INCH-POUND

MIL-DTL-5765G
5 January 1996
SUPERSEDING
MIL-S-5765F
14 June 1990

DETAIL SPECIFICATION

STRAND, WIRE, ARMORED STEEL

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers armored steel tow target cable. The terms "strand" and "cable" as referred to in this specification are defined in 6.3.3 and 6.3.1.

1.2 Classification. Cable shall be of the following sizes, as specified (see 6.2):

Size 1/8-inch diameter, 2,160-pound tensile strength

Size 11/64-inch diameter, 4,000-pound tensile strength

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 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 and documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of referenced documents are those in effect at the time of solicitation. Information regarding the latest issue of government documents and adopted non-government documents can be obtained from the Department of Defense Index of Specification and Standards. (see 6.2).

STANDARDS

MILITARY

MIL-STD-130 - US Military Property, Identification Marking of
MIL-STD-831 - Test Reports, Preparation of

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from Standardization Document Order Desk, 700 Robbins Avenue, Building. 4D, Philadelphia, PA 19111-5094.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: San Antonio Air Logistics Center, SA-ALC/TILDD, Bldg 207, 306 Tinker Drive, Kelly AFB, TX, 78241-6915 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

D-11712 - Spool-Towline Shipping (Department of the Navy, Naval Air Development Center (NADC)).

(Copies of this drawing required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.3 Non Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

American National Standards Institute

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

(Application for copies should be addressed to the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.)

American Society for Testing and Materials

ASTM E8 - Test Methods for Tension Testing of Metallic Materials

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

2.4 Order of precedence. 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. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.3.

3.2 Components. The cable shall consist of one 19-wire strand having an armored covering of one flat wire.

3.3 Materials.

3.3.1 Steel. Steel used in the manufacture of the cable shall be carbon steel and shall be capable of meeting the requirements of this specification.

3.4 Design and construction.

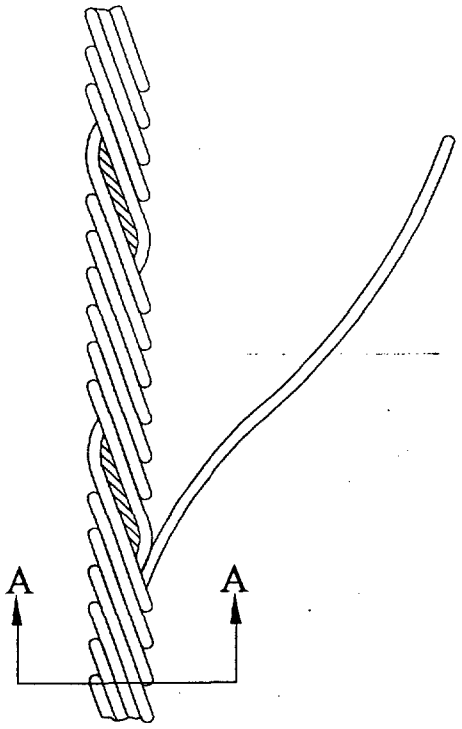
3.4.1 Round wire (see 6.3.2). The round wire used in the fabrication of the strand shall be cylindrical, smooth, and of uniform high quality. It shall be free from splits, cold shuts, and other defects.

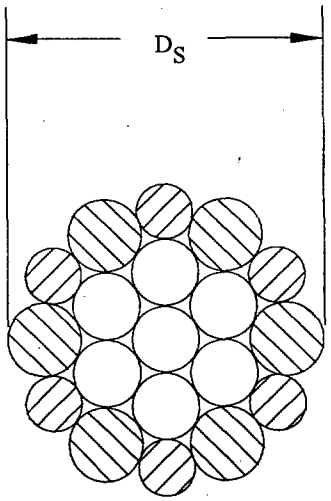
3.4.2 Flat wire (see 6.3.2). The flat wire used in the fabrication of the armor shall be smooth and of uniform high quality. The physical properties shall be as specified in Table I. It shall be free from splits, cold shuts, and other defects.

TABLE I. Physical Properties for Flat Wire

Cable Dia (In.)	Width (In.)	Thickness (In.)	Tensile Strength(PSI) Before Swaging	Weight of Zinc Coating (oz/sq.ft.)
1/8	.125 ±.005	.016 ±.001	147,000 ±17,500	.005 min
11/64	.125 ±.005	.024 ±.001	147,000 ±17,500	.005 min

3.4.3 Strand construction. The strand shall be a Warrington design conforming to Figure 1 and having 19 individual wires. Six wires shall be laid around a central core wire with a left-hand lay (see 6.3.4), and 12 wires shall be laid around the first operation in a left-hand lay. The wires shall have a pitch (see 6.3.5) of not more than 8 nor less than 7 times the strand diameter. The individual wires of the strand shall have three different diameter sizes. The strand diameter is shown on Figure 1.





SECTION A-A

DIMENSIONS IN INCHES

CABLE DIA	D_S	
	STRAND DIA	TOLERANCE OF STRAND
1/8	.100	±.002
11/64	.141	±.002

FIGURE 1. Strand Construction

3.4.4 Wire joints (flat or round wires). All wire joints in the cable shall be welded or brazed. Twisted or tucked-in joints shall not be accepted. Joints in individual wires in any layer of the strand shall be at least 20 feet apart.

3.4.5 Lubricant. The strand shall be coated with a friction preventative non-corrosive lubricant. The lubricant shall be applied so that each wire is coated. The lubricant shall also be resistant to oxidation.

3.4.6 Armoring. The armor shall consist of one flat steel wire wrapped spirally around the strand in a clockwise direction as shown on Figure 2. The spacing between the spirally wound armor flat wire shall be such as to provide a spacing after swage as required in 3.4.7.

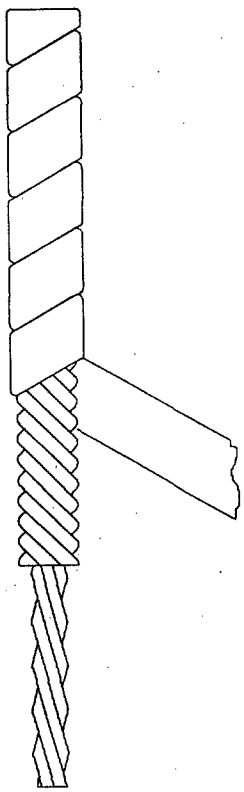


FIGURE 2. Cable Exploded

3.4.7 Swaging. After the armoring has been completed, the cable shall be rotary swaged. The resulting swaged cable shall be cylindrical, smooth, and free from surface metal folds. The swaging shall remove the internal stresses induced by wrapping, and the strand shall be free from tendencies to take a set when operating over level-winding and reeling equipment. The armor shall not unwind nor loosen from the strand when the cable is cut. The internal surface of the armor shall be cold-flowed into the interstices of the strand to lock the armor and prevent untwisting. The width of the flat wire after swaging shall be .135 ±.010 inch for 1/8-inch cable and .140 ±.015 inch for 11/64-inch cable. The spacing between the spirally wound armor after swaging shall be neither greater than .037 inch nor less than .012 inch for 1/8 inch cable, and neither greater than .055 inch nor less than .035 inch for 11/64 inch cable. Finished cable spacing shall be 90 percent compliant with no more than 7 consecutive wraps metal to metal.

3.5 Performance.

3.5.1 Wire Torsion Capacity. An 8 inch length of round wire used in the manufacture of the strand shall withstand a minimum number of turns, determined as 1.5 divided by the diameter of the wire, in inches, as tested in accordance with the wire torsion test of 4.5.3.

3.5.2 Twist characteristics. The cable shall have a maximum twist of one turn per foot of cable with a suspended load of 500 pounds, as tested by the cable torsion stability test of 4.5.4.

3.5.3 Breaking strength after endurance test. The breaking strength of the cable after being subjected to the endurance test shall meet the requirements of Table II and 4.5.6 as tested in 4.5.5.

3.5.4 Tensile strength (strand and cable). The tensile strength of new and unused cable as tested in 4.5.5 shall be not less than 2,160 pounds for 1/8-inch diameter and 4,000 pounds for 11/64-inch diameter.

3.5.5 Resistance to Unlaying. The wire of the strand shall resist unlaying when manually unlaid and then replaced in the strand as tested in accordance with 4.5.2.

3.5.6 Resistance to Fraying. The unseized end of a cut strand shall not unwind or fray by more than the tolerance specified on figure 1, when tested in accordance with 4.5.2.

3.6 Dimensions.

3.6.1 Cable diameter (see 6.3.6). The diameter of the cable after application of the armor shall be .1275 ±.0025 inch for 1/8-inch cable and .1790 ± .0030 inch for 11/64-inch cable.

3.6.2 Length. The cable length shall be as specified by the procuring activity and shall be within ± 200 feet of the specified length. The cable shall be in one continuous length (see 6.2).

3.7 Weight. The weight of the completed cable per 100 feet shall be 4.025 ± .075 pounds for 1/8-inch diameter cable and 7.570 ± .150 pounds for 11/64-inch diameter cable.

3.8 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.8.1 Additional marking. Each spool shall be marked with the applicable lot number.

3.9 Workmanship. The cable shall be fabricated and finished in a workmanlike manner. Particular attention shall be given to accuracy of dimensions, twist, swaging, etc., as set forth in this specification and to freedom from blemishes, defects, burrs, sharp edges, loose wires, and kinks.

3.9.1 Cleaning. The cable shall be wiped clean with a cloth. Metal chips and other foreign material shall be removed during and after final assembly.

3.10 Spools. The cable shall be wound on shipping spools conforming to the dimensions on NADC drawing D-11712. The cable shall be level wound on the spool under a continuous tension of 25 lbs during the winding operation. When winding is complete, the end of the cable shall be securely fastened to the flange of the spool by means of a U-bolt or J-bolt to prevent slipping and loosening of the spool. Only one size cable shall be wound on a spool.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3)

b. Quality conformance inspection (see 4.4)

4.2 Inspection conditions. Unless otherwise specified all inspections and tests shall be performed in accordance with the test conditions specified in ASTM E8.

4.3 First article inspection. First article inspection shall be performed on samples representative of the production of the item after the award of contract to determine that the production meets the requirements of this specification. First article inspection shall consist of all the tests described under 4.5 and shall be performed on the test sample specified in 4.3.1.

4.3.1 First article test sample. The first article test sample shall consist of not less than 200 feet of cable, after the removal of any necessary discard, taken from the head end of the first lot of cable manufactured.

4.3.2 Test report and test samples for the procuring activity. When specified, after completion of the first article tests, samples shall be accompanied by a test report prepared in accordance with MIL-STD-831.

4.4 Quality conformance inspection. The quality conformance inspection shall consist of:

a. Individual inspections (see 4.4.2)
b. Sampling inspections (see 4.4.3)

4.4.1 Lot. All the cable of the same construction, diameter, and heat produced continuously by one machine or one series of progressive processing machines and offered for delivery at one time shall be considered a lot for the purpose of examination and test. The maximum lot size shall be limited to 600,000 feet. A lot number shall be assigned by the manufacturer.

4.4.2 Individual inspection. The cable of each lot shall be subjected to the examination of product (see 4.5.1).

4.4.3 Sampling inspection. Samples (see 4.4.3.1) from each lot presented for acceptance shall be subjected to the tests under 4.5.2 and 4.5.3. Additional tests under 4.5.4, 4.5.5, 4.5.6, and 4.5.7 will not normally be required for subsequent lots of a particular part number, provided that the results of these tests for that part number were previously approved and available. When any of the manufacturing processes have changed that can affect the end item, the part numbers affected must be recertified under those additional tests and recorded. The procuring activity has the option of requiring a specific lot or part number to be tested under the above additional tests based on the history of the item.

4.4.3.1 Samples. Statistical sampling and inspection shall be in accordance with the general requirements of ANSI/ASQC Z1.4. Unless otherwise specified, these samples shall consist of not less than 30 feet of cable. Lot acceptance criteria shall be based on a single sampling plan with a zero acceptance number.

4.5 Test methods.

4.5.1 Examination of product. The cable shall be examined carefully for workmanship and finish as it is wound on the shipping spool. The cable shall be stopped when closer inspection is deemed necessary. Prior to winding, any unqualified portion from the lead end of the cable shall be discarded.

4.5.2 Unlaying and fraying tests. These tests shall be conducted prior to any other tests specified herein. The armor shall be removed from a 12-inch length of cable, and the strand shall be subjected to the tests specified in 4.5.2.1 and 4.5.2.2. Failure of the sample to pass these tests shall be cause for rejection of the cable lot represented.

4.5.2.1 Unlaying test. A minimum of two wires shall be unlayed from the strand as shown on Figure 1 for a distance of not less than 8 inches and then returned to the original helical position in the strand. Wires so unlayed and replaced by hand shall assume original positions in the finished strand without undue stresses which would tend to unwind or distort the helical shape.

4.5.2.2 Fraying test. After the unlaying test specified in 4.5.2.1 has been satisfactorily completed, the strand shall be cut in two pieces. There shall be no unwinding or fraying.

4.5.3 Wire torsion test. A minimum of two wires taken from the strand before the armor is applied shall be subjected to this test. Failure of one wire to withstand the turns specified shall not constitute the final cause for rejection. In such cases, an additional two wires from the same sample shall be tested. If either wire of the second two wires fails the test, the strand shall be rejected.

4.5.3.1 Torsion test method. The wire shall be gripped by two clamps 8 inches apart. One clamp shall be free to revolve and move in an axial direction. The free clamp shall revolve in one direction at a uniform speed of 60 revolutions per minute or less and without heating the wire perceptibly. Sufficient tension shall be applied longitudinally to the wire to keep it from kinking during the test. The number of complete turns causing failure shall be not less than the number computed by the following formula:

The number of turns in an 8-inch length = 1.5 / diameter in inches

4.5.4 Cable torsion stability test (twist characteristic). The resistance of a cable to unlaying under load is termed its torsion stability. In determining this property, a minimum of two lengths of cable of each size, each 6 feet or longer, shall be prepared by the addition of end terminals. One end of the cable assembly shall be connected to a firm overhead fixture and the cable allowed to dangle until it is completely relaxed. A 500-pound weight shall be attached to the opposite end of the cable. When the 500-pound load is applied to the cable, the weight shall be allowed to rotate. Rotation of the weight due to the untwist of the cable shall be retarded by stopping the weight's rotation at least once each revolution to prevent overrunning. The number of revolutions shall be counted. When the weight becomes completely at rest for 10 seconds, the revolutions shall be recorded. With the cable under load and the weight free to turn, there shall be no visible loosening, distortion, or cracking of the armor. The maximum number of revolutions acceptable shall be no more than one revolution per foot of cable between terminals.

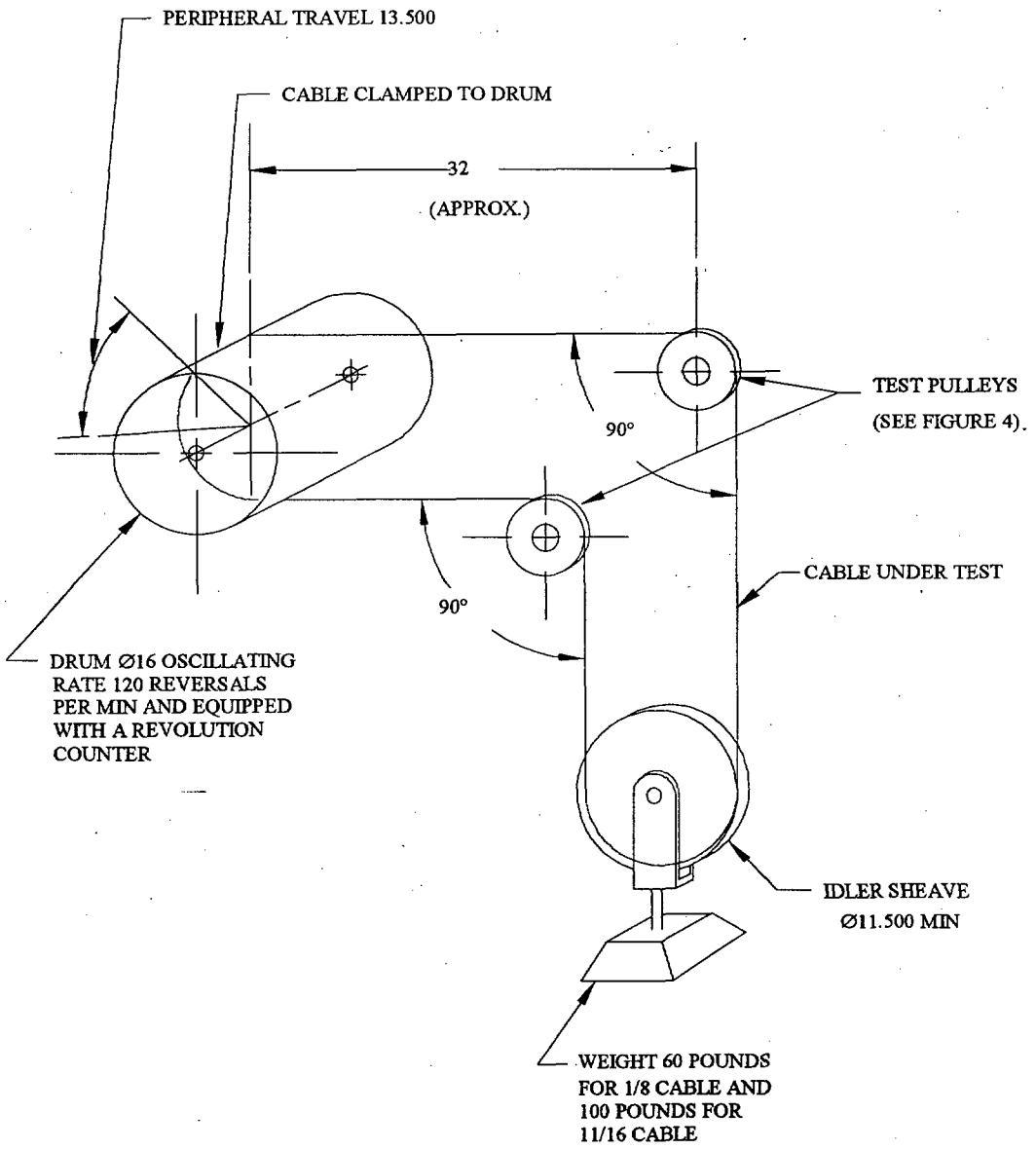
4.5.5 Tension test (breaking strength). Tension testing insures that the cable meets the required strength when new,or after the endurance test, as specified. Three lengths of each size cable shall be tested. Each tension test length shall be not less than 24 inches long. The tension test shall be conducted in accordance with ASTM E8. With the sample in place and ready for testing, the distance between the jaws of the tension testing machine shall be not less than 10 inches. Samples may be clamped in the jaws by swaged fittings on both ends of each sample or by any suitable means.

4.5.6 Endurance test. Three lengths, each 13 feet long, shall be taken from each sample of cable for testing. The application of lubricant other than, or in addition to that used to impregnate the cable during the process of manufacture shall not be permitted either before or during the endurance test. The total number of reversals for each sample shall be as shown in Table II. The test setup shall be as shown on Figure 3 employing test pulleys conforming to the dimensions specified on Figure 4. The total travel of the cable in one direction shall be 13-1/2 inches. No cracks shall be visible in the armor at the conclusion of the 20,000 or 10,000 reversals. Sample No. 2 and sample No. 3 shall be tested as specified in 4.5.7.

TABLE II. Endurance-Strength Relationship for Target Tow Cable

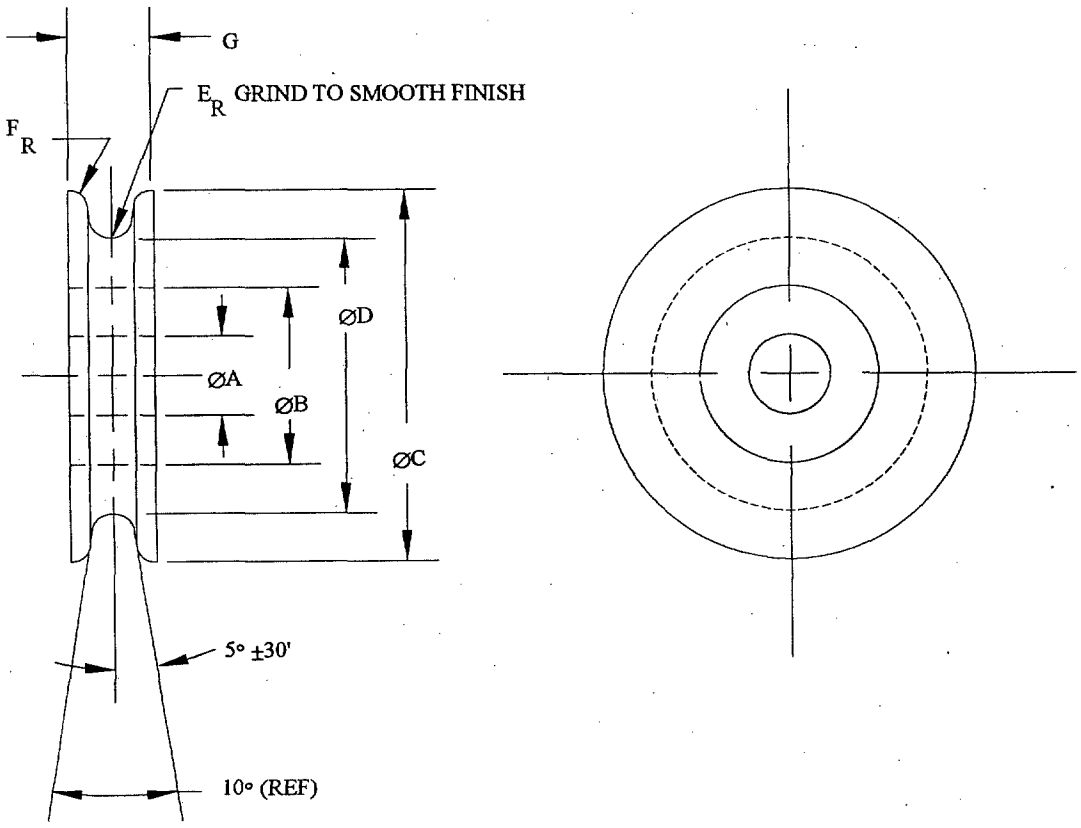
Cable Size	Sample #	Number of Reversals	Minimum Break Strength After Endurance Test (lbs)
1/8 - inch	1	20,000	2,000
	2	40,000	1,300
	3	48,000	700
11/64	1	10,000	3,333
	2	16,000	1,750
	3	22,000	500

4.5.7 Tensile strength after endurance test. Each sample that has satisfactorily passed the endurance test specified in 4.5.6 shall be subjected to the tension test specified in 4.5.5 to determine the breaking point of a portion of the cable that has been subjected to reverse bending by contact with a test pulley on a machine or test stand. The tensile strength of the sample shall be not less than that shown in Table II.



DIMENSIONS IN INCHES

FIGURE 3. Cable-Endurance Testing machine (diagrammatic)



NOTE: Fit pulleys with suitable ball or roller bearings.
"Ø B" should be bored and ground to light press fit for bearings
"Ø A" bore of bearing as received.

Material: Tool Steel.
Heat Treat: Harden to HRc 60 minimum.

DIMENSIONS:
"ØC" = 4.2500 ±.0156
"ØD" = 3.500 + .005 - .000
"E_R" = .133 + .002 - .000
"F_R" = .100 ±.003
"G" = .5000 ±.0156

FIGURE 4. Test Pulley

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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 which may be helpful, but is not mandatory)

6.1 Intended use. The cable covered by this specification is intended for use in towing aerial targets by aircraft. The lengths of cable procured and size specified will vary to meet the needs of a variety of aircraft reeling machines used in conjunction with numerous target types.

6.2 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.

(b) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced.

(c) Size of cable required (see 1.2).

(d) Length of cable required (see 3.6.2).

(e) When First Article Inspection must be performed.

(f) Packaging requirements.

6.3 Definitions. For the purposes of this specification, the following definitions apply.

6.3.1 Cable. A cable is a group of round wires helically twisted or laid about a center round wire and having an armor of one flat wire applied as specified herein.

6.3.2 Wire. A wire is an individual piece of slender, flexible metal, either round or flat.

6.3.3 Strand. A strand is a group of round wires helically twisted or laid about a center round wire and having no armor.

6.3.4 Lay (or twist). The helical form taken by the wires in the cable will be the lay or twist in the cable. In a right-hand lay, the wires are in the same direction (clockwise) as the thread on a right-hand screw and for a left-hand lay, the wires are in the opposite direction (counterclockwise).

6.3.5 Pitch (or length of lay). The distance parallel to the axis of the cable in which a wire makes one complete turn about the axis will be the pitch or length of lay of the cable.

6.3.6 Cable diameter. When measured at the cross section, the diameter will be the straight line passing through the center and terminating on the outermost edge of the cable (including the armored covering).

6.4 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.

6.5 Color tracer filament. Each manufacturer shall incorporate color tracer filaments into the cable for the purposes of identification. The accepted color codes for known manufacturers is hereby listed; any manufacturer not listed in the specification may obtain a combination from the preparing activity.

Manufacturer	Color Code
Bergen Cable Technologies	Orange and Green
Loos and Co., Inc.	Red and Yellow

6.6 Part Identification Number (PIN). The PIN to be used for Target Tow Cable acquired to this specification are created as follows:

M5765 - X
- X — Size number (see 1.2)
- M5765 — Specification number
- M — Prefix for Military Detail Specification

6.7 Subject term (keyword) listing.

Cable, target tow

Custodians:
Navy - AS
Air Force - 99

Preparing activity:
DLA-IS

(Project 4010-0208)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3 and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6 and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, or to request waivers, or 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

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-5765G	2. DOCUMENT DATE (YYMMDD) 960105

3. DOCUMENT TITLE: STRAND, WIRE, ARMORED STEEL

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach sheets if needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY DLA-IS

a. NAME Emelia Altomari	b. TELEPHONE (Include Area Code) (1) Commercial (215) 697-6827
c. ADDRESS (Include Zip Code) Defense Industrial Supply Center 700 Robbins Avenue Bldg. 3 (Code DISC-EED) Philadelphia, PA 19111-5096	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403 Falls Church, VA 22041 TELEPHONE (703) 756-2340 AUTOVON 289-2340