

**FOREST SERVICE
U.S. DEPARTMENT OF AGRICULTURE**

**SPECIFICATION FOR
3,000-POUND DRAWSTRING CARGO NET, EXTERNAL,
HELICOPTER**

1. General.

1.1. Purpose and Scope. The helicopter external cargo nets covered herein are established as standard in the U.S. Forest Service. Cargo nets are those materials which are used to gather and contain an external load suspended beneath helicopters. There are three weight classes of helicopters: light, medium, and heavy. The cargo nets covered in this specification are for use on only light and medium helicopters. The nets covered in this specification are for cargo use only.

2. Applicable Documents.

2.1. Non-Government Publications. The following publications 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 the invitation for bids or request for proposals (see 6.2).

American Society for Quality Control (ASQC)

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

Address requests for copies to:

American Society for Quality
P.O. Box 3005
Milwaukee, WI 53201-3005

Or at their Web site at [http:// www.asq.org](http://www.asq.org).

Non-government standards and other publications normally are available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.

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 4.4.1.

3.1.1. First Article. Unless otherwise specified (see 6.2), the item shall be subjected to first article inspection in accordance with 4.4.2. The contractor shall deliver together with the first article all

of the documents identified in 4.4.2.1. During the term of the contract the contractor shall be required to notify the contracting officer in writing when a component, or the component supplier, changes in any way; when a major manufacturing process changes in any way; and when a manufacturing location changes. The contracting officer may at any time require the contractor to submit a new first article sample when substantive changes occur during the term of the contract.

3.2 Performance. The finished net shall be capable of performing as designed throughout the temperature range of 0 °F to 140 °F. The net shall have a safe working load of 3,000 pounds; and shall have an ultimate load carrying capacity of at least 11,250 pounds, which corresponds to a load safety factor of 3.75.

3.3. Part and Materials.

3.3.1. Component Parts. All component parts (metallic and nonmetallic) for any net shall be new and not reprocessed or reworked.

3.3.1.1 Modification of Standard Parts. If modification of commercially available or standard parts is required, engineering data or laboratory tests shall be supplied to verify that the modified part meets the requirements of the component part within this specification. Each component shall be appropriate for its intended function considering the nature and adverse conditions involved in helicopter operations, including fire fighting (see paragraph 6.1, Intended Use).

3.3.2. Hoisting Links. The links used in the drawstring style net shall have a working load of at least 3,000 pounds, and an ultimate load capacity of 11,250 pounds. The contractor shall obtain a Certificate of Conformance (see 3.9) for the hoisting links used on the drawstring cargo net. The links shall meet the dimensional requirements shown in figure 1, Hoisting Link. The link shall be corrosion resistant or treated for corrosion resistance.

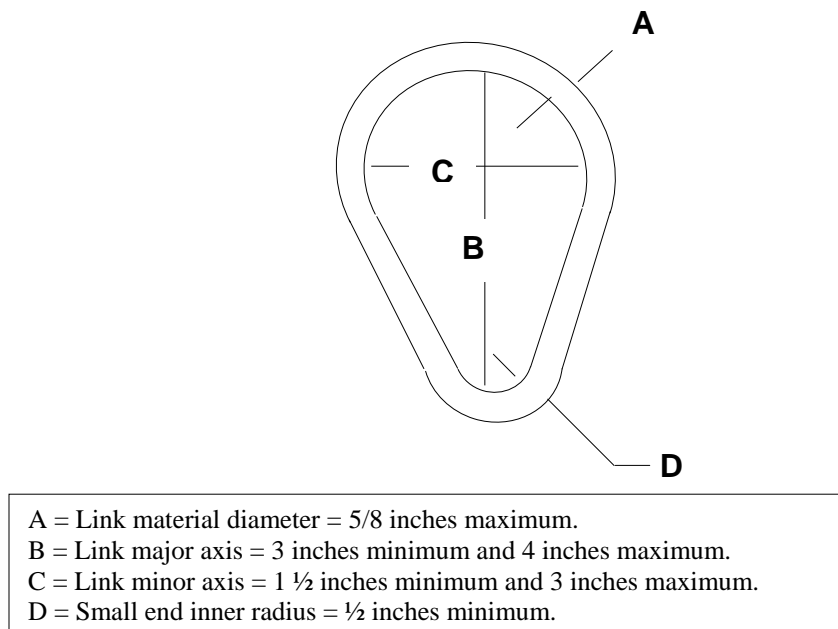


Figure 1. Hoisting link.

3.3.3. Metal Thimbles. Where thimbles are required in the construction of the drawstring net, they shall be galvanized steel or zinc plated steel. The galvanized or zinc plating shall be smooth and free of imperfections that may cut rope fibers during the use of the net, specific attention shall be placed on the inner surface (that surface which comes in contact with the perimeter rope). All thimbles shall be rated “extra heavy” or “heavy duty.” The contractor shall provide a Certificate of Conformance (see 3.9) for the thimbles used in the net.

3.3.4. Rope Material. Nets shall be constructed of synthetic cord. All cordage shall be black in color, except if HMPE (High Modulus Polyethylene) is used. If HMPE fiber is used the color shall be gray or blue-gray. The perimeter rope may be white.

3.3.4.1. Perimeter Rope. The perimeter rope shall be polyester, nylon, Dacron, polypropylene, HMPE, or any polyolefin rope including the HMWPE (High Molecular Weight Polyethylene) family of ropes. The perimeter rope diameter on the drawstring nets shall be as necessary to meet the performance requirements of 3.2 for the assembled net, when lifted using only one of the two hoisting rings. However, the perimeter rope shall not exceed 5/8 inches in diameter. The contractor shall provide a Certificate of Conformance (see 3.9) for the perimeter rope used.

3.3.4.2. Mesh Rope. The mesh rope shall be polypropylene, HMPE, HMWPE, or any polyolefin rope. The size (diameter) of the mesh cord shall be adequate to meet the requirements of the assembled net strength requirement of 3.2. However, the mesh rope diameter shall not be greater than 3/8 inches. The contractor shall provide a Certificate of Conformance (see 3.9) for the mesh rope used.

3.4. Construction and Workmanship. All netting and hardware shall be manufactured by current standard production processes to provide a clean, finished 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 will impair serviceability or detract from the appearance of the product. Additionally, workmanship shall produce a net that lies generally flat (no part of the net shall rise greater than 3 inches above the surface when the net is laid out and relaxed), i.e. terminations around the thimbles and any splicing shall not induce or create a twist or warp to the cord. All cordage in the completed net shall be free from “loops,” pulls, or snags of the fibers or strands.

3.5. Splices and Terminations. All terminations and splices shall incorporate a minimum of four full tucks. All rope terminations shall be an eye splice (figure 2) and include a metal thimble. In all terminations the cord strands ends shall be “heat cut” to eliminate fraying. No termination or splice used anywhere in the net nor mesh intersection shall incorporate the use of any resin material that results in hard inflexible connection. Splices may be used in the mesh cordage, however only a maximum of three splices shall be allowed in the mesh. Splices in the mesh (rope end to end) splices shall use a short splice. The short splice shall have a minimum of four full tucks on both sides of the splice center. No other splice types shall be allowed.



Figure 2. Eye splice.

3.6. Product Marking. Each net procured under this specification shall be marked showing NFES 0531, the net's rated capacity; the manufacturer name or trade mark; and date of manufacture. Figure 3 is provided as an example of the required information and hole edge distance. Tags shall be permanent and securely attached to the net using a 1/16 inch 7x7 or 7x19, galvanized or stainless steel wire rope. The tag cables shall be swaged using best commercial practice, and the tag loop shall be round forming a loop between 1-½ inches and 2 inches in diameter. Swage shall be made of copper. All text shall be legible, all text shall be a minimum of 0.12 inch in height, and shall be stamped, cut, embossed or etched into the tags. Tags shall be made of 20- to 22-gauge stainless steel or brass. The size of the tag shall not exceed 1.25 inches by 2.0 inches. The corners and edges of the tag shall be rounded to eliminate sharp edges.

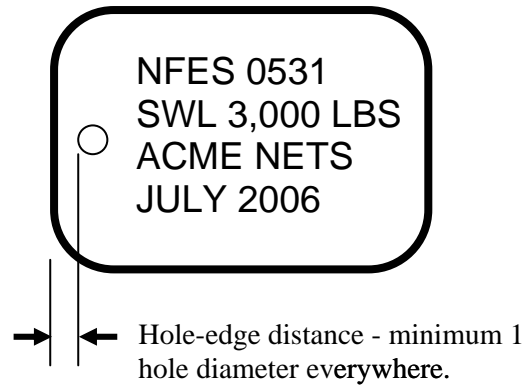


Figure 3. Identification tag example.

3.7. Size and Construction.

3.7.1. Net Mesh. Mesh cords shall be assembled into square webbing with maximum 6.0 inch spacing and minimum 5.0 inch measured between cords, see figure 4. All cord intersections shall be permanently fastened. The intersecting cords shall have minimal movement such that the distance between the cords of adjacent intersections shall not exceed 6.0 inches.

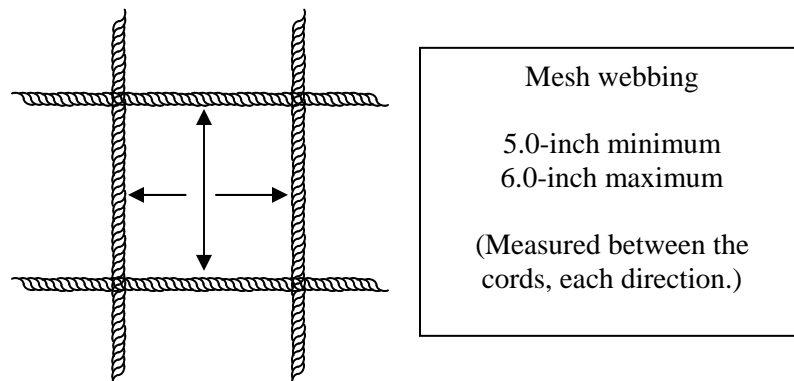


Figure 4. Mesh square size.

3.7.2. Net Size and Shape. Figure 5 illustrates the drawstring style nets. The nets shall be either round or octagonal in shape. The size of the net shall be 12 feet +/- 6 inches across the diameter for the round net or the opposing parallel sides on the octagonal net.

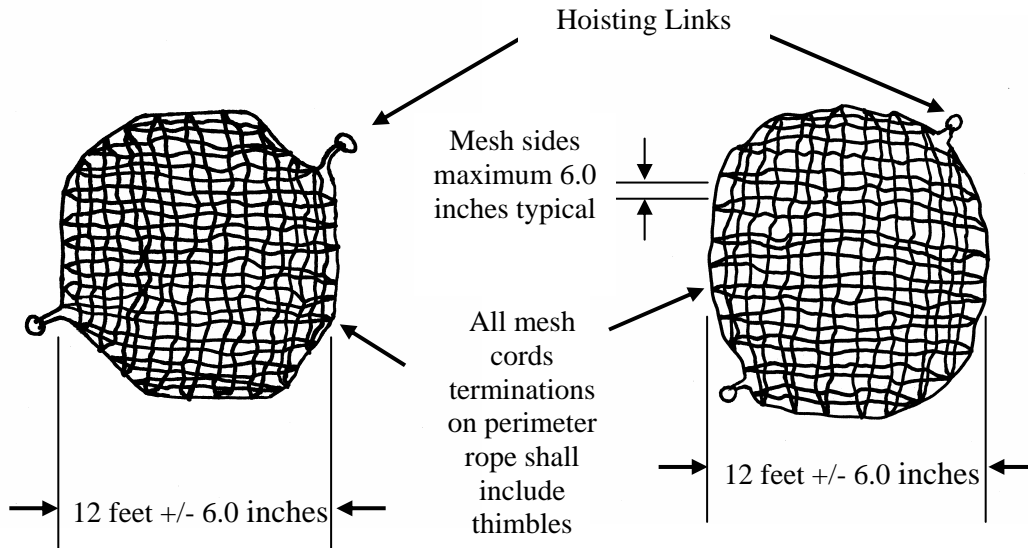


Figure 5. Drawstring style nets.

3.7.2.1. Perimeter Rope. The perimeter rope shall serve as a drawstring to gather the perimeter of the net over the load as it is lifted. The perimeter rope shall be divided into two segments of equal length and fastened onto hoisting links at each end. Each termination on the links shall incorporate an eye splice and a metal thimble. The perimeter rope shall have no other splices than those that terminate on the hoisting rings. The perimeter ropes for the drawstring net shall be treated for abrasion resistance by a minimum of two coats of water-carried polyurethane, 20- to 30-percent solids, or equal. The contractor shall provide a Certificate of Conformance (see 3.9) for the water-carried polyurethane material.

3.7.2.2. Number of Mesh Terminations on Perimeter Rope. The net shall be assembled, and the cordage size selected, such that not all mesh cords are required to terminate on the perimeter rope while still meeting the strength requirements of 3.2, e.g., every other cord of the mesh (or similar) shall not terminate on the perimeter rope. However, the mesh cords adjacent or closest to the hoisting links shall terminate on the perimeter rope.

3.8. Net Volume. The completed net shall be capable of fitting into a 1.96 cubic foot volume box (21 in. x 17 in. x 9.5 in.) with a compaction force of 10 pounds or less.

3.9. 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.

3.9.1. 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, e.g., pear link, perimeter rope, mesh rope
- 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 hoisting link and cordage, or statement or catalog sheet indicating the parts rating for thimbles. The statement or sheet shall include a part number or other that is traceable to the contractor's procuring document.

g. For cordage, material type.

4. Sampling, Inspection, and Test Procedures.

4.1. Responsibility for Tests. The contractor shall be responsible for the performance of all inspection requirements (examinations and tests) as specified herein. The contractor shall perform of 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. The Contractor's Quality Inspection records of the examination and tests shall be kept complete and available to the Government.

4.2. Responsibility for Compliance. The contractor shall be responsible for delivering quality products that meet the requirements of this specification. The contractor's inspection system shall assure that all product submitted to the government shall meet all requirements of section 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 (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 may be selected. The government will select one article for inspection.

4.3.3. Sample for Lot Acceptance Inspections/Tests. Sampling for lot acceptance inspection shall be in accordance with ANSI/ASQ Z1.4. Lot inspection shall be performed when the nets are ready for delivery. 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 4.3.3, each sample item shall be inspected in accordance with table 1, Lot Acceptance Inspections, 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 Para. No.	Nonconformance	Class of Nonconformance
3.3.2.	The hoisting link is not corrosion resistant or treated for corrosion resistance.	Major
3.3.2	The hoisting link used does not meet the requirements of figure 1.	Major
3.3.3.	The metal thimbles are not stainless steel, galvanized steel, or zinc plated steel.	Major
3.3.3	Zinc plated or galvanized steel thimbles that terminate on the perimeter rope are not smooth in the area where they contact the perimeter rope (possibly causing cuts).	Major
3.3.4.	Any of the cordage in the net is not synthetic.	Major
3.3.4.	The color of the cordage is not black, blue, or blue-gray.	Minor
3.3.4.1	The perimeter rope is greater than 5/8 inches in diameter.	Major
3.3.4.2	The mesh rope used is greater than 3/8 inches in diameter.	Major
3.4	The workmanship is poor quality such that it impairs serviceability or detracts from the appearance of the net.	Minor
3.4	The net is not made to industry standards.	Major
3.4.	The net does not generally lie flat.	Minor
3.4.	A loop, pull, or snag exists in the fibers or strands of the cordage.	Major
3.5.	All terminations do not incorporate four tucks.	Major
3.5	Every termination is not an eye splice.	Major
3.5.	Every termination rope does not include a metal thimble.	Major
3.5.	All strands on all terminations or splices are not heat cut to eliminate fraying.	Minor
3.5.	Splice exists in the perimeter rope.	Major
3.5	More than three splices exist in the mesh.	Major
3.5	Splices in the mesh are other than short splices.	Major
3.5	Short splices do not have a minimum of four full tucks on either side of the center of the splice (a minimum of eight full tucks).	Major
3.6.	Marking does not contain all of the required information.	Major
3.6	The hole edge distance is smaller than one hole diameter, see figure 3.	Major
3.6.	Text is not at least 0.12 inches in height.	Major
3.6.	Any text is not legible.	Major
3.6.	Lettering is not embossed, stamped, cut, or etched into a stainless steel or brass tag.	Major

3.6.	The tag is not made of 20- to 22-gauge stainless or brass; or the appropriate size.	Major
3.6.	The wire loop attaching the tag to the net is not as required.	Major
3.6.	The tag has sharp edges or corners.	Major
3.7.1.	The mess webbing is not formed into a square whose dimensions are greater than 5 inches or less than 6 inches on any side.	Major
3.7.1.	The cord intersections are not permanent.	Major
3.7.1.	The cord intersections do not limit movement so that mesh does not exceed 6 inches between cords.	Major
3.7.2.	The net is not round or octagon in shape.	Major
3.7.2.	The size of the net is not 12 feet +/- 6 inches.	Major
3.7.2.1.	The perimeter rope for the net is not divided into two equal segments.	Major
3.7.2.1.	The perimeter rope for the net does not terminate on hoisting links.	Major
3.7.2.1.	The terminations of the perimeter rope do not incorporate both a thimble in an eye splice.	Major
3.7.3.1.	The perimeter rope for the net has splices at places other than where the rope terminates on the links.	Major
3.7.3.1	The perimeter rope for the net is not treated with polyurethane.	Major
3.7.3.2.	All of the mesh cords terminate on the perimeter rope.	Major

4.4.2. First Article Inspection. Unless otherwise specified (see 6.5), the first article submitted in accordance with 3.1.1 shall be inspected as specified in 4.4.1 and table 2, First Article Inspections. Government inspection for compliance on the first article may stop upon any single failure (regardless of classification), and the sample not accepted. The contractor will be informed of the nature of the failure. Additionally, the Government is not 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 Para. No.	Nonconformance	Class of Nonconformance
3.1.1.	The contractor did not prepare and submit a complete first article data package.	Major
3.2.	The net did not meet the ultimate load carrying capacity test.	Major
3.3.1.	Each component of the net is not new.	Major
3.3.1.1	Engineering/test data have not been provided that justify the use of modified component(s).	Major
3.3.1.	Each component is not appropriate when considering its intended function.	Major

3.3.2.	A Certificate of Conformance, meeting 3.9, for the hoisting link was not provided.	Major
3.3.2.	The hoisting link does not have safe working load of 3,000 lbs, or an ultimate strength of at least 11,250 lbs.	Major
3.3.3.	A Certificate of Conformance, meeting 3.9, for the thimbles was not provided.	Major
3.3.3.	The metal thimbles are not rated “heavy duty” or “extra heavy.”	Major
3.3.4.1.	A Certificate of Conformance, meeting 3.9, was not provided for the perimeter rope.	Major
3.3.4.2.	A Certificate of Conformance, meeting 3.9, was not provided for the mesh rope.	Major
3.7.2.1.	A Certificate of Conformance, meeting 3.9, was not provided for the water-carried polyurethane material.	Major
3.8.	The net does not fit into a 1.96 cubic foot volume box.	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, see 3.3.1
- b. All Certificates of Conformance, see 3.3.2, 3.3.3, 3.3.4.1, 3.3.4.2, and 3.7.2.1
- c. Company Inspection Records, see 4.1
- d. All Test Results for the article(s), see 4.7
- e. Ultimate Strength Certificate, see 4.6
- f. All other material necessary to perform the inspections identified in table 2, First Article Inspections

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 on a sample net to verify the completed net’s ultimate load carrying capacity. Testing shall place the item under the ultimate strength load specified in 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. The contractor’s sample article shall marked “NOT FOR STOCK OR SERVICE.” The contractor shall not deliver this test article to the Government as part of any lot or first article submittal. The contractor may be retained or disposed of their ultimate strength test article.

4.6.1. Ultimate Testing Inspection. The item shall not fail (drop the contents). The item may yield, experience plastic deformation, mesh cords may break, and/or change its dimensional properties as a result of the ultimate test load, but shall not fail or break (drop the contents).

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 the following:

- 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 (see 4.7)

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 4.4.1.

4.9. 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 on-site 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. This Government inspection does not replace or negate the contractor's responsibility as identified in paragraph 4.1.

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. All items procured under this specification are intended for use in the suppression of wildland fire or related activities. The wildland fire environment includes, but is not limited to, fire retardants (both long and short term); dust; moisture; pesticides, fuels (aviation, jet, gasoline, kerosene, diesel, etc.); hydraulic fluid and oils (aviation and automotive); herbicides; pesticides; 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 (see 3.1.1, 4.4.2, and 6.5).
- c. Packaging and packing and marking (see 5.1).

6.3. Superseding Data. This document supersedes 5100-502 for 3,000-pound heavy external helicopter drawstring cargo nets.

6.4. 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	lbs. * 0.453	Kilo grams
Inches	in. * 2.54	Centimeter
Inches	in. * 25.4	Millimeters
Foot	ft. * 0.305	Meter
Fahrenheit	(°F-32)*(5/9)	° Centigrade
Cubic Feet	ft. ³ * 0.0284	Cubic Meters

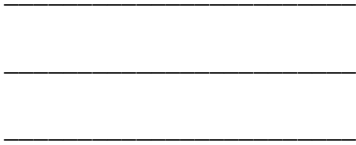
6.5. First Article. When a first article sample(s) is required, it shall be inspected and approved in accordance with the first article clauses set forth in the solicitation. Specific instructions shall be included regarding arrangements for selection, inspection and approval of the first article sample(s). The first articles shall be subjected to the ultimate strength requirement of 3.2. As such, the first articles will be consumed in test. Hence, they shall not be delivered to Government stock or supply.

6.6. 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.

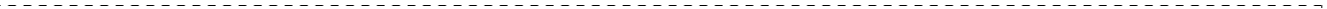
6.7. Preparing Activity. U.S. Forest Service, Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773.

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

<p>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 U.S. 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.</p> <p>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.</p>	
<p>Standard Number and Title: Specification 5100-502, 3,000-Pound Drawstring Cargo Net, External, Helicopter.</p>	
<p>Name of Organization and Address:</p> <p>____ Vendor ____ User ____ Manufacturer</p>	
<p>1. ____ Has any part of this document created problems or required interpretation in procurement use? ____ Is any part of this document too rigid, restrictive, loose or ambiguous? Please explain below.</p> <p>Give paragraph number and wording:</p> <p>Recommended change (s):</p> <p>Reason for recommended change (s):</p>	
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