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MILITARY SPECIFICATION

TUBE, CONDENSER AND HEAT EXCHANGER WITH INTEGRAL FINS
(UNS ALLOY NOS C71500, C70600, C12200)

This amendment forms a part of MIL-T-22214B(SH), dated 16 March 1987, 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.

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2.11: Add under STANDARDS, MILITARY

"MIL-STD-792 - Identification Marking Requirements for Special Purpose Components."

Add new paragraph 2.1.2:

"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.

NAVAL SEA SYSTEMS COMMAND (NAVSEA)
0900-LP-003-8000 - Surface Inspection Standards of Metals.

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

PAGE 3

3.3: Delete and substitute:

"3.3 Soundness. Tubes shall be free of defects which will render the tubes unusable as determined by visual or nondestructive inspection. For class A applications and when specified for class B applications (see 6.2.1), the tube shall pass the eddy current inspection specified in 4.3.3. The inspection shall be conducted on finned tubes."

3.4: Delete and substitute:

"3.4 Number of fins. Unless otherwise specified (see 6.2.1), the tube shall have 19 fins with a tolerance of plus one, minus zero fins per inch as averaged over any 12 inch length."

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3.6: Delete and substitute:

"3.6 Dimensions. Unless otherwise specified (see 6.2.1), dimensions of tubes shall be as specified (see 6.2.1). Nominal dimensions of the finned condenser tubes are as shown in table I."

Table I: Delete and substitute new Table I.

"TABLE I. Dimensions of integral finned condenser tubes (minimum wall).

Nominal		Plain section		Finned section	
Outside diameter	Wall	Outside diameter	Specified minimum wall	Root diameter	Specified minimum wall
inch	inch	inch	inch	inch	inch
1/2	0.032	0.500	0.049	0.375	0.032
1/2	.042	.500	.058	.375	.042
1/2	.049	.500	.065	.375	.049
5/8	.028	.625	.042	.500	.028
5/8	.035	.625	.049	.500	.035
5/8	.049	.625	.065	.500	.049
5/8	.058	.625	.072	.500	.058
5/8	.065	.625	.083	.500	.065
3/4	.028	.750	.049	.625	.028
3/4	.035	.750	.052	.625	.035
3/4	.042	.750	.058	.625	.042
3/4	.049	.750	.065	.625	.049
3/4	.058	.750	.075	.625	.058
3/4	.065	.750	.083	.625	.065
3/4	.072	.750	.086	.625	.072
3/4	.083	.750	.095	.625	.083
3/4	.095	.750	.109	.625	.095
7/8	.035	.875	.052	.750	.035
7/8	.042	.875	.058	.750	.042
7/8	.049	.875	.065	.750	.049
7/8	.058	.875	.075	.750	.058
7/8	.065	.875	.083	.750	.065
7/8	.072	.875	.086	.750	.072
7/8	.083	.875	.095	.750	.083
1	.042	1.000	.058	.875	.042
1	.049	1.000	.065	.875	.049
1	.058	1.000	.075	.875	.058
1	.065	1.000	.083	.875	.065
1	.072	1.000	.086	.875	.072
1	.083	1.000	.095	.875	.083

"

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3.8: Delete and substitute:

"3.8 Cleanliness. The inner and outer surface of the tubes shall be delivered clean, free of dirt, oils, grease, acid, chips, carbonaceous material, free carbon, sulfur bearing compounds and any other foreign matter that render the tube unfit for their intended use. Contaminants such as sulfur or sulfur bearing compounds or carbon or carbon compounds from lubricants used in forming, machining, or other processing, and marking materials used for in-process identification shall be removed from the material prior to any heat treatment. Tubing shall be cleaned by heat treating in a reducing or inert atmosphere or by acid or abrasive cleaning. Traces of acid or abrasive shall be removed following cleaning."

Add new paragraph 3.9:

"3.9 Marking. Each length of tube 1/2 inch in outside diameter and larger shall be permanently marked in accordance with MIL-STD-792, with the manufacturer's name or identifying mark, specification number, alloy number and lot number. Marking shall be placed on one plain end within 1/4 inch of the start of the fins, letter height shall not exceed 1/8 inch. Marking shall not interfere with the rolling operation at installation of the tube nor violate minimum wall thickness. On smaller than 1/2 inch diameter tubing that is packaged, the same information shall be provided on a metal tag securely attached to each bundle."

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4.2, Table III: Delete and substitute and add new table IV:

"4.2 Sampling.

4.2.1 Inspection lot. For sampling purposes, a lot shall consist of lengths of tubes of the same composition, temper, size, heat treated at the same time in the same furnace, offered for delivery at the same time and identifiable by mill records as originating from one or more heats (melts), as necessary, which conform to the chemical requirements. The total weight of the lot shall not exceed 10,000 pounds.

4.2.2 Chemical analysis. Samples shall be taken at the time the metal is cast. One sample shall be taken for each group of castings poured simultaneously from the same source of molten metal. Analysis of all metal comprising the lot shall be reported.

4.2.3 Visual and dimensional examination. From each lot, a representative sample of tubes shall be selected in accordance with table III.

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TABLE III. Sampling for visual and dimensional examinations.

Lot size	Sample size
2 - 8	2
9 - 15	3
16 - 25	5
26 - 50	8
51 - 90	13
91 - 150	20
151 - 280	32
281 - 500	50
501 - 1200	80
1201 - 3200	125

4.2.4 Destructive tests. From the lot as defined in 4.2.1 representative samples for flattening, flaring and grain size tests as specified in ASTM B 359 shall be selected in accordance with table IV.

TABLE IV. Sampling for destructive tests.

Lot size	Sample size
1	1
2 - 64	2
65 - 160	3
161 - 400	4
401 - 2500	6

4.2.5 Nondestructive tests. Each tube shall be subjected to the eddy current and liquid penetrant tests."

4.3.1: Delete first sentence and substitute:

"Each sample tube selected in accordance with 4.2.2 shall be dimensionally inspected for compliance with 3.4 through 3.7 and visually inspected for compliance with 3.3, 3.8, and 3.9."

PAGES 6 AND 7

4.3.3 through 4.3.3.1.4: Delete and substitute:

"4.3.3 Nondestructive inspection. Each tube in the finished form shall be nondestructively inspected in accordance with ASTM B 359 with the following modifications.

4.3.3.1 Eddy current and hydrostatic tests. Both eddy current and hydrostatic tests are required.

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4.3.3.2 Eddy current procedure. An eddy current procedure shall be prepared which meets the requirements of ASTM B 359. The procedure shall be qualified and approved as required by MIL-STD-271. Inspection personnel shall be qualified and certified in accordance with MIL-STD-271.

4.3.3.3 Liquid penetrant inspection. Liquid penetrant inspection in accordance with MIL-STD-271 shall be performed on the outside surface and the end surfaces of the smooth ends of the tubes to inspect the area of the tubes missed by the eddy current test due to "end effect". Alternatively, the area of the tube ends missed due to end effect may be cropped off and discarded. Liquid penetrant acceptance criteria shall be in accordance with NAVSEA 0900-LP-003-8000."

Preparing activity:
Navy - SH
(Project 4710-N010)