

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
SPECIFICATION FOR
6,000 POUND SWIVEL HOOK, EXTERNAL, HELICOPTER

1. GENERAL.

1.1. Purpose and Scope. The 6,000 pound helicopter swivel hook covered herein is established as standard in the USDA Forest Service. This device is used to attach external loads to the cargo hook of a helicopter and is used in activities for the suppression of wildland fire. There are three weight classes of helicopters: light, medium, and heavy. The helicopter accessory covered in this specification is for use with heavy helicopters only. Additionally, the accessories covered in this specification are for cargo use only. Do not use items from this specification for any person lifting application, i.e., short haul.

2. APPLICABLE DOCUMENTS.

2.1. 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 in effect on the date of invitation for bids or request for proposals.

American National Standards Institute, Inc (ANSI)/American Society for Quality (ASQ)

Z 1.4 - Sampling Procedures and Tables for Inspection by Attributes (American Society for Quality Control)

Copies of the ANSI publications can be obtained by writing to American National Standards, Inc., 25 West 43rd Street, 4th Floor, New York, New York, 10036

Or at their Web site at www.ansi.org.

2.2. Order of Precedence. In the event of 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 is obtained.

3. REQUIREMENTS.

3.1. Acceptance. Lot acceptance of like articles shall be performed on product sample(s) in accordance with paragraph 4.4.1.

Beneficial comments, recommendations, additions, deletions, and any pertinent data that may be used in improving this document should be addressed to: USDA Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3103 by using the Standardization Document Improvement Proposal at the end of this document or by letter.

3.1.1 First Article. Unless otherwise specified, first article inspection shall be performed on a product sample(s) in accordance with paragraph 4.4.2.

3.2. Performance. The swivel hook covered by this specification shall be capable of performing as specified throughout the temperature range of 0 °F to 140 °F. A complete swivel hook assembly shall consist of a hook, swivel body, and a link. The swivel hook shall have a safe working load of 6,000 pounds. The swivel hook shall have an ultimate strength of at least 22,500 pounds, which corresponds to a 3.75 load-safety factor.

3.3. Parts and Materials.

3.3.1. Component parts. All component parts (including metallic and nonmetallic parts) shall be new and not reprocessed or reworked. When modification is required of commercially available or standard parts, evidence of engineering data or laboratory tests shall be supplied to verify that the modified part(s) meets the requirements of this specification. Each component shall be appropriate for its intended function considering the nature and adverse conditions involved in helicopter operations, including firefighting (paragraph 6.1).

3.3.2. Materials. All exposed metallic parts used shall be corrosion resistant or treated for corrosion resistance. Where more than one type of material is used in various components, there shall be no incompatibility between materials that may cause corrosion. The contractor shall provide a written statement regarding dissimilar metal corrosion.

3.4. Construction and Workmanship. The swivel hook shall be manufactured by current standard production processes to provide a clean, finished, and quality product. Workmanship shall be equal to the best commercial practices consistent with the highest engineering standards in the industry and shall be free from any defect that may impair serviceability or detract from the appearance of the product. Further workmanship shall ensure that no sharp edges, burrs, etc. exist on the finished product.

3.5. Product Marking. Each and every article of the lot shall be marked showing the safe working load, manufacturer name or trademark, and date (month and year) of manufacture. All text size shall be a minimum 0.12-inches in height, legible, and permanently stamped, embossed, cut or etched on to the barrel portion of the swivel hook.

3.6. Certificate of Conformance. Where certificates of conformance are required, the Government reserves the right to verify by test any such item to determine the validity of the certification.

3.6.1. Certification. The contractor shall provide individual certificates of conformance for the component where required in this specification. The contractor shall provide the following information on the certificate:

- a. Item description, i.e., shank hook, pear link.
- b. Item manufacturer's name, address, and telephone number.
- c. Manufacturer's item part number.
- d. Procuring document for the item (to include the quantity and date ordered).
- e. Manufacturer's lot number, if applicable.
- f. Manufacturer's statement of safe working load and ultimate strength for the item.

3.7. Hook. The hook used in the swivel shall be a shank-style hook only. The hook used in the swivel shall have a safe working load of at least 6,000 pounds. The style and dimensions of the hook shall be as shown in figure 1. If first article testing is required, a certificate of conformance (paragraph 3.6) for the hook shall be provided. Threading of the hook's shank shall follow the manufacturer's recommendations. A thread locking system shall be used on the hook to keep it from loosening during use.

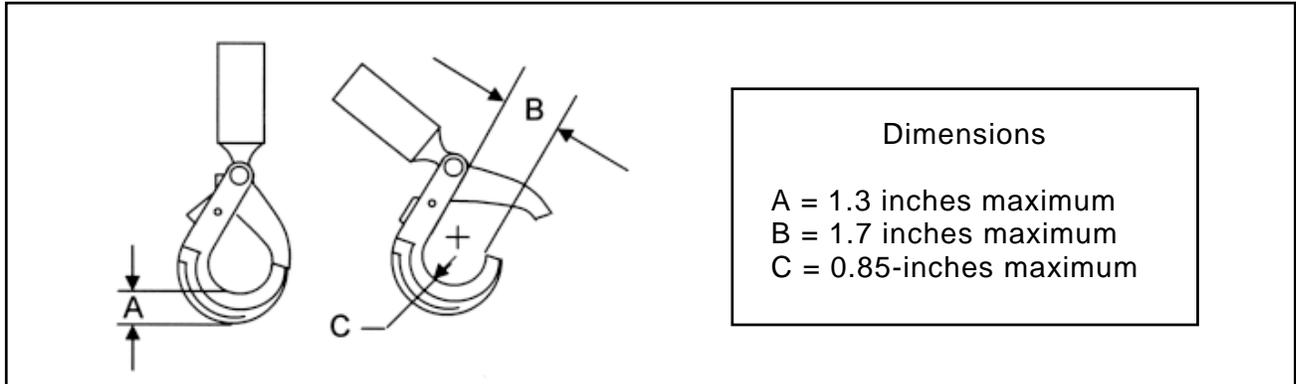


Figure 1—Shank hook.

3.7.1. Gate Release. A gate release shall be incorporated in the hook and have a spring return to lock the gate closed. The release lock and hook gate shall have a minimum engagement of 0.20 inch, as shown in figure 2. (Note: The dashed lines in figure 2 are hidden lines.)

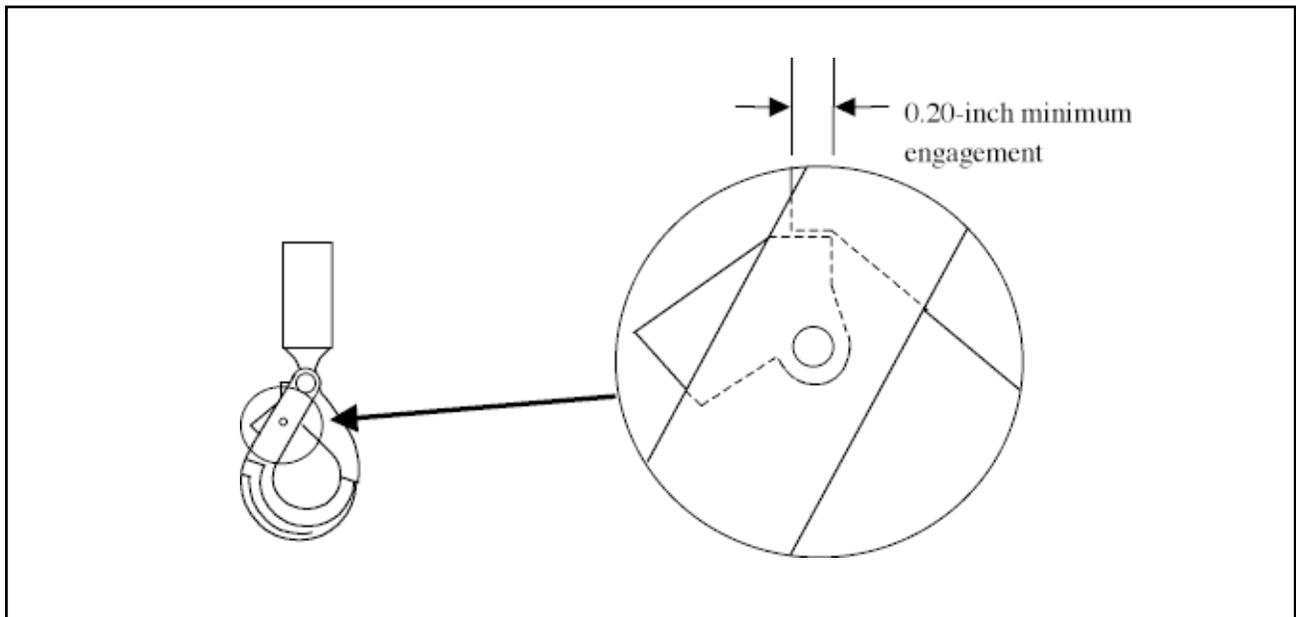


Figure 2—Gate lock engagement.

3.8. Link. The link used in the swivel hook shall be a weldless alloy steel, oblong or pear shaped. The link used in the swivel shall have a minimum safe working load of 6,000 pounds. If first article testing is required, a certificate of conformance for the hook shall be provided (paragraph 3.6). The dimensions of the link shall be in accordance with figure 3. The “C” dimension in figure 3 shall be controlled by the “F” dimension in figure 4.

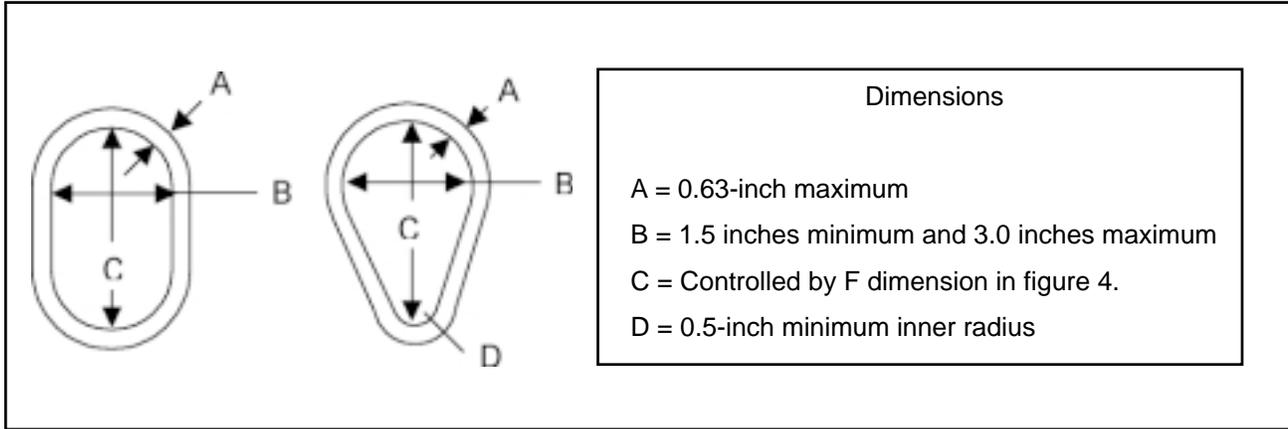


Figure 3—Link dimensions.

3.9. Assembled Dimensions and Weight. The completed swivel hook assembly dimensions shall be as shown in figure 4. Dimension F in figure 4 is measured from the inner loading surface of the link to the top of the clevis of the swivel body. The completed assembly shall weigh less than 9.0 pounds.

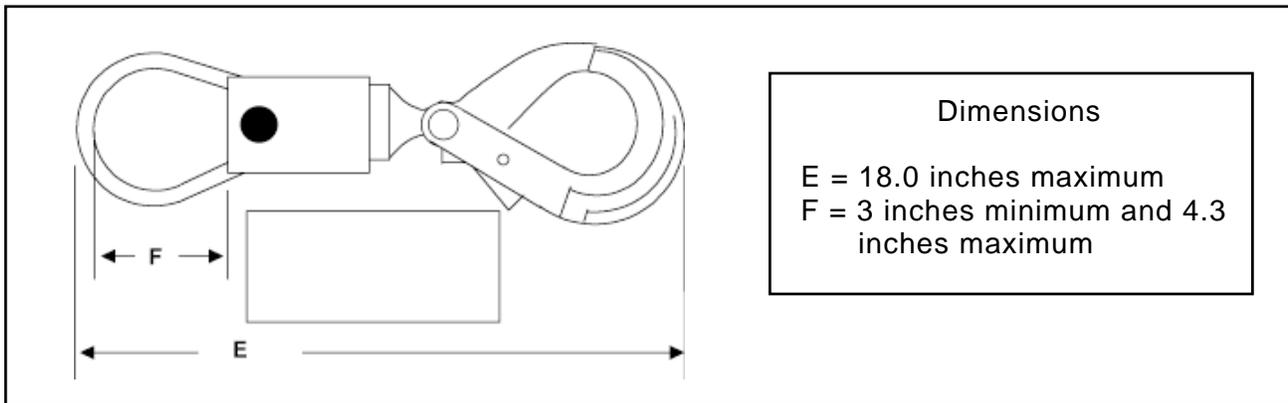


Figure 4—Swivel hook dimensions.

3.10. Link Attachment. The device used to attach the link to the swivel body shall be a threaded fastener. The fastener shall use a self-locking nut or some other system that provides equivalent safety. The fastener system shall allow for replacement of the link. No cotter pins, roll pins, or similar devices shall be used as the safety device on the link attachment. If a bolt is used as the fastener system, it shall be a “low profile” style, and the number of threads extending beyond the end of the nut shall not be less than one and nor greater than 2.

3.10.1. Slip Indicator Paint. The link attachment fastener system shall be painted or similar to provide an indication that the fastener has begun to loosen. The paint shall be applied as shown in figure 5. The color of the paint shall be contrasting to the metal. For fastener systems other than a bolt and nut, a similar paint application shall be implemented. The paint indicator shall be permanent and durable (paragraph 6.4).

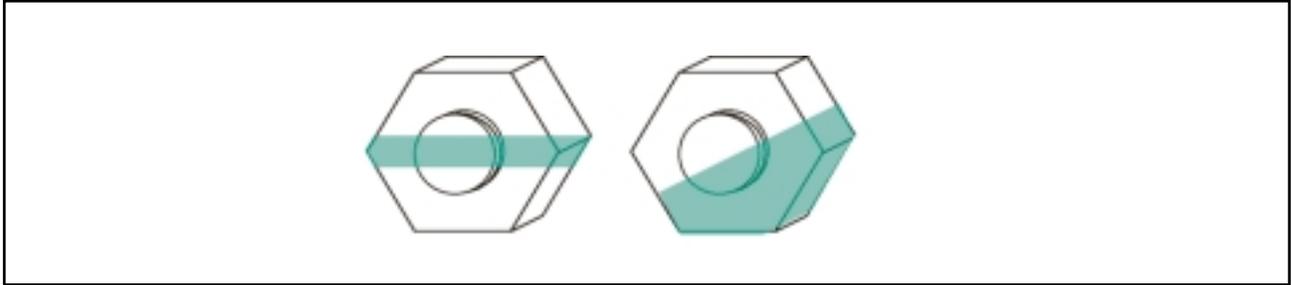


Figure 5—Slip indicator paint.

3.11. Swivel Bearing. The swivel body shall incorporate a permanently lubricated and sealed thrust-type ball or roller bearing. Free swivel rotation shall be maintained for all loads up to the safe working load.

3.12. Design. The swivel shall be designed in such a way as to eliminate sharp edges and points.

3.13. No Load Free Rotation. The hook shall freely rotate when unloaded. Free rotation is defined as holding the swivel body horizontally, fully opening the jaw of the hook, rotating the swivel body at 10 revolutions per minute or less, and having the hook remain within 135 degrees of vertical throughout multiple revolutions (figure 6). This shall be done in both directions (paragraph 6.7).

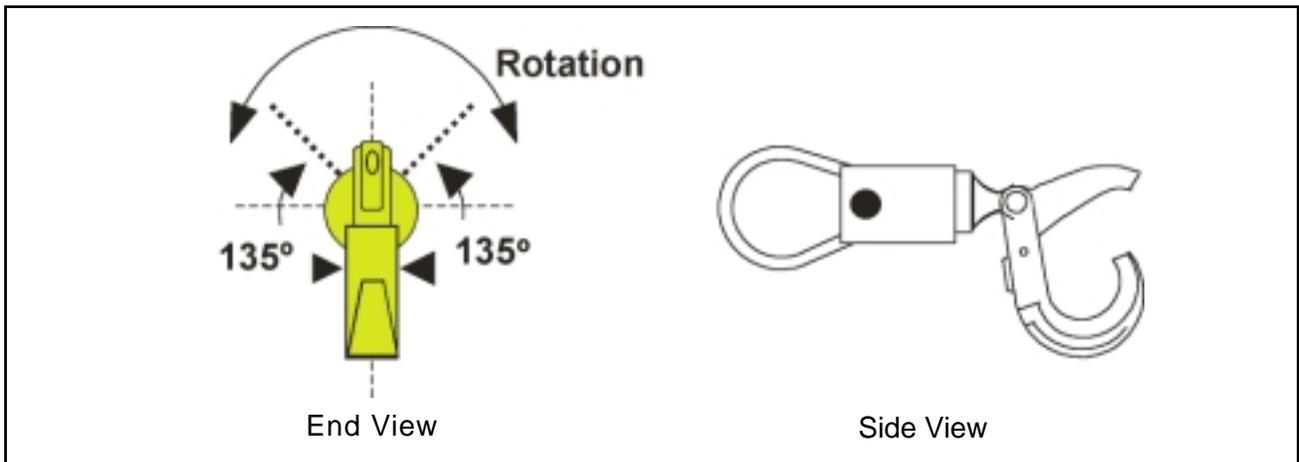


Figure 6—Free rotation.

3.14. Rotation Under Load. The hook shall rotate freely under the rated load. Free rotation under load is defined as requiring no greater than 9 foot-pounds of torque to rotate the hook for one full revolution in each direction. See paragraph 4.9 for testing method.

4. SAMPLING, INSPECTION AND TEST PROCEDURES.

4.1. General Inspections and Tests. The contractor shall be responsible for delivering quality products that meet the requirements of this specification. The contractor shall perform all inspection and test requirements prior to submission for Government acceptance and tests. The contractor may utilize his or her own test facilities or any commercial laboratory acceptable to the Government. Inspection records of the examination and tests shall be kept complete and available to the Government.

4.2. Responsibility for Compliance. The contractor's inspection system shall assure that all product submitted to the Government shall meet all requirements of sections 3 and 5. The inspections set forth in this specification shall become a part of the contractor's overall inspection system and quality program. The absence of any inspection requirements in this specification shall not relieve the contractor of the responsibility of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements. However, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.3. Classification of Inspection. The inspection requirements specified herein are classified as follows:

- a. First Article Inspection (paragraph 4.3.2.).
- b. Lot Acceptance Inspection (paragraph 4.3.3.).

4.3.1. Lot. All like items presented together in one delivery will be considered one lot for the purposes of inspections.

4.3.2. First Article. The contractor shall make available to the Government items from which a first article(s) may be selected. The Government will select a minimum of two articles for inspection. Additional articles may be selected based on the number of items in the lot. One of the articles will be made unserviceable due to the testing and retained, the other(s) will be returned since its testing will not render it unserviceable.

4.3.3. Sample for Lot Acceptance Inspections/Tests. Sampling for lot acceptance inspection shall be in accordance with ANSI/ASQ Z1.4. The sample size shall be per special inspection level S-3.

4.4. Inspection and Tests.

4.4.1. Lot Acceptance. When selected in accordance with paragraph 4.3.3, each sample item shall be inspected in accordance with table 1, to determine conformance with this specification. If the sample is found to have any major nonconformances, as identified in table 1, the lot shall not be accepted. Additionally, if the number of minor nonconformances (per table 1) in the sample exceeds an AQL level of 1.5 percent nonconforming, the lot shall not be accepted.

Table 1—Lot acceptance inspection.

Reference Paragraph Number	Nonconformance	Class of Nonconformance
3.2.	The swivel hook is not a completed assembly.	Major
3.3.2.	All exposed metal parts are not corrosion resistant or treated for corrosion resistance.	Major
3.4.	Workmanship caused the item not to meet being a clean, finished, and quality product.	Minor
3.4.	Sharp edges and/or burrs exist on the swivel.	Major
3.5.	Marking does not contain all of the required information.	Major
3.5.	Text is not at least 0.125 inches in height.	Major
3.5.	Any lettering is not legible.	Major
3.5.	Text is not embossed, stamped, cut, or etched into the swivel body.	Major
3.7.	The hook on the swivel is not a shank-style hook.	Major
3.7.	Any dimension of the hook is not per figure 1.	Major
3.7.1.	The minimum engagement of the gate and lock release is not greater than shown in figure 2.	Major
3.8.	The link is not either an oblong or pear shaped..	Major
3.8.	The link does not meet the dimensions shown in figure 3.	Major
3.9.	Any of the completed swivel hook's dimensions are not as shown in figure 4.	Major
3.9.	The completed swivel is in excess of 9.0 pounds.	Major
3.10.	The device used to attach the link to the swivel body is not a threaded fastener.	Major
3.10.	The fastener is not provided with a thread safety lock system.	Major
3.10.	Cotter pins, roll pins, or similar devices are used in the link attachment system.	Major
3.10.	If a self-locking nut is used, it is not a low profile type.	Major
3.10.	The number of threads extending beyond the nut is not as required.	Major
3.10.1.	The paint slip indicator is not as shown in figure 5, or similar.	Major
3.13.	The hook does not swivel freely.	Major

4.4.2. First Article Inspection. Unless otherwise specified in paragraph 6.3, the first article(s) submitted in accordance with paragraph 3.1.1 shall be inspected as specified in paragraph 4.4.1 and table 2. The sample size shall be in accordance with paragraph 4.3.2. Government inspection for compliance on the first article(s) may stop upon any single failure (regardless of classification), and the sample(s) not accepted. The contractor will be informed of the nature of the failure. Additionally, the Government is not to be obligated to continue with first article compliance inspection, unless it is considered in the best interest of the Government.

Table 2—First article inspections.

Reference Paragraph Number	Nonconformance	Class of Nonconformance
3.2.	The swivel hook assembly does not have an ultimate strength of at least 22,500 pounds.	Major
3.3.1.	All of the components are not new, and engineering/ test data have not been provided justifying the use of reworked/modified component(s).	Major
3.3.1.	Each component is not appropriate when considering its intended function.	Major
3.3.2.	The contractor has not provided a dissimilar metals corrosion statement.	Major
3.7.	A certificate of conformance for the hook containing all of the required data was not provided.	Major
3.8.	A certificate of conformance for the link containing all of the required data was not provided.	Major
3.11.	The bearing used is not a thrust type or roller bearing. Information was not provided to verify the bearing as being permanently lubricated and sealed.	Major
3.11.		Major
3.12.	Sharp edges and points exist in the swivel design.	Major
3.14.	The swivel does not freely rotate up to the safe working load.	Major

4.4.2.1. First Article Inspection Package. The contractor shall submit to the Government along with the selected first article(s), copies of:

- a. Engineering analysis or test data for altered commercial products, if applicable, paragraph 3.3.1
- b. All certificates of conformance, paragraph 3.6
- c. Company inspection records, paragraph 4.1
- d. All test results for the article(s), paragraph 4.7
- e. Ultimate strength certificate, paragraph 4.6
- f. All other information necessary to perform the inspections identified in table 2.

4.5. Certification of Conformance. Where certificates of conformance are required, the Government reserves the right to verify by test any such items to determine the validity of certification.

4.6. Ultimate Strength Testing. The contractor shall perform testing to verify the completed swivel ultimate strength. Testing shall place the item under the ultimate strength load specified in paragraph 3.2 and held for 10 seconds. The applied force shall be a static tensile load applied in the direction the item will encounter in its intended use. The equipment used to apply the loading force shall be calibrated to a recognized State or Federal standard. The calibration of the equipment shall be current at the time of testing.

4.6.1. Ultimate Testing Inspection. An item shall not fail or break. The item may yield, experience plastic deformation, or change its dimensional properties as a result of the ultimate test load, but shall not fail or break. All items subjected to ultimate testing shall be considered consumed by the testing. As such, they shall be conspicuously marked as "Nonserviceable" and not delivered to the Government for stock or supply.

4.6.2. Certification of Ultimate Test Result. The contractor shall prepare and provide as part of the first article inspection and upon request of any Government inspector, a certificate of conformance for the ultimate strength test. The certificate shall contain:

- a. Product description
- b. Description of the test equipment involved and the metrology information
- c. Manufacturer's name, address, and telephone number
- d. Manufacturer's lot number
- e. Product's date of manufacture
- f. Test company name, address, and telephone number
- g. Testing date
- h. Test technician's name and title
- i. All characteristic test values, paragraph 4.7

The ultimate strength test shall have been completed within the last 24 months, on an article of the same configuration as being offered in the current procurement.

4.7. Test Results. The contractor shall have available copies of all test results performed to assure the quality or acceptability of the product submitted for acceptance. The test results shall also show the product's acceptable range or expected test result and the item's test value. All test equipment, which shall be used as media of inspection, shall be calibrated and current at the time of testing. Calibration shall be to a recognized State or Federal standard.

4.8. Nonaccepted Lots. Nonaccepted lots may be offered again for inspection in accordance with paragraph 6.4 of ANSI/ASQ Z1.4, except that Table 2-B – Single sampling plans for tightened inspection (Master table) from ANSI/ASQ Z1.4 shall be used with the parameters of paragraph 4.3.3.

4.9. Hook Rotation Test Under Load. The following test is one method of meeting the requirement of paragraph 3.14, but other suitable methods may exist. Link two swivels together (hook to hook) (figure 7) with their gates closed. Place the connected swivels into a tensile tester whose capacity is at least 6,000 pounds. Attach a tool to one of the hooks, such that the tool will allow the application of torque on the bearings of swivels. Load the swivels to 6,000 pounds +/- 50 pounds. Attach a force meter (weight scale) to the torque application tool in such a manner as to be able to readily read the torque applied to cause rotation (attachment is suggested at 12 inches from the pivot point). Rotate the swivels in each direction for one full revolution, while monitoring the scale. The torque value shall not exceed 18 foot-pounds. Note: Since two swivels are involved it is assumed that the friction force is equal in both swivels. Hence the measured value may be up to twice the requirement of paragraph 3.14.

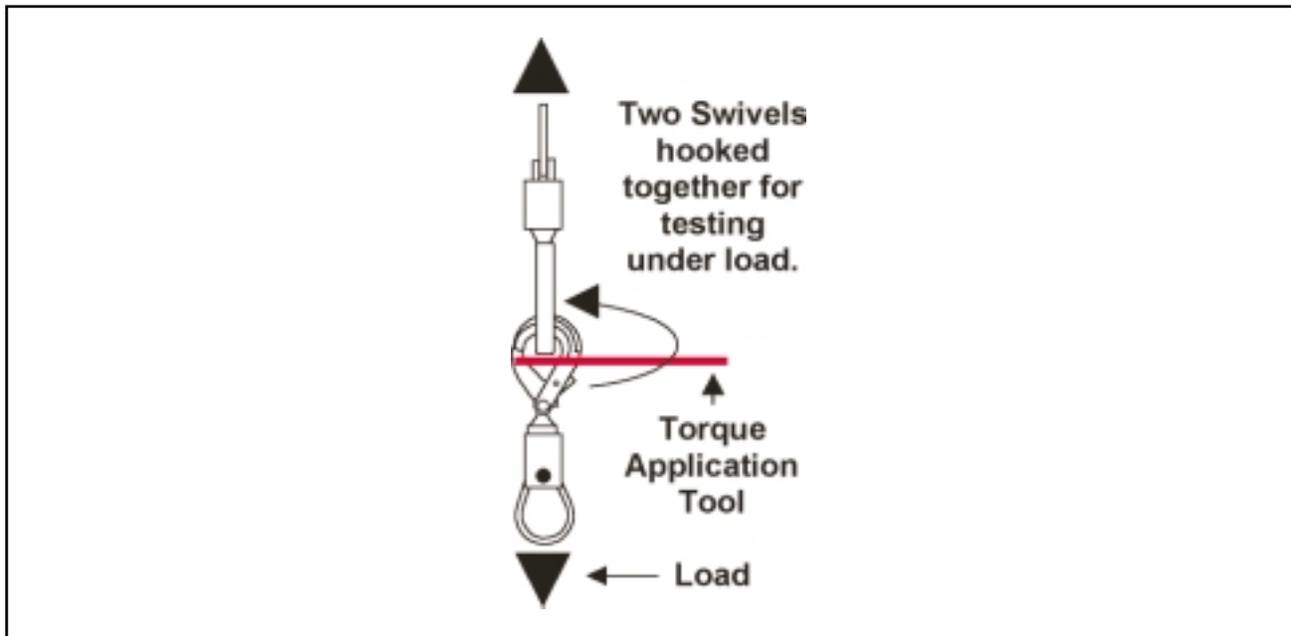


Figure 7—Hook rotation test under load.

4.10. Government Lot Acceptance. The Government will conduct lot acceptance inspections and tests to determine compliance with the specification. The Government's inspection will be in accordance with the requirements of section 4. If lot acceptance and tests are conducted at locations other than the manufacturing facilities, the contracting officer will specify location and arrangements. In the case of onsite inspections at the contractor facility, the contractor shall furnish the inspector all reasonable facilities for their work. During any inspection, the inspector may take from the lot one or more samples and submit them to an independent test laboratory approved by the Government or to a Government test facility for inspection and tests.

5. PACKAGING, PACKING, AND CONTAINER/SHIPMENT MARKING.

5.1. Packaging, Packing and Container/Shipment Marking. The packaging, packing, and container/shipment marking shall be as specified in the contract or order.

6. NOTES.

6.1. Intended Use. The item procured under this specification is intended to attach external loads to the cargo hook of a helicopter and used in the suppression of wildland fire or related activities. The wildland fire environment includes, but is not limited to, fire retardants; dust; moisture; pesticides and fuels (aviation, jet, gasoline, kerosene, diesel, etc.); hydraulic fluid and oils (aviation and automotive); herbicides; and lubricants (aviation and automotive).

6.2. Acquisition Requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. If a first article sampling and inspection is not required, paragraphs 3.1.1, 4.4.2, and 6.3.
- c. Location of Government inspection, paragraph 4.10.
- d. Packaging, packing, and marking, paragraph 5.1.

6.3. First Article. When a first article sample(s) is required, it shall be inspected and approved in accordance with the first article clauses set forth in the solicitation. Specific instructions shall be included regarding arrangements for selection, inspection, and approval of the first article sample(s).

6.4. Paint Indicator Durability. The swivel hooks are stored together in boxes that allow for movement due to vibration and handling. Hence, the swivels knock into each other, and thereby can cause chipping of the paint indicator. High viscous stripe indicators that create a thick coating are not appropriate for this use as they are more prone to chipping and breaking under this movement. Additionally, the swivels are handled roughly and dropped from helicopters, which increases the chance for chipping of thick coatings.

6.5. Superseding Data. Reserved.

6.6. Metric Equivalence. The following table provides the conversion factors to be used in creating metric equivalence for this specification.

Conversion Factors		
English System	Calculation	To Obtain Metric Equivalence
Pounds	pounds * 0.453	Kilograms
Inches	in. * 2.54	Centimeter
Inches	in. * 25.4	Millimeters
Foot	ft * 0.305	Meter
Fahrenheit	(°F-32)*(5/9)	Centigrad
Foot-pounds	Ft-lbs *1.357	Newton-Meters

6.7. No Load Free Rotation. This test is a quality measure of the assembly process and not a bearing test.

6.8. NOTICE: When Government drawings, specification and standards or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever.

6.9. Preparing Activity. USDA Forest Service, Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198.

**United States Department of Agriculture, Forest Service
Standardization Document Improvement Proposal**

Instructions: This form is provided to solicit beneficial comments that may improve this document and enhance its use. Contractors, government activities, manufacturers, vendors, or other prospective users of this document are invited to submit comments to the USDA Forest Service, San Dimas Technology and Development Center, 444 East Bonita Avenue, San Dimas, California 91773-3103. Attach any pertinent data that may be of use in improving this document. If there is additional documentation, attach it to the form and place both in an envelope addressed to the preparing activity. A response will be provided when a name and address are included.

Note: This form shall not be used to submit request for waivers, deviation, or for clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

Standard Number and Title: **Specification 5100-506, 6,000 Pound Swivel Hook, External, Helicopter**

Name of Organization and Address:

___ Vendor ___ User ___ Manufacturer

1. ___ Has any part of this document created problems or required interpretation in procurement use?

2. ___ Is any part of this document too rigid, restrictive, loose, or ambiguous?
Please explain below.

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USDA Forest Service
San Dimas Technology & Development Center
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