

NOTICE OF CHANGE

INCH-POUND

MIL-STD-777E(SH)

NOTICE 7

8 July 2002

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NEW PAGE	DATE	SUPERSEDED PAGE	DATE
12	8 July 2002	12	31 January 2002
13	8 July 2002	13	7 February 2002
14	8 July 2002	14	7 February 2002
A-1.1	8 July 2002	A-1.1	13 November 1991
A-1.2	8 July 2002	NEW PAGE	
A-2.1	8 July 2002	A-2.1	13 November 1991
A-2.2	8 July 2002	NEW PAGE	
A-3.1	8 July 2002	A-3.1	13 November 1991
A-3.2	8 July 2002	A-3.2	13 November 1991
A-4.1	8 July 2002	A-4.1	13 November 1991
A-4.2	8 July 2002	NEW PAGE	
A-5.1	8 July 2002	A-5.1	13 November 1991
A-5.2	8 July 2002	NEW PAGE	
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A-6.2	8 July 2002	NEW PAGE	
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A-8.1	8 July 2002	A-8.1	13 November 1991
A-8.2	8 July 2002	NEW PAGE	
A-9.1	8 July 2002	A-9.1	13 November 1991
A-9.2	8 July 2002	NEW PAGE	
A-10.1	8 July 2002	A-10.1	7 February 1986
A-10.2	8 July 2002	A-10.2	7 February 1986
B-1.1	8 July 2002	B-1.1	13 November 1991
B-1.2	8 July 2002	B-1.2	13 November 1991
B-2.1	8 July 2002	B-2.1	7 February 1986
B-2.2	8 July 2002	B-2.2	7 February 1986
P-1.1	8 July 2002	P-1.1	13 November 1991

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.

Review Activity:
DLA-CC

Preparing activity:
Navy - SH
(Project 4730-1083)

AMSC N/A

FSC 4730

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DISTRIBUTION STATEMENT A. Approved for public release; distribution is limited.

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4.49 Mechanically attached fittings (MAFs). Fittings utilizing mechanical means of attachment to piping (for example, crimping, ring locking, heat shrinking) are available from commercial suppliers. However, only limited approvals for specific MAF types and compositions have been granted for use in certain ship spaces and piping systems. Approvals are presently limited to fittings 2 1/2 NPS and below in size. MAFs may be substituted for welded or silver-brazed fittings within the MAF application and performance requirements as specified in NSTM-505, unless additional approval/notification of the substitution is required by the appropriate contractual document. Only approved MAFs that have passed the fire test requirements of ASTM F 1387 shall be used in fire hazardous areas or in systems that do not allow silver-brazed fittings. Except for training purposes, there are no joint record requirements for currently approved MAFs.

5. DETAILED REQUIREMENTS

5.1 Service categories and groups. Detailed requirements for piping systems are provided here in tables arranged by service category and piping system group. In general, service categories refer to the types of fluids handled, while system groups are designated according to piping pressure and temperature requirements. For example, the table for category-group G-1 provides detailed requirements for all piping in the first system group (3000 psig, 150°F, steam catapult) of category G (hydraulics).

5.2 Using the tables. For each service category and group, the reference to maximum system for pressure and temperature is not meant to infer that only systems with these conditions are applicable to the category and group; only that the components and materials identified are suitable up to these maximum conditions, unless notes within a category and group identify other limitations. The contractor or installing activity shall be responsible for matching system requirements as closely as possible with the applicable category and group.

5.3 Category and group listing. The list below identifies the seventy category and group combinations whose requirements are tabulated in this standard. The "date" column shows the date of the most recent update or change for each table.

<u>Category and group</u>	<u>Service</u>	<u>Date</u>
A-1	Steam and steam drains, 1500 psig, 1000°F	8 July 2002
A-2	Steam and steam drains, 1500 psig, 775°F	8 July 2002
A-3	Propulsion plant saturated steam and steam drains, 600 to 1500 psig, 775°F	8 July 2002
A-4 and A-7	Steam and steam drains, 600 psig, 875°F	8 July 2002
A-5	Steam and steam drains, 600 psig, 775°F	8 July 2002
A-6	Steam and steam drains, 150 psig, 775°F	8 July 2002
A-8	Steam and steam drains for auxiliary boiler, reboiler and waste heat boiler installation only, 150 psig, 366°F	8 July 2002
A-9	Steam system overboard discharge, steam generator blowdown, 1500/600 psig, 650°F	8 July 2002

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<u>Category and group</u>	<u>Service</u>	<u>Date</u>
A-10	High pressure steam drains between low point trap discharge stop check valve and DFT/gland exhaust piping from turbines and discharge main, 100 psig, 425°F	8 July 2002
B-1	Feed systems, 600 psig, 400°F; 1200 psig, 475°F	8 July 2002
B-2	Propulsion plant saturated feed system, 600 to 2050 psig, 300°F	8 July 2002
C-1	Fresh water, including feed, chilled water and condensate; feed, potable, gas turbine	31 January 2002
C-2	washdown, and electronic cooling water 200 psig, 250°F	
D-1	Sea water, 250 psig, 150°F	February 7, 1986
D-2	Sea water missile injection system between fresh water accumulating tank and nozzles, main and secondary drainage, ballast and oily waste transfer, 400 psig, 150°F	February 7, 1986
D-3	Sea water, 50 psig, 150°F	February 7, 1986
E-1	Fuel, 1200 psig	February 7, 1986
E-2	Fuel, 600 psig	February 7, 1986
E-3	Fuel, 200 psig	February 7, 1986
E-4	Fuel (gas turbine powered ships), 200 psig	February 7, 1986
F-1	Lubricating oil, 150 psig, 250°F	February 7, 1986
G-1	Steam catapult, hydraulic oil, 3000 psig, 150°F	February 7, 1986
G-2	Steam catapult, hydraulic oil, 200 psig, 150°F	February 7, 1986
G-3	Hydraulic oil - other than steam catapult, 3000 psig, 180°F	February 7, 1986
G-4	Hydraulic oil - other than steam catapult, 1500 psig, 180°F	February 7, 1986
G-5	Hydraulic oil - other than steam catapult, 900 psig, 180°F	February 7, 1986
G-6	Hydraulic oil - other than steam catapult, 300 psig, 180°F	February 7, 1986
G-7	Hydraulic oil - other than steam catapult, 150 psig, 150°F	February 7, 1986
H-1	Gasoline, 150 psig, 150°F	February 7, 1986

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<u>Category and group</u>	<u>Service</u>	<u>Date</u>
H-2	Cleaning fluid and contaminated aviation lubricating system, 100 psig, 150°F	February 7, 1986
I-1	JP-5 200 psig, 100°F	February 7, 1986
J-1	Air, nitrogen and helium, 6000 psig, 150°F	February 7, 1986
J-1	Air, nitrogen and helium, 3300 psig, 150°F	February 7, 1986
J-3	Air and nitrogen, 600 psig, 150°F	February 7, 1986
J-4	Air and nitrogen, 200 psig, 150°F	February 7, 1986
J-5	Air, aircraft, starting and cooling, bleed-off and 20.2 psi absolute systems, 150 psi, 550°F	February 7, 1986
J-6	Air, aircraft, starting and cooling, main system, 150 psig, 450°F	February 7, 1986
J-7	Air, Prairie-Masker, gas turbine starting sewage aerating, 100 psig, 600°F	February 7, 1986
J-8	Air, deballast, 50 psig, 400°F	February 7, 1986
J-9	Gas turbine bleed air system, 250 psig, 950°F	February 7, 1986
K-1	Gaseous oxygen, outside hull, 4500 psig, 150°F	February 7, 1986
K-2	Gaseous oxygen, inside hull, 4500 psig, ambient	February 7, 1986
K-3	Gaseous oxygen, 100 psig, ambient	February 7, 1986
K-4	Liquid oxygen and nitrogen, 6000 psig	February 7, 1986
K-5	Liquid oxygen and nitrogen, 250 psig	February 7, 1986
K-6	Mixed gas, 4500 psig, 150°F	February 7, 1986
K-7	Propane, 200 psig	February 7, 1986
L-1	Cooling (electronic equipment, diesel engine, and so forth) ethylene glycol, fresh water solution, distilled water transfer, 150 psig, 150°F	31 January 2002
M-1	Sea water-washdown countermeasure system, 200 psig, 100°F	February 7, 1986
N-1	Sprinkling system (dry) other than foam, 175 psig	February 7, 1986
N-2	Magazine sprinkling system (wet) 175 psig	February 7, 1986
O-1	Diesel, sewage treatment, incinerator and gas turbine exhaust, 1125°F	February 7, 1986
P-1	Boiler safety valve and super-heater outlet safety valve escape, 150 psig, 850°F	8 July 2002
Q-1	Refrigerant piping, 30 inches vacuum to 300 psig, minus 85°F to plus 250°F	February 7, 1986

SUPERSEDES PAGE 14 OF NOTICE 5 TO MIL-STD-777E

Category and Group	Services	Maximum System Pressure psig	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-P-24691/2	
Valves	Globe/angle stop and stop check 1/4 to 2 NPS	Chrome molybdenum alloy steel ASTM A 182, grade F-11 or ASTM A 217, grade WC-6	Drawing 803-5184193	Socket weld ends
	Globe/angle/Y-pattern stop and stop check 2-1/2 NPS and above		MIL-V-22052	Butt weld ends
	Swing/lift check		Commercial	See note A-1-2
	Astern		MIL-V-22682	
	Gate, 2-1/2 NPS and above		MIL-V-18110	See note A-1-1
	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 234, grade WP-11	ASME B16.9	
	Socket welding		ASME B16.11	
	Socket welding laterals		MS18307	
Take-down joints	Flanges, butt and socket welding	Chrome molybdenum alloy steel ASTM A 182, grade F-11	ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Through bolting (nuts at both ends)	Alloy steel		See 4.15
	Nuts			

SUPERSEDES PAGE A-1.1 OF NOTICE 2 TO MIL-STD-777E

A-1.1

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Category and Group	Services	Maximum System Pressure psig	Maximum system Temperature °F	Remarks
A-1, cont'd	Steam and steam drains	1500	1000	See note A-1-1

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 lowest practical point of the body neck cavity, 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-1-2 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.

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A-1.2

Category and group	Services	Maximum system pressure psig	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-P-24691/1	
Valves	Globe/angle stop, stop check, lift check and throttle 1/4 to 2 NPS	Carbon steel ASTM A 216, grade WCB or ASTM A 105	Drawing 803-2177525	Butt or socket weld ends ASME Class 900
			Commercial	ASME Class 1500 See note A-2-3
			MIL-V-22052	Butt weld ends
	Globe/angle/Y- pattern stop and stop check 2-1/2 NPS and above			
	Swing/lift check		Commercial	See note A-2-3
	Gate, 2-1/2 NPS and above		MIL-V-18110	See note A-2-2
	Relief		MIL-V-20065	Flanged ends only
	Pressure-reducing		MIL-V-17848	
	Control		MIL-V-18030	
Fittings	Butt welding	Carbon steel ASTM A 105, ASTM A 234, class WPB ASTM A 181, class 70	ASME B16.9	
	Socket welding		ASME B16.11	
	Socket welding laterals		MS18307	See note A-2-4
Take-down joints	Flanges, butt and socket welding	Carbon steel ASTM A 105 or ASTM A 181, class 70	ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flangebolting	Bolt-stud	Alloy steel		See 4.15
	Nuts			

NEW PAGE

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-2, cont'd	Steam and steam drains	1500	775	See note A-2-1

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 lowest practical point of the body neck cavity, 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 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.
- A-2-4 Fabricated from carbon steel material.

A-2.2

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Category and group	Services	Maximum system pressure psig	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-P-24691/1	
Valves	Gate, 2-1/2 NPS and above	Carbon steel ASTM A 105 or ASTM A 216, grade WCB	MIL-V-18110	Butt weld ends
	5 to 16 NPS		Drawing 803-2177518	See note A-3-2
	Globe/angle stop, stop check, lift check and throttle, 1/4 to 2 NPS		Drawing 803-2177525	Socket or butt weld ends ASME Class 900
	2-1/2 NPS		Drawing 803-2177140	Butt weld ends
	3 and 4 NPS		Drawing 803-2177141	Butt weld ends ASME Class 900
	5 and 6 NPS		Drawing 803-2177142	Butt weld ends ASME Class 900
	Globe/angle/Y-pattern stop and stop check 2-1/2 NPS and above		MIL-V-22052	Butt weld ends
	3-way bypass 1/2 to 1 NPS		Drawing 803-1385965	Socket or butt weld ends ASME Class 900
	Swing-check		Commercial	See note A-3-5
	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 psig	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	ASME B16.5	
	Butt welding	Carbon steel	ASME B16.9	
	Socket welding	ASTM A 105, ASTM A 181, class 70 ASTM A 234, class WPB	ASME B16.11	
	Socket welding laterals		MS18307	See note A-3-3
Take-down joints	Flanges, butt and socket welding	Carbon steel ASTM A 105 ASTM A 181, class 70	ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolt-stud	Alloy steel		See 4.15
	Nut			

NOTES:

- A-3-1 This category excludes high pressure steam drain main between each low point trap discharge or drain strainer orifice/orifice plate assembly 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 lowest practical point of the body neck cavity, 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 Fabricated from carbon steel material.
- A-3-4 Valve design proposal in accordance with MIL-V-24619 shall be submitted to NAVSEA for review and approval.
- A-3-5 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-4 and A-7	Steam and steam drains	600	875	

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Chrome molybdenum alloy steel	MIL-P-24691/2 ASTM A 335, grade P-11	
Valves	Gate, 2-1/2 NPS and above	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/Y-pattern stop and stop check, 2-1/2 NPS and above		MIL-V-22052	Butt weld ends
	Globe/angle stop and stop check, 1/4 to 2 NPS		Drawing 803-5184193	Socket weld ends
	Lift/swing check		MIL-V-18436	300 psig max at 850°F max temp
			Commercial	See note A-4-2
	Astern		MIL-V-22682	
	Pressure-reducing		MIL-V-17848	Flanged ends only
	Control		MIL-V-18030	
	Relief		MIL-V-20065	
Fittings	Socket welding	Chrome molybdenum alloy steel	ASME B16.11	
	Butt welding	ASTM A 182, grade F-11 or	ASME B16.9	
	Flanged	ASTM A 234, grade WP-11	ASME B16.5	
	Socket welding laterals		MS18307	
Take-down joints	Flanges, butt and socket welding	Chrome molybdenum alloy steel ASTM A 182, grade F-11	ASME B16.5	

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Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-4 and A-7, cont'd	Steam and steam drains	600	875	

Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolt-stud	Alloy steel		See 4.15
	Nuts			

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 lowest practical point of the body neck cavity, 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-4-2 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.

A-4.2

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Category and group	Services	Maximum system pressure psig	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-P-24691/1 ASTM A 106, grade B	
Valves	Globe/angle stop, stop check, lift check and throttle 1/4 to 2 NPS	Carbon steel ASTM A 216, grade WCB ASTM A 105	Drawing 803-2177525	Socket weld ends
	Globe/angle/Y-pattern stop and stop check, 2-1/2 NPS and above		MIL-V-22052	Butt weld ends
	Astern		MIL-V-22682	
	Gate, 2-1/2 NPS and above		MIL-V-18110	See note A-5-2
	Swing check		MIL-V-18436	300 psig max at 850°F max temp
			Commercial	See note A-5-4
	Pressure-reducing		MIL-V-17848	Flanged ends only
	Relief		MIL-V-20065	
	Control		MIL-V-18030	
Fittings	Flanged	Carbon steel ASTM A 216, grade WCB	ASME B16.5	
	Butt welding	Carbon steel	ASME B16.9	
	Socket welding	ASTM A 234, class WPB ASTM A 105, ASTM A 181, class 70	ASME B16.11	
	Socket welding lateral		MS18307	See note A-5-3

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-5, cont'd	Steam and steam drains	600	775	See note A-5-1

Take-down joints	Flanges, butt and socket welding	Carbon steel ASTM A 105 or ASTM A 181, class 70	ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolt-stud	Alloy steel		See 4.15
	Nut			

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 lowest practical point of the body neck cavity, 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 Fabricated from carbon steel material.
- A-5-4 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.

Category and group	Services	Maximum system pressure psig	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-P-24691/1 ASTM A 106, grade B	
Valves	Gate, 2-1/2 NPS and above	Carbon steel ASTM A 105 or ASTM A 216, grade WCB	MIL-V-18110	
	Globe/angle/Y-pattern stop and stop check 2-1/2 NPS and above		MIL-V-22052	Butt weld ends
	Globe/angle stop, stop check, lift check and throttle, 1/4 to 2 NPS		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-DTL-19772, type IV	
	Quick closing		MIL-V-24569, type IA	
Fittings	Flanged	Carbon steel ASTM A 216, grade WCB	ASME B16.5	See note A-6-4
	Socket welding	Carbon steel ASTM A 105 or ASTM A 234, class WPB ASTM A 181, class 70	ASME B16.11	
	Socket welding lateral		MS18307	See note A-6-5
	Butt welding		ANSI/ASME B16.9	
			ASME B16.9	
Take-down joints	Flanges, butt and socket welding	Carbon steel ASTM A 181, class 70 ASTM A 105	ASME B16.5	See note A-6-4

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Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-6, cont'd	Steam and steam drains	150	775	See notes A-6-1 and A-6-2

Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
	Sheet	Non-asbestos	MIL-G-24696	See note A-6-4
Flange bolting	Bolt-stud	Alloy steel		See 4.15
	Nuts			

NOTES:

- A-6-1 The basic ASME rating for Class 150 components is 150 psig 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 Fabricated from carbon steel material.

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A-6.2

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-8	Steam and steam drains for auxiliary boiler, reboiler and waste heat boiler installation only	150	366 (Sat. temp.)	See note A-8-1,3 See note A-8-5

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Copper-nickel 90-10	MIL-T-16420	
Valves	Gate, 2-1/2 NPS and above	Bronze	Drawing 803-2177917	Flanged ends only
	Gate, 1/4 to 2 NPS		Drawing 803-1385714	Union ends only
	Globe/angle stop and stop check, 2-1/2 NPS and above		Drawing 803-1385541	See note A-8-2 Flanged ends only
	Globe Y-pattern, stop and stop check, 2-1/2 to 10 NPS		Drawing 803-1385623	Flanged ends only
	Globe/angle stop, stop check and needle, 1/4 to 2 NPS		Drawing 803-4384536	Union ends only
	Control		MIL-V-18030	
	Relief		MIL-V-20065	
	Pressure-reducing		MIL-V-17848	
	Check, 2-1/2 NPS and above		MIL-V-17547	Flanged ends only
	Check, 2-1/2 to 12 NPS		Drawing 803-1385637	
	Swing check, 1/4 to 2 NPS		Drawing 803-1385721	Union ends only
	Quick closing		MIL-V-24569	150°F max at 150 psig
Fittings				g
	Socket welded	Copper-nickel	Drawing 803-6397430	

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Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-8, cont'd	Steam and steam drains for auxiliary boiler, reboiler and waste heat boiler installation only	150	366 (Sat. temp.)	See note A-8-1,3 See note A-8-5

Fittings cont'd	Welding	Copper-nickel 90-10	Drawing 803-1385880	150°F max
	Bulkhead/deck		Drawing 803-1385866	
	Mechanically attached (MAFs)	Various	ASTM F1387	See 4.49
Take-down joints	Flanges, socket welded	Copper-nickel	Drawing 810-4715319	
	Union end, socket weld tailpiece assy		Drawing 803-7063850	
	Unions, socket welded		Commercial	See note A-8-4
Gaskets	Sheet	Non-asbestos	MIL-G-24696	
Flange bolting	Bolt, studs and nuts			See 4.15

NOTES:

- A-8-1 For other boiler installations, use other applicable category.
A-8-2 100 psig maximum.
A-8-3 Use category A-6 for superheated steam application.
A-8-4 Commercial items not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.
A-8-5 System pressure is gauge pressure.

A-8.2

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Category and group	Services	Maximum system pressure psig	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, stop check, lift check and throttle, 1/4 to 2 NPS	Nickel-copper alloy	Drawing 803-2177525	See note A-9-1
			Commercial	
Fittings	Socket welding	Nickel-copper alloy, QQ-N-281, class A, annealed	ASME B16.11, bored as required	See note A-9-3
	Butt welding	Nickel-copper alloy, MIL-T-1368, class A	ASME B16.9	
	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			
Take-down joints	Flanges socket welding, 1/4 and 3/8 NPS	Nickel-copper alloy, QQ-N-281, class A, annealed	Commercial	1/4 inch, raised face
			MS18308	See note A-9-3 and A-9-4
	Flanges, butt and socket welding, 1/2 NPS and above		ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolts or bolt-stud	Nickel-copper aluminum		See 4.15
	Nuts			

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Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-9, cont'd	Steam system overboard discharge, steam generator blowdown	1500 / 600	650	See note A-9-2

NOTES:

- A-9-1 If higher pressure ratings are needed than specified on the valve drawing, commercial valves shall be used. Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.
- A-9-2 Does not include boiler pressure piping.
- A-9-3 Fabricated from nickel-copper alloy material.
- A-9-4 Where MS18308 is used to procure nickel copper alloy flanges, the pressure ratings for these flanges must be suitably reduced to account for their lower strength compared to steel flanges. Conservatively, these flanges should not be used above 720 psig at room temperature nor above 535 psig at 650°F.

A-9.2

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Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-10	High pressure steam drains between low point trap, drain strainer orifice/orifice plate assembly discharge stop check valve and DFT or gland exhaust piping from turbines, and discharge main	100	425	See note A-10-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless or welded	Corrosion-resisting steel, 304 or 304L	MIL-P-24691/3 ASTM A 269, ASTM A 312	
	Seamless	Nickel-copper alloy	MIL-T-1368, class A	
Valves	Gate, 2-1/2 NPS and above	Corrosion-resisting steel, SAE-AMS-QQ-S-763, QQ-S-304, 304L, 316 or 316L, ASTM A 182, grade F304L, F316L	MIL-V-18110	See note A-10-3
	Globe/angle/Y-pattern stop and stop check 2-1/2 NPS and above		MIL-V-22052	
	Globe/angle stop, stop check, life check and throttle, 1/4 to 2 NPS		Drawing 803-2177525	
	Relief	Nickel-copper alloy, QQ-N-281	MIL-V-20065	See note A-10-2
Fittings	Socket welding	Corrosion-resisting steel in accordance with ASTM A 182, grade F304 or F304L ASTM A403, Class WP304LS, WP316LS	ASME B16.11	
	Butt welding	Nickel-copper alloy	ASME B16.9	See note A-10-2
	Socket welding laterals		MS18307	
	Mechanically attached (MAFs)	Various	ASTM F1387	See 4.49

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Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
A-10, cont'd	High pressure steam drains between low point trap, drain strainer orifice/orifice plate assembly discharge stop check valve and DFT or gland exhaust piping from turbines, and discharge main	100	425	See note A-10-1

Item	Types	Material	Applicable documents	Remarks
Take-down joints	Flanges, butt and socket welding	Corrosion-resisting steel, ASTM A 182, grade F304 or F304L Nickel-copper alloy, QQ-N-281	ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolts, studs and nuts	Nickel-copper aluminum		See 4.15

NOTES:

- A-10-1 This category applies to drains covered in category A-3 only. For drains in systems other than category A-3, see the applicable category.
- A-10-2 Fabricated from nickel-copper alloy material.
- A-10-3 Fabricated from stainless steel alloy material.

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
B-1	Feed systems	600 maximum boilers 1200 boilers	400 475	See notes B-1-1 and B-1-2

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	MIL-P-24691/1 or ASTM A 106, grade B	
Valves (see note B-1-3)	Globe/angle stop and stop check 1/4 to 2 NPS	Carbon steel ASTM A105 or ASTM A216, grade WCB	Commercial	Socket welded ends only See note B-1-4
	Globe/angle/Y-pattern stop and stop check 2-1/2 NPS and above		MIL-V-22052	
	Globe/angle stop, stop check, throttle and lift check 1/4 to 2 NPS		Drawing 803-2177525	Socket or butt welded ends ASME Class 900 max
	Gate, 2-1/2 NPS and above		MIL-V-18110	
	Relief		MIL-V-24332	Flanged ends only
	Control		MIL-V-18030	Flanged ends only
	Check		Commercial	see note B-1-4
Fittings	Butt welding	Carbon steel ASTM A181, class 70 ASTM A105 or ASTM A234, class WPB	ASME B16.9	
	Socket welding		ASME B16.11	
	Socket welding end branch outlets		Commercial	
	Butt weld end branch outlets			

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
B-1, cont'd	Feed systems	600 maximum boilers 1200 boilers	400 475	See notes B-1-1 and B-1-2

Item	Types	Material	Applicable documents	Remarks
Fittings cont'd	Mechanically attached (MAFs)	Various	ASTM F1387	See 4.49
Take down joints	Flanges, butt and socket welding	Carbon steel ASTM A105 ASTM A181, class 70	ASME B16.5	See note B-1-3
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolt-stud and nuts	Carbon steel		See 4.15

NOTES:

- B-1-1 In view of the exceptionally high relief valve setting in the boiler's feed system, which if used for selection of pressure series, might result in a heavier series than necessary, this category specifies the required series for both 600 and below and 1200 psig boiler.
- B-1-2 The 400/475°F temperature applies only to that section of the feed system between the economizer and the steam drum. Refer to category B-2 for feed system piping component requirements upstream of economizer.
- B-1-3 Valves and flanges of 600 psig and below boilers shall be ASME Class 600. Valves and flanges for 1200 psig boilers shall be ASME Class 900 except for valves 2 NPS and below which shall be Class 1500.
- B-1-4 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
B-2	Propulsion plant saturated feed system	600 to 2050	300	See note B-2-1

Item	Types	Material	Applicable documents	Remarks
Pipe	Seamless	Carbon steel	ASTM A106, grade B MIL-P-24691/1	
Valves	Gate 2-1/2 NPS and above	Carbon steel ASTM A105 or	MIL-V-18110	Butt weld ends
	Gate, 5 to 16 NPS	ASTM A216, grade WCB	Drawing 803-2177518	Butt weld ends Class 900 max
	Globe/angle stop, stop check, throttle and lift check, 1/4 to 2 NPS		Drawing 803-2177525	Socket or butt weld ends ASME Class 900 max
			Commercial	ASME Class 1500 See note B-2-3
	2-1/2 NPS		Drawing 803-2177140	Butt weld ends ASME Class 1500
	3 and 4 NPS		Drawing 803-2177141	Butt weld ends ASME Class 900 (see note B-2-2)
	5 and 6 NPS		Drawing 803-2177142	
	Globe/angle/Y-pattern stop and stop check 2-1/2 NPS and above		MIL-V-22052	Flanged or butt weld ends
	Swing check		Commercial	(see note B-2-3)
	Relief		MIL-V-24332	Flanged ends
	Control		MIL-V-18030	
Fittings	Butt welding	Carbon steel ASTM A 181, class 70 ASTM A 105 or ASTM A 234, class WPB	ASME B16.9	

Category and group	Services	Maximum system pressure psig	Maximum system temperature °F	Remarks
B-2, cont'd	Propulsion plant saturated feed system	600 to 2050	300	See note B-2-1

Item	Types	Material	Applicable documents	Remarks
Fittings cont'd	Socket welding	Carbon steel ASTM A 181, class 70	ASME B16.11	
	Socket welding end branch outlets	ASTM A 105 or ASTM A 234, class WPB	Commercial	
	Butt welding end branch outlets			
	Mechanically attached (MAFs)	Various	ASTM F1387	See 4.49
Take-down joints	Flanges, socket or butt welding	Carbon steel ASTM A105, or ASTM A181, class 70	ASME B16.5	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolt-stud and nuts	Carbon steel		See 4.15

NOTES:

- B-2-1 To be used in conjunction with A-3 steam system only. Feed systems for use with other category A steam systems shall be in accordance with category B-1.
- B-2-2 Valves and flanges of 600 psig and below boilers shall be ASME Class 600. Valves and flanges for 1200 psig boilers shall be ASME Class 900 except for valves 2 NPS and below which may be Class 900 or 1500 depending upon system operating pressure.
- B-2-3 Commercial valves not in accordance with DoD adopted non-government standards shall be approved by NAVSEA.

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Category and group	Services	Maximum system pressure psig	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-P-24691/1 ASTM A 106, grade B	See note P-1-1
Fittings	Butt welding	Carbon steel, ASTM A 105 or ASTM A 181, class 70	ASME B16.9	
Take-down joints	Flanges, butt welding	Carbon steel ASTM A 181, class 70, or ASTM A 105	ASME B16.5, series 150	
Gaskets	Spiral wound	Metallic-flexible graphite	MIL-G-24716	
Flange bolting	Bolt - stud	Alloy steel		See 4.15
	Nuts			

NOTE:

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

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