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INCH-POUND

MIL-DTL-23599B(AS)
15 August 2011
SUPERSEDING
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DETAIL SPECIFICATION

HOOK, RESCUE

This specification is approved for use by the Naval Air Systems Command and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the requirements for all types of rescue hooks.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 or 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 or 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Air Warfare Center Aircraft Division, Code 4L8000B120-3, Highway 547, Lakehurst, NJ 08733-5100 or emailed to michael.sikora@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil.

AMSC N/A FSC 4030

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DEPARTMENT OF DEFENSE SPECIFICATIONS

MS18027	Hook, Helicopter Rescue
MS20115	Shackle-Wire Rope

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129	Military Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1472	Human Engineering
MIL-STD-1907	Inspection, Liquid Penetrant and Magnetic Particle, Soundness Requirements for Materials, Parts and Weldments

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359.1	Systems, Subsystems and Components, Personal Fall Arrest, American National Standard Safety Requirements for. (DoD Adopted)

(Copies of this document are available online at www.ansi.org or from the American National Standard Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036.)

AMERICAN SOCIETY FOR QUALITY

ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes. (DoD Adopted)

(Copies of this document are available online at www.asq.org or from the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203.)

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ASTM INTERNATIONAL

ASTM E1444	Standard Practice for Magnetic Particle Testing (DoD Adopted)
ASTM E1742/E1742M	Standard Practice for Radiographic Examination (DoD Adopted)

(Copies of these documents are available online from www.astm.org or from ASTM International, 100 Barr Harbor Drive, Conshohocken, PA 19428-2959.)

SAE INTERNATIONAL

SAE-AMS 2175	Castings, Classification and Inspection of. (DoD adopted)
SAE-AMS 2374	Quality Assurance Sampling and Testing, Corrosion and Heat-Resistant Steel and Alloy Forgings.
SAE-AMS 2700	Passivation of Corrosion Resistant Steels. (DoD adopted)
SAE-AMS 5355	Steel, Corrosion Resistant, Investment Castings, 16CR-4.1NI – 0.28Cb – 3.2 Cu, Homogenization and Solution Heat Treated or Homogenization, Solution and Precipitation Heat Treated. (DoD adopted)
SAE-AMS 5643	Steel, Corrosion-Resistant, Bars, Wire, Forgings, Tubing, and Rings 16CR-4.1NI - 0.30Cb – 4.0 Cu, Solution Heat Treated, Precipitation Hardenable. (DoD adopted)

(Copies of these documents are available from www.sae.org or SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article inspection. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Design. The rescue hooks covered by this specification shall be designed as stated below:

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3.2.1 Hook assembly. The rescue hook (see 6.4) shall consist of a single hook and an auxiliary ring. The auxiliary ring (see 6.4) shall be located on the lower aft part of the hook and shall be an integral part of the forging or casting.

3.2.2 Hoisting operations. The rescue hook shall be able to contain and support the equipment necessary for all hoisting operations.

3.2.3 Dimensions. The rescue hook shall be designed within the following dimensional constraints:

3.2.3.1 Hook diameter. The hook throat shall be compatible with standard rescue devices such as litters, straps, baskets, and penetrators (see 6.3). The hook shall be capable of simultaneously containing a minimum of 5 lifting rings (see 6.4) with a circular cross section of 0.35 inch.

3.2.3.2 Auxiliary ring diameter. The auxiliary ring shall be sized so as not to compromise or interfere with the function of the hook. The ring shall accommodate a 10,000 pound (lb.) locking carabiner.

3.2.4 Swivel fitting. The hook shall be capable of being configured with a swivel fitting in accordance with MS18027 and accommodate, at a minimum, a 10,000 lb. locking carabiner.

3.3 Performance.

3.3.1 Hook Strength.

3.3.1.1 Static proof loads. When tested as specified in 4.6, the rescue hook shall support the following static proof loads and shall not exhibit elastic deformation:

a. Hook	4,200 lb.
b. Auxiliary Ring	4,200 lb.
c. Swivel Fitting	4,200 lb.

3.3.1.2 Static ultimate loads. When tested as specified in 4.6, the rescue hook shall support the following static ultimate loads while maintaining hook functionality. Plastic deformation is allowed under the condition that the safety latch is able to remain in a closed and locked position:

a. Hook	6,300 lb.
b. Auxiliary Ring	6,300 lb.
c. Swivel Fitting	6,300 lb.

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3.3.1.3 Dynamic loads. When tested as specified in 4.6, the rescue hook shall support the following dynamic loads without exhibiting plastic deformation. Following the dynamic testing, the hook shall be non-destructively inspected for cracking using the methods in 4.5.3.1:

a. Hook	200,000 cycles at 2,100 lb.
b. Auxiliary Ring	200,000 cycles at 2,100 lb.
c. Swivel Fitting	200,000 cycles at 2,100 lb.

3.4 Safety latch. In order to prevent ring roll-out or reversal due to load release, torsion, load jolt, etc., the rescue hook shall employ a spring latch (see 6.4) mechanism with a positive lock.

3.4.1 Lock. The lock (see 6.4) shall prevent the latch from opening unless the lock is disengaged.

3.4.2 Operation. The locking arrangement shall be positive and easily operable with one hand by personnel, providing rapid engagement and disengagement of the locking mechanism in accordance with 5.9.11.4, push and pull forces, of MIL-STD-1472. A positive identification of locked or unlocked status shall be provided by the mechanism.

3.4.2.1 Force. The force required to open the latch in operation shall be not greater than 9.5 lb.

3.4.2.2 Auto locking. Any latch with an automatic locking feature shall provide the ability to disable the automatic locking function.

3.4.2.3 Disengagement. The lock design shall be resistant to inadvertent disengagement of the lock resulting from contact and use expected in normal operations including:

a. Abrasion or sliding contact with structures
b. Impact with surfaces in multiple orientations
c. Normal handling or gripping by the operator or survivor

3.4.3 Latch strength.

a. The face of the safety latch shall be loaded to 900 lb in accordance with ANSI Z359.1, 4.3.1.1.2, Gate Face Testing of Snaphook and Carabiner. The latch shall not separate more than 0.125 inch from the nose of the hook during loading with no permanent deformation or damage allowed to any components. The latch and lock components shall function as intended after removal of the test load.

b. The side of the safety latch shall be loaded to 900 lb in accordance with ANSI Z359.1, 4.3.1.1.3 Side Load Testing of Snaphook and Carabiner. The latch shall not separate more than 0.125 inch from the nose of the hook during loading with no permanent deformation or damage allowed to any components. The latch and lock components shall function as intended after removal of the test load.

c. The face and side load tests shall be performed with the latch in the closed and locked condition.

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3.5. Materials and manufacturing.

3.5.1 Forging. For manufacturers using forging, the rescue hook, including the auxiliary ring, safety latch, lock and swivel fitting, shall be formed using 17-4PH steel alloy. The hook shall be heat treated and hardened to a minimum of the H1025 condition in accordance with SAE-AMS 5643.

3.5.2 Casting. For those manufacturers using investment casting that have undergone hot isostatic pressing, cast the hooks using 17-4PH steel alloy. The hook shall be heat treated and hardened to a minimum of the H1025 condition in accordance with SAE-AMS 5355. Hooks that have undergone investment casting with hot isostatic pressing shall have an added safety factor of 1.25 for all strength requirements.

3.5.3 Hardness. Indentations shall not be allowed in high stress areas.

3.5.4 Processes. Forging and casting processes shall not be mixed within each hook lot.

3.6 Environmental. When tested as specified in 4.7, the rescue hook shall not suffer a decrease in structural integrity or operability. The hook shall be tested as specified in 4.6.1.2 following each environment test.

3.7 Identification of product. Each rescue hook shall be permanently and legibly marked in accordance with MIL-STD-130. The identification detail shall include enterprise identifier, part number, lot or batch number, and serial number.

3.8 Marking. In addition to any special marking required by the contract or order, marking for shipment shall be in accordance with MIL-STD-129 and shall include the date of manufacture, month and year.

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3.9 Workmanship. The rescue hooks shall be uniform in quality and shall be free from irregularities or defects which would adversely affect performance, reliability, or durability.

4. VERIFICATION

4.1 Classification of inspections.

a. First article inspection (see 4.2).
b. Conformance inspection (see 4.4).

4.2 First article inspection. The first article inspection of the rescue hooks shall consist of examinations and tests for all of the requirements of this specification.

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4.3 First article samples. Unless otherwise specified, the manufacturer shall submit two first article samples. The samples shall be representative of the construction, workmanship and materials to be used during production. When a manufacturer is in continuous production of these rescue hooks from contract to contract, submission of further samples on the new contract may be waived at the discretion of the procuring activity. Approval of the first article samples by waiving first article inspection does not preclude the requirement for performing conformance inspection. The samples shall be furnished to the Government as directed by the Contracting Officer (see 6.2). The samples shall be identified with the following information:

> Sample submitted by (name), (date), (Contract No.) for first article inspection in accordance with the requirements of MIL-DTL-23599.

4.3.1 Sample disposition. Upon the completion of the first article inspection, one approved first article sample will be returned to the manufacturer for use in monitoring production. The remaining sample will be consumed or destroyed in the first article inspection and will not be considered as part of the quantity to be delivered under contract.

4.4 Conformance inspection. Conformance inspection shall consist of the following:

Visual examination
Dimensional examination
Metal examination
Metal inspection
Strength tests
Environmental tests

4.4.1 Inspection lot. An inspection lot shall be expressed in units of one rescue hook made under the same conditions and from the same materials and components. The sample unit shall be one rescue hook.

4.4.2 Tests and examinations. The sample size, tests, and examinations shall be as specified in table I.

TABLE I. Sample size, examinations, and tests.

INSPECTION	TEST METHOD PARAGRAPH	SAMPLE SIZE 1/
Visual Examination	4.5.1	Every unit for critical defects. Inspection Level II for minor defects
Dimensional Examination	4.5.2	Inspection Level S-2
Metal Examination	4.5.3	Inspection Level S-2
Metal Inspection	4.5.3.1	Inspection Level S-2
Strength Tests	4.6	Inspection Level S-2

1/ The sample size shall be in accordance with ANSI/ASQ Z1.4.

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4.5 Inspection methods.

4.5.1 Visual examination. Each rescue hook selected in accordance with table I shall be examined visually to determine conformance with this specification. Table II shall be used to classify the defects found.

TABLE II. Classification of defects.

DEFECT	CRITICAL	MINOR
Material imperfections-foreign matter embedded	X	
Surface-unclean, rough, misaligned or containing cracks, nicks or other flaws	X	
Any component missing, fractured, malformed, or otherwise damaged	X	
Any component loose or otherwise not securely retained	X	
Incorrect assembly or improper positioning of components	X	
Any functioning part that works with difficulty	X	
Faulty workmanship that would materially reduce performance, reliability, or durability	X	
Faulty workmanship or defects that would not materially reduce performance , reliability, or durability		X
Measurement deviating from the dimensions and tolerances	X	

4.5.2 Dimensional examination. Each rescue hook selected as a sample unit shall be thoroughly checked dimensionally to determine conformance to this specification.

4.5.3 Metal examination. The rescue hooks shall be examined to ensure that they are free from all sharp edges, burrs, cracks or any other imperfections which could affect the performance of the hooks. Each hook shall pass the following inspection criteria:

a. Chemical certification in accordance with SAE-AMS 5643 for forged hooks and SAE-AMS 5355 for cast hooks.

b. Physical certification in accordance with SAE-AMS 5643 for forged hooks and SAE-AMS 5355 for cast hooks.

c. Solution heat treat in accordance with SAE-AMS 5463 for forged hooks and homogenization and solution heat treat in accordance with SAE-AMS 5355 for cast hooks.

d. Passivation in accordance with SAE-AMS 2700, type 2.

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4.5.3.1 Metal inspection. The rescue hooks and swivel fittings shall pass the following inspection criteria:

a. For forged parts: 100 percent magnetic particle inspection in accordance with ASTM 1444 and MIL-STD-1907, Grade A.

b. For cast parts: 100 percent radiographic inspection in accordance with ASTM E1742 and SAE-AMS 2175, Grade A and 100 percent magnetic particle inspection in accordance with ASTM E1444 and SAE-AMS 2175, Grade A.

4.6 Strength tests. The rescue hooks shall be supported by a 0.375-inch round bar, to simulate an MS20115 shackle, through the swivel fitting of the hook. The loads may be applied by means of hydraulic or pneumatic press, jacks or equivalent high density material. The hook shall support the loads specified in 3.3.1. The rescue hooks shall pass the listed criteria of the following strength tests.

4.6.1 Static load test. The rescue hooks shall be loaded statically in order to determine the load capacity of the hooks. This shall be accomplished through a static proof load test and a static ultimate load test.

4.6.1.1 Static proof load test. The rescue hook shall be supported by the swivel fitting. All proof loads defined in 3.3.1.1 shall be sustained for a period of 15 seconds to obtain the load data. The hook and ring shall be checked dimensionally during the loading to assure absence of elastic deformation. This is to ensure that the integrity of the safety latch and the positive locking mechanism is not compromised. The swivel fitting shall also be checked dimensionally during the loading to assure absence of plastic deformation.

4.6.1.2 Static ultimate load test. An ultimate static load test shall be performed on the rescue hook and the auxiliary ring. The rescue hook shall be supported by the swivel fitting. All ultimate loads defined in 3.3.1.2 shall be sustained for a period of 15 seconds to obtain the load data. The auxiliary ring shall be tested in the same manner. Plastic deformation is allowed under the condition that the safety latch is able to remain in a closed and locked position.

4.6.2 Dynamic load test. The rescue hook shall be loaded dynamically in order to ensure the integrity of the hooks to repeatedly carry a load. The load shall be administered as stated in 4.6. The rescue hook shall be supported by the swivel fitting. The hook and auxiliary ring shall be cycled 200,000 times at a load of 2,100 lb as stated in 3.3.1.3. The hook, auxiliary ring, and swivel fitting shall support these loads through every cycle without plastic deformation. The hook shall be loaded statically as stated in 4.6.1.2 after the load cycling has been completed.

4.7 Environmental tests. The rescue hook shall not suffer a decrease in structural integrity or operability. The hook shall be tested as specified in 4.6.1.2 following each environment test. Additionally, the operability of the hooks shall be demonstrated per 3.4 following each environmental test.

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4.7.1 Temperature test. The rescue hook shall be tested thermally to temperatures ranging from -50° F to +160° F in accordance with methods 501.5 and 502.5, Procedure 1, Storage of MIL-STD-810.

4.7.2 Humidity test. The rescue hook shall undergo a humidity test in accordance with method 507.5, Procedure I, Induced Cycles of MIL-STD-810.

4.7.3 Salt-fog test. The rescue hook shall undergo a salt-fog test with an alternating 24 hour period of exposure and drying time, for a minimum of four 24 hour periods. This test will determine the effect of a sea salt atmosphere on corrosion and physical function of the hooks. Conduct the test in accordance with method 509.5 of MIL-STD-810.

4.7.4 Sand and dust. The rescue hook shall undergo a sand and dust test with six faces exposed, in accordance with method 510.5, Procedure I, Dust and Procedure II, Sand of MIL-STD-810.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. The rescue hook covered by this specification is used to assist personnel performing hoist rescue work from aircraft.

6.2 Ordering data. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Quantity desired
c. Drawings
d. Whether first article inspection is waived (see 4.2).
e. Packaging requirements (see 5.1).
f. Name and address of the first article inspection laboratory (see 4.3.1).

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6.3 Search and rescue manuals.

a. The manual for U. S. Navy Search and Rescue (SAR) is the Navy Tactics, Techniques and Procedures, Navy Search and Rescue SAR Manual, NTTP 3-50.1.

b. The manual for Joint Combat SAR is Joint Pub 3-50.2, the Doctrine for Joint Combat Search and Rescue.

(Request for access to these manuals can be addressed to: Commander, Naval Air Systems Command, Code 4.3.5.4, 48110 Shaw Rd. Bldg. 2187, Patuxent River, MD 20670.)

6.4 Definitions and descriptions.

Auxiliary ring -	Available for attaching lines to steady rescue equipment while raising or lowering. Also available for attaching tools and other rescue equipment.
Hook -	A curved or angular form used to suspend rescue devices or other equipment.
Lifting ring -	The means of attachment on a rescue device.
Lock -	Any mechanism that serves to secure the safety latch in the closed condition.
Safety Latch -	A guard over the hook opening or throat that prevents load release.

6.5 Subject term (key word) listing.

Hoisting
Latch
Lock
Ring
Swivel

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

CONCLUDING MATERIAL

Custodian:
Navy – AS

Preparing activity:
Navy - AS

(Project 4030-2011-003)

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