INCH-POUND
MIL-C-15430J(SHIPS)
AMENDMENT 4
24 April 1989
SUPERSEDING
AMENDMENT 3
16 June 1983

MILITARY SPECIFICATION

CONDENSERS, STEAM, NAVAL SHIPBOARD

This amendment forms a part of MIL-C-15430J(SHIPS), dated 19 June 1974, and is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

PAGE 1

* 2.1, under "SPECIFICATIONS, FEDERAL": Delete reference to "QQ-C-465" and add the following:

"HH-P-151 - Packing; Rubber Sheet, Cloth-Insert."

PAGES 1 and 2

2.1, under "SPECIFICATIONS, MILITARY": Delete reference to "MIL-B-857", "MIL-P-15137", "MIL-A-17472", "MIL-S-24113", and "MIL-N-25027" and add the following:

"MIL-S-8660 - Silicone Compound.
MIL-S-16216 - Steel Plate, Alloy, Structural, High Yield Strength (HY-80 and HY-100).
MIL-S-22698 - Steel Plate and Shapes, Weldable Ordinary Strength and Higher Strength: Hull Structural.
MIL-N-24106 - Nickel-Copper Alloy Bars, Rods and Forgings.
MIL-L-24131 - Lubricant, Colloidal Graphite in Isopropanol.
MIL-L-24478 - Lubricant, Molybdenum Disulfide in Isopropanol.
MIL-L-24479 - Lubricant, Red Lead and Graphite in Mineral Oil.
MIL-B-24480 - Bronze, Nickel-Aluminum Castings, for Seawater Service.
DOD-G-24508 - Grease, High Performance, Multi-purpose.
MIL-P-24691 - Pipe and Tube, Carbon Alloy and Stainless Steel, Seamless and Welded, General Specification for.
MIL-P-24691/1 - Pipe and Tube, Carbon Steel, Seamless."

PAGE 3

* 2.2, under "AMERICAN SOCIETY FOR TESTING AND MATERIALS": Delete reference to "A105", "A131", "B98", and "B139".

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PAGE 4

3.2.2, line 4: Delete "MIL-B-857" and substitute "MIL-S-1222".

3.2.2: Add: "Threaded plugs, threaded connections and threaded closures are prohibited in the submergence pressure boundary of submarine condensers."

PAGE 5

Table I: Delete and substitute:

"TABLE I. Class A material (submarine application).

Part	Material	Applicable document
(a) Tube sheets, outer 1/	Copper-nickel alloy, composition 70-30 soft temper	5/ MIL-C-15726
(b) Tube sheets, inner 2/	Steel, grade LF2 or LF3	ASTM A 350
	Steel, grade A, B, D, E	ASTM A 203
	Steel, grade EH-36T	MIL-S-22698
	Steel, grade HY-80	MIL-S-16216
(c) Longitudinal pipe stays	Pipe, carbon steel, schedule 80, seamless	3/ ASTM A 53
		ASTM A 106
*		MIL-P-24691 MIL-P-24691/1
(d) Tubes	Copper-nickel alloy, composition 70-30	4/, 5/ MIL-T-15005
* (e) Bolts or studs in joints involving sea water tightness, or subject to submergence pressure 6/, 11/	Nickel-copper-aluminum alloy, grade 500	MIL-S-1222
* (f) Bolts or studs in contact with sea water 11/	Nickel-copper alloy, class A, grade 400	MIL-S-1222
	Nickel-copper alloy	MIL-N-24106

TABLE I. Class A material (submarine application) - Continued.

Part	Material	Applicable document
* (g) Nuts for bolts and studs specified in (e)11/	Nickel-copper-aluminum alloy, grade 500	MIL-S-1222
	Nickel-copper alloy, class A, hot finished, grade 400	MIL-S-1222
	Nickel-copper alloy, cold drawn and stress relieved, or hot finished	MIL-N-24106
* (h) Nuts for bolts and studs specified in (f)11/	Nickel-copper alloy, class A or B, grade 400 or 405	MIL-S-1222
(i) Bolts, studs, and nuts exposed to steam or condensate	Corrosion-resisting steel or non-ferrous alloys	7/MIL-S-1222
(j) Bolts, studs, and nuts for services other than as specified in (e), (f), and (i)	Carbon or alloy steel or non-ferrous alloys8/	MIL-S-1222
(k) Gaskets for waterbox-tube sheet joints, waterbox cover joints, and waterbox inspection or manhole cover joints10/	O-ring, type I	MIL-G-21610
(l) Gaskets between double tubesheets10/	O-ring, type I	MIL-G-21610
(m) Gaskets for shell flange-tube sheet joints (U-bend tube-removable bundle construction), and shell * covers9/	Synthetic rubber, cloth insert, class 4, or	HH-P-151
	Non-asbestos sheet	Commercial

See footnotes at top of next page."

PAGE 6

Footnote 5/ to table I: Delete and substitute:

"5/ Yield strength of copper-nickel material shall not exceed 48,000 pounds per square inch (lb/in^2)."

Footnotes to table I: Add as footnotes 9/, 10/, and 11/:

"9/ See 3.2.21.

"10/ If required, lubricant for O-ring gaskets shall be in accordance with MIL-S-8660 or DOD-G-24508.

"11/ Form in accordance with MIL-S-1222."

* 3.2.2.1.2, items (a) and (b): Delete and substitute:

"(a) For submarine condensers, the thread lubricant for bolting in joints involving seawater tightness shall be red-lead and graphite in mineral oil per MIL-L-24479.

(b) For fasteners exposed to steam or condensate where fastener preload is required, the thread lubricant shall be graphite in isopropanol per MIL-L-24131 (Military Symbol CGI).

(c) For all other applications, the thread lubricant shall conform to one of the following:

(1) Graphite in isopropanol per MIL-L-24131 (Military Symbol GCI).
(2) Molybdenum disulfide in isopropanol per MIL-L-24478.
(3) Red lead and graphite in mineral oil per MIL-L-24479."

PAGE 7

Table II: Delete and substitute:

"TABLE II. Class B material (surface ship application).

Part	Material	Applicable document
(a) Tube sheets, outer	Copper-nickel alloy, composition 90-10	ASTM B 171
(b) Tube sheets, inner 5/	Steel, grade DH-36	MIL-S-22698
	Steel	MIL-S-23194
	Steel, class 1 or 2	ASTM A 537

TABLE II. Class B material (surface ship application) - Continued.

	Part	Material	Applicable document
*	(c) Longitudinal pipe stays	Pipe, carbon steel, schedule 80, seamless	1/ASTM A 53 ASTM A 106 MIL-P-24691 MIL-P-24691/1
	(d) Tubes	Copper-nickel alloy, composition 90-10	MIL-T-15005
*	(e) Bolts, studs and nuts in contact with sea water	Nickel-copper alloy, grade 400 or 405	MIL-S-1222
*	(f) Bolts, studs, and nuts in joints involving sea water tightness	Nickel-copper alloy, grade 400 or 405	MIL-S-1222
	(g) Bolts, studs, and nuts exposed to steam or condensate	Corrosion-resisting or non-ferrous alloys	3/MIL-S-1222
*	(h) Bolts, studs, and nuts for services other than as specified in (e), (f), and (g)	Steel, zinc plated, grade 2 or 5	MIL-S-1222
*	(i) Stays and washers in contact with sea water, and washers in joints involving sea water tightness	Nickel-copper alloy, class A or B	ASTM B 164
	(j) Gaskets for water-box-tube sheet joints, waterbox cover joints, and waterbox inspection or manhole cover joints	Synthetic rubber, cloth inserted	Commercial, (U.S. Rubber style 210, or Garlock style 19 or equal), or HH-P-151, class 3

TABLE II. Class B material (surface ship application) - Continued.

Part	Material	Applicable document
* (k) Gaskets for shell flange-tube sheet joints (U-bend tube-removable bundle construction) and shell covers 4/	Synthetic rubber, cloth inserted, class 4, or	HH-P-151
	Non-asbestos sheet	Commercial
(l) Condenser tube packing	Packing, flexible, metallic, grade A	MIL-P-2863

See footnotes on top of next page."

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* Footnotes to table II: Delete footnote 2/. Add as footnotes 4/ and 5/.

"4/ See 3.2.21.

* 5/ Inner tube sheets shall meet the impact test requirements in 4.3 as applicable."

PAGE 10

3.2.8.2, line 2: Delete "plus of minus" and substitute "plus or minus".

PAGE 11

Add as new paragraph 3.2.8.5:

"3.2.8.5 Interchangeability. Component parts shall not be physically interchangeable nor reversible unless such parts are interchangeable or reversible with regard to function, performance, and strength."

PAGE 13

3.2.12: Delete and substitute:

"3.2.12 Type I, II, or III condensers shall be provided with a condensate sump or well having a volumetric capacity at maximum design working condensate level equal to or exceeding the volume of condensate handled by the condensate pumps during 1 minute of normal operation when the connected equipment is operating at rated full-load. Condensate sump or well shall be attached to the bottom of the condenser shell; shall be provided with the necessary swash plates, liquid level gauge connections, clean-out holes, drain connection to permit complete draining of the hotwell, flanged connections for the condensate pump suctions;

and, if required for maintaining proper submergence of the condensate pump suctions under the conditions specified in 3.2.1, a drain pocket extending the length of the hotwell and having the low point and suction connections at the end nearest the pumps. Condensate pump suction connection in the hotwell shall minimize the amount of corrosion products and foreign materials that may enter the condensate pump suction by incorporating baffles to minimize solid material from entering the connection, traps to provide stagnant areas for solid material settling, and clean-out ports for manual removal of these solid materials. Where the condensate pump suction connection is located on the bottom of the hot well, the connection configuration shall as a minimum, consist of a standpipe located in a tapered recess in the hotwell bottom. The depth of the recess shall be a minimum of one standpipe diameter, and the width of the recess shall be at least twice the standpipe diameter. The standpipe shall extend upward through the recess at least one inch above the true hotwell bottom. For type I and II double tube sheet condensers, this condensate connection configuration shall be submitted to the drawing review agency for approval. Type IV condensers shall be provided with clean-out ports in each section of the condenser shell to permit manual removal of corrosion products. The design of condensate outlets for type IV condensers shall minimize the likelihood of plugging of drain lines due to corrosion products."

PAGE 16

3.2.13.5, first sentence: Delete and substitute: "Tube sheets shall be welded to the condenser shell or to an extended neck or collar section of the shell (not applicable to removable bundle condensers (see 3.2.9.2) nor to outer tube sheets of double tube sheet condensers)."

3.2.13.5.1 and 3.2.13.5.2: Delete and substitute:

"3.2.13.5.1 Fastener holes shall not extend or penetrate through the portion of the tubesheet which is exposed to steam or water, unless the hole is blanked by a welded closure. The blanked holes shall satisfactorily pass the hydrostatic test of 4.2.1.2.

"3.2.13.5.2 When necessary to fasten attachments to the tubesheets, studs accessible from the waterbox or steam space shall be used."

3.2.13.5.3 (a), line 1: Delete "prestress" and substitute "torque".

3.2.13.5.3 (b), line 1: Delete "prestressing" and substitute "torquing".

PAGE 17

3.2.13.5.3 (c), line 1: Delete "prestress" and substitute "torque".

3.2.13.5.3 (d): Delete and substitute:

"(d) For submarines, the value of installation torque specified on the drawings shall be calculated as follows:

(1) Using the hydrostatic test load and high coefficient of friction (μ = 0.13), determine torque using the following relation: $(P/T)\mu$ = Load per unit torque corresponding to bolt size and lubricant.

$$(P/T)\mu = \frac{12}{r_t\left[\frac{\cos\theta\tan\alpha + \mu}{\cos\theta - \mu\tan\alpha} + \frac{r_c\,\mu}{r_t}\right]}$$

where r_t = minimum pitch radius of external threads (inches)

θ = 1/2 of thread angle (degrees)

α = Helix angle (degrees)

* α = arc tan $[1/(2\pi r_t N)]$, where N = number of threads per inch

r_c = Collar radius, average of $Dh/2$ and bolt major radius (inches), where

Dh = diameter across flats of nuts (average of maximum and minimum) (inches)

μ = 0.13

T = Torque (foot-pounds)

(2) Using the installation torque above and low coefficient of friction (μ = .065) determine stress from Section III-420 of SDB-63. This calculated stress when combined with other stresses specified in SDB-63 shall not exceed the limits of SDB-63. See 3.2.15.4.1.6 for additional requirements on threaded fasteners securing waterbox inspection openings."

3.2.13.5.3: Add as item (f):

"(f) For submarine condensers subject to submergence pressure, submergence pressure boundary studs and bolts shall be of a reduced shank or body design to reduce bending stresses."

PAGE 18

Add as paragraph 3.2.15.4.1.6:

"3.2.15.4.1.6 Threaded fasteners securing waterbox inspection openings in submarine condensers shall be designed such that 300 inspection cover removal and reinstallation cycles, 200 hydrostatic test pressure cycles, and 20,000 submergence pressure cycles will not cause the maximum cumulative usage factor allowed by SDB-63 to be exceeded. The effect on threaded fastener stress levels caused by any movement between the inspection cover and inspection cover flange when the sea water side of the waterbox is pressurized shall be specifically

analyzed. The analysis shall be submitted to the drawing review agency for approval. The amount of movement or relative slip used in above analysis shall be confirmed during factory hydrostatic testing of first unit (see 4.2.1.7.1). The measured amount of relative slip shall be compared to the assumed value and forwarded to the drawing review agency. It is the vendor's responsibility that the fastener design meet the requirements of SDB-63 when the measured slip (rather than the assumed slip) is factored into the analysis."

3.2.15.5, lines 7 and 8: Delete "plug and tube end" and substitute "plug any tube end".

PAGE 20

3.2.15.13: Delete and substitute:

"3.2.15.13 Waterboxes fabricated of nickel-copper alloy shall have the inside surfaces covered with a continuous coating of solder (two parts lead, and one part tin) to a thickness of not less than 1/64 inch and not more than 1/16 inch. Examination of solder application shall be in accordance with 4.5.8."

3.2.16.1: Insert after first sentence: "For submarine sea water cooled condensers, the maximum tube wall thickness shall not exceed 110 percent of the minimum tube wall thickness."

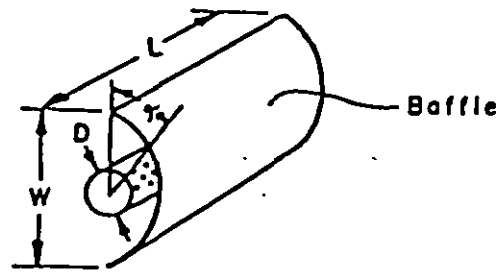
PAGE 21

3.2.17.2.2, line 3: Delete "3.2.17.3.6" and substitute "3.2.17.3.5".

PAGE 22

3.2.17.3.1.2: Delete and substitute:

"3.2.17.3.1.2 Unless otherwise approved by the drawing review agency, the pressure/velocity reducing configuration shall be in the form of the perforated pipe and baffle which shall have the following general configuration:



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Note: Other pipe and baffle configurations may be used provided they meet the guidelines below.

Perforations in the pipe shall be such that the steam will exit evenly along the pipe length and shall be located such that the steam emerging from the perforations will strike the baffle. To ensure this, the minimum angle "α" shall be 30 degrees where α is the angle from the outermost row of perforation to the edge of the baffle as measured from the center of the pipe. Maximum orifice or perforation size shall be 3/8 inch diameter. The location of tubes with respect to the baffle opening is optional.

(a) For auxiliary exhaust steam and other connections treated like the auxiliary exhaust steam connection, the area L x W shall be such that the average velocity of the steam when expanded to a 29 inch vacuum (referred to a 30 inch barometer) and passed through this area shall not exceed 250 feet per second (ft/s) or 750 ft/s if the impingement tubes of 3.2.11.1 are installed between the connection baffle and the tube bundle and the requirements of 3.2.11.1 are satisfied with respect to the connection baffle exit. For the auxiliary exhaust assembly, the vendor shall justify the structural adequacy of the design by submitting a vibration analysis to the drawing review agency for approval. Baffles which are required to protect the condenser shell, tubes, or other internals from impingement by auxiliary exhaust steam shall be considered part of the auxiliary exhaust assembly and shall be included in the vibration analysis.

(b) For the steam dump, "L" shall be as nearly equal to the effective tube length as possible, allowing for shell neck where fitted and differential expansion between the shell and steam dump pipe and "W" shall be at least three times the steam pipe diameter "D". The impingement tubes of 3.2.11.1 shall be installed between the steam dump baffle and the tube to the steam dump baffle exit. Baffles required to protect the shell, tubes, or other condenser internals from impingement of dump steam shall be considered part of the steam dump assembly and shall meet the design requirements noted below. For the steam dump assembly, the vendor shall justify the structural adequacy of the design by submitting the following to the drawing review agency for approval:

(1) Vibration analysis.
(2) Fatigue analysis (in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Subsection NB-Class 1 components) due to thermal and pressure loads for the number of operating cycles specified (see 6.1.1). Operating cycles shall be based on the steam dump design operating temperature and pressure (see 6.1.1).

Multiple parallel pressure/velocity reducing configurations may be used provided the sum of the individual areas and the sum of the individual lengths satisfy the relationships of (a) or (b) as applicable."

Add as paragraph 3.2.17.3.1.3:

"3.2.17.3.1.3 For some condenser designs, the design operating pressure at the steam dump inlet may be less than the maximum operating pressure at the steam dump inlet. This maximum pressure is the pressure which maximizes flow to the steam dump when system steam supply requirements and steam dump steam demand requirements are compared. The maximum operating pressure and temperature at the steam dump inlet shall be specified (see 6.1.1). The vendor shall design the condenser (including steam dump) so that it is not damaged or caused to malfunction by operation with a continuous steam dump flow resulting from the maximum pressure expected at the steam dump inlet."

PAGE 23

3.2.17.3.3 through 3.2.17.3.6.1: Delete and substitute:

"3.2.17.3.3 Condenser design shall take into account the amounts of drains, make-up feed, recirculated condensate, inter-condenser drains, and other such heat inputs as specified (see 6.1.1).

"3.2.17.3.4 Requirements for drain connections which introduce steam or water into the condenser shell are as follows:

(a) Connection location requirements.

* (1) Connections discharging steam or water shall be so located or piped inside the condenser such that they discharge near the bottom of the shell but above the maximum condensate level, except for the overriding considerations of deaeration and reheating or condensate cooling as noted below.

(2) Connections discharging water and steam from sources which can, under either normal or abnormal operating conditions, become aerated and contain large amounts of oxygen, may be discharged high enough in the condenser to permit sufficient deaeration and reheating in order to meet the condensate oxygen content limitation requirements of 3.3.2.5.

(3) For each drain connection, regardless of location, there shall be no chance of water droplets impinging directly on heat transfer tubes, or being entrained by the steam flow and thereby impinged on heat transfer tubes.

(4) When condensate recirculation is required to maintain adequate circulation through the air ejector condenser, two connections shall be provided. One connection, to be used only when starting up, shall be provided with a perforated or slotted pipe inside the condenser shell and so located and directed that the condensate issuing from such perforations or slots will trickle down over the condenser tubes and will not impinge in jet streams on any of them or on the turbine or condenser exhaust reinforcing stay rods. The other condensate recirculating connection, for normal operation use, shall be located or piped inside the condenser shell so that it discharges near the bottom of the shell, but above the maximum condensate level.

(b) Connection design requirements.

* (1) Connections discharging steam, or water which could flash under either normal or abnormal operating conditions, shall be treated in the same manner as auxiliary exhaust, and the requirements of 3.2.17.3.1 through 3.2.17.3.1.2 shall apply, except that location requirements shall be in accordance with (a) above and vibration analysis is not required. These connections shall be baffled inside the condenser shell so that the shell, shell structure, or tubes will not be damaged by impingement of high velocity steam, nor by condensate entrained by such steam flow, should a valve in a "normally closed after warm-up" drain be left open or a steam trap stick open and allow a continuous flow of steam through the connection. To provide quiet connection design in condensers, the following additional requirements apply to feed and condensate pump recirculation connections and hotwell recirculation (except start-up recirculation) connections:

a. Nozzle hole diameters shall be either 1/4, 5/16 or 3/8 inches with nozzle differential pressures not exceeding 22, 18 or 15 pounds per square inch difference respectively. Nozzle differential pressures for these connections shall be as specified (see 6.1.1).
b. Impingement baffle shall be 1-1/4 inch or less from the nozzle holes.
c. The nozzle shall be removable for cleaning from outside the condenser shell. The nozzle should be flanged and held in place by the bolting used to fasten system piping to the condenser shell.

(2) Connections discharging water which will not flash under any condition of operation, such as make-up feed and intercondenser drain connections, shall be baffled or piped inside the shell to prevent direct impingement on the shell, shell structure, or tubes.
(3) For inter-condenser drain connection, provision shall be made for venting the upper end of any leg of the drain piping located inside the shell, in order that the loop seal between condenser and inter-condenser will not be affected by any siphon action in this piping.

"3.2.17.3.5 External tube wall erosion due to impingement of either high velocity steam or water on the tubes has been, in the past, a continual source of trouble in shipboard condensers. Strict compliance with 3.2.17.3.1 through 3.2.17.3.4 is therefore of the utmost importance.

"3.2.17.3.6 Pipe and fittings in lines discharging steam or condensate or both into the condenser shall (except for auxiliary exhaust and steam dump) be of schedule 80 thickness, and shall be of type 304(L) or 316(L) stainless steel. Where fitted, baffles, screens, or other protective devices shielding the discharge of drain connections shall be of type 304(L) or 316(L) stainless steel."

PAGES 23 and 24

3.2.18.1: Delete and substitute:

"3.2.18.1 For condensers on saturated steam plant ships (see 6.1.1), zinc anode protection in accordance with MIL-A-19521, shall be provided, except that for submarine condensers, threaded support plugs which penetrate the sea pressure boundary shall not be used. Cover plates secured by four or more threaded fasteners may be used for support of zinc anodes. Compliance with MIL-A-19521 shall be certified by a drawing notation."

PAGE 24

Add as paragraph 3.2.21:

* "3.2.21 Flat gaskets. Flat gaskets shall be in accordance with tables I and II, and shall be 1/16 or 1/8 inch thick. Where the temperature of metal surfaces contacting the gasket will exceed 250°F during any condition of operation, gasket material shall be a suitable nonasbestos material approved by NAVSEA and containing less than 250 parts per million of each of the following materials:

(a) Total halogens (fluorine, chlorine, and bromine)
(b) Sulfur
(c) Lead
(d) Cadmium."

Table IV: Delete and substitute:

"TABLE IV. Material for type I and type II condensers.

Part	Material	Applicable document
Shells, tube support plates and swash plates	Steel, grade DH-36	MIL-S-22698
	Steel, class 1 or 2	ASTM A 537
	Steel	1/ ASTM A 588
Shell pressure/velocity reducing configurations, tube protection baffles, bars, tubes or screens, and piping and fittings subject to internal or external impingement	Stainless steel, type 304, 304L, 316, 316L	Commercial

"TABLE IV. Material for type I and type II condensers - Continued.

Part	Material	Applicable document
Waterboxes (for class A)	Nickel-copper alloy, class A	QQ-N-281
Waterboxes (for class B)	Copper-nickel alloy, composition 90-10 with reinforcing ribs of composition 90-10 copper-nickel alloy or of steel	MIL-C-15726 or MIL-T-16420 MIL-C-15726 ASTM A 516

1/ For double tube sheet condensers contracting activity approval to use this material shall be obtained."

PAGE 27

3.3.2.11.3, line 4: Delete "MIL-W-24027" and substitute "MIL-W-24270".

3.3.2.13: Delete.

3.4.2.1, line 2: Delete "3.3.2.12 and 3.3.2.13" and substitute "and 3.3.2.12."

PAGE 28

Table V: Delete and substitute:

"TABLE V. Material for type IV condensers.

Part	Material	Applicable document
Shells, tube support plates and swash plates	Steel, grade DH-36	MIL-S-22698
	Steel, class 1 or 2	ASTM A 537
	Steel	1/ASTM A 588

"TABLE V. Material for type IV condensers - Continued.

Part	Material	Applicable document
Shell pressure/velocity reducing configurations and, tube protection baffles, bars, tubes and screens, and piping and fittings subject to internal or external impingement	Stainless steel type 304, 304L, 316, or 316L	Commercial
Waterboxes (for class A)	Copper-nickel alloy, composition 70-30	MIL-C-15726
	Copper-nickel alloy, composition 70-30, cast	MIL-C-20159

See footnotes at end of table."

PAGE 29

Footnotes to table V: Add as footnote 2/:

"2/ Yield strength of copper-nickel material shall not exceed 48,000 lb/in^2."

3.6.2.1: Delete reference to "3.3.2.13".

PAGE 33

3.10.1.4(a), line 7: Delete "for 45°" and substitute "for 28°, 45°,".

PAGE 34

3.10.2, item (f): Delete and substitute:

"(f) Submarine waterbox design (see 3.2.15.4.1.1, 3.2.15.4.1.6, and 4.2.3)."

3.10.2: Add as items (q), (r) and (s):

"(q) For double tube sheet condensers, adequacy of condensate pump suction configuration to minimize the passage of corrosion products and foreign material (see 3.2.12).
"(r) For double tube sheet condensers, erosion/corrosion allowances used in the design of condenser shell and shell internals.
"(s) Analyses of condenser sea water side pressure drop based on:

(1) The tubing dimensions used in the thermal analysis.
(2) The tubing dimensions resulting in the worst case pressure drop."

PAGE 35

4.1.2.1.1: Delete and substitute:

"4.1.2.1.1 For submarine condensers, approval of tube sheet machining variations shall be handled as follows:

(a) Tube holes which are over 0.631 inch inside diameter (i.d.) up to and including 0.641 inch i.d. shall be classed as minor variations. The DCAS or Supervisor of Shipbuilding (SUPSHIP) has authority to approve up to 10 of these oversize holes in each tube sheet provided the minimum ligament thickness (see 3.2.13.3) is maintained. Oversize tube holes shall be completely documented on drawings which shall be included in the technical manual.

(b) Undersize tube sheet ligaments which meet minimum ligament requirements (see 3.2.13.3) shall be classed as minor variations. The DCAS or SUPSHIP has authority to approve these undersize ligaments provided their number does not exceed 1-1/2 percent of the total number of ligaments in that sheet. The extent of the condenser vendor's authority to locally approve a lesser percentage of undersize ligaments shall be as agreed to between the drawing approval agency and the applicable DCAS or SUPSHIP."

4.1.2.1.3, line 5: Delete "4 percent" and substitute "1 percent".

4.1.2.2: Add the following: "Traceability records shall be retained by the contractor for 7 years from delivery of the last item under the associated contract. At the expiration of the retention period, all records shall be made available to NAVSEA or its authorized representative by written notification. If no disposition is authorized within 6 months, the records may be destroyed."

PAGE 36

4.2.1.2, line 1: Delete "Stud" and substitute "Fastener".

* 4.2.1.4, line 1: Add "surface ship" before "condensers".

* 4.2.1.4, line 3: Delete "30 lb/in^2 g" and substitute "shell".

* 4.2.1.4, line 4: Delete "increased as necessary" and substitute "33 lb/in^2 g".

Add as paragraph 4.2.1.7.1:

"4.2.1.7.1 For submarine condensers, the amount of relative movement between inspection cover and inspection cover flange shall be measured on each inspection opening on the waterbox during hydrostatic testing of first unit by taking four radial deflection measurements 90 degrees apart (see 3.2.15.4.1.6)."

4.2.1.8, lines 1 and 4: Delete "4.2.1.7" and substitute "4.2.1.7.1".

PAGE 38

4.2.3.1, lines 3 and 4: Delete "1 and 2" and substitute "of 4.2.3(a) and (b)".

4.2.3.1, line 11: Delete "Modified Goodman Diagram and".

PAGES 38 and 39

4.2.4, line 6 and line 19: Delete "and pushout".

PAGE 39

4.3: Add: "Steel for surface ship condenser inner tube sheets shall have an average charpy V-notch impact energy absorption value of 30 foot-pounds (average of 3 specimens) at minus 30°F. Only one specimen may exhibit a value below 30 foot-pounds. This value shall be not less than 25 foot-pounds."

PAGE 40

4.5.7(b): Delete and substitute:

"(b) Heat transfer tubing shall be eddy-current tested in accordance with MIL-T-15005 except as specified in 4.5.7.1. Additionally, this tubing shall be ultrasonically tested as specified in 4.5.7.1 through 4.5.7.7."

4.5.7.2: Delete and substitute:

"4.5.7.2 Ultrasonic test. Condenser and heat exchanger tubes shall be tested by shear wave ultrasonic methods. Sensitivity of the device used for testing shall be adjusted to detect the artificial discontinuities on the calibrated tube in accordance with 4.5.7.3. Tubes shall be tested along the entire length and shall have at least 4 inches cut from each end of the length after testing."

4.5.7.3, line 9: Delete "6 inches from one end" and substitute "a minimum of 3 inches from one end".

4.5.7.3, sixth sentence: Delete and substitute: "The other notch is to be placed in line with the first but on the outside surface, with sufficient separation from the first notch to allow their individual detection when passed through at the maximum production speed."

4.5.7.4.1: Delete.

PAGES 40 and 41

4.5.7.4.2, fourth sentence: Delete and substitute: "The search unit position with respect to the tube axis shall be maintained within 0.010 inch of the tube. Proper rotation and through speeds shall be used to insure 100 percent inspection coverage (helix not to exceed 1/2 the transducer width). Scanning

shall be done with the same couplant, search unit alinement, and instrument settings as were used during calibration. Inspection shall be done in opposite circumferential directions."

PAGE 41

4.5.7.5, first sentence: Delete and substitute: "Testing devices shall be calibrated at the start of the test run and at least once every hour of continuous operation or whenever improper functioning of the testing unit is indicated."

4.5.7.6, line 1: Delete "eddy-current or".

PAGE 42

5.1.2.1, title and first sentence: Delete and substitute: "Single tube sheet condensers. Single tube sheet condensers shall be cleaned and dried after which all internal steel surfaces shall be preserved with grade 5 of MIL-C-16173. Superficial light rusting of internal carbon steel surfaces is permitted."

Add as paragraph 5.1.2.3:

"5.1.2.3 Double tube sheet condensers. Double tube sheet condensers shall be thoroughly cleaned and dried, after which all openings shall be sealed to accomplish a water and vaporproof closure. Superficial light rusting of internal carbon steel surfaces is permitted. Closure of openings shall be by bolting steel plates with resilient gaskets of 1/8-inch minimum thickness to flanges. Openings which cannot be closed in this manner shall be sealed with plastic plugs or caps and barrier material conforming to class 1 of MIL-B-131, and weather-resistant tape. Static dehumidification of condenser shells shall be provided in accordance with method II of MIL-P-116 using type 3 dessicant in accordance with MIL-P-116. Humidity indicator plugs shall be provided as required in MIL-P-116. External unpainted ferrous surfaces, such as flange faces and bearing surfaces, shall be coated with preservative conforming to grade 4 of MIL-C-16173."

PAGE 43

6.1.1(o): Delete and substitute:

"(o) If steam dump connection is required; if so, specify design pressure, temperature and hydrostatic test pressure for the steam dump assembly (see 3.2.17.3 and 3.2.17.3.1). Also specify steam dump design operating condition including pressure, temperature and enthalpy at the dump inlet, flow through the steam dump, and operating cycles (see 3.2.17.3.1.2). Also specify maximum operating pressure and temperature at the steam dump inlet if applicable (see 3.2.17.3.1.3). Also specify maximum design temperature for turbine exhaust flexible connections (if used) (see 3.2.17.3.1.1)."

6.1.1, item (r): Delete "(see 3.2.17.3.4)" and substitute "(see 3.2.17.3.3)".

6.1.1: Add as items (ff) and (gg):

"(ff) Specify nozzle differential pressures for feed and condensate pump recirculation connections and hotwell recirculation connections (see 3.2.17.3.4(b)(1)).

"(gg) Specify if condenser is for a saturated steam plant ship (see 3.2.18.1)".

LAST PAGE

DD 1426, Standardization Document Improvement Proposal: Delete address and substitute:

"COMMANDER
NAVAL SEA SYSTEMS COMMAND (SEA 55Z3)
DEPARTMENT OF THE NAVY
WASHINGTON, DC 20362-5101"

NOTE: The margins of this amendment are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

Preparing activity:
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