

INCH - POUND

MIL-HDBK-843 (SH)

20 August 1993

MILITARY HANDBOOK

SHIP METALLIC MATERIAL COMPARISON



AMSC N/A

FSC 1990

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FOREWORD

1. This military handbook is approved for use within the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 Scope. This handbook provides Naval Sea Systems Command (NAVSEA) guidance for the selection or substitution of the most common material types and forms used in ship design, construction, overhaul, or repair. Recommended specifications have been established and cross-indexed to prior specifications. By using the consolidated material specifications provided by this handbook, the volume of redundant specifications, stock numbers, and associated material inventories can be reduced.

1.2 Purpose. A reduction in the volume of redundant specifications, stock numbers and associated material inventories can be accomplished through the use of the consolidated material specifications provided by this handbook. Recommended specifications have been established and cross indexed to the prior specifications.

1.3 Applicability. This handbook applies to material applications for combatant and noncombatant ships controlled by the following documents (see appendix): NAVSEA 0900-LP-006-1000, NAVSEA 0900-LP-000-1000, NAVSEA 0900-LP-060-4010, NAVSEA 0900-LP-014-5010, NAVSEA 0900-LP-001-7000, NAVSHIPS 0900-LP-014-1010, NAVSEA 0991-LP-023-3000, NAVSEA 0900-LP-082-3010, NAVSEA S9A00-AB-G0S-010/GS0, NAVSEA 0902-018-2010, NAVSEA S9AA0-AA-SPN-010/GEN SPEC, MIL-STD-278, MIL-STD-438, MIL-STD-777, MIL-STD-1681, MIL-STD-1688, and MIL-STD-1689. This handbook does not apply to any of the following:
(a) systems and components under NAVSEA Code 08 cognizance in nuclear powered ships and tender nuclear support facilities, (b) systems identified in NAVSEAINST C9210.4, (c) SUBSAFE or non-nuclear material control Level I applications. Recommended material specifications may be invoked for initial design, alteration, or repair applications of material types and forms covered by this handbook. Whenever repair or overhaul work results in the removal and discard of material, replacement may be made using the recommended material specification. When acquiring material for the Naval Supply System stock, the recommended material specifications may be invoked in the acquisition document in lieu of the previous material specifications.

2. APPLICABLE DOCUMENTS

See appendix.

3. DEFINITIONS

Not applicable to this handbook.

4. GENERAL REQUIREMENTS

4.1 The general requirements of this handbook covering steel and nonferrous alloys based on the types and forms of material are provided in tables I through XI.

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4.2 In the "Recommended specification" column of the tables are preferred specification callouts to be used for specific reference on drawings, equipment, or component specifications. These callouts further identify specific materials required for particular applications by reference to their generally accepted commercial or Unified Numbering System (UNS) designation. Source documents where these materials are referred in current or previous specifications (sometimes by former designations) are also listed. The appendix contains the index of page numbers where each recommended or previous specification is referenced in MIL-HDBK-XX48(SH). Whenever a specification is invoked in a document it can readily be determined, by reference to this index, whether an alternate recommended or superseding specification exists. Canceled specifications have been marked with a "C".

4.3 This handbook may be used as a guide to select material based on old drawing references from what is available in present-day stocks.

4.4 When Government or commercial specifications (such as American Society for Testing and Materials (ASTM)) covered by this handbook are referenced in acquisition contracts or work requests, they should invoke the additional requirements, where noted, under the "Remarks" column of the tables. In addition, for ASTM specification callouts, supplementary requirements pertaining to Government packaging (preservation, packing, and marking), identification marking and certification and mill test reports should be included.

4.5 Material selection. When a standard material listed in this document is selected for a new design application, the "Recommended specification" should be invoked. Actual material selection should still be made on sound engineering judgment. The listing of a material in tables I through XI does not imply that the material is suitable for all applications.

4.6 Material substitution. When a standard material listed in this document is used in an existing design and the referenced specification is a "Previous specification", the material used may be acquired to the corresponding "Recommended specification" when any of the following apply:

- (a) The "Previous specification" material is no longer available from standard stock and the "Recommended specification" material is supplied instead.
- (b) The "Previous specification" has been canceled and superseded by the "Recommended specification" or by a specification tree that leads to the "Recommended specification".
- (c) The "Recommended specification" has been approved as a replacement specification for the "Previous specification" via a waiver in accordance with MIL-STD-480 or MIL-STD-481.

(Note: The "Recommended specifications" have been compared to the "Previous specifications" and represent identical material.)

"Previous specification" materials should not be substituted for "Recommended specification" materials. All "Previous specifications" listed under a "Recommended specification" should not be assumed to be interchangeable with each other.

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TABLE I. Structural steel.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Ordinary strength steel, ABS grade A	K02300	Plate	MIL-S-22698B grade A 1/	MIL-S-22698A class A ASTM A 36 QQ-S-741 QQ-S-698	Surface ship hull and structure; propulsion and reduction gear assemblies; turbine couplings and line shafts; vaneaxial fans; fluid coolers; lubricating oil heaters; weapon and cargo elevators.	MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-STD-278 MIL-F-18602 MIL-E-17807 MIL-H-24299 MIL-C-19836 MIL-T-24398 MIL-G-17859 MIL-B-18381 MIL-H-22881 MIL-H-17428 NAVSEA 0900-LP-001-7000 MIL-C-15730 MIL-C-19553 MIL-C-19113 MIL-C-18419 MIL-C-23961 MIL-G-18473 MIL-G-3124 MIL-S-17849 MIL-C-19713 MIL-T-17523	
ABS grade B	K02102		MIL-S-22698B grade B 1/	MIL-S-22698A class B ASTM A 36 QQ-S-741 QQ-S-698			
ABS grade D	K02101		MIL-S-22698B grade D 1/	MIL-S-22698A class C ASTM A 36 QQ-S-741 QQ-S-698			
ABS grades A & B	K02300 K02102	Shapes	MIL-S-22698B grade A & B 1/	MIL-S-20166 grade M ASTM A 36 QQ-S-741			
Higher strength steel, ABS grade DH 36	K11852	Plate	MIL-S-22698B grade DH-36 1/	MIL-S-22698A class D MIL-S-16113 grade HT, type I grade N MIL-S-24094	Ship hulls and structures; steam turbines and steam condensers.	MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-STD-278 MIL-F-18602 MIL-E-17807 MIL-H-24299 MIL-T-17600	

See footnote at end of table.

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TABLE I. Structural steel - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
ABS grade EH 36U	K11852	Plate	MIL-S-22698B grade EH-36T 1/	MIL-S-16113 grade HT, type II MIL-S-24113 grade N		MIL-C-15430 MIL-C-23233 MIL-C-19553 MIL-C-19113 MIL-C-17944 MIL-T-24398 MIL-T-17523 MIL-G-17859 MIL-S-17803 MIL-C-18419 MIL-C-23961	
ABS grade EH 36Z			MIL-S-22698B grade EH-36Z 1/				
ABS grade EH 36ZU			MIL-S-22698B grade EH-36TZ 1/				
ABS grade AH 36		Shapes	MIL-S-22698B grade AH-36 1/	MIL-S-20166 grade HT, type I ASTM A 441		NAVSEA 0900- LP-001-7000 MIL-C-15730 MIL-S-21433 MIL-C-19836 MIL-S-17849 MIL-G-18473 MIL-G-3124 MIL-S-17849	ASTM A 322 grade 8620, Fine- ground, normalized
ABS Grade AH 36U			MIL-S-22698B grade AH-36T 1/	MIL-S-20166 grade HT, type II MIL-S-24412 ASTM A 441 ASTM A322 grade 8620			

See footnote at end of table.

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TABLE I. Structural steel - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Carbon	K02001	Plate	ASTM A 515		Pressure vessels, heavily formed parts such as flanges and bearing mounts.	Gen. Spec. MIL-STD-278	
	K02401						
	K02800						
	K03101						
Carbon	K01800	Plate	ASTM A 516		Pressure vessels.	MIL-STD-278	
	K02100						
	K02403						
	K02700						
Carbon (Mn-Si)	K12437	Plate	ASTM A 537		Pressure vessels.	MIL-STD-278	
	HY-80/ HY-100	Plate	MIL-S-16216		Submarine and surface ship hull and structure; steam turbines and reduction gears	MIL-STD-1689 NAVSEA 0900-LP-006-9010 MIL-STD-1688 MIL-T-24398 MIL-T-17600 MIL-T-17523 MIL-STD-278 MIL-C-15430 MIL-S-18957 MIL-C-23961 MIL-S-24235	
Plate (heads)		MIL-S-24451					
		Bar	MIL-S-21952 grade HY-80 grade HY-100	MIL-S-890 alloy No 3 alloy No 4			
		Forging	MIL-S-23009				
		Extrusions	MIL-S-22664		Structural.	MIL-STD-1688 Gen. Spec	

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
HY-130	K51255	Plate	MIL-S-24371		Submarine hull.	MIL-STD-1681	
		Forging	MIL-S-24512				
HSLA-80		Plate, sheet, coil	MIL-S-24645		Surface ship hull.	MIL-STD-1689	
Alloy steel (8630)	G86300	Plate, sheet, strip	MIL-S-18728			MIL-STD-278	
Alloy steel (4130)	G41300	Plate, sheet, strip	MIL-S-18729			MIL-STD-278	
Alloy steel (Mn-Mo)	K12021	Plate	ASTM A 302		Pressure vessels.	MIL-STD-278	
	K12022						
	K12039						
	K12054						

1/ Recommended specification is MIL-S-22698B or later revision.

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TABLE II. Steel bars, billets, and forgings.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
AISI/SAE 1016	G10160	Bars and billets	DOD-F-24669 DOD-F-24669/1	MIL-S-866 NAVY 46-S-32	Propulsion gears, couplings, line clutches, line shafts for turbines, carburizing stock.	MIL-G-17859 MIL-G-18087 MIL-G-23233 MIL-T-17523 MIL-T-24398	Specify depth of carburizing desired
AISI/SAE 4615	G46150						
AISI/SAE 8615	G86150						
AISI/SAE 1018	G10180	Carbon and free machining steel bar (standard quality)	ASTM A 108	MIL-S-16124 MIL-S-18411 QQ-S-637 QQ-S-634	Parts for bearings, valves, purifiers, and air ejectors.	MIL-F-3541 MIL-E-15465 MIL-V-24586 MIL-P-22088 MIL-T-24398 MIL-T-17523 MIL-S-17849	Add optional mechanical properties for plain carbon steel in accordance with ASTM A 311. Free machining grades and grades permitting more than 0.35 per cent maximum carbon should not be specified for welded applications.
AISI/SAE 1035	G10350						
AISI/SAE 1045	G10450						
AISI/SAE 1050	G10500						
AISI/SAE 1117	G11170						
AISI/SAE 1137	G11370						
AISI/SAE 1141	G11410						
AISI/SAE 1144	G11440						

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TABLE II. Steel bars, billets, and forgings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks		
Commercial	UNS								
Carbon and alloy steel AISI/SAE 1022 AISI/SAE 4130 AISI/SAE 4140 AISI/SAE 4340	G10220	Bars, billets, blooms, and slabs	DOD-F-24669/1	MIL-S-16974 NAVY 46-S-4	Reforging stock for production of turbine shafting, couplings, and propulsion gears.	MIL-T-24398 MIL-T-17523 MIL-G-17859 MIL-C-23233 MIL-C-19836 MIL-STD-278	Shall be heat treated prior to use. Specify strength level on drawings.		
	G41300								
	G41400								
	G43400								
Alloy steel Nitralloy 135M		Bars, billets, and forgings	DOD-F-24669/3 class A	MIL-S-869 class A	Machinery applications in pumps, compressors, and turbines where hard surfaces are necessary for galling and wear resistance.	MIL-C-19836 MIL-P-18547 MIL-C-18419 MIL-C-23961 MIL-T-24398 MIL-T-17523 MIL-P-19131 MIL-STD-278 MIL-T-17600	Shall be quenched and tempered prior to nitriding		
								DOD-F-24669/3 class B	class B
Nitralloy EZ									
	Nitralloy N								
Nitralloy 135G			DOD-F-24669/3 class D	class D MIL-S-23966 Navy 46-S-30					
Chromium molybdenum steel	K12822	Bars, billets, and forgings	DOD-F-24669/2	MIL-S-872	Reforging stock for application to couplings and propulsion clutches.	MIL-C-18087 MIL-STD-278			

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TABLE II. Steel bars, billets, and forgings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel and nickel-molybdenum modified Hadfield steel		Bar and forgings	DOD-F-24669/4	MIL-S-17758	For applications where high strength and low magnetic permeability are required.		
AISI/SAE 4340	H43400	Bars and forgings	MIL-S-5000	QQ-S-624	Bearings and pinion gears for turbines; hubs, pins, and sleeves for propulsion clutches; condenser tube sheets; hose fittings.	MIL-T-24398 MIL-T-17523 MIL-H-24135 MIL-G-17859 MIL-C-18087	All conditions except condition F shall be heat treated prior to placing in service. Specify strength desired on drawings (condition F = 130 kilo-pounds per square inch (KSI) minimum yield strength).

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TABLE II. Steel bars, billets, and forgings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Carbon and alloy steel		Forgings	MIL-S-24093 class A class B class C class D class E class F class G class H	MIL-S-890 alloy 1 alloy 2 alloy 4 class HG class An class Ac class B-S (special) class C	General shipboard use (excluding torsionally loaded shafting).	MIL-T-24398 MIL-T-17523 MIL-STD-278 MIL-G-17859 MIL-E-17807 MIL-C-19553 MIL-H-17428 MIL-P-18547 MIL-C-23233 MIL-P-19131 MIL-C-18087 MIL-P-18472 MIL-C-19113 MIL-C-18419 MIL-C-23961 MIL-F-18602 NAVSHIPS O900-LP-014-1010 MIL-G-3124 MIL-S-17849 MIL-P-22088 MIL-P-20632 MIL-C-19836	
Ni-Mo steel		Forgings	MIL-S-23284 class 1 class 2	MIL-S-890 class HG class An and Ac	Torsional shafts (generators and motors); propulsion shafts (steam turbines); sleeves, couplings, gear assemblies, rudder and diving plane stock.	MIL-T-17523 MIL-G-17859 MIL-G-18473 MIL-T-24398 MIL-S-17849 MIL-P-22088 MIL-P-20632 MIL-G-3124 MIL-P-18547	
Carbon steel	G10250	Forgings	MIL-S-23284 class 3	MIL-S-890 class B-S (special)			

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TABLE II. Steel bars, billets, and forgings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Carbon steel	G10250	Forgings	MIL-S-23284 class 4	MIL-S-890 class B and C MIL-S-20137 NAVY 49-S-2 NAVY 46-S-43		MIL-C-23233 MIL-P-19131 MIL-C-18087 MIL-P-18472 MIL-C-19113 MIL-C-18419 MIL-C-23961 MIL-F-18602 MIL-C-19553 MIL-H-17428 MIL-C-19836 NAVSHIPS 0900-LP-014-1010	
Carbon steel	G10350	Forgings	MIL-S-19434 class 1 class 2 class 3 class 4	QQ-S-626	Gears and pinions for turbines (propulsion and auxiliary).	MIL-T-24398 MIL-T-17523 MIL-G-17859	
Carbon and alloy steel	K14501	Forgings	MIL-S-860 grade A		Steam turbine rotors and shafts.	MIL-T-24398 MIL-T-17600 MIL-T-17523 MIL-STD-278	
	K22578		grade B				
	K22878		grade C				
	K42885		grade D				
	K42885		grade E				
	K23010		grade F				

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TABLE II. Steel bars, billets, and forgings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Stainless steel (12 percent Cr)		Forgings	MIL-S-860 grade G	NAVY 46-S-39			
Alloy steel 4-6 Cr - 1/2 Mo 1-1/4 Cr - 1/2 Mo 2-1/4 Cr - 1 Mo	K41545 K11572 K21590	Forgings	ASTM A 182 grade F5 grade F11 grade F22	MIL-S-20146 NAVY 46-S-41 ASTM A 336 MIL-S-872	Intended for high temperature steam equipment (flanges, fittings and valves). F-22 used for high pressure air/gas flasks.	MIL-STD-278 MIL-F-22606	Invoke hydrostatic testing, and weld repair requirements of MIL-STD-278. The 2-1/4 Cr - 1 Mo alloy should not be used for new design of high temperature application.

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TABLE III. Steel pipe, tube, and fittings.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Carbon steel	G10260	Pipe and tube, seamless	MIL-P-24691 MIL-P-24691/1	MIL-T-20157 Type E WW-P-404 MIL-T-20160 ASTM A 53 MIL-T-20169 NAVY 44-T-41	Steam drains (specific application propulsion plant equipment, steam condensers, and distillation units).	MIL-B-18381	
Carbon steel	K03200	Bar for forged fittings	ASTM A 696 grade B		Strainers.	MIL-S-2953	ASTM A 234 manufacturing limitations apply.
Carbon steel	K03502	Forged fittings	ASTM A 105	ASTM A 234 Grade WPB MIL-F-20236	Coolers Socket weld fittings, valves.	MIL-C-15730 MIL-STD-777 MIL-STD-438 MIL-STD-777	
Carbon steel		Pipe and tube, seamless and welded	ASTM A 500/ A 501	MIL-T-16343	Structural. Railings, ladders. Structural, railings, ladders.	Gen. Spec. Gen. Spec. Gen. Spec.	

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TABLE III. Steel pipe, tube, and fittings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Alloy steel (1-1/4 Cr- 1/2 Mo)	K11572	Pipe and tube	MIL-P-24691/2	MIL-T-20155 MIL-T-18165 class 1	Steam service drains.		
		Bar for forgings	DOD-F-24669/2 comp. F-11	MIL-S-18410 class A	Diaphragms, control valves, and nozzle blocks for turbines.	MIL-T-24398 MIL-T-17600 MIL-T-17523	ASTM A 234 manufacturing limitations apply.
		Forged fittings	ASTM A 182 grade F-11		Boiler and steam valves; steam strainers.		
Alloy steel (2-1/4 Cr- 1 Mo)	K21590	Pipe and tube	MIL-P-24691/2	MIL-T-18165 class 2	Steam service; diaphragms, control valves; and nozzle blocks for turbines.	MIL-V-17462 MIL-V-17737	Should not be used for new design with temperature under 1000°F.
		Bar for forgings	DOD-F-24669/2 comp. F-22	MIL-T-18410 class B	Boiler and steam valves; steam strainers.		ASTM A 234 manufacturing limitations apply.
		Forged fittings	ASTM A 182 grade F-22				

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Carbon and alloy steel		Seamless tube	MIL-T-16286	MIL-T-17188 ASTM A 213	Boilers.	MIL-STD-278	
Alloy steel (4130)		Tubing, seamless and welded	MIL-T-6736			MIL-STD-278	

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TABLE IV. Steel and iron castings.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Carbon steel	J03007	Castings	ASTM A 216		Valves.	MIL-STD-438 MIL-STD-777	
	J03008		MIL-C-24707/1 Grade WCA	QQ-S-681 grade N-1, N-2 MIL-S-15083 grade CW grade B QQ-S-681 grade 60-30	For various machinery and structural parts including steam service. Primary uses are in pumps, compressors, coolers, heaters, capstans, generators, steering gears, gear assemblies, couplings and clutches for turbines, Strainers, purifiers, valves, fans, and weapon and cargo elevators.	MIL-STD-278 MIL-STD-1689 MIL-H-17428 MIL-C-17944 MIL-M-19097 MIL-M-19160 MIL-C-19553 MIL-M-19633 MIL-P-17639 MIL-P-18472 MIL-P-24475 MIL-C-15730 MIL-S-17803 MIL-G-17859 MIL-C-19113 MIL-C-23961 MIL-C-18087 MIL-C-23233 MIL-S-17849 MIL-P-22088 MIL-P-19131 MIL-P-18547 MIL-V-19772 MIL-T-24398 MIL-T-17600 MIL-T-17523	
	J03008						
	J03009		grade 65-35	MIL-S-15083 grade 65-35			
	J03504		grade 70-36	QQ-S-681 grade 70-36 grade 65-35 MIL-S-15083 grade 70-36			
	J05002		grade 80-40	QQ-S-681 grade 80-40 grade 70-40 MIL-S-15083			
	grade 80-50	MIL-S-15464 class 3 QQ-S-681 grade 80-50 MIL-S-15083					
Alloy steel			grade 90-60	QQ-S-681 grade 90-60 MIL-S-15083	Submarine hull and structure.	MIL-E-17807 MIL-P-20632 MIL-F-18602 MIL-C-18419	
	HY-80	J42015	MIL-S-23008 Grade HY-80	MIL-S-15083 grade 100-70			

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TABLE IV. Steel and iron castings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks		
Commercial	UNS								
HY-100	J42240	Castings	MIL-S-23008 grade HY-100	MIL-S-15083 grade 105-85 grade 120-95 QQ-S-681 grade 105-85 grade 120-95		MIL-P-18682 MIL-S-17803 MIL-G-3124 MIL-V-19772 NAVSEA 0900- LP-006-9010 MIL-STD-1688	The 2-1/4 Cr-1 Mo alloy should not be used for new design.		
C-1/2 Mo	J12520		MIL-C-24707/2	MIL-S-870					
1-1/4 Cr- 1/2 Mo	J12072		MIL-S-15464 class 1						
2-1/4 Cr- 1 Mo	J21880		MIL-S-15464 class 2						
1-1/4 Cr- 1/2 Mo-V	J11875		MIL-S-15464 class 3						
Austenitic manganese	J91109		MIL-S-17249 type A and B						
Gray iron Class 20	F11401		ASTM A 48	QQ-I-652 NAVY 46-I-5				For general pur- pose use in vari- ous machinery equipment such as housings for winches, hoists, pumps, motors, and compressors.	MIL-W-15802 MIL-H-904 MIL-P-19131 MIL-P-18547 MIL-P-17869 MIL-C-18419 MIL-C-23961 MIL-C-19113 MIL-H-15317 MIL-W-17265
Class 25	F11701								
Class 30	F12101								
Class 35	F12401								
Class 40	F12801								

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TABLE IV. Steel and iron castings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Class 45	F13101	Castings	MIL-I-24137 class A	MIL-I-11466 MIL-I-17166 QQ-I-666 ASTM A 395	Intended for general machinery components requiring shock resistance, with higher strength and ductility than gray iron castings. Major uses are in actuators, generators, conveyors, weapon and cargo elevators, cranes, winches, compressors, and reduction gears for turbines, hoists, pumps, boilers, and motors.	MIL-C-17949 MIL-C-17933	
Class 50	F13501						
Class 55	F13801						
Class 60	F14101						
Ductile iron grade 60 40-18	F33101						

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TABLE IV. Steel and iron castings - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Ferritic malleable iron		Castings	ASTM A 47		Structural	Gen. Spec.	
Austenitic ductile iron Type D-2	F43020		MIL-I-24137 class B	MIL-I-18397 class A	Similar in usage to ductile iron, except that the austenitic compositions are used for seawater applications or where nonmagnetic properties are required.	MIL-E-17807 MIL-A-24533 MIL-M-19097 MIL-M-19160 MIL-M-19633 MIL-C-23218 MIL-C-23842 MIL-C-17949 MIL-C-17933 MIL-W-17265 MIL-T-17600 MIL-T-17523 MIL-T-24398 MIL-R-24085 MIL-W-15808 MIL-H-904 MIL-P-17840	
			MIL-I-24137 class C	MIL-I-18397 class b			
Type D-2C	F43021						

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TABLE V. Stainless steel, wrought.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 302	S30200	Bar and shapes (austenitic)	ASTM A 276	QQ-S-763 MIL-S-18170	Used where good corrosion resistance is required in air, oil, and fresh water systems. Specific applications include pipe fittings, valves, air compressors and ejectors, fans, pumps, purifiers, dehydrators, and strainers. Also used where nonmagnetic properties are required in propulsion equipment.	MIL-E-15465 MIL-N-52110 MIL-P-18472 MIL-V-20065 MIL-V-24332 MIL-V-18436 MIL-C-24356 MIL-E-17807 MIL-C-19553 MIL-C-18419 MIL-C-23961 MIL-S-21433 MIL-G-17859 MIL-V-2961 MIL-V-17737 MIL-V-20064 MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-F-18602 MIL-P-22088 MIL-P-20632 MIL-STD-278 MIL-C-19113 MIL-S-17849 MIL-T-17523 MIL-S-24235	Specify intergranular corrosion test in accordance with ASTM A 262, practice E. Prohibit oxalic etch screening test.
Type 304	S30400						
Type 304L	S30403						
Type 309	S30900						
Type 310	S31000						
Type 316	S31600						
Type 316L	S31603						
Type 321	S32100						
Type 347	S34700						
Type 348	S34800						
Type 303	S30300	Bar-free machining (austenitic)	ASTM A 582	QQ-S-764	Where good corrosion resistance and machinability are required for valve components, including disks, seat rings, threadpieces, and nuts; pump shafts.	MIL-V-18436 MIL-V-24272 MIL-P-18472 MIL-V-22549	
Type 303Se	S30323						

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TABLE V. Stainless steel, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 302	S30200	Plate, sheet, and strip (austenitic)	QQ-S-766	ASTM A 240 ASTM A 167 MIL-S-18171	Steam strainers; oil and fuel, purifiers; boiler shells; compressor bed-plates; fan casings, inlet cones, diffusers, and general use.	MIL-C-24356 MIL-E-15465 MIL-F-18602 MIL-R-16743 MIL-S-2953 MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-B-18381 MIL-C-19553 MIL-C-19113 MIL-C-23233 MIL-G-17859 MIL-S-21427 MIL-B-17748 MIL-S-17849 MIL-P-22088 MIL-P-20632 MIL-STD-278 MIL-T-17523	Specify intergranular corrosion test in accordance with ASTM A 262, practice E. Prohibit oxalic etch screening test.
Type 304	S30400						
Type 304L	S30403						
Type 309S	S30908						
Type 310S	S31008						
Type 316	S31600						
Type 316L	S31603						
Type 321	S32100						
Type 347	S34700						
Type 348	S34800						
Type 302	S30200	Forgings (austenitic)	QQ-S-763		Pump shafts and crankcases; valve components; fittings and fasteners; wire rope sockets and turnbuckles; lube oil sumps.	MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-E-17807 MIL-C-19553 MIL-C-18419 MIL-S-23961 MIL-S-21433 MIL-G-17859 MIL-V-2961	
Type 303	S30300						
Type 303Se	S30323						
Type 304	S30400						
Type 304L	S30403						
Type 309	S30900						
Type 310	S31000						
Type 316	S31600						
Type 316L	S31603						
Type 321	S32100						

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TABLE V. Stainless steel, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 347	S34700					MIL-V-17737	
Type 348	S34800					MIL-V-20064 MIL-V-22549 MIL-D-17847 MIL-F-18602 MIL-P-18472 MIL-P-22088 MIL-P-20632 MIL-STD-278 MIL-C-19113 MIL-S-17849 MIL-T-17523 MIL-V-24394	
Type 304	S30400	Pipe and tube (austenitic)	MIL-P-24691/3	MIL-P-1144 ASTM A 312 ASTM A 269	Pipe lines for gas, liquid oxygen and nitrogen, cooling water, steam and chemical drains, fuel, hydraulic oil, lube oil, and control oil. Fittings for high temperature service.	NAVSEA 0900-LP-001-7000 MIL-W-17265 MIL-T-17523 MIL-G-17859 MIL-STD-438 MIL-STD-278 MIL-STD-777	
Type 304L	S30403						
Type 316	S31600						
Type 316L	S31603						
Type 321	S32100						
Type 347	S34700						
Type 302	S30200	Bar and billet (austenitic)	DOD-F-24669/6	MIL-S-862	Reforging stock for applications where good corrosion resistance is required. For example, components of oil and fuel	MIL-STD-278 MIL-P-20632 MIL-P-22088	
Type 303	S30300						
Type 303Se	S30323						
Type 304	S30400						
Type 304L	S30403						
Type 309	S30900						
Type 310	S31000						

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 316	S31600				purifiers (fittings, and so forth).		
Type 316L	S31603						
Type 321	S32100						
Type 347	S34700						
Type 348	S34800						
Cr-Ni-P	S30260	Bar, billet and forgings (austenitic)	DOD-F-24669/5	MIL-S-17759	For use where high strength and low magnetic permeability are required.		
Cr-Ni-Mn-P	S30210						
Type 302	S30200	Wire (austenitic)	ASTM A 313	QQ-S-763	Springs for gas and fluid valves.	MIL-V-24332 MIL-V-16556 MIL-N-52110	
Type 304	S30400						
Type 316	S31600						
Type 321	S32100						
Type 347	S34700						
Type 403	S40300	Bars and shapes (martensitic)	ASTM A 276	QQ-S-763	For high temperature use in the hardened and tempered condition. Major applications include components of steam and gas turbines, such as blading. Additional uses include steam valves, pump shafts, and other machinery parts for fans, compressors and turbines requiring high	MIL-P-17639 MIL-P-18472 MIL-V-18436 MIL-V-24332 MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-E-17807 MIL-C-19553 MIL-C-18419 MIL-C-23961 MIL-S-21433 MIL-G-17859 MIL-V-2961 MIL-V-17737 MIL-V-20064	Specify macro-exam in accordance with ASTM E 381 (one test per lot).
Type 410	S41000						
Type 414	S41400						
Type 420	S42000						
Type 440A	S44002						
Type 440B	S44003						
Type 440C	S44004						
Type 431	S43100						
Type 422	S42200	Bars (martensitic)	ASTM A 565 grade 616				
Type 405	S40500	Bars and shapes (ferritic)	ASTM A 276	QQ-S-763			

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TABLE V. Stainless steel, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 416 Type XM-6 Type 416Se Type 420F Type 420FSe Type 440F	S41600 S41610 S41623 S42020 S42023	Bars-free machining (martensitic)	ASTM A 582	QQ-S-764	Same as martensitic bars and shapes, but where increased machinability is required.	MIL-STD-278 MIL-T-24398 MIL-T-17600 MIL-T-17523 MIL-S-17849 MIL-V-24619 MIL-V-24569 MIL-V-24586 MIL-F-18502 MIL-C-19113 MIL-F-3541	
Type 405 Type 410 Type 430	S40500 S41000 S43000 S44635	Plate, sheet, strip (ferritic and martensitic)	QQ-S-766	ASTM A 176	For high temperature use in turbines and compressors, where high strength and corrosion resistance are required. Typical applications in turbines including casings	MIL-S-21427 MIL-T-24398 MIL-T-17600 MIL-T-19113 MIL-C-19553 MIL-C-23233 MIL-G-17859 MIL-S-17849 MIL-T-17523 MIL-STD-278	Specify intergranular corrosion test in accordance with ASTM A 262, practice

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TABLE V. Stainless steel, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 403	S40300	Forgings (marten- sitic)	QQ-S-763		and steam chests, nozzle block par- titions, and lube oil sumps.	MIL-STD-1689 NAVSEA 0900- LP-060-4010 MIL-S-2953	E. Pro- hibit oxalic acid screening test
Type 410	S41000						
Type 414	S41400						
Type 420	S42000						
Type 431	S43100						
Type 440A	S44002						
Type 440B	S44003						
Type 440C	S44004						
Type 422	S42200		ASTM A 565 Grade 616		Same as marten- sitic bars and shapes.	MIL-V-2961 MIL-V-20064 MIL-G-17859 MIL-C-19553 MIL-C-23961 MIL-S-21433 MIL-E-17807 MIL-V-17737 MIL-C-18419 MIL-F-18602 MIL-P-18472 MIL-C-19113 MIL-S-17849 MIL-V-24586 MIL-P-17639 MIL-V-24619 MIL-V-24569 MIL-F-3541 MIL-T-24398 MIL-T-17600 MIL-T-17523 MIL-STD-278 MIL-STD-1689 NAVSEA 0900- LP-060-4010	

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TABLE V. Stainless steel, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Type 403	S40300	Bar, billet and forgings	DOD-F-24669/7	MIL-S-861	Steam turbine parts.	MIL-F-18602 MIL-T-24398 MIL-T-17600 MIL-T-17523 MIL-STD-278	
Type 405	S40500						
Type 410	S41000						
Type 422	S42200						
Type 403	S40300	Bar and billet (martensitic)	DOD-F-24669/7	MIL-S-862	Reframing stock for use where corrosion resistance and high strength are required.	MIL-V-17737 MIL-STD-278	
Type 410	S41000						
Type 414	S41400						
Type 420	S42000						
Type 431	S43100						
Type 440A	S44002						
Type 440B	S44003						
Type 440C	S44004						
Grade MT403	S40300	Seamless tube-mechanical (martensitic)	ASTM A 511	MIL-T-52010	Intended for machinery frames, bushings, and various types of hollow cylindrical or ringlike formed parts.		Invoke tensile test and conformance to mechanical properties.
Grade MT410	S41000						
Grade MT414	S41400						
Grade MT431	S43100						
Type 403	S40300	Wire (martensitic)	ASTM A 580	QQ-S-763	Springs for gas and fluid valves.	MIL-V-18436 MIL-V-2961	
Type 410	S41000						
Type 414	S41400						
Type 431	S43100						
Type 440C	S44004						

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
17-4PH (type 630)	S17400	Bar, shapes, and wire (precipitation hardening)	ASTM A 564	MIL-C-24111 ASTM A 441	Intended for elevated temperature applications such as high temperature heat exchangers, springs, bellows, and fasteners.		
17-7PH (type 631)	S17700						
15-7PH (type 632)	S15700						
AM355 (type 634)	S35500						
17-4PH (type 630)	S17400	Plate, sheet and strip (precipitation hardening)	ASTM A 693	MIL-S-81506 MIL-S-8955 MIL-S-25043			
17-7PH (type 631)	S17700						
15-7PH (type 632)	S15700						
AM350 (type 633)	S35000						
AM355 (type 634)	S35500						
17-4PH (grade 61)	S17400	Forgings (precipitation hardening)	ASTM A 579	MIL-C-24111			
17-7PH (grade 62)	S17700						
15-7PH (grade 63)	S15700						
AM355 (grade 64)	S35500						

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TABLE VI. Stainless steel castings.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
CF-3 (19-CR-9Ni)	J92500	Castings	MIL-G-24707/3	ASTM A 743 Grade CF8 ASTM A 376 MIL-S-867 class I MIL-S-17509 class I 46S27	Austenitic alloys used for steam turbine equipment, piping system components, feed and condensate pumps, and air compressors. Hardenable alloys used in similar applications where improved wear and erosion resistance are required, such as valve bodies, disks, and seats.	MIL-G-17859 MIL-C-19113 MIL-S-17849 MIL-C-19553 MIL-P-17639 MIL-P-18472 MIL-T-24398 MIL-T-17523 MIL-T-17600 MIL-STD-278 MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-STD-777 MIL-STD-438	
CF-8 (19 Cr-9Ni)	J92600						
CF-8C (19 Gr-10Ni with Cb)	J92710			MIL-S-867 class II MIL-S-17509 class II			
CF-3M (19 Cr-10Ni with Mo)	J92800						
CF-8M (19 Gr-10Ni with Mo)	J92900			MIL-S-867 class III MIL-S-17509 class III			
CN-7H (20 Cr-29Ni with Cu and Mo)	J95150			ASTM A 744			

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
CA-15 (12 Cr)	J91150	Castings	MIL-S-16993	MIL-S-16993 class 1			
CA-15M (12 Cr)	J91151			MIL-S-16993 class 2			
CA-6NM (12 Cr-4Ni with Mo)	J91540						

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TABLE VII. Nickel base alloys.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel-copper (monel 400)	N04400	Rod, bar forgings, wire, shapes, sheet, strip and plate	QQ-N-281 class A	MIL-N-894 NAVY 46-M-7	Used primarily where good corrosion resistance and anti-ignition properties are required for oxygen and hydrogen piping systems; air, water, and oil service valves (body and internal trim components); and seawater or fresh water pumps (shafting, casing bolts, and nuts). Other miscellaneous nickel-copper components are used in distillation units, dehydrators, condensers, compressors, comminutors, hydraulic actuators, coolers, and air conditioning equipment.	MIL-C-19553 MIL-C-18419 MIL-C-23961 MIL-C-19179 MIL-D-18641 MIL-H-24135 MIL-F-18866 MIL-F-3541 MIL-M-19852 MIL-V-18683 MIL-P-17639 MIL-P-17840 MIL-P-18472 MIL-P-24475 MIL-P-18682 MIL-P-18547 MIL-D-23523 MIL-F-24402 MIL-V-1189 MIL-V-24439 MIL-V-22549 MIL-V-24336 MIL-V-24384 MIL-V-24509 MIL-V-15508 MIL-V-17547 MIL-V-24569 MIL-V-23953 MIL-V-20064 MIL-V-16556 MIL-S-1222 MIL-A-24533 MIL-C-19836	R-405 is a free machining modification of monel 400.
Nickel-copper (monel R-405)	N04405		QQ-N-281 class B				

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TABLE VII. Nickel base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel-copper (monel 400)	N04400	Pipe and tube, seamless	MIL-T-1368		Typical applications include: High pressure drain for SSTG sets. High pressure drain-collection header and cross over. Plumbing system (for gaseous oxygen). Coolant discharge system. Internal	MIL-C-15730 MIL-C-19713 MIL-R-24085 MIL-S-24603 MIL-C-15430 MIL-C-24231 MIL-STD-278 MIL-C-19113 MIL-H-15787 MIL-V-2187 MIL-V-15358 MIL-P-19131 MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-F-23509 NAVSEA 0900-LP-001-7000 NAVSEA 0900-LP-001-7000 MIL-STD-278 MIL-C-15730 MIL-C-19113 MIL-V-24439	

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TABLE VII. Nickel base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel-copper aluminum (K-monel)	N05500	Bar, rod, flats, forged parts, plate, sheet, strip, and wire	QQ-N-286	MIL-N-17506 NAVY 46-N-5 QQ-N-286 class B monel 502	storage tanks. Pressure relief tanks. Blow down lines. Oil, hydraulic, and fresh water coolers. Oxygen and helium valves. Air compressors. Used for applications that require the corrosion resistance of monel 400 but greater strength. Monel 502 is a modification of K-monel that is no longer produced. Numerous applications occur in the following equipment: pumps, sewage, compressors, coolers and compressors, oil heaters, distillation units, dehydrators, valves, and condensers. Some of the major uses of the alloys in pumps are	MIL-C-15730 MIL-R-24085 MIL-V-24332 MIL-V-22133 MIL-V-24509 MIL-V-24569 MIL-V-23953 MIL-V-18683 MIL-P-17639 MIL-P-17840 MIL-P-18472 MIL-P-24475 MIL-P-18682 MIL-P-18547 MIL-C-19553 MIL-S-24603 MIL-H-24299 MIL-D-18641 MIL-H-24135 MIL-D-23523 MIL-C-15430 MIL-S-1222 MIL-P-19131	

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TABLE VII. Nickel base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel-copper (monel M-35)		Castings	MIL-C-24723 composition M-30C	QQ-N-288 composition A and E MIL-C-15345 alloy 18 and 19 QQ-C-551 NAVY 46-M-1	Used for parts requiring high strength, pressure tightness, and high resistance to corrosion and mechanical wear. Monel M-35 has lower strength than either H or S monel, but is weldable. H-monel is used when non-galling and anti-seizing characteristics are required. S-monel combines these properties with	MIL-D-18641 MIL-H-24135 MIL-S-17849 MIL-C-24231	
Nickel-copper (H-monel)			MIL-C-24723 composition M-30H	QQ-N-288 composition B MIL-C-15345 alloy 16		MIL-F-15618 MIL-V-1189 MIL-V-23953 MIL-V-18436 MIL-V-15508 MIL-V-17547 MIL-V-17501 MIL-V-20065 MIL-V-24332 MIL-V-24272 MIL-V-22133 MIL-V-24509 MIL-P-17840 MIL-P-18472 MIL-C-19553 MIL-C-18419 MIL-C-23961 MIL-V-2961 MIL-V-24336	
Nickel-copper (S-monel)			MIL-C-24723 composition M-25S	QQ-N-288 composition C and D			

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TABLE VII. Nickel base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
				MIL-C-15345 alloy 17 and 26 NAVY 46-N-7	maximum hardness for compressive loading applications. Applications include parts for pumps, valves, turbines, compressors, dehydrators, distillers, and strainers.	MIL-V-18683 MIL-D-17847 MIL-V-22549 MIL-V-24394 MIL-P-17639 MIL-P-24475 MIL-P-18682 MIL-V-15358 MIL-C-18087 MIL-T-24398 MIL-T-17600 MIL-T-17523 MIL-G-17859 MIL-STD-278 MIL-STD-1689 NAVSEA 0900-LP-060-4010 NAVSEA 0900-LP-001-7000	
Inconel 600	N06600	Bar and rod	ASTM B 166	MIL-N-6710	Used to machine bosses, tail-pieces, thread-pieces, adapters, caps and plugs.	MIL-T-24398 MIL-V-24336 MIL-STD-278 NAVSEA 0900-LP-060-4010 MIL-STD-1689 NAVSEA 0900-LP-001-7000	
		Plate, sheet, and strip	ASTM B 168	MIL-N-6840	Used to machine seal plugs and used in manufacture of hydrogen receiver.	MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-STD-278	

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TABLE VII. Nickel base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Inconel 600	N06600	Plate, sheet strip	ASTM B 168			MIL-F-23509 NAVSEA 0900-LP-001-7000	
		Forgings	ASTM B 564	MIL-N-6710	Used to machine bosses, tail-pieces, thread-pieces, adapters, caps, and plugs.	MIL-T-24398 MIL-V-24336 MIL-STD-278 NAVSEA 0900-LP-060-4010 NAVSEA 0900-LP-001-7000 MIL-STD-1689	
		Pipe, seamless	ASTM B 167	MIL-T-7840	In addition to piping, used to machine bulkhead sleeves.	NAVSEA 0900-LP-001-7000 MIL-STD-278	
Inconel 625	N06625	Wire	QQ-W-390	JAN-W-562	High temperature springs for use in valves and lubrication fittings.	MIL-V-15508 MIL-V-15358 MIL-V-17501 MIL-F-3541	
		Bar and rod	ASTM B 446		Used for ambient temperature seawater applications in valves and pumps where improved corrosion resistance is required compared to monel. Also used for	MIL-STD-777 MIL-STD-438	Caution: Susceptible to crevice corrosion in non metal crevices in seawater.
		Plate, sheet, and strip	ASTM B 443				
		Pipe and tube	ASTM B 444				

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TABLE VII. Nickel base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Castings	MIL-C-24615		elevated temperature exhaust gas systems found in submarines and ships.		
Inconel 750	N07750	Bars, forgings, and forging stock	ASTM B 637	MIL-N-8550	Used for turbine packing springs requiring oxidation resistance at elevated temperatures.	MIL-T-24398 MIL-T-17523 MIL-T-17600	
		Sheet and strip	MIL-N-7786				

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TABLE VIII. Copper base alloys, wrought.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Oxygen-free electronic (OFE)	C10100	Sheet, strip, plate, and rolled bar	ASTM B 152	QQ-C-576	Compressor gas-ket; fluid cooler and air ejector shells; regulator float for distillation units.	MIL-C-15730 MIL-C-19113 MIL-STD-278 MIL-E-15465 MIL-C-17557 MIL-C-19713 MIL-D-18641	Acquisition documents shall specify embrittlement test for all alloys except C11000, C11300, C11400, C11600, C12500, and C14200.
Oxygen-free without residual deoxidants (OF)	C10200						

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Oxygen-free extra-low phosphorus	C10300						
Oxygen-free silver bearing (OFS)	C10400 C10500 C10700						
Oxygen-free low phosphorus	C10800						
Electrolytic tough pitch (ETP)	C11000						
Silver bearing tough pitch (STP)	C11300 C11400 C11600						
Phosphorized, low residual phosphorus (DLP)	C12000						

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Phosphor-ized, high residual phosphorus (DHP)	C12200						
Phosphor-ized, silver bearing (DPS)	C12300						
Fire-refined tough pitch (FRTP)	C12500						
Phosphorus deoxidized, arsenical (DPA)	C14200						
Oxygen-free without residual deoxidants (OF)	C10200	Tube (water tube), seamless	ASTM B 88	WW-T-799	Water chiller and refrigerant lines.	MIL-R-16743 MIL-R-24085 MIL-C-17557 MIL-C-2939 MIL-A-23798 MIL-H-3117 MIL-H-16235 MIL-U-17293	
Oxygen-free, extra-low phosphorus	C10300						

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Oxygen-free low phosphorus	C10800						
Phosphorized, low residual phosphorus (DLP)	C12000						
Phosphorized, high residual phosphorus (DHP)	C12200						
Oxygen-free, without residual deoxidants (OF)	C10200	Tube (general purpose), seamless	MIL-T-24107	WW-T-797 ASTM B 75	Various tube lines on surface ships and submarines, including the following: fresh water, potable, and condensate; hydraulic oil; lubricating; sewage and cleaning fluid; prairie-masker air; gas (air, nitrogen, helium, and oxygen); liquid oxygen and nitrogen; steam drains.	MIL-F-1183 NAVSEA 0900-LP-001-7000 MIL-STD-777 MIL-STD-438 MIL-E-23457 MIL-U-17293 MIL-C-15730 MIL-D-18641	
Oxygen-free, extra low phosphorus	C10300						
Oxygen-free, low phosphorus	C10800						

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Phosphor- ized, low residual phosphorus (DLP)	C12000						
Phosphor- ized, high residual phosphorus (DHP)	C12200						
Phosphor- ized deoxidized, arsenical (DPA)	C14200						
Oxygen-free without residual deoxidants (OF)	C10200	Pipe, seamless	ASTM B 42	WW-P-377	After condenser tubes for air ejector and fluid cooler shells.	MIL-E-15465 MIL-C-17557	
Oxygen- free, extra-low phosphorus	C10300						
Oxygen- free, low phosphorus	C10800						

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Phosphorized, low residual phosphorus (DLP)	C12000						
	C12200						
Phosphorized, high residual phosphorus (DHP)	C17200	Rod and bar	ASTM B 196	QQ-C-530 alloy 172 MIL-C-6941 ASTM B 196 alloy 25 ASTM B 194 alloy 25	Intended for use as springs, bearings, valve sleeves, and seats, gears, and so forth where high strength, good corrosion resistance, and high electrical conductivity are required.		Add supplementary requirements to cover (1) tensile tests for all temperatures and thicknesses of as-supplied material; (2) substitution of hardness for tensile properties (when specified).
	C17300	Wire	ASTM B 197	QQ-C-530 alloy 172 and 173 MIL-C-6941			
	C17000 C17200	Plate, sheet, and strip	ASTM B 194	QQ-C-533 alloy 170 and 172 ASTM B 194 alloy 165 and 25			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Gilding metal	C21000	Plate, sheet, strip, and rolled bar (unleaded)	ASTM B 36	MIL-C-21768 alloy 210	Castings for heat exchangers and baffles for fluid coolers; tie rods and spacers for distillation units; fittings for nonferrous valves and nozzles; fuel filters.	MIL-C-15730 MIL-V-20064 MIL-H-24146 MIL-D-18641 MIL-D-16196 MIL-F-15618 MIL-N-52110	
	Commercial bronze			C22000			
Red brass	C23000			QQ-B-613 alloy 230			
Cartridge brass	C26000			QQ-B-613 alloy 260 MIL-C-50 alloy 260			
	C27200						
Leaded brass	C34200	Plate, sheet, strip, and rolled bar	ASTM B 121	QQ-B-613 alloy 342	Same as ASTM B 36 and QQ-B-613 for unleaded brass.	MIL-C-15730 MIL-H-24146 MIL-V-20064 MIL-N-52110	
Free-turning brass	C36000	Rod, bar and shapes (leaded)	ASTM B 16	QQ-B-626 alloy 360	Bodies, bonnets, and disks for non-ferrous valves; parts for nonmagnetic gears.	MIL-C-15730 MIL-V-18436 MIL-G-17859 MIL-H-24146 MIL-N-24427 MIL-N-24408 MIL-V-20064 MIL-S-21433	

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Commercial bronze	C22000	Tube, seamless	MIL-T-20168		Shells for fluid coolers; fuel nozzles; pipe and fittings.	MIL-C-19836 MIL-C-15730 MIL-E-23457 MIL-N-52110 MIL-C-19713 MIL-F-1183 NAVSEA 0900-LP-001-7000 MIL-C-17557	
	Red brass						
Cartridge brass	C26000						
Red brass	C23000	Pipe, seamless	ASTM B 43	WW-P-351 alloy 230			
Naval brass	C46200	Plate, sheet, and strip	QQ-B-639	QQ-B-639 alloy 462 or composition 4 MIL-B-994 composition C	Condenser plates and headers; strainers.	MIL-C-19713 MIL-C-19113 MIL-H-15787 MIL-V-1189 MIL-V-2187 MIL-V-16468 MIL-V-15358 MIL-C-19836 MIL-STD-278 MIL-C-15730 MIL-G-17859 MIL-H-24146	
				QQ-B-639 alloy 464 or composition 1 MIL-B-994 composition A			
Naval brass (uninhibited)	C46400						
Naval brass (medium leaded)	C48200			QQ-B-639 alloy 482 or composition 2 MIL-B-994 composition B			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Naval brass (high leaded)	C48500			QQ-B-639 alloy 485 or composition 3			
Naval brass	C46200	Rod, bar, and shapes	ASTM B 21	QQ-B-637 and alloy 485 or composition 3 QQ-B-639 alloy 462 or composition 4 MIL-B-994 composition C	Marine fasteners and fittings; valve stems fluid cooler spacer rods.	MIL-STD-278 MIL-C-19836 MIL-C-15730 MIL-S-21433 MIL-G-17859 MIL-H-17428 MIL-P-17840 MIL-V-24332 MIL-V-17501 MIL-V-22133 MIL-S-17849 MIL-V-15508 MIL-V-17547 MIL-N-52110 MIL-V-17501 MIL-V-22133 MIL-V-16556 MIL-F-15618 MIL-V-22549 MIL-V-24394 MIL-V-2961 MIL-S-1222 MIL-H-24146	
Naval brass (uninhibited)	C46400			QQ-B-637 and alloy 464 or composition 1 MIL-B-994 composition A			
Naval brass (medium leaded)	C48200			QQ-B-637 and alloy 482 or composition 2 MIL-B-994 composition B			
Naval brass (high leaded)	C48500			QQ-B-637 and alloy 485 or composition 3			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Red brass	C23000	Wire (unleaded)	ASTM B 134	QQ-W-321 alloy 230 and composition 3	Diaphragm actuated valves.	MIL-V-15508	
Cartridge brass	C26000			QQ-W-321 alloy 260 and composition 6			
Brass		Tubing, seamless	MIL-T-20219		Voice and pneumatic tubing.	MIL-STD-438 MIL-STD-777	
Phosphor bronze	C51000 C51100 C52400	Rod, bar, and shapes	ASTM B 139	ASTM B 139 alloy A and D QQ-B-750, QQ-P-330 and QQ-B-746 composition A and D	Fasteners, sleeve bushings, and springs in fluid coolers, distillers, and heaters.	MIL-R-24085 MIL-E-23457 MIL-E-15465 MIL-C-17557 MIL-C-15430 MIL-D-18641 MIL-D-16196 MIL-G-3111 MIL-C-16388 MIL-C-19836 MIL-C-15730 MIL-G-17859 RR-W-410 MIL-S-17849 MIL-V-22064 MIL-STD-278 MIL-H-17428 MIL-S-1222 MIL-V-17501 MIL-N-52110 MIL-C-19713 MIL-V-1189	
		Plate, sheet, strip, and rolled bar	ASTM B 103	ASTM B 103 alloy A and A1 and D QQ-B-750, QQ-P-330 and QQ-B-746 composition A and D			
		Wire	ASTM B 159	Alloy B 159 alloy A and D QQ-W-321 alloy 510 QQ-B-750 and			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Phosphor bronze	C51000	Tubing	MIL-T-3595	QQ-P-330 composition A and D QQ-W-401 alloy 510 MIL-W-16602 NAVY 22-W-5		MIL-STD-278	
Aluminum bronze	C61400	Rod, bar, and shapes	ASTM B 150	ASTM B 150 alloy 3 QQ-C-465 alloy 614 QQ-B-679 composition 5 QQ-B-663 composition 5 MIL-A-15939 composition 5	Valve seats and stems; bearings; gears; marine fasteners; water boxes, shells, tube supports, and baffles; filters and diffusers; alloy C63200 intended for general seawater applications.	MIL-D-18641 MIL-C-15430 MIL-F-24402 MIL-E-15465 MIL-G-17557 MIL-D-16196 MIL-A-24533 MIL-C-15730 MIL-G-17859 MIL-N-24427 MIL-F-15618 MIL-D-23523 MIL-V-22549 MIL-V-24394 MIL-V-24109 MIL-V-2961 MIL-V-2042 MIL-V-24232 MIL-C-18419 MIL-C-23961 MIL-C-19836 MIL-C-16388	
Nickel-aluminum bronze	C63000			ASTM B 150 alloy 2 QQ-C-465 alloy 630 QQ-B-679 composition 2 QQ-B-663 composition 2			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks	
Commercial	UNS							
Nickel-aluminum bronze	C63000	Rod, bar and shapes	ASTM B 150	MIL-A-15939 composition 2		MIL-F-15618 MIL-C-19553 MIL-V-1189 MIL-C-19713 MIL-H-15787 MIL-STD-278 MIL-S-1222 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-C-24231		
	C63200							QQ-C-465 alloy 632 and 632M MIL-B-24059
	C64200							QQ-C-465 alloy 642
Aluminum bronze	C60600	Plate, sheet strip, and rolled bar	QQ-C-450	QQ-C-450 alloy 606 QQ-B-679 composition 3 QQ-C-450 alloy 610 QQ-C-450 alloy 613 QQ-C-450 alloy 614 QQ-B-679 composition 5 MIL-A-15939 composition 5 ASTM B 169	Tube sheets, shells, and baffles for distillers; marine bed-plates.	MIL-C-18419 MIL-C-19553 MIL-D-16196 MIL-V-1189 MIL-C-19836 MIL-H-17428 MIL-F-15618 MIL-R-24085 MIL-C-15730 MIL-C-16388 MIL-C-23961 MIL-STD-278 NAVSEA 0900-LP-001-7000		
	C61000							
	C61300							
	C61400							

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Aluminum bronze	C62300	Forgings (hot pressed)	MIL-B-16166 alloy 623 alloy 630	QQ-C-465 alloy 630 MIL-B-24059 (alloy 63200)	Diesel engine and gear assembly parts; alloy C63200 intended for general sea-water applications.	MIL-S-1222 MIL-C-15730 MIL-G-17859 MIL-N-24427 MIL-F-15618 MIL-D-23523 MIL-V-22549 MIL-V-24394 MIL-V-24109 MIL-V-2961 MIL-V-2042 MIL-V-24232 MIL-D-18641 MIL-E-23457 MIL-A-24533 MIL-C-19553 MIL-C-19713 MIL-STD-278 NAVSEA 0900-LP-001-7000	Hot forged bar, rod, and shapes shall not be used in seawater service unless heat treated in accordance with ASTM B 283.
	C63000						
Nickel-aluminum bronze	C62300	Forging stock (rod bar, and shapes)	ASTM B 124 UNS C62300, C63000, C63200	QQ-B-663 composition 2 (alloy 63000) MIL-A-15939 composition 2 (alloy C63000) QQ-A-630 and QQ-B-679 composition 2 (alloy C63000) QQ-C-465 alloy 630 alloy 632			
	C63000						
Copper-nickel silicon alloy	C64700	Bar and rod	QQ-C-591		Marine fasteners; tube sheets, heads, and plates; pump rotors.	MIL-C-15730 MIL-C-16388 MIL-C-23961 MIL-H-17428 MIL-H-24299 MIL-P-18472 MIL-P-18682 MIL-P-18547 MIL-V-24509 MIL-V-24569 MIL-C-19836 MIL-C-18419	
	Low-silicon bronze	Bar, rod, and shapes	ASTM B 98	ASTM B 98 alloy B QQ-C-591 alloy 651 MIL-C-17516 composition 2			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
High-silicon bronze	C65500	Bar, rod, and shapes	ASTM B 98	ASTM B 98 alloy A QQ-C-591 alloy 655 MIL-C-17516 composition 1		MIL-H-15787 MIL-P-19131 MIL-S-1222 MIL-STD-278 MIL-C-19713 MIL-C-19553 MIL-C-18419 MIL-P-19131 MIL-F-15618	
Leaded high-silicon bronze	C66100			ASTM B 98 alloy D QQ-C-591 alloy 661			
Copper-nickel silicon alloy	C64400	Sheet and strip	ASTM B 422				
Low-silicon bronze	C65100	Plate, sheet, strip, and rolled bar	QQ-C-591 alloy 651	MIL-C-17516 composition 2			
High-silicon bronze	C65500		QQ-C-591 alloy 655	MIL-C-17516 composition 1			
High-silicon bronze	C65500	Die forgings (hot pressed)	QQ-C-591 alloy 655				
Copper-nickel-silicon alloy	C64700	Wire	ASTM B 412	QQ-C-591 alloy 647			

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Low-silicon bronze	C65100	Wire (general purpose)	ASTM B 99	QQ-C-591 alloy 651 MIL-C-17516 composition 2			
	C65500			QQ-C-591 alloy 655 MIL-C-17516 composition 1			
Manganese bronze	C67000	Rod, bar, and shapes	ASTM B 138	QQ-B-728 class B QQ-M-80 class B	Parts for nonmagnetic propulsion gear assemblies and turbines; parts for duplex strainers; valve stems and yoke bushings; fasteners.	MIL-G-17859 MIL-S-17849 MIL-S-1222 MIL-P-17840 MIL-STD-278 NAVSEA 0900-LP-001-7000 MIL-V-1189 MIL-V-2187 MIL-E-23457	
	C67500			QQ-B-728 class A QQ-M-80 class A			
	C67500	Die forgings (hot pressed)	ASTM B 283	QQ-M-80 class A QQ-B-728 class A			
	C67500	Plate, sheet, strip, rolled bar and wire	QQ-B-728 class A	QQ-M-80 class A			
Nickel-silver	C76400	Rod and bar	ASTM B 151	QQ-C-586 alloy 764	Intended for instrument parts requiring good		

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel silver	C77000	Bar and rod	ASTM B 151	alloy 770	corrosion resistance, such as springs.		
	C79200			alloy 792			
		Plate, sheet, strip and rolled bar	ASTM B 122	QQ-C-585 and QQ-C-586			
	C74500			alloy 745			
	C75200						
	C77000		alloy 752				
			alloy 770				
90-10 cop-per nickel	C70600	Rod, bar plate, sheet, strip, and wire	MIL-C-15726 composition 70600		(1) Soft rod - machining of tail-pieces, adapters, bosses, thread-pieces, couplings, sight glass housings, vent and drain fittings, retaining rings, bodies for sight flow indicators, pressure assemblies and plugs.	MIL-STD-1689 NAVSEA 0900-LP-060-4010 NAVSEA 0900-LP-001-7000 MIL-E-15465 MIL-C-19836 MIL-C-15730 MIL-C-16388 MIL-C-19713 MIL-R-24085 MIL-C-15430 MIL-C-19113 MIL-C-18419 MIL-C-23961 MIL-F-24202 MIL-P-18682 MIL-F-18866	
70-30 cop-per-nickel	C71500		MIL-C-15726 composition C71500		Used in condensate and feed recirculating system, auxiliary system,		

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
70-30 copper nickel	C71500	Rod, bar, plate sheet, strip and wire	MIL-C-15726 comp C71500		auxiliary drain system, fuel oil compensation water piping, ASW system. (2) Hard temper rod - machining of tailpieces, pene- trations, strain- ers, adapters. Used in EAFW cool- ing expansion tank, HP air stuf- fing box assembly piping penetra- tions, missile gas piping, torpedo air piping. (3) Soft plate - manufacture of drain separators, backing rings, various tanks. Used in HP air system, potable water pressure tank, RPFW aux- iliary expansion tank, EAFW cooling expansion tank,	MIL-H-17428 MIL-H-24299 MIL-D-17847 MIL-F-24402 MIL-V-24109 MIL-V-20064 MIL-V-15020 MIL-STD-278 MIL-R-16743 MIL-D-16196 MIL-H-15787 MIL-F-15618 MIL-D-23523 MIL-C-17557 MIL-D-18641	

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
					charging water system. (4) Hard temper plate - manufacture of flanges, spacers, seat retainers, flanged adapter assemblies, air trip assemblies, and RPFW expansion tank. Used in 12,000 GPD steam supply piping, oxygen-pressure reducing manifold, trim and drain system. EAFW coolant pump suction piping, ASW continuous vents.		
90-10 copper-nickel	C70600	Forgings	MIL-C-24679	MIL-C-15726			
70-30 copper-nickel	C71500						
90-10 copper-nickel	C70600	Tube	MIL-T-16420 composition 90-10		Hydraulic, pneumatic, and seawater systems.	MIL-C-17557 MIL-C-19713 MIL-D-17847 MIL-STD-1689 NAVSEA 0900-LP-060-4010	
70-30 copper-nickel	C71500		MIL-T-16420 composition 70-30				

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
						NAVSEA 0900-LP-001-7000 MIL-C-19836 MIL-C-15730 MIL-C-16388 MIL-C-19113 MIL-C-18419 MIL-C-23961 MIL-C-19179 MIL-W-17265 MIL-D-16196 MIL-F-1183 MIL-F-24202 MIL-H-24299 MIL-P-17639 MIL-F-15618 MIL-STD-278 MIL-R-16743 MIL-C-15430	
90-10 cop- per nickel	C70600	Tube (condenser and heat exchanger)	MIL-T-15005 composition 90-10		Surface ship and submarine conden- sers, evaporators, and heat exchangers.	NAVSEA 0900-LP-001-7000 MIL-E-15465 MIL-C-19836 MIL-C-15730 MIL-C-16388 MIL-C-19713 MIL-C-15430 MIL-C-18419 MIL-C-23961 MIL-D-18641 MIL-D-16196 MIL-C-19113 MIL-D-23523 MIL-STD-278 MIL-R-24085	
70-30 cop- per nickel	C71500		MIL-T-15005 composition 70-30				

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TABLE VIII. Copper base alloys, wrought - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
90-10 cop- per nickel	C70600	Tube (condenser and heat exchanger with integral fins)	MIL-T-22214 composition 90-10				
70-30 cop- per nickel	C71500		MIL-T-22214 composition 70-30				

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TABLE IX. Cast copper base alloys.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded red brass (Muntz metal)	C83600	Static cast	QQ-C-390 type I	ASTM B 145 alloy 4A	Low pressure valves, pipe fittings, gasoline and oil line fittings, small gears fire equipment, general plumbing hardware.	MIL-C-17949	QQ-C-390, type III is an acceptable substitute for QQ-C-390, type I and type II.
				QQ-C-390 alloy B5 or 836 (type I)		MIL-C-17933	
				ASTM B 62		MIL-E-23457	
		Centrifugal cast	QQ-C-390 type II	QQ-B-1005 composition 2		MIL-N-52110	
				QQ-B-691 composition 2		MIL-V-20064	
				MIL-B-16444		MIL-V-15020	
		Continuous cast	QQ-C-390 type III	ASTM B 584		NAVSEA 0900-LP-001-7000	
				QQ-C-390 alloy B5 or 836 (type II)		MIL-A-24533	
				ASTM B 62		MIL-D-18641	
				MIL-C-15345 alloy 1		MIL-S-17849	
				QQ-B-1005 composition 2		MIL-F-1183	
				MIL-B-16444		MIL-F-15618	
				ASTM B 271		MIL-D-23523	
				QQ-C-390 alloy B5 or 836 (type III)		MIL-V-18436	
				QQ-B-1005 composition 2		MIL-C-19553	
				MIL-B-16444		MIL-S-21433	
				ASTM B 505		MIL-H-24146	
						MIL-V-15358	
				QQ-C-390 alloy B5 or 836 (type III)		MIL-G-17859	
				QQ-B-1005 composition 2		MIL-C-18087	
				MIL-B-11553 composition 2		MIL-F-24227	
				MIL-B-16444 composition 2			
				MIL-B-16444			
				ASTM B 505			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded red brass (hydraulic bronze)	C83800	Static cast	QQ-C-390 type I	QQ-C-390 alloy B4 or 838 (type I) ASTM B 584 ASTM B 145 alloy 4B QQ-B-1005 composition 17	Air, gas, water, fittings, carburetors, injectors, plumbing supplies.	MIL-C-17949 MIL-C-17933 MIL-E-23457 MIL-N-52110 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-F-24227	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy B4 or 838 (type II) ASTM B 271 QQ-B-1005 composition 17			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy B4 or 838 (type III) ASTM B 505 QQ-B-1005 alloy 17 MIL-B-11553 composition 17			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded semi-red brass (valve metal)	C84400	Static cast	QQ-C-390 type I	QQ-C-390 alloy B2 or 844 (type I) ASTM B 145 alloy 5A QQ-B-1005 composition 11 MIL-B-18343 ASTM B 584	Threaded pipe, ornamental fixtures, electrical fixtures.	MIL-C-17949 MIL-C-17933 MIL-E-23457 MIL-N-52110 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-N-24408 MIL-F-24227	
		Centrifugal	QQ-C-390 type II	QQ-C-390 alloy B2 or 844 (type II) QQ-B-1005 composition 11 ASTM B 271			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy B2 or 844 (type III) QQ-B-1005 composition 11 MIL-B-11553 composition 11 ASTM B 505			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded semi-red brass	C84800	Static cast	QQ-C-390 type I	QQ-C-390 alloy 848 (type I) ASTM B 584	Threaded pipe, ornamental fixtures, electrical fixtures.	MIL-C-17949 MIL-C-17933 MIL-E-23457 MIL-N-52110 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy 848 (type II) ASTM B 271			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy 848 (type III) ASTM B 505			
Leaded yellow brass (high copper yellow brass)	C85200	Static cast	QQ-C-390 type I	QQ-C-390 alloy A4 or 852 (type I) ASTM B 584 ASTM B 146 alloy 6A QQ-B-621 class C MIL-B-17668 composition 2	Plumbing fittings, fixtures, hardware, ornamental brass, low pressure valves, good machining properties.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-G-3111	
		Static cast	QQ-C-390 type I	QQ-C-390 alloy A3 or 854 (type I) ASTM B 584 ASTM B 146			
Leaded yellow brass (no. 1 yellow brass)	C85400	Static cast	QQ-C-390 type I	QQ-C-390 alloy A3 or 854 (type I) ASTM B 584 ASTM B 146		MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533	

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
				alloy 6B QQ-B-621 class B MIL-B-17668 composition I		MIL-D-18641 MIL-S-17849 MIL-G-3111	
Leaded yellow brass (leaded naval brass)	C85700	Static cast	QQ-C-390 type I	QQ-C-390 alloy A1, A2, or 857 (type I) ASTM B 584 ASTM B 146 alloy 6C MIL-B-17511 QQ-B-621 class A	Bushings, hardware, fittings, ornamental brass, lock hardware; for corrosion resistant castings where strength or bearing requirements are unimportant.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-STD-278 MIL-C-18087	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy A1, A2, or 857 (type II) ASTM B 271 MIL-C-15345 alloy 3			
Manganese bronze (high strength yellow brass)	C86200	Static cast	QQ-C-390 type I	QQ-C-390 alloy C4 or 862 (type I) ASTM B 584 QQ-B-726 class B	For superior strength or toughness; resistance to corrosion by seawater is unsatisfactory; gears, gun mounts, bushings, bearings.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849	

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
				MIL-B-16522 class B NAVY 46-B-29		MIL-STD-278 MIL-C-18419	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy C4 or 862 (type II)			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy C4 or 862 (type III)			
Manganese bronze (high strength yellow brass)	C86300	Static cast	QQ-C-390 type I	QQ-C-390 alloy C7 or 863 (type I) QQ-B-726 class C MIL-B-16522 class I ASTM B 584	High strength alloy for gears, cams, bearings, cylinder parts; not to be used in marine atmos- pheres, ammonia, or highly corro- sive environment.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900- LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-C-18419 MIL-C-18087	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy C7 or 863 (type II) MIL-C-15345 alloy 6			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy C7 or 863 (type III)			
Manganese bronze (lead high strength yellow brass)	C86400	Static cast	QQ-C-390 type I	QQ-C-390 alloy C2 or 864 (type I) ASTM B 147 alloy 7A QQ-B-726 class D ASTM B 584	Shock loaded slides, free machining bronze, bearings, worm wheels, valve stems, marine fittings, lever arms, light duty gears, propellers; is subject to stress-corrosion.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849	
Manganese bronze (high strength yellow brass)	C86500	Static cast	QQ-C-390 type I	QQ-C-390 alloy C3 or 865 (type I) ASTM B 147 alloy 8A QQ-B-726 class A MIL-B-16443 NAVY 49-B-3 ASTM B 584	Machinery requiring a little higher strength and toughness than alloy C86400; not subject to stress-corrosion.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 NAVSEA 0991-LP-023-3000 MIL-STD-278 MIL-C-18087 MIL-C-17944 MIL-C-17949 MIL-C-17933 MIL-E-23457 MIL-C-15730	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy C3 or 865 (type II) MIL-C-15345 alloy 4			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Tin bronze (g-bronze; gun metal)	C90300	Static cast	QQ-C-390 type I	QQ-C-390 alloy D5 or 903 (type I) ASTM B 143 alloy 1B QQ-B-1005 composition 3 MIL-M-16576 QQ-B-691 composition 5 QQ-L-225 composition 3 ASTM B 584 composition 3	Expansion joints, special pipe fit- tings gears, bolts, nuts, valves, pipe, pis- tons, casings, bushings, bear- ings; steam applications.	MIL-D-18641 MIL-P-17639 MIL-S-17849 NAVSEA 0900- LP-001-7000 MIL-A-24533 MIL-S-24603 MIL-T-24398 MIL-T-17523 MIL-F-1183 MIL-V-18683 MIL-P-24475 MIL-P-18682 MIL-D-23523 MIL-V-24509 MIL-P-18472 MIL-C-15730 MIL-V-24509 MIL-P-18472 MIL-C-15730 MIL-V-24569 MIL-V-15430 MIL-V-22133 MIL-P-18547 MIL-V-2042 MIL-E-15465 MIL-C-17557 MIL-C-18419 MIL-C-23961 MIL-H-15787 MIL-P-19131 MIL-H-17428 MIL-P-18547	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy D5 or 903 (type II) MIL-C-15345 alloy 8 QQ-B-1005 composition 3 ASTM B 271 MIL-M-16576			
				QQ-B-691 composition 5 QQ-L-225 composition 3			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy D5 or 903 (type III) QQ-B-1005 composition 3 MIL-M-16576 MIL-B-11553 composition 5 QQ-L-225 composition 3		MIL-V-1189 MIL-V-24332 MIL-C-19836 MIL-C-16388 MIL-C-19713 MIL-C-19553 MIL-C-19113 MIL-C-18087 MIL-F-24227	
Tin bronze (g-bronze; gun metal)	C90500	Static cast	QQ-C-390 type I	QQ-C-390 alloy D6 or 905 (type I) ASTM B 143 alloy 1A QQ-B-1005 composition 16 QQ-L-225 composition 16 ASTM B 584	Guides, bushings operating at high loads and low speeds, gears and worms; easier to machine than alloy C90300.	MIL-C-17949 MIL-C-17933 MIL-E-23457 MIL-C-15730 MIL-P-17639 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-C-15430 MIL-V-22133 MIL-P-18682 MIL-C-18419 MIL-C-23961 MIL-P-17840 MIL-P-18472 MIL-V-15508 MIL-F-24227	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy D6 or 905 (type II) QQ-B-1005 composition 16			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded tin bronze (steam or valve bronze - Navy "M")	C92200	Continuous cast	QQ-C-390 type III	QQ-L-225 composition 16 QQ-C-390 alloy D6 or 905 (type III) QQ-B-1005 composition 16 QQ-L-225 composition 16 MIL-B-11553 composition 16			
		Static cast	QQ-C-390 type I	QQ-C-390 alloy D4 or 922 (type I) ASTM B 584 MIL-B-16541 ASTM B 143 alloy 2A QQ-B-1005 composition 1 QQ-L-225 composition 1 ASTM B 61	Low and medium pressure valves, propeller shaft sleeves, hose couplings for use up to 550°F; free machining.	MIL-C-17949 MIL-C-17933 MIL-E-23457 MIL-C-15730 MIL-D-18641 MIL-P-17639 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-S-17849 MIL-F-1183 MIL-P-24475 MIL-D-23523 MIL-V-24509	

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy D4 or 922 (type II) ASTM B 271 MIL-C-15345 alloy 9 MIL-B-16541		MIL-V-24569 MIL-F-24227 MIL-P-18472 MIL-F-15618 MIL-V-22549 MIL-V-24394 MIL-V-18030 MIL-V-2961 MIL-V-2042 MIL-V-18436 MIL-V-15508 MIL-V-19772 MIL-V-17501 MIL-V-16556 MIL-V-3155 MIL-V-15020 MIL-R-16743 MIL-R-24085 MIL-N-24427 MIL-P-17840 MIL-V-24332 MIL-V-22133 MIL-C-19713 MIL-C-19553 MIL-V-1189 MIL-V-16468 MIL-V-17547 MIL-V-15358 MIL-C-19836 MIL-H-15787 MIL-C-15430 MIL-V-22133 MIL-E-15465	
				QQ-B-1005 composition 1 QQ-L-225 composition 1 ASTM B 61			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy D4 or 922 (type III) MIL-B-16541 QQ-B-1005 composition 1 QQ-B-691 composition 1 QQ-L-225 composition 1 MIL-B-11553 composition 1			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded tin bronze (leaded Navy g-bronze)	C92300	Static cast	QQ-C-390 type I	QQ-C-390 alloy D3 or 923 (type I) ASTM B 584 ASTM B 143 alloy 2B QQ-L-225 composition 6 QQ-B-1005 composition 6 MIL-B-16540	Same as alloy C90300 but easier to machine; sounder castings than alloy C90300.	MIL-C-17557 MIL-C-18087 MIL-C-19113 MIL-C-18419 MIL-C-23961 MIL-S-17803 MIL-H-17428 MIL-H-24146 MIL-P-18547 MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-C-18087 MIL-F-24227 MIL-C-15430 MIL-V-22133 MIL-P-18547	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy D3 or 923 (type II) MIL-C-15345 alloy 10 QQ-B-1005 composition 6 QQ-L-225 composition 6			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy D3 or 923 (type III) QQ-B-1005 composition 6 MIL-B-11553 composition 6 QQ-L-225 composition 6			
High leaded tin bronze (bearing bronze 660)	C93200	Static cast	QQ-C-390 type I	QQ-C-390 alloy E7 or 932 (type I) ASTM B 584 ASTM B 144 alloy 3B QQ-L-225 composition 12 QQ-B-1005 composition 12 MIL-B-16261 grade VI QQ-B-691 composition 12	General utility bearings and bushings; shock resistant.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-T-24398 MIL-T-17523 MIL-V-18683 MIL-C-18419 MIL-C-23961 MIL-C-18087 MIL-F-24227	
		Centrifugal cast	QQ-C-390	QQ-C-390 alloy E7 or 932 (type II) MIL-C-15345 alloy 12			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
High-lead tin bronze (anti-acid metal)	C93800	Static cast	QQ-C-390 type I	QQ-B-1005 composition 12 MIL-B-16261 grade VI QQ-L-225 composition 12	Bearings and bushings under light loads and high speeds.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-T-24398 MIL-T-17523 MIL-C-18419	
				QQ-C-390 alloy E7 or 932 (type III) QQ-B-1005 composition 12 MIL-B-11553 composition 12			
				MIL-B-16261 grade VI QQ-L-225 composition 12			
		Continuous cast	QQ-C-390 type III				

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Centrifugal cast	QQ-C-390 type II	MIL-B-16261 grade IV QQ-C-390 alloy E6 or 938 (type II) QQ-B-1005 composition 19 MIL-B-16261 grade IV QQ-L-225 composition 7 and 19		MIL-C-23961 MIL-F-24227	
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy E6 or 938 (type III) QQ-B-1005 composition 19 MIL-B-11553 composition 19 MIL-B-16261 grade IV QQ-L-225 composition 7 and 19			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
High-leaded tin bronze (soft bronze)	C94300	Static cast	QQ-C-390 type I	QQ-C-390 alloy E1 or 943 (type I) ASTM B 144 alloy 3E QQ-B-1005 composition 18 MIL-B-16261 grade V QQ-L-225 composition 18 ASTM B 584	Same as alloy C93800.	MIL-C-17949 MIL-C-17933 MIL-E-23457 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-T-24398 MIL-T-17523 MIL-C-18419 MIL-C-23961 MIL-F-24227	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy E1 or 943 (type II) QQ-B-1005 composition 18 MIL-B-16261 grade V QQ-L-225 composition 18			
		Continuous cast	QQ-C-390 (type III)	QQ-C-390 alloy E1 or 943 (type III)			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Nickel-tin bronze (grade A)	C94700	Static cast	QQ-C-390 type I	QQ-C-390 alloy F2 or 947 (type I) MIL-B-17528 alloy I ASTM B 584	Valve stems and bodies, bearings, gears, piston parts, nozzles, pipe fittings, bolts.	NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-STD-278 MIL-G-17859	
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy F2 or 947 (type III) MIL-B-17528 alloy I MIL-B-11553 composition 21			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Leaded nickel-tin bronze (grade B)	C94800	Static cast	QQ-C-390 type I	QQ-C-390 alloy F3 or 948 (type I) MIL-B-17528 alloy 2	Similar to alloy C94700 but with less strength and better machinability.	NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-F-24227 MIL-C-17949 MIL-C-17933 MIL-E-23457	
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy F3 or 948 (type III) MIL-B-11553 composition 22 MIL-B-17528 alloy 2			
Aluminum bronze	C95200	Static cast	QQ-C-390 type I	QQ-C-390 alloy G6 or 952 (type I) QQ-B-671 class 1 MIL-B-16033 class 1 ASTM B 148	Gun slides and mountings, worm wheels, gears, valve seats, guides, plungers, pump rods, bushings, bearings, propellers.	NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-C-18419 MIL-C-18087 MIL-C-19113 MIL-G-17859 MIL-C-15730 MIL-STD-278 MIL-T-17600 MIL-C-23961 MIL-V-22133	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy G6 or 952 (type II)			

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
				QQ-B-671 class 1 MIL-B-16033 class 1			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy G6 or 952 (type III)			
Aluminum bronze	C95300	Static cast	QQ-C-390 type I	QQ-C-390 alloy G7 or 953 (type I) QQ-B-671 class 2 MIL-B-16033 class 2 ASTM B 148	Same as alloy C95200.	MIL-C-18419 MIL-C-23961 MIL-V-22133 MIL-P-17639 MIL-V-22549 MIL-V-24394 MIL-V-2961 MIL-C-18087 NAVSEA 0900-LP-001-7000 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-T-17600	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy G7 or 953 (type II) QQ-B-671 class 2 MIL-B-16033 class 2			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy G7 or 953 (type III)			

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Aluminum bronze	C95400	Static cast	QQ-C-390 type I	QQ-C-390 alloy G5 or 954 (type I) ASTM B 148 QQ-B-671 class 3 MIL-B-16033 class 3	Same as alloy C95200.	MIL-C-18419 MIL-C-23961 MIL-V-22133 MIL-E-15465 MIL-C-18087 MIL-C-19179 NAVSEA 0900-LP-001-7000 MIL-STD-278 MIL-A-24533 MIL-D-18641 MIL-S-17849 MIL-C-15730 MIL-T-17600	
		Centrifugal cast	QQ-C-390 type II	QQ-C-390 alloy G5 or 954 (type II) MIL-C-15345 alloy I3 QQ-B-671 class 3 MIL-B-16033 class 3			
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy G5 or 954 (type III)			
Aluminum bronze	C95500	Static cast	QQ-C-390 type I	QQ-C-390 alloy G3 or 955 (type I) QQ-B-671 class 4	Same as alloy C95200.	MIL-C-18419 MIL-C-23961 MIL-V-22133 NAVSEA 0900-LP-001-7000 MIL-A-24533	

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
		Centrifugal cast	QQ-C-390 type II	MIL-B-16033 class 4 ASTM B 148 QQ-C-390 alloy G3 or 955 (type II) MIL-C-15345 alloy 14 QQ-B-671		MIL-D-18641 MIL-S-17849 MIL-C-15730 MIL-STD-278 MIL-T-17600 MIL-C-18087	
		Continuous cast	QQ-C-390 type III	QQ-C-390 alloy G3 or 955 (type III)			
Nickel-aluminum bronze (propeller bronze)	C95800	Static cast	MIL-B-24480	MIL-B-21230 alloy 1 MIL-B-23921	Propellers for submarines and surface ships; also used for general seawater applications primarily in pumps, valves, and compressors.	NAVSEA 0991-LP-023-3000 NAVSEA 0900-LP-001-7000 MIL-STD-278 MIL-C-18419 MIL-C-23961 MIL-V-22133 MIL-C-15730 MIL-C-15430 MIL-D-18641 MIL-P-17639 MIL-V-24509 MIL-V-24569 MIL-R-24085 MIL-G-17859	

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TABLE IX. Cast copper base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
						MIL-P-24475 MIL-V-22549 MIL-V-24394 MIL-V-24109 MIL-V-22133 MIL-V-2961 MIL-V-2042 MIL-V-24232 MIL-C-18087	
		Centrifugal cast	MIL-B-24480	MIL-B-23921 MIL-C-15345 alloy 28			
Copper-nickel alloy 90-10	C96200	Static and centrifugal cast	MIL-C-20159 alloy C96200	MIL-C-15345 alloy 25	For piping system components (fittings flanges, valves, and so forth), pump bodies, and other applications requiring resistance to seawater corrosion.	MIL-STD-1689 NAVSEA 0900-LP-060-4010 NAVSEA 0900-LP-001-7000 MIL-H-17428 MIL-P-17639 MIL-V-24332 MIL-STD-278 MIL-P-24475 MIL-C-18087 MIL-C-15730 MIL-C-15430 MIL-D-18641 MIL-P-17840 MIL-C-19836 MIL-R-24085 MIL-P-18682 MIL-F-15618 MIL-F-24402 MIL-V-2042 MIL-V-18436	
70-30	C96400		MIL-C-20159 alloy C96400	MIL-C-15345 alloy 24			

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TABLE X. Titanium alloys.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Unalloyed titanium	R50700	Bars (rolled or forged) and reworking stock	MIL-T-9047 composition CP-70	MIL-T-9047 composition 1 and type I composition A	Special control valves; balls for seawater ball valves; and turbine blades.	MIL-T-17523 MIL-STD-278 MIL-S-1222 MIL-STD-438	
Titanium alloy (Ti-5Al-2.5 Sn)	R54520		MIL-T-9047 composition 5Al-2.5 Sn	MIL-T-9047 composition 2 and type II composition A			
Titanium alloy (Ti-6Al-4V)	R56400		MIL-T-9047 composition 6Al-4V	MIL-T-9047 composition 6 and type III composition A			
Titanium (Ti-6Al-4V ELI)	R56401		MIL-T-9047 composition 6A-4V (ELI)	MIL-T-9047 composition 7 and type III composition B			
Unalloyed titanium	R50700	Sheet, strip, and plate	MIL-T-9046 composition CP-1	MIL-T-9046, type I, composition B ASTM B 265 grade 4	Marine applications, such as seawater heat exchanger plates and turbine engine casings.	MIL-STD-278	

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TABLE X. Titanium alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
	R50550		MIL-T-9046 composition CP-2	MIL-T-9046, type I, composition C ASTM B 265 grade 3			
	R50400		MIL-T-9046 composition CP-3	MIL-T-9046, type I, composition A ASTM B 265 grade 2			
	R50250		MIL-T-9046 composition CP-4	ASTM B 265 grade 1			
Titanium alloy (Ti-5Al-2.5Sn)	R54520		MIL-T-9046 composition A-1	MIL-T-9046, type II, composition A ASTM B 265 grade 6			
Titanium alloy (Ti-6Al-4V)	R56400		MIL-T-9046 composition AB-1	MIL-T-9046 type III, composition C, composition 6, and type III, composition C ASTM B 265 grade 5			

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TABLE X. Titanium alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
Titanium alloy (Ti-6Al-4V ELI)	R56401		MIL-T-9046 composition AB-2	MIL-T-9046 type III, composition D, composition 7, and type III, composition D			
Unalloyed titanium	R50250	Tube	ASTM B 338 grade 1 ASTM B 337 grade 1		For use in surface ship condensers, evaporators, and heat exchangers.		
	R50400		ASTM B 338 grade 2 ASTM B 337 grade 2				
	R50550		ASTM B 338 grade 3 ASTM B 337 grade 3				
Titanium alloy (Ti-3Al-2.5V)	R56320		ASTM B 338 grade 9 ASTM B 337 grade 9				
Titanium alloy (Ti-6Al-4V)	R56400	Castings	ASTM B 367 grade C-5		Balls for ball valves.	MIL-STD-278	

TABLE XI. Aluminum base alloys.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
1100 (commercial purity)	A91100	Bar, rod, and wire (rolled or cold finished)	ASTM B 211	QQ-A-225	Various parts for coolers and fans, hydraulic actuators, bar type grating, and gear assemblies	MIL-G-17859 MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-STD-278 MIL-S-1222 MIL-F-18953	Where applicable, specify requirement for yield strength
	A93003			QQ-A-225/1 QQ-A-411			
5052	A95052	Rivet and cold-heading wire and rods	ASTM B 316	QQ-A-225/2 QQ-A-356	For manufacture of rivets used in various types of ventilation fans.	MIL-G-18015 MIL-A-24533 MIL-C-16388 MIL-F-19004 MIL-G-18014	
	A96061			QQ-A-225/7 QQ-A-315			
6061	A96061	Forgings	ASTM B 247	QQ-A-225/8 QQ-A-325	Hydraulic actuators; couplings and nozzles for fuel lines and fire hoses.	MIL-C-23456 MIL-C-19179 MIL-A-24533 MIL-N-24408	
	A95052			QQ-A-430			
1100 (commercial purity)	A91100	Sheet and plate	ASTM B 209	QQ-A-367 alloy 6061	Nonskid tread, gratings and floor plate; parts for couplings, propulsion clutches, and gear assemblies; parts for fans,	MIL-STD-1689 NAVSEA 0900-LP-060-4010 MIL-STD-278 MIL-G-17859 MIL-G-18473 MIL-F-19004	
	A93003			QQ-A-250 QQ-A-250/1 QQ-A-561			
3003	A93003			QQ-A-250/2 QQ-A-359			

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TABLE XI. Aluminum base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
5052	A95052			QQ-A-250/8 QQ-A-318	coolers, compressors, motors, and generators (covers, screens, and so forth).	MIL-F-18953 MIL-G-18014 MIL-G-18015 MIL-G-3117 MIL-C-15730 RR-T-650 MIL-C-19113 MIL-C-18087 MIL-G-3124	
5083	A95083			QQ-A-250/6 MIL-A-17358			
5086	A95086			QQ-A-250/7 MIL-A-19070			
5454	A95454			QQ-A-250/10 MIL-A-21598			
5456	A95456			QQ-A-250/9 MIL-A-19842			
6061	A96061			QQ-A-250/11 QQ-A-327			
3003	A93003	Bar, rod, wire shape, and tube (extruded)	ASTM B 221	QQ-A-200 QQ-A-200/1 QQ-A-357			Floor plate, propulsion gears, hydraulic actuators, fluid coolers, and fire hose nozzles; small boat and craft construction.
5083	A95086			QQ-A-200/4 MIL-A-19005			
5086	A95086			QQ-A-200/5 MIL-A-21579			
5454	A95454			QQ-A-200/6 MIL-A-21599			
5456	A95456			QQ-A-200/7 MIL-A-21170			

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Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
6061	A96061			QQ-A-200/8 QQ-A-270			
6063	A96063			QQ-A-200/9 QQ-A-274			
6061	A96061	Standard structural shapes (rolled or extruded)	ASTM B 308	QQ-A-200/16	For general structural applications		
1100	A91100	Tube (drawn seamless)	ASTM B 210	WW-T-700 WW-T-700/1 WW-T-783	Small boat and craft construction	NAVSEA 0900-LP-060-4010 MIL-STD-1689 MIL-STD-278 MIL-N-52110	
3003	A93003			WW-T-700/2 WW-T-788			
5086	A95086			WW-T-700/5 MIL-T-21494			
6061	A96061			WW-T-700/6 WW-T-789			
295.0	A02950	Sand castings	ASTM B 26	QQ-A-601 alloy 295.0 and alloy 195 MIL-A-17129 class 4 ASTM B 26 alloy C4A	Casings, covers and bases for machinery equipment; marine fittings (couplings and nozzles); parts for marine engines and compressors; nonmagnetic parts for fans and motors.	MIL-C-18419 MIL-C-23961 MIL-G-17859 MIL-G-22077 MIL-N-5877 MIL-STD-278 MIL-F-19004 MIL-F-18953 MIL-C-19713 MIL-C-19179 MIL-C-23233	Add supplementary requirements for NDT inspection in accordance with MIL-STD-278

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TABLE XI. Aluminum base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
355.0	A03550	Sand castings	ASTM B 26	QQ-A-601 alloy 355.0 and alloy 355 MIL-A-17129 class 7 ASTM B 26 alloy SC51A			
356.0	A03560			QQ-A-601 alloy 356.0 and alloy 356 MIL-A-17129 class 3 ASTM B 26 alloy SG70A			
A356.0	A13560			QQ-A-601 alloy A356.0 ASTM B 26 alloy SG70B			
B443.0	A24430			QQ-A-601 alloy B443.0 and alloy 43 MIL-A-17129 class 2 ASTM B 26 alloy S5A			

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TABLE XI. Aluminum base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
514.0	A05140	Sand castings	ASTM B 26	QQ-A-601 alloy 514.0 and alloy 214 MIL-A-17129 class 5 ASTM B 26 alloy G4A			
535.0	A05350			QQ-A-601 alloy 535.0 and almag 35 ASTM B 26 alloy GM70B			
710.0	A07100			QQ-A-601 alloy 710.0, alloy A712.0, and alloy A612 ASTM B 26 alloy ZG61B			
712.0	A07120			QQ-A-601 alloy 712.0, alloy D712.0, and alloy 40E MIL-A-17129 class 1 ASTM B 26 alloy ZG61A			

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TABLE XI. Aluminum base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
713.0	A07130	Sand castings	ASTM B 26	QQ-A-601 alloy 713.0 and tenzaly (alloy 613) MIL-A-17129 class B ASTM B 26 alloy ZC81A			
C443.0	A34430	Die castings	ASTM B 85	QQ-A-591 alloy C443.0 ASTM B 85 alloy S5C	Parts for electric generators (including manhole or access covers, terminal boxes, air baffles, blower shrouds, bearing seals, end brackets, and fans).	MIL-G-3111	Add supplementary tests (NDT, hydrostatic, and so forth), when specified, in accordance with MIL-STD-278.
518.0	A05180			QQ-A-591 alloy 518.0 ASTM B 85 alloy G8A			
356.0	A03560	Permanent mold castings	ASTM B 108	QQ-A-596 alloy 356.0, alloy 356 and class B ASTM B 108 alloy SG70A	Parts for fans, compressors, chain hoists, and nozzles exposed to marine environment.	MIL-F-19004 MIL-H-904 MIL-N-52110 MIL-F-18953 MIL-G-19179	Add supplementary requirements for inspection and repair of castings in accordance with MIL-STD-278.

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TABLE XI. Aluminum base alloys - Continued.

Alloy designation		Description	Recommended specification	Previous specification	General application	Source document	Remarks
Commercial	UNS						
A356.0	A13560	Permanent mold castings	ASTM B 108	QQ-A-596 alloy A356.0 and alloy A356 ASTM B 108 alloy SG70B			
713.0	A07130			QQ-A-596 alloy 713.0, tenzalo (alloy 613), and class 12 ASTM B 108 alloy ZC81A			
A201.0 354.0 C355.0 A356.0 A357.0 359.0		Castings, high strength	MIL-A-21180			MIL-STD-278	

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5. DETAILED REQUIREMENTS

Not applicable to this handbook.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This handbook is intended to permit one-way substitution from previous specification to the recommended specification, This handbook is also intended to give designers a source of material specifications.

6.2 Issue of DODISS. When this document is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation (see 2.1.1, and 2.2).

6.3 Substitution criteria. Prior specification materials cannot be substituted for recommended specification material without NAVSEA approval.

6.4 Subject term (key word) listing.

Alloy designation
Aluminum base alloy
Cast copper base alloy
Copper base alloy
Metallic material
Nickel base alloy
Stainless Steel
Steel bars
Structural steel
Titanium

Preparing activity:
Navy - SH
(Project 1990-N096)

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APPENDIX

APPLICABLE DOCUMENTS

Page listed

10. SCOPE

10.1 Scope. This appendix provides a listing of the recommended specifications, previous specifications, and source documents referred to in the body of the handbook. This appendix is not a mandatory part of this handbook. The information contained herein is intended for compliance.

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20. APPLICABLE DOCUMENTS

20.1 Government documents.

20.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

QQ-A-200	-	Aluminum Alloy, Bar, Rod, Shapes, Structural Shapes, Tube and Wire, Extruded; General Specification for.	83
QQ-A-200/1	-	Aluminum Alloy 3003, Bar, Rod, Shapes, Tube and Wire, Extruded.	83
QQ-A-200/4	-	Aluminum Alloy 5083, Bar, Rod, Shapes, Tube and Wire, Extruded.	83
QQ-A-200/5	-	Aluminum Alloy 5086, Bar, Rod, Shapes, Tube and Wire, Extruded.	83
QQ-A-200/6	-	Aluminum Alloy 5454, Bar, Rod, Shapes, Tube and Wire, Extruded.	83
QQ-A-200/7	-	Aluminum Alloy 5456, Bar, Rod, Shapes, Tube and Wire, -Extruded.	83
QQ-A-200/8	-	Aluminum Alloy 6061, Bar, Rod, Shapes, Tube and Wire, Extruded.	84
QQ-A-200/9	-	Aluminum Alloy 6063, Bar, Rod, Shapes, Tube and Wire, Extruded.	84
QQ-A-200/16	-	Aluminum Alloy Structural Shapes, Extruded, 6061.	84
QQ-A-225	-	Aluminum and Aluminum Alloy Bar, Rod, Wire, or Special Shapes; Rolled, Drawn, or Cold Finished; General Specification for.	82
QQ-A-225/1	-	Aluminum Alloy Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished, 1100.	82
QQ-A-225/2	-	Aluminum Alloy Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished, 3003.	82

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FEDERAL (Continued)

	QQ-A-225/7	- Aluminum Alloy 5052, Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished.	82
	QQ-A-225/8	- Aluminum Alloy 6061, Bar, Rod, Wire and Special Shapes; Rolled, Drawn or Cold Finished.	82
	QQ-A-250	- Aluminum and Aluminum Alloy Plate and Sheet: General Specification for.	82
	QQ-A-250/1	- Aluminum 1100, Plate and Sheet.	82
	QQ-A-250/2	- Aluminum Alloy 3003, Plate and Sheet.	82
	QQ-A-250/6	- Aluminum Alloy 5083, Plate and Sheet.	83
	QQ-A-250/7	- Aluminum Alloy 5086, Plate and Sheet.	83
	QQ-A-250/8	- Aluminum Alloy 5052, Plate and Sheet.	83
	QQ-A-250/9	- Aluminum Alloy 5456, Plate and Sheet.	83
	QQ-A-250/10	- Aluminum Alloy 5454, Plate and Sheet.	83
	QQ-A-250/11	- Aluminum Alloy 6061, Plate and Sheet.	83
C	QQ-A-270	- Aluminum Alloy; Bars, Rods, Shapes; Extruded; 6061 and 6062.	84
C	QQ-A-274	- Aluminum Alloy Bars, Rods, and Shapes, Extruded, 6063.	84
C	QQ-A-315	- Aluminum Alloy Bars, Rods, and Wire; Rolled, Drawn, or Cold Finished, 5052.	82
C	QQ-A-318	- Aluminum Alloy Plate and Sheet 5052.	83
C	QQ-A-325	- Aluminum Alloy Bars, Rods, Wires, and Special Shapes; Rolled, Drawn, or Cold Finished, 6061.	82
	QQ-A-327	- Aluminum Alloy Plate and Sheet 6061.	83
C	QQ-A-356	- Aluminum Alloy Bars, Rods, and Wire, Rolled, Drawn, or Cold Finished, 3003.	82
	QQ-A-357	- Aluminum Alloy Bars, Rods, and Shapes, Extruded, 3003.	83
C	QQ-A-359	- Aluminum Alloy Plate and Sheet 3003.	82
	QQ-A-367	- Aluminum Alloy Forgings.	82
C	QQ-A-411	- Aluminum Alloy Bars, Rods, and Wire; Rolled, Drawn, or Cold Finished, 1100.	82
	QQ-A-430	- Aluminum Alloy Rod and Wire; for Rivets and Cold Heading.	82
C	QQ-A-561	- Aluminum Alloy Plate and Sheet, 1100.	82
	QQ-A-591	- Aluminum Alloy Die Castings.	87
	QQ-A-596	- Aluminum Alloy Permanent and Semipermanent Mold Castings.	87, 88
C	QQ-A-601	- Aluminum Alloy Sand Castings.	84-87
	QQ-A-630	- Aluminum Bronze Bars, Rods, Shapes, Drawn Strip, and Forgings.	49

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FEDERAL (Continued)

C	QQ-B-613	- Brass, Leaded and Nonleaded: Flat Products (Plate, Bar, Sheet, and Strip).	43
C	QQ-B-621	- Brass Castings, Leaded Yellow.	60, 61
	QQ-B-626	- Brass, Leaded and Nonleaded: Rod, Shapes, Forgings, and Flat Products with Finished Edges (Bar and Strip).	43
C	QQ-B-637	- Brass, Naval: Rod, Wire, Shapes, Forgings, and Flat Products with Finished Edges (Bar, Flat Wire, and Strip).	45
	QQ-B-639	- Brass, Naval: Flat Products (Plate, Bar, Sheet, and Strip).	44 44, 45
	QQ-B-663	- Bronze, Aluminum; Rods, Bars, Shapes, and Forgings.	49
C	QQ-B-671	- Brass Castings, Aluminum.	75, 76
C	QQ-B-679	- Bronze, Aluminum; Rod, Flat Products with Finished Edges (Flat Wire, Strip, and Bar), Shapes, and Forgings.	48, 49
	QQ-B-691	- Bronze; Castings.	64, 69
C	QQ-B-726	- Bronze Castings, Manganese and Aluminum-Manganese.	62, 63
C	QQ-B-728	- Bronze Manganese; Rod, Shapes, Forgings, and Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate),	51
	QQ-B-746	- Bronze, Phosphor; Bars, Plates, Rods, Shapes, Sheets, and Strips.	46
C	QQ-B-750	- Bronze, Phosphor; Bar, Plate, Rod, Sheet, Strip, Flat Wire, and Structural and Special Shaped Sections.	46
C	QQ-B-1005	- Bronze Castings, Leaded Tin and High Leaded Tin.	57-59 65-73
	QQ-C-390	- Copper Alloy Castings (Including Cast Bar).	57- 57- 77 77
	QQ-C-450	- Copper-Aluminum Alloy (Aluminum Bronze) Plate, Sheet, Strip, and Bar (Copper Alloy Numbers 606, 610, 613, 614, and 630).	48 48
C	QQ-C-465	- Copper-Aluminum Alloys (Aluminum Bronze) (Copper Alloy Numbers 606, 614, 630, 632M, and 642); Rod, Flat Products with Finished Edges (Flat Wire, Strip, and Bar), Shapes, and Forgings.	47- 49

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C	QQ-C-530	- Copper-Beryllium Alloy Bar, Rod, and Wire (Copper Alloy Numbers 172 and 173).		42
C	QQ-C-533	- Copper-Beryllium Alloy Strip (Copper Alloy Numbers 170 and 172).		42
	QQ-C-551	- Copper-Nickel-Alloy; Castings.		33
	QQ-C-576	- Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet, and Strip),		37
	QQ-C-585	- Copper-Nickel-Zinc Alloy Plate, Sheet, Strip, and Bar (Copper Alloy Numbers 735, 745, 752, 762, 766, and 770).		52
	QQ-C-586	- Copper-Nickel-Zinc Alloy; Rod, Shapes, and Flat Products with Finished Edges (Flat Wire, Strip, and Bar).		52
	QQ-C-591	- Copper-Silicon, Copper-Zinc-Silicon, and Copper-Nickel-Silicon Alloys: Rod, Wire, Shapes, Forgings, and Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate).	49, 50	50, 51
C	QQ-I-652	- Iron Castings, Gray.		17
C	QQ-I-666	- Iron Malleable, Ferritic, for Castings.		18
C	QQ-L-225	- Lead Tin Bronze Castings and High Lead Tin Bronze Castings.		64- 73
	QQ-M-80	- Manganese Bronze Bars, Plates, Rods, Sheets, Strips, Flat Wire, Forgings, and Structural and Special Shaped Sections.		51
	QQ-N-281	- Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections.	30	
	QQ-N-286	- Nickel-Copper-Aluminum Alloy, Wrought (UNS N05500).	32	32
	QQ-N-288	- Nickel-Copper Alloy and Nickel-Copper-Silicon Alloy Castings.		33
C	QQ-P-330	- Phosphor Bronze Bars, Plates, Rods, Sheets, Strips, Flat Wire, and Structural and Special Shaped Sections.		46, 47
C	QQ-S-624	- Steel, Bar, Alloy, Hot Rolled and Cold Finished (General Purpose).		9
C	QQ-S-626	- Steel Plate, Alloy (Structural Quality).		11
C	QQ-S-634	- Steel, Bar, Carbon, Cold Finished (Standard Quality).		7
C	QQ-S-637	- Steel, Bar, Carbon, Cold-Finished (Standard Quality, Free Machining).		7
C	QQ-S-681	- Steel Castings.		16, 17
	QQ-S-698	- Steel Sheet and Strip; Low Carbon.		3

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C	QQ-S-741	- Steel, Carbon: Structural Shapes; Plates; and Bars.		3
	QQ-S-763	- Steel Bars, Wire, Shapes, and Forgings, Corrosion-Resisting.	21, 25	23, 26
C	QQ-S-764	- Steel Bar, Corrosion Resisting, Free Machining.		20, 24
	QQ-S-766	- Steel, Stainless and Heat Resisting, Alloys, Plate, Sheet and Strip.	21, 24	
	QQ-W-321	- Wire, Copper Alloy.		46
	QQ-W-390	- Wire, Nickel-Chromium-Iron Alloy.	35	
C	QQ-W-401	- Wire, Round, Copper Alloy Number 510 (Phosphor-Bronze A); Spring.		47
	RR-T-650	- Treads, Metallic and Nonmetallic, Nonskid.		
	RR-W-410	- Wire Rope and Strand.		
	WW-P-351	- Pipe; Red Brass, (Copper Alloy No. 230), Seamless Standard Pipe Size, Regular and Extra-Strong.		44
	WW-P-377	- Pipe, Copper, Seamless, Standard Sizes.		41
	WW-P-404	- Pipe, Steel, (Seamless and Welded, Black and Zinc-Coated (Galvanized)).		13
	WW-T-700	- Tube, Aluminum and Aluminum Alloy, Drawn, Seamless, General Specification for.		84
	WW-T-700/1	- Tube, Aluminum, Drawn, Seamless, 1100.		84
	WW-T-700/2	- Tube, Aluminum Alloys, Drawn, Seamless, 3003.		84
	WW-T-700/5	- Tube, Aluminum Alloy, Drawn, Seamless, 5086.		84
	WW-T-700/6	- Tube, Aluminum Alloy, Drawn, Seamless, 6061.		84
C	WW-T-783	- Tube Aluminum Alloy, Round, Square, Rectangular, and Other Shapes, Drawn, Seamless, 1100.		84
C	WW-T-788	- Tube, Aluminum Alloy, Round, Square, Rectangular, and Other Shapes, Drawn, Seamless, 3003.		84
C	WW-T-789	- Tube, Aluminum Alloy, Round, Square, Rectangular and Other Shapes, Drawn, Seamless, 6061 and 6062.		84
	WW-T-791	- Tube, Brass, Seamless.		44
C	WW-T-797	- Tube, Copper, (Seamless).		40
	WW-T-799	- Tube, Copper, Seamless, Water (For Use with Solder-Flared- or Compression-Type Fittings).		39

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C	MIL-C-50	- Copper Alloy Number 260 (Cartridge Brass, 70%); Sheet, Strip, Plate, Bar, and Discs.	43
C	JAN-W-562	- Wire, Nickel-Alloy, Spring (Heat-Resistant and Age-Hardenable).	35
	MIL-S-860	- Steel Forgings for Steam Turbine Rotors.	11, 12
C	MIL-S-861	- Steel Bars, Corrosion Resisting, Naval Steam Turbine Parts Use.	26
C	MIL-S-862	- Steel Bars, Corrosion Resisting, and Steel Billets, Corrosion Resisting; Reforging Applications.	22, 26
C	MIL-S-866	- Steel: Bars and Billets (For Carburizing).	7
C	MIL-S-867	- Steel Castings, Corrosion Resisting, Austenitic.	28
C	MIL-S-869	- Steel Bars, Billers and Forgings - Alloy Nitriding Application.	8
C	MIL-S-870	- Steel Castings, Molybdenum Alloy.	17
C	MIL-S-872	- Steel Bars, Billets, and Forgings - Carbon-Molybdenum Alloy.	8, 12
C	MIL-S-890	- Steel: Forgings and Bars for Hulls, Engines, and Ordnance (Heat Treated).	5, 10, 11
C	MIL-N-894	- Nickel-Copper Alloy Bars, Plates, and Other Wrought Forms.	30
	MIL-H-904	- Hoists, Chain, Hand-Operated, Hook and Trolley Suspension.	
	MIL-E-917	- Electric Power Equipment, Basic Requirements (Naval Shipboard Use).	
	MIL-B-994	- Brass, Naval: Rods, Wire, Shapes, Forgings, and Flat Products (Flat Wire, Strip, Sheet, Bar, and Plate).	44, 45
C	MIL-P-1144	- Pipe, Corrosion-Resistant, Stainless Steel, Seamless or Welded.	22
	MIL-F-1183	- Fittings, Pipe, Cast Bronze, Silver-Brazing, General Specification for.	
	MIL-V-1189	- Valve, Gate, Bronze.	
	MIL-S-1222	- Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws, and Nuts.	
	MIL-T-1368	- Tube and Pipe, Nickel-Copper Alloy, Seamless and Welded.	
	MIL-V-2042	- Valves, Reducing, Water Service, For Naval Shipboard Use.	

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C	MIL-V-2187	- Valves, Angle and Globe, Manually Operated, Naval Shipboard: Magazine Sprinkling and Test Fitting, and Hose.		
	MIL-C-2939	- Cooling Coils, Air, Duct Type and Gravity Type; Cooler Units, Air, Naval Shipboard Environmental Control Systems.		
	MIL-S-2953	- Strainers, Steam (Sizes 3 Inches and Below).		
	MIL-V-2961	- Valves, Globe, Pressure Reducing, Gas Service.		
	MIL-G-3111	- Generators, Electric, Direct-Current (Naval Shipboard Use).		
	MIL-H-3117	- Heaters, Convection, Steam and Hot Water.		
	MIL-G-3124	- Generator, Alternating Current, 60-Hertz (Naval Shipboard Use).		
	MIL-V-3155	- Valve, Temperature Regulating Ventilation Heater, Steam Control, Naval Shipboard Use.		
	MIL-F-3541	- Fittings, Lubrication, General Specification for.		
	MIL-T-3595	- Tubing, Phosphor Bronze: (CDA No. 510) Round, Seamless.	47	
	MIL-S-5000	- Steel, Chrome-Nickel-Molybdenum (E4340) Bars and Reforging Stock.	9	
	MIL-N-5877	- Nozzle, Pressure Fuel Servicing, Locking, Type D-1 and D-2, Nominal 2 1/2 Inch Diameter.		
C	MIL-N-6710	- Nickel-Chromium-iron Alloy; Bars, Rods and Forgings.		34, 35
	MIL-T-6736	- Tubing, Chrome-Molybdenum, 4130 Steel, Seamless and Welded, Aircraft Quality.	15	
C	MIL-N-6840	- Nickel-Chromium-Iron Alloy; Plate, Sheet, and Strip.		34-
	MIL-C-6941	- Copper-Beryllium, Bar, Rod, and Wire.		42
	MIL-N-7786	- Nickel-Chromium Alloy, Sheet and Strip, Age-Hardenable Annealed,	36	
C	MIL-T-7840	- Tubing, Nickel-Chromium-iron Alloy, Seamless or Welded, (For Aircraft Applications).		35
C	MIL-N-8550	- Nickel Alloy, Bars, and Forgings, 1,200° to 1,500°F Operating Temperatures.		36
C	MIL-S-8955	- Steel Plate, Sheet and Strip, PH 15-7 Mo Corrosion-Resistant Precipitation Hardening.		27
	MIL-T-9046	- Titanium and Titanium Alloy, Sheet, Strip, and Plate.	79-	79- 81 81

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	MIL-T-9047	- Titanium and Titanium Alloy Bars (Rolled or Forged) and Reforging Stock, Aircraft Quality.	79	79
C	MIL-I-11466	- Iron, Ductile Castings.		18
C	MIL-B-11553	- Bronze Castings, Continuous Cast.		57-59, 65-67, 69-71 73, 74
	MIL-T-15005	- Tubes, Condenser and Heat Exchanger, Copper-Nickel Alloys (UNS C70600 and C71500).	55	
	MIL-V-15020	- Valves, Flush (Shipboard).		
C	MIL-S-15083	- Steel Castings.		16, 17
	MIL-H-15317	- Hoists, Chain or Wire Rope, Electric Power Operated, Lug, Hook, or Trolley Suspension and Base Mounted.		
C	MIL-C-15345	- Castings, Nonferrous, Centrifugal.		33, 34 57, 61-64, 67-69, 76-78
C	MIL-V-15358	- Valve, Automatic Regulating, Pressure (Diaphragm Actuated and Controls, for Hi-Octane Gasoline Systems 125 P.S.I. Maximum W.P., 140°F. Minimum).		
	MIL-C-15430	- Condensers, Steam, Naval Shipboard.		
C	MIL-S-15464	- Steel, Alloy, Chromium-Molybdenum; Castings.	17	16
	MIL-E-15465	- Ejector Assemblies, Air.		
	MIL-V-15508	- Valves, Remote Control, Diaphragm Actuated (Fluid Systems, 150 and 250 P.S.I. W.P. 140°F Maximum).		
	MIL-F-15618	- Filter-Separators and Filter Elements, Fluid, Pressure, Aviation and Diesel Fuel, Naval Shipboard.		
	MIL-C-15726	- Copper-Nickel Alloy, Sheet, Plate, Strip, Bar, Rod and Wire.	52,	54 53
	MIL-C-15730	- Coolers, Fluid, Naval Shipboard: Lubricating Oil, Hydraulic Oil, and Fresh Water.		
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	MIL-P-24691/3	- Pipe and Tube, Corrosion Resistant, Stainless Steel, Seamless or Welded	22	
	MIL-C-24723	- Castings, Nickel-Copper Alloy.	33	
	MIL-S-25043	- Steel Plate, Sheet, and Strip, 17-7 PH, Corrosion-Resistant, Precipitation Hardening.		27
C	MIL-T-52010	- Tube, Corrosion Resisting Steel, Mechanical Seamless and Welded.		26
	MIL-N-52110	- Nozzles, Fuel and Oil Servicing, Nonautomatic Shutoff and Nozzles, Fuel Servicing, Automatic Shutoff.		
C	MIL-S-81506	- Steel plate, Sheet, and Strip, 17-4PH, Corrosion-Resistant, Precipitation Hardening.		27

STANDARDS

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	MIL-STD-278	- Welding and Casting Standard.		
	MIL-STD-438	- Schedule of Piping, Valves, Fittings, and Associated Piping Components for Submarine Service.		
	MIL-STD-480	- Configuration Control - Engineering Changes, Deviations and Waivers.		
	MIL-STD-481	- Configuration Control - Engineering Changes (Short Form), Deviations and Waivers		
	MIL-STD-777	- Schedule of Piping, Valves, Fittings, and Associated Piping Components for Naval Surface Ships.		
	MIL-STD-1681	- Fabrication, Welding, and Inspection of HY-130 Submarine Hulls.		
	MIL-STD-1688	- Fabrication, Welding, and Inspection of HY-80/100 Submarine Applications.		
	MIL-STD-1689	- Fabrication, Welding, and Inspection of Ships Structure.		

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(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, BLDG. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and Publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

PUBLICATIONS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

0900-LP-001-7000 - Fabrication and Inspection of Brazed Piping Systems.

0900-LP-006-9010 - Fabrication, Welding, and Inspection of HY-80/100 Submarine Hulls.

0900-LP-014-1010 - Instructions for Repair Welding, Straightening, and Cold Rolling of Main Propulsion Shafting.

0991-LP-023-3000 - Bronze Ship Propellers, Straightening and Welding.

0900-LP-060-4010 - Fabrication, Welding, and Inspection of Metal Boat and Craft Hulls.

0902-LP-018-2010 - General Overhaul Specifications for Deep Diving SSBN/SSN Submarines (DDGOS).

S9AA0-AA-SPN-010/GEN-SPEC - General Specifications for Ships of the United States Navy.

S9AA0-AB-GOS-010/GSO - General Specifications for Overhaul of Surface Ships (GSO).

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Data on Navy Specifications taken from "Index of Specifications and Standards used by Department of the Navy, Vol. III, specification cancelled or superseded since 1 January 1947," dated 1 April 1960. Many Navy Specifications were converted (superseded) by Military Specifications without being cancelled. An "S" below indicates supersession by Military Specifications.

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S	NAVY 46-B-29	- Bronze, Aluminum-Manganese, Castings.	62
C	NAVY 46-I-5	- Iron, Gray, High-Test: Castings	17
C	S NAVY 46-M-1	- Nickel-Copper-Alloy: Castings.	33
S	NAVY 46-M-7	- Nickel-Copper-Alloy: Bars, Forgings, Plates, Rods, Shapes, Sheets, Strips, and Wire.	30
S	NAVY 46-N-5	- Nickel-Copper-Aluminum-Alloy: Forgings, Rods, Strips, and Wire.	32
C	S NAVY 46-N-7	- Nickel-Copper-Silicon Alloy Castings.	34
S	NAVY 46-S-4	- Steel, Carbon and Alloy: Bars, Billets, Blooms, and Slabs (For Reforging or Other Operations Before Heat Treatment).	8
S	NAVY 46-S-30	- Steel: Forgings for Nitriding and Nitrided Steel.	8
S	NAVY 46-S-32	- Steel: Bars and Billets (For Carburizing).	7
S	NAVY 46-S-39	- Steel: Forgings for Turbine Rotors (Heat Treated).	12
C	S NAVY 46-S-41	- Steel, Chromium-Molybdenum-Alloy, Wrought.	12
S	NAVY 46-S-43	- Steel; Rolled, Heat Treated, Bars (for Shafting).	11
S	NAVY 49-B-3	- Bronze, Manganese, Castings.	63
S	NAVY 49-S-2	- Steel: Forgings and Bars for Hulls, Engines, and Ordnance (Heat Treated).	11

(Application for copies should be addressed to the Standardization Documents Order Desk, BLDG. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 36 - Standard Specification for Structural Steel. (DoD adopted)		3
A 47 - Standard Specification for Ferritic Malleable Iron Castings. (DoD adopted)	19	
A 48 - Standard Specification for Gray Iron Castings (DoD adopted)	17	
A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.		13
A 105 - Standard Specification for Forgings, Carbon Steel, for Piping Components. (DoD adopted)	13	
A 108 - Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality. (DoD adopted)	7	
A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip. (DoD adopted)		21
A 176 - Standard Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip. (DoD adopted)		24
A 182 - Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service. (DoD adopted)	12, 14	
A 213 - Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes.		15
A 216 - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service. (DoD adopted)	16	
A 234 - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures. (DoD adopted)		13
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A 302 - Standard Specification for Pressure Vessel Plates, Alloy Steel, Manganese-Molybdenum and Manganese-Molybdenum-Nickel. (DoD adopted)	6	
A 311 - Standard Specification for Steel Bars, Carbon, Stress-Relieved Cold-Drawn, Subject to Mechanical Property Requirements.		

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A 322	- Standard Specification for Steel Bars, Alloy, Standard Grades. (DoD adopted)	4
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A 376	- Standard Specification for Seamless Austenitic Steel Pipe for High-Temperature Central-Station Service.	28
A 381	- Standard Specification for Metal-Arc-Welded Steel Pipe for Use With High-Pressure Transmission Systems.	
A 395	- Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.	18
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B 637 - Standard Specification for Precipitation-Hardening Nickel Alloy Bars, Forgings, and Forging Stock for High-Temperature Service.	36	
E 381 - Standard Method of Macroetch Testing, Inspection, and Rating Steel Products, Comprising Bars, Billets, Blooms, and Forgings.		

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MIL-HDBK-843 (SH)

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93/08/20

3. DOCUMENT TITLE

SHIP METALLIC MATERIAL COMPARISON

4. NATURE OF CHANGE (identity paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

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