Specification 5100-502
October 2003
Superseding
Specification 5100-500e
For external cargo nets only

**U.S. DEPARTMENT OF AGRICULTURE**

**FOREST SERVICE**

**SPECIFICATION FOR**

# 3,000-POUND CARGO NETS, EXTERNAL, HELICOPTER

## 1. GENERAL.

1.1. Purpose and Scope. The helicopter external cargo nets covered in this application are established as standard in the USDA 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. Do not use this specification for any person-lifting application, i.e., short haul.

1.2. Classification. Two styles of nets are specified herein, the heavy four corner pickup and the heavy drawstring. The procuring document shall indicate the classification of net being procured.

1.2.1. Four-Corner Pickup Net. The four-corner pickup-style net is square in shape and the mesh cords terminate on the perimeter rope without the ability to move.

1.2.2. Drawstring Net. The drawstring style net is round or octagonal in shape and the mesh cords terminate in thimbles with the ability to move around the perimeter rope. The perimeter rope is divided into two equal parts with hoisting links. Pulling the hoisting rings causes the mesh to close over the top of the items contained in the net when in use.

## 2. APPLICABLE DOCUMENTS.

2.1. Publications. The following documents of the issue in effect on the date of invitation for bids form a part of this document to the extent specified herein.

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

Z1.4 - Sampling Procedures and Tables for Inspection by Attributes (American Society for Quality Control)

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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.

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

Or from 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.

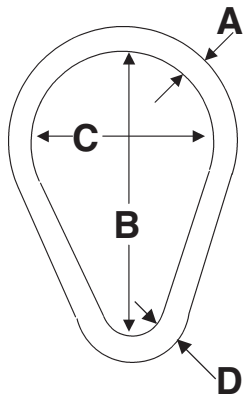
3.1.1. First Article. Unless otherwise specified, first article inspection shall be performed on a product sample(s) in accordance with paragraph 4.4.2.

3.2. Performance. Both styles of 3,000 pound helicopter cargo nets shall be capable of performing as designed throughout the temperature range of 0 °F to 140 °F. Both styles of net shall have a safe working load of 3,000 pounds; and they shall have an ultimate load carrying capability 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 (including metallic and nonmetallic parts) for any net 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 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 firefighting (see paragraph 6.1).

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 paragraph 3.9) for the hoisting links used on the drawstring cargo net. The links shall meet the dimensional requirements shown in figure 1. The link shall be corrosion resistant or treated for corrosion resistance.




A = Link material diameter = ⅝ inches maximum

B = Link major axis = 3 inches minimum and 4 inches maximum

C = Link minor axis = 1½ inches minimum and 3 inches maximum

D = Small end inner radius = ½ inch minimum

Figure 1—Hoisting link.

3.3.3. Metal Thimbles. Where thimbles are required in the construction of the drawstring style cargo net, they shall be stainless steel. They shall be rated “extra heavy” or “heavy duty.” The contractor shall provide a certificate of conformance (see paragraph 3.9) for the thimbles used in the cargo net.

3.3.4. Rope Material. Nets shall be constructed of synthetic cord. All cordage shall be black in color, except if high modulus polyethylene (HMPE) is used. If HMPE fiber is used the color shall be gray or blue-gray.

3.3.4.1. Perimeter Rope. The perimeter rope shall be polyester, nylon, dacron, polypropylene, HMPE, or any polyolefin rope including the high molecular weight polyethylene (HMWPE) family of ropes. The contractor shall provide a certificate of conformance (see paragraph 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 paragraph 3.2. However, the mesh rope diameter shall not be greater than ⅜ inches. The contractor shall provide a certificate of conformance (see paragraph 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, 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 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 splices on either style net shall incorporate a minimum of four tucks. Terminations on the perimeter rope of drawstring nets shall include a metal thimble. In all terminations or splices the cord strands ends shall be “heat cut” to eliminate fraying. No termination or splice used anywhere in the net or mesh intersection shall incorporate the use of any resin material that results in a hard inflexible connection.

3.6. Product Marking. Each net procured under this specification shall be marked showing the net’s rated capacity, manufacturer name or trademark, and date (month and year) of manufacture. Tags shall be permanent and securely attached to the net using a 1/16 inch 7 by 7 or 7 by 19, 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 1½ 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 inches 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.

3.7. Size and Construction.

3.7.1. Net Mesh. Mesh cords shall be assembled into square webbing with a maximum 6.0-inch spacing and a minimum 5.0 inches measured between cords, see figure 2. 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.

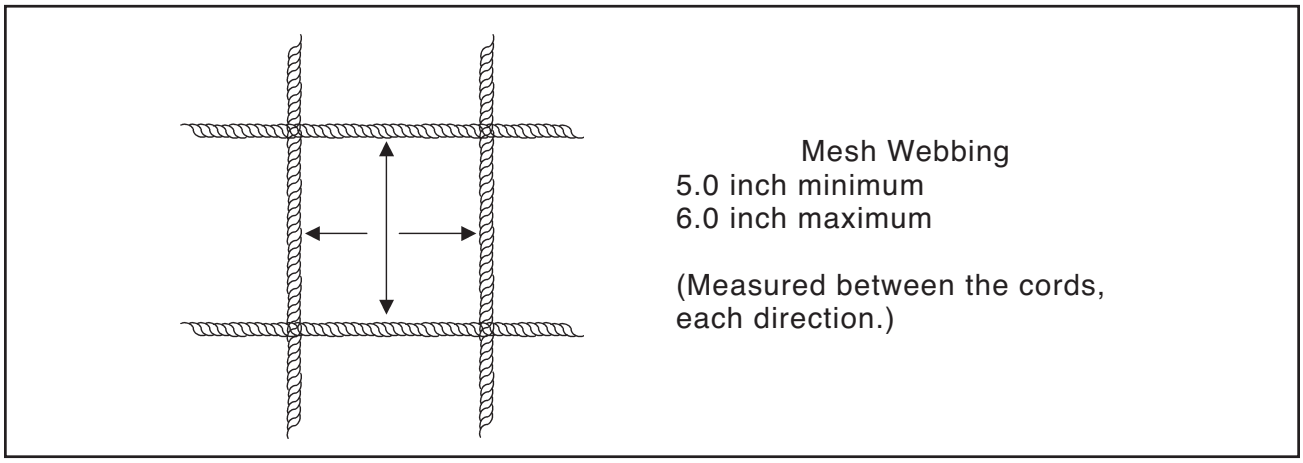



Figure 2—Mesh square size.

3.7.2. Four-Corner Pickup-Style Net. Figure 3 illustrates the four-corner pickup-style net. Each net shall consist of a net mesh and a perimeter rope. The mesh cords terminate on the perimeter rope such that they shall not move along the perimeter rope. The net shall be square in shape and the size of the net shall be 12 feet ± 6 inches on each side.

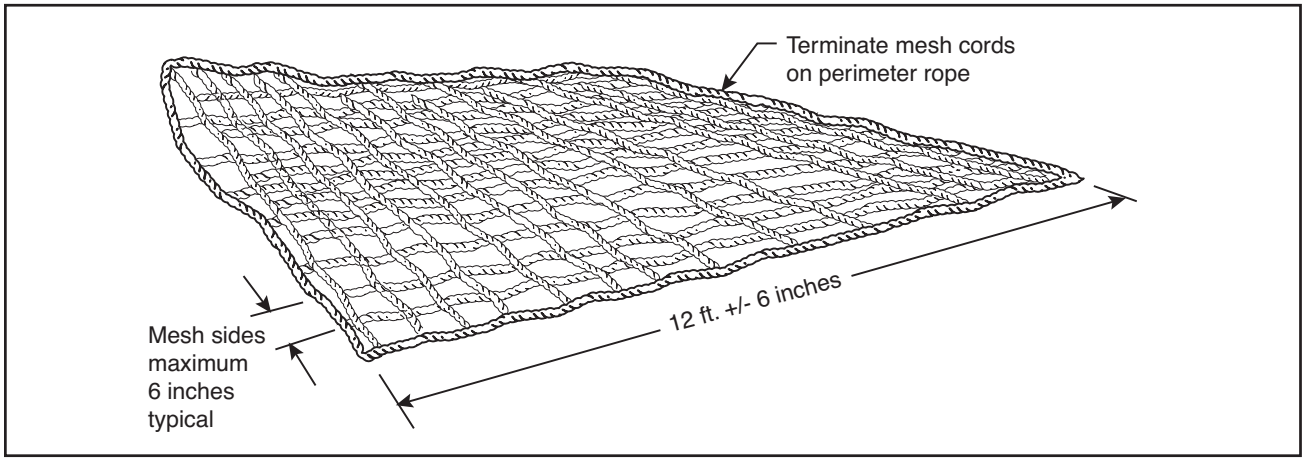



Figure 3—Four-corner pickup net.

3.7.2.1. Four-Corner Pickup Net Perimeter Rope. The perimeter rope diameter on the four-corner pickup nets shall be as necessary to meet the performance requirements of paragraph 3.2, for the assembled net. However, the rope diameter shall not exceed ¾ inches. The perimeter rope shall have only one splice to join the single continuous rope together. The contractor shall obtain a certificate of conformance (see paragraph 3.9) for the material used in the perimeter rope.

3.7.3. Drawstring-Style Net. Figure 4 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.

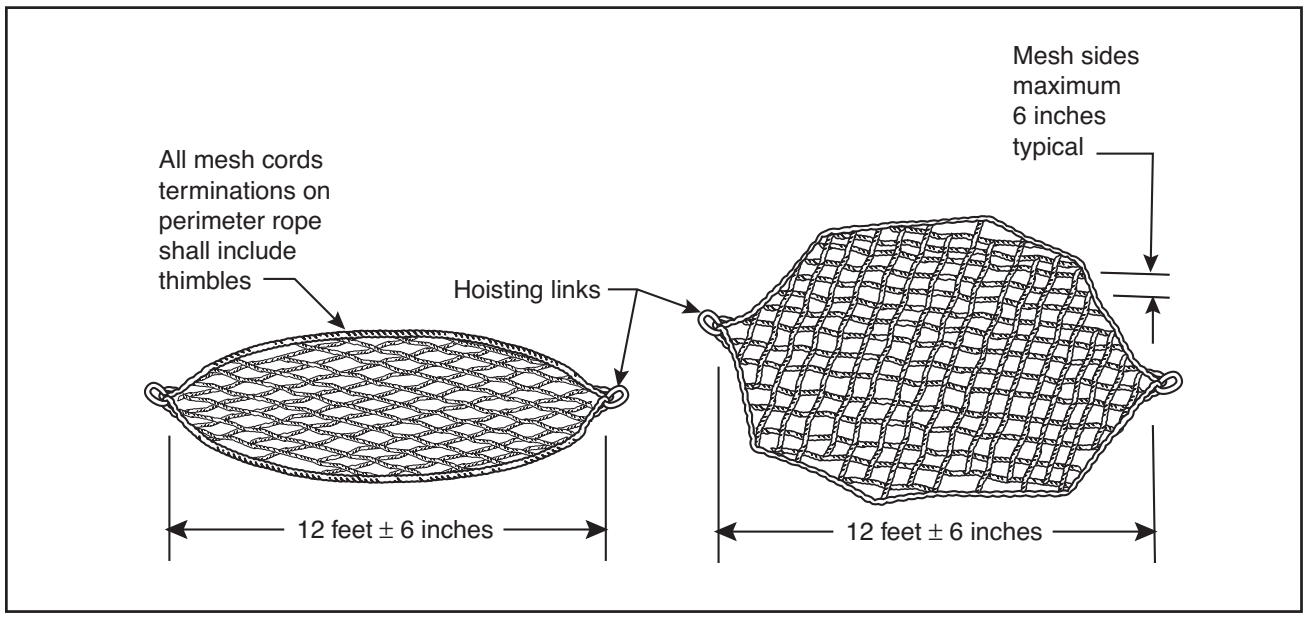



Figure 4—Drawstring-style nets.

3.7.3.1. Drawstring Net 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 diameter on the drawstring nets shall be as necessary to meet the performance requirements of paragraph 3.2 for the assembled net, when lifted using only one of the two hoisting rings. However, the perimeter rope shall not exceed ⅝ inches in diameter. 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 a thimble. The perimeter rope shall have no other splices than those that terminate on the hoisting rings. The contractor shall obtain a certificate of conformance (see paragraph 3.9) for the material used in the perimeter rope. The perimeter ropes for the drawstring net shall be treated for abrasion resistance by a minimum of two coats of solvent-carried polyurethane, 20 to 30 percent solids, or equal.

3.7.3.2. Drawstring Mesh. The net shall be assembled and the cordage size selected so not all mesh cords are required to terminate on the perimeter rope while still meeting the strength requirements of paragraph 3.2, e.g., every other cord of the mesh (or similar) shall not terminate on the perimeter rope.

3.8. Net Volume. The completed net, either style, shall be capable of fitting into a 1.96 cubic foot volume (21 inches by 17 inches by 9.5 inches) 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 a 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. General Inspections and Tests. The contractor shall be responsible for delivering quality products that meet the requirements of this specification. 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. 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. Sampling for Inspection. When inspection is performed, sampling shall be in accordance with ANSI/ASQC Z 1.4.

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 may select 1, 2, or 3 articles for inspection based on the number of items in the lot.

4.3.3. Sample for Lot Acceptance Inspections/Tests. Sampling for lot acceptance inspection shall be in accordance with ANSI/ASQC 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 |
|---|---|---|
| 3.3.2. | The hoisting link is not corrosion resistant or treated for corrosion resistance. | Major |
| 3.3.3. | The metal thimbles are not stainless steel. | Major |
| 3.3.4. | Any of the cordage in the either style of 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 workmanship is poor or not to industry standard such that it impairs serviceability or detracts from the appearance of the net. | Minor |
| 3.3.4.1. | The net does not generally lie flat. | Minor |
| 3.3.4.1. | A loop, pull, or snag exists in the fibers or strands of the cordage. | Minor |
| 3.5. | Each splice does not incorporate four tucks. | Major |
| 3.5. | Each mesh termination on the perimeter rope of a drawstring net does not include a thimble. | Major |
| 3.5. | A strand on a termination or splice is not heat cut to eliminate fraying. | Minor |
| 3.5. | Any termination, splice, or mesh intersection uses a hardened resin. | Major |
| 3.6. | Marking does not contain all of the required information. | 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 as required. | Major |
| 3.6. | The tag has sharp edges or corners. | Major |
| 3.7. | The mesh 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 permanent. | Major |
| 3.7.1. | The cord intersections shall limit movement so that mesh does not exceed 6 inches between cords. | Major |

Table 1—Lot acceptance inspection (continued).

| Reference Paragraph Number | Nonconformance | Class of Nonconformance |
|---|---|---|
| 3.7.2. | All of the mesh cords on the four-corner pickup net do not terminate on the perimeter rope. | Major |
| 3.7.2. | The mesh terminations on the four-corner pickup net move around on the perimeter rope. | Major |
| 3.7.2. | The four-corner pickup net is not square in shape. | Major |
| 3.7.2. | The four-corner pickup net is not 12 feet ±6 inches per side. | Major |
| 3.7.2.1. | The perimeter rope for the four-corner pickup net exceeds ¾ inches in diameter. | Major |
| 3.7.2.1. | The perimeter rope for the four-corner pickup net has more than 1 splice in its length. | Major |
| 3.7.3. | The drawstring style net is not round or octagon in shape. | Major |
| 3.7.3. | The size of the drawstring style net is 12 feet ± 6 inches. | Major |
| 3.7.3.1. | The perimeter rope for the drawstring style net is greater than ⅝ in diameter. | Major |
| 3.7.3.1. | The perimeter rope for the drawstring style net is not divided into 2 equal segments. | Major |
| 3.7.3.1. | The perimeter rope for the drawstring style net does not terminate on hoisting links. | Major |
| 3.7.3.1. | The terminations of perimeter rope for the drawstring style net on the link do not incorporate a thimble. | Major |
| 3.7.3.1. | The perimeter rope for the drawstring style net has splices at places other than where the rope terminates on the links. | Major |
| 3.7.3.1 | The perimeter rope for the drawstring style 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 in paragraph 6.5, 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 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 |
|---|---|---|
| 3.3.1. | 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. | A certificate of conformance, meeting paragraph 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 pounds, or an ultimate strength of at least 11,250 pounds. | Major |
| 3.3.3. | A certificate of conformance, meeting paragraph, 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 paragraph 3.9, was not provided for the perimeter rope. | Major |
| 3.3.4.2. | A certificate of conformance, meeting paragraph 3.9, was not provided for the mesh rope. | |
| 3.8. | Either style of cargo net does not fit into a 1.96 cubic foot volume. | 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, paragraphs 3.3.2, 3.7.2.1, 3.7.3.1, and 3.9
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 material 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 net(s) 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 not be delivered to Government 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

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/ASQC Z1.4, except that table 2-B – Single sampling plans for tightened inspection (Master table) from ANSI/ASQC A1.4 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 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. 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; 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 paragraphs 3.1.1, 4.4.2, and 6.5.
c. Whether the net style being procured is a four-corner pickup or a drawstring net, see paragraph 1.2.
d. Packaging and packing and marking, see paragraph 5.1.

6.3. Superseding Data. This document supersedes 5100-500e for 3,000-pound heavy external helicopter cargo nets only.

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 | Kilograms |
| 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 paragraph 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. USDA Forest Service, Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3103.

**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 5100-502, 3,000 Pound Cargo Net, 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.

Give paragraph number and wording:

Recommended change (s):

Reason for recommended change (s):

Remarks:

| Submitted by: (Print or type name and address - Optional) | Telephone number: (Optional) |
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USDA Forest Service
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