel, 90-10	MIL-T-16420	Sea water filled	
Valves	Gate, 2 inches maximum	Bronze	Drawing 803-1385714	Union end	
	Globe, 2 inches maximum		Drawing 803-4384536		
	Swing check, 2 inches maximum		Drawing 803-1385721		
	Gate, 2-1/2 inches and above		Drawing 803-2177917		Flanged end
	Globe, 2-1/2 inches and above		Drawing 803-1385623		
	Swing check, 2-1/2 inches and above		Drawing 803-1385637		
	Sprinkling control				MIL-V-17501
	Butterfly	Bronze	MIL-V-24624		
Fittings	Welding	90-10 copper-nickel	Drawing 803-1385880 ANSI B16.11		
	Socket welding				
Flanges	Socket welding	90-10 copper-nickel	Drawing 810-4715319 Drawing 810-1385992		
	Butt welding				
Gaskets	Sheet	Synthetic rubber Cloth, inserted rubber	MIL-G-1149 HH-P-151		
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405		

Supersedes page N-2.1 of 7 February 1986.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
0-1	Diesel, sewage treatment, incinerator and gas turbine exhaust		1125	See notes 0-1-1 and 0-1-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	Carbon steel	MIL-S-22698, type I ASTM A 106, grade B	775°F maximum
		Corrosion-resisting steel 321, or 347	ASTM A 376 MIL-P-1144 ASTM A 167	
Fittings	Special fabricated	Corrosion-resisting steel ASTM A 182, ASTM A 376, MIL-P-1144	Commercial	
	Socket welding	Carbon steel, ASTM A 105 or A 181, class 70	ANSI B16.11	775°F maximum
	Butt welding	Carbon steel, ASTM A 105 ASTM A 100, grade B or ASTM A 181, class 70	ANSI B16.9	
Take-down joints	Flanges	Corrosion-resisting steel, ASTM A 182, 321, or 347	ANSI B16.5 or specially fabricated	
		Cast carbon steel ASTM A 216, grade WCB	ANSI B16.5	775°F maximum
Gaskets	Sheet	Asbestos	HH-P-46	
	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolts - stud	Alloy steel	MIL-S-1222, grade B16	
	Nuts		MIL-S-1222, grade 4	

## NOTES:

- 0-1-1 Grade 316L corrosion-resisting steel shall not be used where the temperatures may exceed 750°F.  
 0-1-2 Gas turbine exhaust uptake surfaces in direct contact with hot exhaust gas shall be of nickel-chromium-molybdenum-columbium alloy (Ni-Cr-Mo-Cb) in accordance with ASTM B 443 or ASTM B 444.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
P-1	Boiler safety valve, and super-heater outlet safety valve escape	150	850	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	MIL-T-20157 ASTM A 106, grade B	See note P-1-1
Fittings	Butt welding	Carbon steel, ASTM A 105, ASTM A 106, grade B, or ASTM A 181, class 70	ANSI B16.9	
Flanges	Butt welding	Carbon steel ASTM A 181, class 70, or ASTM A 105	ANSI B16.5, series 150	
Gaskets	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolt - stud	Alloy steel	MIL-S-1222, grade B16	
	Nuts		MIL-S-1222, grade 4	

## NOTE:

P-1-1 Carbon steel pipe permitted based on 850°F non-continuous and open ended service.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
Q-1	Refrigerant piping	30 inches vacuum to 300 lb/in <sup>2</sup>	minus 85 to plus 250	See notes Q-1-1 and Q-1-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper	ASTM B 88, hard drawn	
		Copper-nickel	MIL-T-16420	
Valves	Manual	Bronze	MIL-V-20064	
		Forged brass	MIL-R-16743	
	Angle relief (line) Control	Brass	MIL-R-16743	
			MIL-R-16743 or MIL-R-24085	
Fittings	Silver-brazing	Wrought copper or forged brass	ANSI B16.22	See note Q-1-3
	Socket and butt weld	Copper-nickel	ANSI B16.11 or B16.9	
Mechanical take-down joints	O-ring face seal unions, brazed or welded	Corrosion-resisting steel Copper-nickel	Commercial Drawing 810-1385889 Drawing 803-1385948	O-ring material shall be compatible with refrigerant in system
Flanges	Silver-brazing, 4-bolt tongue and groove	Steel	ASTM A 105	Flange
		Brass	Commercial	Adapter
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	
Gaskets	Sheet	Asbestos	HH-P-46	

## NOTES:

- Q-1-1 Copper-nickel piping with welded joints shall be used where practical for locations where joints would not otherwise be accessible for leak detection and repair.
- Q-1-2 The system design gauge pressure is dependent with refrigerant utilized R-11, 30 lb/in<sup>2</sup>; R-12, 225 lb/in<sup>2</sup>; R-22, 300 lb/in<sup>2</sup>, and R-114, 50 lb/in<sup>2</sup>.
- Q-1-3 ANSI B16.22 fittings shall be silver-brazed.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
R-1	Waste water and oily water drainage, oily waste transfer and weather deck drainage systems	50	150	See notes R-1-1 through R-1-4

Item	Types	Material	Applicable documents	Remarks	
Pipe	Seamless or welded	90-10 copper-nickel	MIL-T-16420		
	Seamless	Aluminum alloy, 5086	WW-T-700/5		
		Carbon steel, galvanized	ASTM A 106, grade B		
		Glass reinforced plastic	MIL-P-24608		
Valves	Gate	Bronze	Drawing 803-2177917	See note R-1-5	
	Globe, angle, and stop check		Drawing 803-1385714		
			Drawing 803-1385541		
	Swing check		Drawing 803-4384536		
	Ball, 1/4 inch - 2-1/2 inches		Drawing 803-1385637		
			Drawing 803-1385721		
Ball, 3 inches - 6 inches	Drawing 803-5001003				
Fittings	Flanged	Bronze	Drawing 810-1385915		
	Silver-brazing		MIL-F-1183		
	Deck drain	Copper-nickel	Drawing 803-1385789		
		Carbon steel	Commercial		
	Butt welding	90-10 copper-nickel	Drawing 803-1385880		
		Aluminum alloy, 5086 or carbon steel	ANSI B16.9		
	Socket bonded	Glass reinforced plastic	MIL-P-24608		See note R-1-5
	Socket welding	Carbon steel, ASTM A 105 or ASTM A 181, class 70	ANSI B16.11		
Flanges	Silver-brazing	Bronze	MIL-F-20042	See note R-1-5	
	Socket bonded	Glass reinforced plastic	MIL-P-24608		
	Socket welding	Carbon steel, galvanized ASTM A 105 or ASTM A 181, class 70	ANSI B16.5		

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
R-1, cont'd	Waste water and oily water drainage, oily waste transfer and weather deck drainage systems	50	150	See notes R-1-1 and R-1-4

Item	Types	Material	Applicable documents	Remarks
Gaskets	Sheet	Synthetic rubber	MIL-G-1149	
		Synthetic rubber cloth inserted	HH-P-151	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- R-1-1 Aluminum pipe, fittings and drains are to be used in area of aluminum structures only.
- R-1-2 Steel pipe, fittings and deck drains are to be used only in the weather deck drains above the main deck in the area of steel structure outside ship envelope.
- R-1-3 Copper-nickel pipe, bronze fittings and valves to be used in weather deck drains within ship envelope, oily waste, waste water and oily waste transfer.
- R-1-4 Glass reinforced plastic pipe or fittings may be used in oily waste transfer.
- R-1-5 Adhesive in accordance with MIL-P-24608 shall be used for joining glass reinforced GRP pipe to GRP fittings and flanges.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
R-2	Chemical drains	30	150	See note R-2-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Corrosion-resisting steel	MIL-P-1144, 316L or ASTM A 312	
		Carbon steel (lead lined)	ASTM A 106, grade B	
		Lead lined	MIL-L-24055	
Valves	Gate	Bronze	Drawing 803-2177917	
	Swing check	Corrosion-resisting steel, ASTM A 351, grade CF-8M	Drawing 803-1385721	
		Ball, 1/4 inch - 2-1/2 inches		Drawing 803-5001003
	Ball, 3 inches - 6 inches		Drawing 803-5001004	
Fittings	Flanged	Corrosion-resisting steel	ANSI B16.5	
		Carbon steel (lead lined)		
Flanges	Butt welding	Corrosion-resisting steel, ASTM A 182, 316L	ANSI B16.5	
		Carbon steel (lead lined)		
	Socket welding	Carbon steel (lead lined)		
Gaskets	Silver-brazing	Bronze	MIL-F-20042	
	Sheet	Lead		
	Spiral wound	Metallic	MIL-G-21032	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

NOTE:

R-2-1 Corrosion-resisting steel material to be used for photo lab drainage piping system.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
R-3	Drains and vents, deck drains and plumbing	50	150	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	90-10, copper-nickel	MIL-T-16420	See note R-3-1
	Seamless	Carbon steel (galvanized)	ASTM A 106	See note R-3-2
		Copper	MIL-T-24107	See note R-3-3
		Aluminum alloy 5086	ASTM B 210	See note R-3-5
Valves	Flanged, 50 lb/in <sup>2</sup> scupper	Bronze	Drawing 810-1385707	
	Full port, ball or plug		MIL-V-24509	See note R-3-4
Fittings	Silver-brazing	Bronze	MIL-F-1183	
	Socket welding	Carbon steel, ASTM A 105, ASTM A 181, class 70	ANSI B16.11	
	Butt welding	Carbon steel, ASTM A 105, ASTM A 106, grade B, and ASTM A 181, class 70	ANSI B16.9	
		Copper-nickel	Drawing 803-1385880	
	Deck drain	Aluminum alloy 5086 Copper-nickel	Drawing 803-1385789	See note R-3-5
Take-down joints	Flanges, 150 lb/in <sup>2</sup> silver-brazing	Bronze	MIL-F-20042	
	Union, silver-brazing		MIL-F-1183	
Gaskets	Sheet	Synthetic rubber	MIL-G-1149	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

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NOTES:

- R-3-1 Required for water closet and urinal drains, and sea water waste drains, and vent piping subjected to sea water emersion up to a height of fixture overflow, and sewage treatment plant effluent overboard discharge.
- R-3-2 Steel pipe and fittings are to be used only in vent piping above the height of fixture overflows.
- R-3-3 Use for fresh water waste drains and vents up to a height of fixture overflow.
- R-3-4 Impregnation of castings as an aid in meeting tightness test is permissible on flanged end valves which have no need for application of heat in either manufacture or installation. Impregnation requirements of MIL-STD-278 are applicable.
- R-3-5 Use for fresh water drains in interior aluminum superstructure.
- R-3-6 Fittings used in gravity drainage systems shall promote smooth flow and facilitate cleaning. Pipe bends, long radius elbows, sweep ties, laterals and reducing fittings shall be used to the maximum extent practicable. The use of short radius elbows, tees and bushings shall be avoided.

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
R-4	Sewage collection, holding and transfer (CHT)	50	150	See notes R-4-1 and R-4-4

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper	MIL-T-24107	See note R-4-3
	Seamless or welded	Copper-nickel, 90-10	MIL-T-16420	
Valves	Swing check	Bronze	MIL-V-17547 Drawing 803-1385637	See note R-4-2
	Swing check with manual jack-open device			
	Full port		MIL-V-24509	
	3 port, two position			
Fittings	Welding	Copper-nickel	Drawing 803-1385880	
	Silver-brazing	Bronze	MIL-F-1183	
Take-down joints	Flanges	Bronze	MIL-F-20042	
	Union		MIL-F-1183	
Gaskets	Sheets	Synthetic rubber	MIL-G-1149 HH-P-151	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

- R-4-1 Deck discharge connections shall be in accordance with Drawing 803-4444650.
- R-4-2 Impregnation of castings as an aid in meeting tightness test is permissible on flanged end valves which have no need for application of heat in either manufacture or installation. Impregnation requirements of MIL-STD-278 are applicable.
- R-4-3 Use for fresh water collection piping.
- R-4-4 This category and group shall apply to soil and waste drain piping, waste drain pump and sewage pump suction and discharge piping, and overflow and vent piping for waste drain tanks.

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Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
S-1	Aqueous film-forming foam (AFFF) concentrate and AFFF/SW solution	250		Silver-braze restriction See paragraph 4.14

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	90-10, copper-nickel alloy	MIL-T-16420	
Valves	Gate	Bronze	Drawing 803-1385714	With ethylene propylene terpolymer (EPT diaphragms) See note S-1-1
	Globe and angle		Drawing 803-2177917	
	Swing check		Drawing 803-1385623	
	Hose end		Drawing 803-4384536	
	Remote control		Drawing 803-1385721	
			Drawing 803-1385637	
			Drawing 803-1385711	
		Drawing 803-1385712		
		MIL-V-15508		
		MIL-V-17501		
		Commercial		
		Drawing 803-5001003		
		Drawing 803-5001004		
		MIL-V-24624		
Fittings	Silver-brazing	Bronze	MIL-F-1183	
	Welding		Drawing 803-1385880	
			ANSI B16.9	
			ANSI B16.11	
Take-down joints	Flanges	Bronze	MIL-F-20042	Special flanges for butterfly valves. 200 lb/in <sup>2</sup> maximum
			Drawing 810-1385892	
			Drawing 810-1385992 Drawing 810-4715319	
		Copper-nickel		

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
S-1 cont'd	Aqueous film-forming foam (AFFF) concentrate and AFFF/SW solution	250		Silver-braze restriction See paragraph 4.14

Item	Types	Material	Applicable documents	Remarks
	Unions, silver-brazing	Bronze	MIL-F-1183	With ethylene propylene terpolymer O-rings
	Unions, weld	Copper-nickel alloy, MIL-C-15726	Commercial	See note S-1-1
Gaskets	Sheet	Ethylene propylene terpolymer (EPT)	MIL-G-22050	
Flange bolting	Bolts, studs and nuts	Ni-Cu	MIL-S-1222, grade 400, 405	

## NOTES:

S-1-1 The use of commercial items shall be subject to NAVSEA approval.

Supersedes page S-1.2 of Notice 1 (17 January 1990).

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S-1.2

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
W-1	Pneumatic tubes			

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Brass	MIL-T-20219	
Fittings	Socket sweated	Brass	Commercial	

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W-1.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
Y-1	Overflows, sounding tubes, vents and air escapes for JP-5, tanks	50	150	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	90-10 copper-nickel, except for special applications	MIL-T-16420	See note Y-1-1
Valves	Gate	Bronze	Drawing 803-2177917/803-1355714	
	Swing check		Drawing 803-1385637	
	Ball, 1/4 inch - 2-1/2 inches		Drawing 803-1385721	
	Ball, 3 inches - 6 inches		Drawing 803-5001003	
Fittings	Silver-brazing	Bronze	MIL-F-1183	
	Deck (sounding and filling)	As specified	Drawing 803-1385848	
	Butt weld	Copper-nickel	ANSI B16.9	
	Socket weld		Drawing 803-1385880	
Take-down joints	Flanges	Copper-nickel	ANSI B16.11	
	Silver-brazing unions	Bronze	Drawing 810-1385992	
Gaskets	Sheet	Buna-N and cork	MIL-F-20042	
			MIL-F-1183	
Flange bolting	Bolts	Ni-Cu	MIL-C-6183, class 1, grade C-firm	
	Nuts		MIL-S-1222, grade 400, 405	

## NOTE:

Y-1-1 Air escapes and sounding tubes above the height of the overflow loop may be black steel in accordance with the requirement delineated in category Y-2 or galvanized steel in accordance with the requirements delineated in category Y-3 if the tank can contain ballast.

Supersedes page Y-1.1 of 7 February 1986.

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Y-1.1

Category and group	Services	Maximum system pressure lb/in <sup>2</sup>	Maximum system temperature °F	Remarks
Y-4	Vents, reduction gear	5	Ambient	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	Copper-nickel, 90-10	MIL-T-16420	
Fittings	Silver-brazing	Bronze	MIL-F-1183	
Flanges	Silver-brazing	Bronze	MIL-F-20042	
Gaskets	Sheet	Commercial	Commercial	
Flange bolting	Bolts, studs and nuts	N1-Cu	MIL-S-1222, grade 400, 405	

Supersedes page Y-4.1 of 7 February 1986.

