

MIL-A-24280A(SHIPS)
 11 December 1972
 SUPERSEDING
 MIL-A-24280(SHIPS)
 21 April 1967
 (See 6.6)

MILITARY SPECIFICATION

ANCHORS, MARINE FLUKED, LIGHT WEIGHT TYPE (LWT),
 (30 DEGREES AND 50 DEGREES FLUKE ANGLES WITH WEDGE-BLOCK ADAPTERS),

HIGH STRENGTH CAST STEEL

1. SCOPE

1.1 Scope. This specification covers high holding power, nonfouling, light weight type (LWT), high strength, cast steel anchors with variable fluke angles for use on ships or boats and for salvage applications.

1.2 Classification. The anchors shall be of the following nominal weights as specified (see 6.2).

<u>Nominal weight</u>		
Pounds		
6,000	16,000	30,000
10,000	20,000	
14,000	25,000	

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of the specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

TT-V-51 - Varnish; Asphalt.

MILITARY

MIL-C-450 - Coating Compound, Bituminous Solvent Type, Black (For Ammunition).
 MIL-E-22200/1 - Electrodes, Welding, Mineral Covered, Iron-Power Low-Hydrogen Medium and High Tensile Steel, as Welded or Stress-Relieved Weld Application.
 MIL-E-22200/5 - Electrodes, Welding, Mineral Covered, Iron-Power, Low-Hydrogen, Low-Alloy Steel for Hardening and Tempering Heat Treatment Applications Only.
 MIL-S-24093 - Steel Forgings, Carbon and Alloy Heat Treated.

STANDARDS

FEDERAL

FED-STD-151 - Metals; Test Methods.

MILITARY

MIL-STD-129 - Marking for Shipment and Storage.
 MIL-STD-271 - Nondestructive Testing Requirements for Metals.

DRAWINGS

MILITARY

805-2482962 - Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge-Block Adapters) - Assembly.
 805-2482963 - 6,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge Block Adapters) - Details.
 805-2482964 - 10,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge Block Adapters) - Details.
 805-4355995 - 14,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge-Block Adapters) - Details.

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- 805-4355996 - 16,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge-Block Adapters) - Details.
- 805-4355997 - 20,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge-Block Adapters) - Details.
- 805-4355998 - 25,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge-Block Adapters) - Details.
- 805-4355999 - 30,000 Pound Light Weight Type (LWT) Anchor (30° and 50° Fluke Angles with Wedge-Block Adapters) - Details

PUBLICATIONS

MILITARY

NAVSHIPS 0900-000-1000 - Fabrication, Welding and Inspection of Ships Hulls.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

- # 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 222 South Riverside Plaza, Room 1106, Chicago, Illinois 60606.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A370-68 - Mechanical Testing of Steel Products, Methods and Definitions for.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

NATIONAL CLASSIFICATION BOARD

National Motor Freight Classification Rules

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., 1616 P Street, N.W., Washington, D.C. 20036.)

ASSOCIATION OF AMERICAN RAILROADS RULES GOVERNING LOADING OF COMMODITIES/FREIGHT ON/IN OPEN AND CLOSED CARS

(Application for copies should be addressed to the Association of American Railroads, Operations and Maintenance Department, 59 East Van Buren Street, Chicago, Illinois 60605.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Material.3.1.1 Shank, crown, and flukes.

3.1.1.1 The anchor proper, consisting of shank, crown and flukes, for all weights, shall be made from steel castings (see 3.5.1 and 3.5.2) in accordance with the chemical composition and mechanical properties specified in tables I and II.

Table I - Chemical composition.

	Type I ^{1/} , 2/	Type II ^{1/} , 2/
Chemical composition	Percent	Percent
Carbon	0.25 to 0.35	0.20 maximum
Manganese	1.50 to 1.80	.55 to 0.75
Silicon	0.30 to 0.60	.50 maximum
Molybdenum	.40 to .60	.30 to 0.60
Phosphorus	0.04 maximum	.020
Sulfur	.04 maximum	.015
Nickel	-----	2.50 to 3.25
Chromium	-----	1.35 to 1.85

^{1/} The anchor shall be fabricated such that residuals of titanium and vanadium do not exceed 0.07 percent. Residuals of copper shall not exceed 0.25 percent.

^{2/} Check analysis variations. On check analysis the percentages of the elements shall be not over the upper limits or under the lower limits shown in table I by more than the following amounts. Where no check analysis variation is shown, the limits for check analysis and ladle analysis are the same.

Variations

<u>Element</u>	<u>Over the upper limit</u>	<u>Under the lower limit</u>
Manganese	0.05	0.05
Phosphorus	.005	----
Sulfur	.005	----
Silicon	.03	----
Nickel	.07	.07
Chromium	.06	.06
Molybdenum	.03	.03

Table II - Mechanical properties^{1/}.

Mechanical properties	Minimum Type I	Minimum Type II
Tensile strength	100,000 p.s.i.	100,000 p.s.i.
Yield point	80,000 p.s.i.	80,000 p.s.i.
Elongation in 2 inches	15 percent	20 percent
Reduction in area	25 percent	35 percent
Cold bend	90 degrees to inner radius 1/2 inch (1 inch by 1/2 inch section)	90 degrees to inner radius 1/2 inch (1 inch by 1/2 inch section)
Charpy-Vee at 0°F ^{1/}	30 ft. lbs.	30 ft. lbs.

^{1/} Mechanical property tests to be determined from a keel block or a separately cast test block without chills, 3 inch by 6 inch by 12 inch minimum size, and heat treated with the applicable casting(s).

3.1.2 Anchor stocks, shackles and shackle pins. Anchor stocks, shackles, shackle pins for all weights of anchors shall be made from forged steel conforming to MIL-S-24093, class D, type I.

3.1.3 Split keys and rings. Split keys and rings shall be made from a good commercial quality medium steel conforming to the applicable drawing specified in 2.1.

3.1.4 Chain. The chain shall be of the close link type made from a good commercial quality steel, and shall be of the size and length shown on the applicable drawings specified in 2.1.

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3.1.5 Wedge-block adapters, bolts and set screws. The wedge-block adapters shall be made from good commercial quality forged or cast steel, and shall be of the size and dimensions shown on the applicable drawings specified in 2.1. The bolts and set screws shall be steel cadmium plated as required by the applicable drawings specified in 2.1.

3.2 General description. The anchor shall consist essentially of a long shank and two sharp, double-swinging flukes with the stock located at the crown end of the anchor. Each anchor shall be furnished complete with shackle, with all parts, including the wedge block adapters, properly fitted and assembled, ready for use.

3.3 Design and dimensions. The anchor, including the shackle and pin and all parts, shall be constructed in accordance with the design and dimensions shown on the applicable drawings specified in 2.1.

3.4 Weight tolerance. The tolerances in weight shall be plus 4 percent and minus 2 percent of the nominal weights specified in the applicable drawings listed in 2.1.

3.5 Heat treatment. Both type I and type II castings (see 3.5.1 and 3.5.2) shall be heat treated to obtain the properties specified in table II. The manufacturer shall determine the detailed procedure with the exception that the minimum temperatures and temperature ranges specified herein shall be required.

3.5.1 Type I castings. Type I castings shall be heat treated by homogenizing (if required see 6.4), normalizing, austenizing, liquid quenching, tempering and liquid quenching again.

3.5.1.1 Normalizing. All castings shall be normalized. This heat treatment should be at a uniform rate not to exceed 400°F per hour to a minimum temperature of 1750°F. The castings should be held at this temperature for a period of at least 1 hour per inch of thickest cross section but in no case less than 1 hour. The castings should then be removed from the furnace and air cooled to below 1000°F. Accelerated cooling is recommended.

3.5.1.2 Austenizing. Type I castings, after normalizing, shall be reheated in a furnace to the austenizing temperature range and held for a minimum of 30 minutes per inch of thickest cross-section, but in no case less than 1 hour. The castings shall then be liquid quenched.

3.5.1.3 Tempering. Following cooling to ambient temperature, all castings should be reheated at a rate not to exceed 400°F per hour to a minimum temperature of 1000°F. The castings should be held at this temperature for a period of at least 1 hour per inch of thickest cross-section, but in no case less than 1 hour. The castings should then be removed from the furnace and cooled to ambient temperature. Type I castings shall be cooled by liquid quenching.

3.5.2 Type II castings. Type II castings shall be heat treated by homogenizing, (if required see 6.4), the normalized and tempered in accordance with 3.5.1.1 and 3.5.1.3.

3.5.2.1 It is recommended that type II castings be given accelerated cooling for better toughness values in thick sections. Where it is required, the castings may be retempered and liquid quenched to improve toughness.

3.6 Magnetic particle inspection. All cast steel parts shall be magnetic particle inspected in accordance with MIL-STD-271. The castings shall be proven free of linear indications over 1/8 inch length. Discontinuities may be weld repaired. Weld repair shall comply with the requirements of NAVSHIPS 0900-000-1000. Quenched and tempered anchors may be weld repaired prior to heat treatment using type MIL-10018-N1 of MIL-E-22200/5. Weld repairs after heat treatment shall use MIL-9018-M or MIL-11018-M of MIL-E-22200/1. Weld repairs shall be ground smooth to blend into the contiguous cast surface. Magnetic particle inspection shall be performed after final heat treatment and weld repairs and prior to painting.

3.7 Proof. Each anchor assembled with shackles, pins, stock and wedge adapters in place ready for service, shall be subjected to a proof test as specified in 4.6.4. The magnitude of the proof load shall be that required for 80,000 pounds per square inch (p.s.i.) yield strength material as specified in the table on Drawing 805-2482962.

3.8 Identification markings. The anchors shall be marked with 1-inch letters and 1-1/8-inch numerals, as shown on the applicable drawing specified in 2.1. The legend shall be cut, stamped, or cast in place on the shank of the anchor. When markings are stamped or cut, such markings shall be completed prior to the tempering heat treatment operation.

3.8.1 Serial number. Each anchor shall be assigned a serial number, which shall be cut, stamped, or cast in place on the shank crown, and each wedge-block adapter. These parts also shall be permanently "match-marked" to indicate the proper fitted position of each in assembly.

3.9 Finish. The entire surface of all parts shall be coated with one coat of black asphalt varnish conforming to TT-V-51 or MIL-C-450, type I.

3.9.1 Shank. Special attention shall be given to the radii on the corners of the shanks to assure a smooth curve free from cracks, and coldshuts or irregularities. The stop on the shank shall make full surface contact with the boss in the crown when the flukes are in the operating positions. The angle between the shank and fluke centerlines shall conform to the applicable drawings specified in 2.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Sampling for quality conformance inspection.

4.2.1 Lot.

4.2.1.1 Castings. A lot shall consist of castings made from the same heat.

4.2.1.2 Chemical analysis of castings. A lot shall consist of castings of one type made from the same heat or the same pouring of a ladle containing a number of crucible heats, heat-treated in the same furnace charge, and offered for inspection at one time.

4.2.2 Sampling for visual and dimensional examination. A random sample of anchors shall be selected from each lot of material offered for examination of visual and dimensional characteristics specified in 4.3.2 with lot acceptance based on table III.

Table III - Sampling for visual and dimensional examination
AQL (approximate) = 2.5 percent defective.

Number of anchors in lot	Number of anchors in sample	Acceptance number (defectives)	Rejection number (defectives)
25 and under	10	0	1
26 to 40	15	1	2
41 to 110	25	1	2
111 to 300	35	2	3
301 to 500	50	3	4
501 to 800	75	4	5
801 and over	110	6	7

4.2.2.1 Sampling for nominal weight. A random sample of assembled anchors shall be selected from each lot to verify compliance with this specification in regard to weight (see 4.3.3). Lot acceptance shall be based on table IV.

Table IV - Sampling for nominal weight of assembled anchors
AQL (approximate) = 2.5 percent defective.

Number of anchors in lot	Number of anchors in sample	Acceptance number (defectives)	Rejection number (defectives)
40 and under	5	0	1
41 to 110	10	0	1
111 to 300	15	1	2
301 to 500	25	1	2
501 to 800	35	2	3
801 and over	50	3	4

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4.2.2.2 Sampling for magnetic particle inspection of anchor parts. Each anchor part in every lot shall be subjected to the magnetic particle inspection specified in 4.4.1.

4.2.2.3 Sampling for chemical analysis of castings.

4.2.2.3.1 Material. Where the material can be identified by heat, two samples shall be obtained from each heat (see 4.5.2). Each sample shall be analyzed separately.

4.2.2.3.1.1 Where material cannot be identified by heat, it shall be divided into sublots of not more than 1,000 pounds each, or a single casting more than 1,000 pounds. One sample shall be obtained from each subplot for chemical analysis, and these samples shall be analyzed individually.

4.2.2.3.2 Sampling for mechanical properties of castings. For castings estimated to weigh 500 pounds and over, one sample for the tension test and one sample for the bend test and a minimum of two charpy-Vee samples shall be taken to represent each casting (see 4.5.1). For castings estimated to weigh less than 500 pounds, two samples for the tension test and one sample for the bend test shall be taken from each lot. Test specimens shall be taken from approximately the mid thickness of the test block.

4.3 Examination.

4.3.1 Patterns. Patterns for all parts of the anchor shall be carefully checked to verify that dimensions are in conformance with the applicable drawings specified in 2.1 and further insure that the patterns are free from defects that would affect the quality of the casting.

4.3.2 Visual and dimensional examination. Each of the sample anchors selected in accordance with 4.3.1, shall be visually and dimensionally examined prior to painting for defects of manufacture, workmanship, and to verify compliance with this specification. Any anchor in the sample containing one or more visual or dimensional defects shall not be offered for delivery and if the number of defective anchors in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

4.3.3 Weight. Each assembled anchor selected in accordance with 4.3.2 shall be weighed to verify compliance with 3.4. Anchors exceeding the tolerance limits specified shall not be offered for delivery. If the number of defective anchors in any sample exceeds the acceptance number of that sample the lot represented by the sample shall be rejected.

4.4 Inspection.

4.4.1 Magnetic particle inspection. Each part of each anchor shall be subjected to magnetic particle inspection in accordance with MIL-STD-271 and to determine conformance with 3.6.

4.5 Tests.

4.5.1 Mechanical property tests (castings). Mechanical property tests shall be performed in accordance with ASTM A370-68 to determine conformance with table II. If any casting fails to pass any of the mechanical property tests specified in table II, the lot from which the castings were selected shall be rejected. Retests for mechanical properties shall be performed in accordance with FED-STD-151 or ASTM A370-68 as applicable.

4.5.2 Chemical composition (casting). Chemical analysis shall be performed in accordance with FED-STD-151 to determine conformance to table I.

4.5.3 Proof test. Proof test shall be conducted in accordance with the requirements specified in 3.7.

4.5.3.1 Method. With the anchor assembled including the wedge block adapters, and opened to its maximum degree of swing, (30 degrees) and with both flukes secured at the tips, specified proof load shall be applied to the anchor at the anchor shackle in the manner shown diagrammatically on Drawing 805-2482962. The proof load shall be applied with the flukes in both operative positions.

4.5.3.2 Gaging. The anchors shall be gaged before and after they have been tested in each operative position to determine any permanent deformation caused by applied stress. There shall be no permanent deformation of any part of the anchor upon completion of this test.

4.6 Inspection for preparation for delivery. The packaging, packing and marking shall be inspected for compliance with section 5 of this document.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 Levels A, B, and C. All movable parts shall be securely fastened to the anchor stock or shank to prevent movement, dislodgement or loss during handling, shipment and storage. Anchors shall be arranged, secured and packed for shipment in a manner acceptable to the carrier and which will insure safe delivery at destination in a satisfactory condition at the lowest applicable rate. The method of packing, packing media (skids, pallets, containers, etc) when used, and loading shall comply with the Uniform Freight or National Motor Freight Classification Rules and Regulations or other carrier rules as applicable to the mode of transportation. Loading methods for closed or open rail cars shall be in accordance with the Association of American Railroads Rules as applicable to the type of vehicle employed.

5.2 Marking. In addition to any special marking(s) required (see 6.2) and 3.8, shipment markings shall be in accordance with MIL-STD-129; level A requirements for stock procurements, level C requirements for immediate need procurements.

6. NOTES

6.1 Intended use. Cast steel marine anchors covered by this specification are intended for use on ships or boats and for salvage operations and other similar applications.

6.2 Ordering data. Procurement documents shall specify the following:

- (a) Title, number, and date of this specification.
- (b) Nominal weight of anchor required (see 1.2).
- (c) Special marking(s) required (see 5.2).
- (d) That the nominal weight of anchor ordered will determine the price and no payment will be made for any excess of weight.

6.3 Anchors covered by this specification are commonly referred to as "LWT Wedge-Block Model, High Strength."

6.4 Homogenization. Homogenization is recommended for all castings where in the foundry practices exercise no other control over hydrogen in the melt. When homogenization is performed, the castings shall be heated at a controlled rate to a temperature between 1850°F and 2350°F, and shall be held at the homogenization temperature a sufficient length of time to minimize harmful heterogeneity by diffusion. The castings shall then be withdrawn from the furnace and permitted to cool through the critical range. Homogenization is recommended for the control of flaking.

6.5 The Department of the Navy is licensed under U.S. Patents 2,249,546, 2,320,966, 2,469,315 and 2,677,343, which cover the anchors specified herein.

6.6 THE MARGINS OF THIS SPECIFICATION ARE MARKED "¶" TO INDICATE WHERE CHANGES (ADDITIONS, MODIFICATIONS, CORRECTIONS, DELETIONS) FROM THE PREVIOUS ISSUE 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 ISSUE.

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Navy - SH
(Project 2040-N126)

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