MIL-C-5424
30 November 1949
Superseding
AN-C-44
11 August 1948

MILITARY SPECIFICATION

CABLE; STEEL (CORROSION-RESISTING), FLEXIBLE, PREFORMED (FOR AERONAUTICAL USE)

This specification was approved on the above date by joint action of the Air Force and Navy Departments for use in the procurement of aeronautical supplies.

1. SCOPE AND CLASSIFICATION

1.1 Scope.- This specification presents requirements for flexible, corrosion-resisting steel cable intended for aircraft structural applications.

1.2 Classification.- Flexible, corrosion-resisting steel cable shall be furnished in one type only, designated as the preformed type.

2. APPLICABLE SPECIFICATIONS, OTHER PUBLICATIONS, AND DRAWINGS

2.1 Specifications.- Issues of the following specifications in effect on date of invitation for bids shall form a part of this specification to the extent specified herein:

Federal

QQ-M-151	Metals; General Specification for Inspection of
QQ-S-781	Strapping; Flat, Steel
QQ-S-790	Strapping; Round, Steel, Bare and Zinc Coated

Military

JAN-B-121	Barrier-Material; Greaseproof
JAN-P-125	Packaging and Packing for Overseas Shipment - Barrier-Material; Waterproof, Flexible

Air Force-Navy Aeronautical

AN-W-24	Wire; Corrosion-Resisting (Grade C) Steel

U. S. Army

94-40645	Marking; Exterior, Domestic and Export Shipment by Contractors 1/

1/ Applicable only to Air Force purchases.

2.2 Other publication.- The issue of the following publication in effect on date of invitation for bids shall form a part of this specification to the extent specified herein:

Bureau of Supplies and Accounts publication

Navy Shipment Marking Handbook 1/

(Copies of this publication and copies of applicable publications thereto required for Government procurement, and the Index of Military Aeronautical (AN or MIL) Standards may be obtained upon application to the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio; or to the Commanding Officer, U.S. Naval Air Station, Johnsville, Pennsylvania. Military Specifications (aeronautical AN or MIL), ANA Bulletins, Qualified Products Lists, and ANA Drawings are available for purchase from the above agencies, acting as agents for the Superintendent of Documents. The price may be obtained from the Index of Military Aeronautical (AN or MIL) Standards or upon application to either of the above agencies, and payment shall be made by check or money order, payable to the Superintendent of Documents or the Treasurer of the United States.)

3. REQUIREMENTS

3.1 Material.- The wire used in the manufacture of cable shall conform to all requirements of Specification AN-W-24.

3.1.1 Preforming of wires and strands.- The individual wires and strands composing the cable shall be preformed into the exact helical position they will have in the finished cable, so that if the cable is cut or severed there is no tendency for the normal diameter of the cable at the unsized ends to increase by more than the amount specified in table I.

3.2 Joining.- Splices in individual wires 0.014 inch in diameter and smaller may be twisted. Wires of larger diameter shall be brazed or welded. Splices in individual wires in any layer of a strand shall be not closer than 20 feet.

3.2.1 Broken ends.- Protruding wires are considered as defects and not more than one broken end will be accepted in 1000 feet of cable.

3.3 Construction, dimensions, and physical properties.- The type of construction for the respective diameter, the dimensional tolerances, and the physical properties shall be as specified in table I.

3.4 Types of construction.- Flexible steel cable covered by this specification shall be 3 by 7, 7 by 7, 7 by 19, or 6 by 19 (IWRC) construction, according to the diameter of the cable, as specified in table I.

3.4.1 3 by 7 construction.- Cable of this construction shall consist of three strands of seven wires each. There shall be no core in this construction. The cable shall have a length of lay of not more than 8 times nor less than 5 times the nominal cable diameter.

3.4.2 7 by 7 construction.- Cable of this construction shall consist of six strands of seven wires each, laid around a core strand of seven wires. The wire shall be laid in accordance with the best commercial practice so as to develop a cable which will produce the greatest bending and wearing properties. The cable shall have a length of lay of not more than 8 times nor less than 6 times the cable diameter.

1/ Applicable only to Navy purchases.

TABLE I

Construction and Physical Properties

Nominal diameter of cable	Construction	Tolerance on diameter (plus only)	Allowable increase in diameter at unseized end (max)	Breaking strength of cable (min)	Weight per 100 feet (approximate)
Inches		Inch	Inch	Pounds	Pounds
1/32	3 by 7	0.006	0.006	110	0.16
1/16	7 by 7	0.010	0.009	480	0.75
3/32	"	.012	.010	920	1.60
1/8	7 by 19	.014	.011	1 900	2.90
5/32	"	.016	.017	2 600	4.50
3/16	"	.018	.019	3 900	6.50
7/32	"	.018	.020	5 200	8.60
1/4	"	.018	.021	6 600	11.00
9/32	"	.020	.023	8 000	13.90
5/16	"	.022	.024	9 600	17.30
3/8	"	.026	.027	13 000	24.30
7/16	6 by 19 (IWRC)	.030	.030	17 600	35.60
1/2	"	.033	.033	22 800	45.80
9/16	"	.036	.036	28 500	59.00
5/8	"	.039	.039	35 000	71.50
3/4	"	.045	.045	49 600	105.20
7/8	"	.048	.048	66 500	143.00
1	"	.050	.050	85 400	187.00
1-1/8	"	.054	.054	106 400	240.00
1-1/4	"	.057	.057	129 400	290.00
1-3/8	"	.060	.060	153 600	330.00
1-1/2	"	.062	.062	180 500	420.00

3.4.3 7 by 19 construction.- Cable of this construction shall consist of six strands laid around a core strand. The wire composing the seven individual strands shall be laid around a central wire in two layers. The single core strand shall consist of a layer of 6 wires laid around the central wire in a right-hand direction, and a layer of 12 wires laid around the 7 wire strand in a right-hand direction. The 6 outer strands of the cable shall consist of a layer of 6 wires laid around the central wire in a left-hand direction, and a layer of 12 wires laid around the 7 wire strand in a left-hand direction.

3.4.3.1 Length of lay.- The length of lay of the layers of both the core strand and the outer strands shall be as follows: The outside layer of 12 wires of the strands shall have a length of lay not greater than 50 percent of the cord or cable lay. The inside layer of the strands consisting of 6 wires around the central wire shall have a length of lay not greater than 60 percent of the lay of the outside layer of 12 wires.

3.4.3.1.1 The 6 outer strands shall be laid around the core strand in a right-hand direction, with a length of lay not more than 8 nor less than 6 times the cable diameter.

3.4.4 6 by 19 (IWRC).- Cable of this construction shall consist of 6 strands of 19 wires each, laid around a 7 by 7 independent wire rope core. The 7 by 7 independent wire rope core shall consist of cable or wire rope of six strands of 7 wires each, twisted or laid around a strand core consisting of seven wires.

3.5 Cable lengths.- The cable shall be furnished in minimum lengths of 1000 feet, except that 20 percent of the cable on the order may be furnished in lengths of 500 to 1000 feet.

3.6 Lubrication.- The wires of the cable shall be thoroughly coated with a suitable friction-preventive compound. The amount of compound adhering to the finished cable after the application shall be such that a white cloth, which has been rubbed once over a one-foot length of cable, will show a noticeable amount of the compound. The friction-preventive compound shall possess corrosion resisting properties.

3.7 Endurance.- Cable of the sizes included in table II shall resist the endurance test at the loads and for the number of reversals specified without failure.

3.7.1 Strength after endurance test.- The breaking strength of the cable after endurance test shall be not less than the minimum values specified in table II.

TABLE II

Breaking Strength After Endurance Test

Cable diameter	Tension 1/	Number of reversals	Breaking strength (min)
inch	pounds		pounds
1/8	20	150 000	950
5/32	30	75 000	1 300
3/16	45	65 000	1 950
1/4	70	50 000	3 300

1/ Tension is equal to half of weight (W) which includes idler sheave and hanger, as shown in figure 2.

3.8 Workmanship.- All details of workmanship shall be in accordance with the best practice for high quality aircraft cable consistent with the requirements of this specification. The cable shall be securely laid and free from kinks, loose wires, loose strands, or other defects.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Inspection tests.- The contractor shall furnish all samples and shall be responsible for accomplishing the tests specified herein. All samples shall be in addition to the quantity ordered and shall be furnished without additional cost to the Government. When inspection is conducted at the contractor's plant, all inspection and testing shall be under the supervision of the Government Inspector and, unless otherwise specified, contractor's records of all inspection work and tests, giving the results of tests required to determine compliance with the requirements and tests specified herein shall be kept complete. Duplicate copies shall be furnished to the Procuring Service. The record or report of inspection and tests shall be signed or approved by a responsible

person specifically designated by the contractor. Contractors not having laboratory testing facilities satisfactory to the Government shall engage the services of a commercial testing laboratory acceptable to the Inspector. Acceptance or approval of material during course of manufacture shall in no case be construed as a guaranty of the acceptance of the finished product.

4.1.1 Sampling.- When conducting the tests specified herein, with the exception of Examination of product, one sample, not less than 40 feet in length for sizes listed in table II, and not less than 15 feet in length for other sizes, shall be taken, after any discard has been removed, from the head or starting end of the first manufacturing reel for each lot of cable. In addition to this sample, one sample shall be taken from each shipping reel of 10,000 feet or less, except that for shipping reels of 5,000 feet or less, one sample shall be taken from each 5,000 feet of cable from each lot.

4.1.1.1 Lot.- A lot shall consist of cable of the same construction and diameter produced continuously by one machine or one series of progressive processing machines.

4.1.1.2 Each manufacturing reel shall be given a significant number by the manufacturer. When the manufacturing reel is cut into specified lengths for shipping reels, each shipping reel shall be marked with the number of the manufacturing reel, starting from the head end and numbering each shipping reel consecutively.

4.1.1.3 Each sample shall be cut into two pieces, and one piece shall be tested by the manufacturer and the other piece properly identified, shall be forwarded to the Procuring Service for such check tests as may be required.

4.1.2 Tests.-

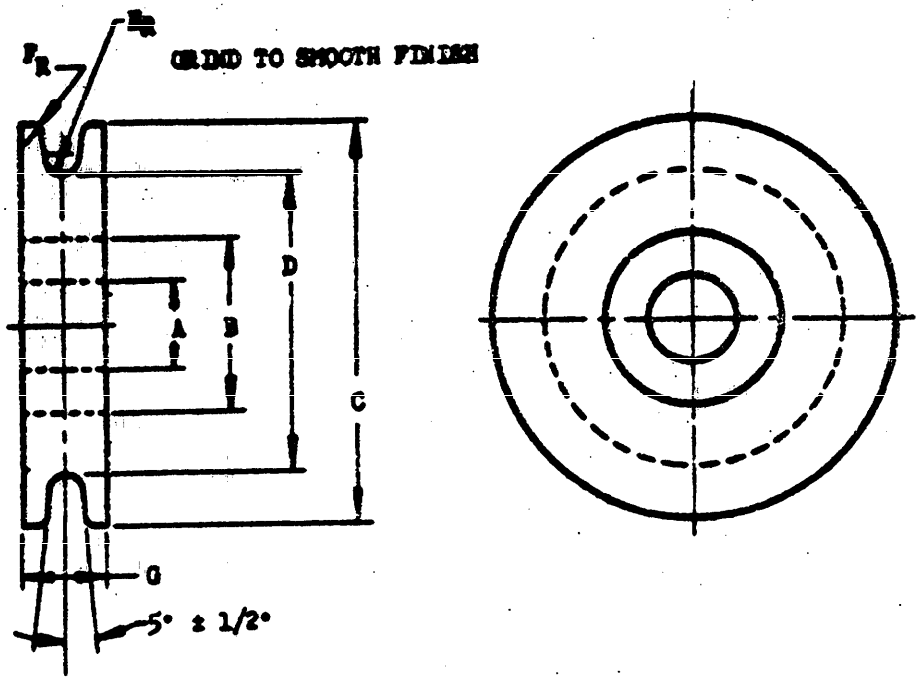
4.1.2.1 Examination of product.- All cable shall be examined for workmanship and finish. For this purpose the cable shall travel no faster than 100 feet per minute and shall be stopped for closer inspection when deemed necessary. This inspection shall take place at the time the cable is wound on shipping reels. Any discard from the head end of the manufacturing reel shall be removed prior to winding on the shipping reels.

4.1.2.2 Breaking strengths.- Three specimens shall be prepared from each sample of cable selected. These specimens shall be straight and not less than 24 inches long. The breaking strength shall be determined on a tensile testing machine in accordance with Specification QQ-M-151. The distance between the jaws of the machine, with the sample in place ready for testing, shall be not less than 10 inches. Specimens may be clamped in the testing machine jaws in the usual manner, by socketing in zinc or other suitable metal, or by swaging fittings on ends.

4.1.2.3 Endurance.- One endurance test specimen shall be prepared from each sample of cable of the diameters shown in table II. The number of oscillations per minute, the total number of reversals, and the tension in the cable for the endurance test shall be as indicated in figure 2 and table II for each size of cable. The total travel of the cable in one direction shall be 13-1/2 inches. The test pulleys shall be made of steel and shall conform to the dimensions shown in figure 1.

4.1.2.3.1 The application of lubricant to the endurance test sample, in addition to the lubricant applied during the manufacturer of the cable shall not be permitted either before or during the endurance test.

4.1.2.4 Breaking strength after endurance test.- The breaking strength after endurance test shall be determined by the method specified for determining the breaking strength of cable except that the specimen for this test shall be so selected as to determine the breaking strength of a portion of the cable that has been subjected to reverse bending by contact with a test pulley.



NOTE: FIT PULLEYS WITH SUITABLE BALL OR ROLLER BEARINGS.
"B" SHOULD BE BORED AND GROUND TO LIGHT PRESS FIT FOR BEARINGS.
"A" BORE OF BEARING AS RECEIVED.
MATERIAL:- TOOL STEEL.
HEAT TREAT:- HARDEN TO ROCKWELL C60 MINIMUM.

DIMENSIONS OF STEEL PULLEYS USED IN ENDURANCE TESTS

Cable Diameter	Pulley Ratio 1/	Pulley Dimensions				
		C ± 1/64	$D^{+.005}_{-.000}$	$R^{+.002}_{-.000}$	F_R	G ± 1/64
Inch		Inches	Inches	Inch	Inch	Inch
1/8	9.5	1-9/16	1.187	0.070	1/16	3/8
5/32	9.5	2	1.484	.086	1/16	3/8
3/16	9.5	2-3/8	1.781	.103	1/16	1/2
1/4	9.5	3-1/8	2.375	.133	1/16	1/2

1/ RATIO OF PULLEY DIAMETER "D" TO NOMINAL CABLE DIAMETER.

FIGURE 1. Endurance Test Pulley

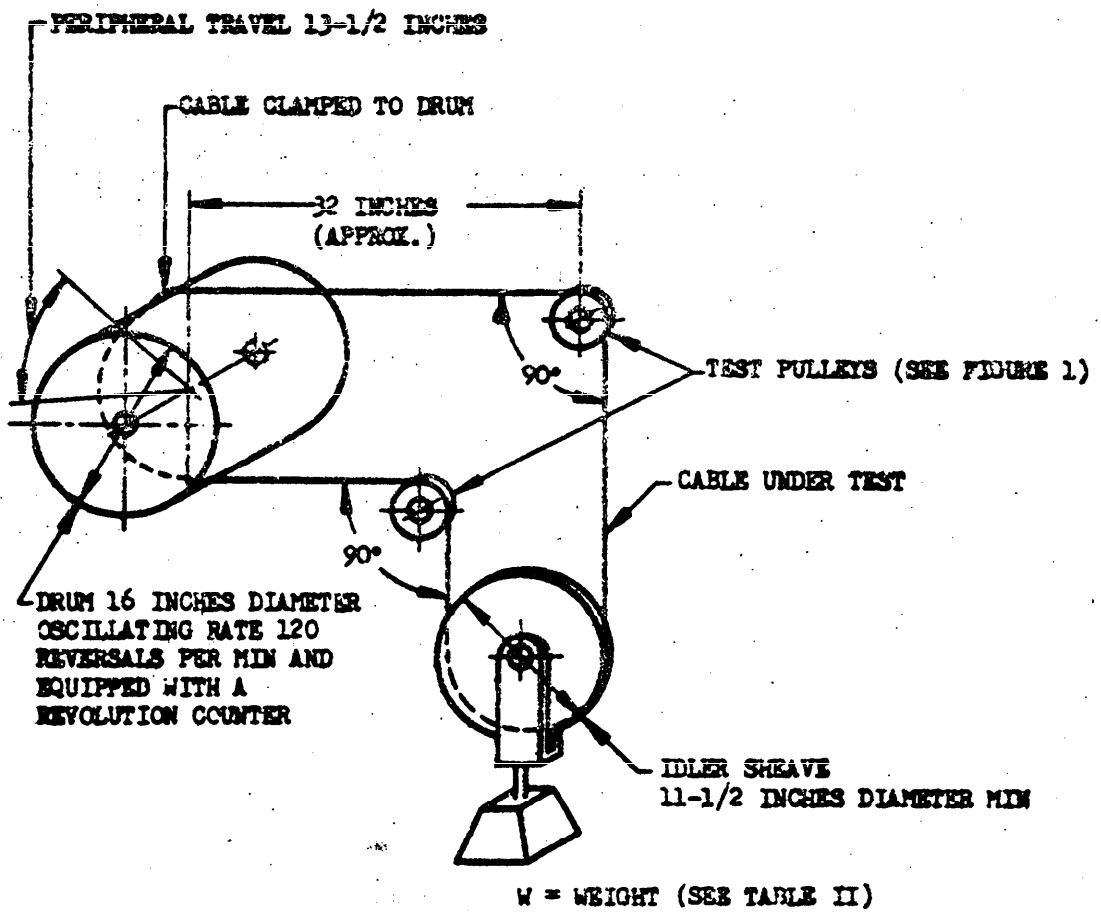


FIGURE 2. Cable Endurance Testing Machine (Diagrammatic).

4.2 Rejection and retest.- The failure of any specimen shall be cause for the rejection of the lot represented except that the manufacturer may, at his own expense, in the presence of the Inspector, sample each length of cable comprising a rejected lot and subject specimens from these samples to retest. The Inspector may accept lengths of cable shown to conform to all the requirements of this specification by this retest.

5. PREPARATION FOR DELIVERY

5.1 Application.- The packaging, packing, and marking requirements specified herein apply only to direct purchases by or direct shipments to the Government.

5.2 Packaging.- The cable shall be wound, one size on a reel, on reels constructed to the dimensions specified in table III. Before starting to wind the cable on the reel, a layer of waterproof barrier-material, Specification JAN-P-125, and then a layer of greaseproof paper, Specification JAN-B-121, shall be applied to the barrel of the reel and the inside of the flanges against which the cable will subsequently rest. After the cable is wound on the lined reel, a layer of greaseproof paper, Specification JAN-B-121, then a layer of waterproof paper, Specification JAN-P-125, shall be applied and fastened by three or more wooden lagging stripe and two metal straps. The metal strapping shall conform to Specification QQ-S-781 or QQ-S-790.

5.3 Packing.- Unless otherwise specified, all material shall receive domestic packing.

5.3.1 Domestic packing.- For domestic packing, no additional packing is necessary.

5.3.2 Overseas packing.- When overseas packing is specified, each packaged reel shall be lagged with a layer of lumber in such a manner that the waterproof barrier-material is not exposed to forces which may cause mechanical damage.

5.4 Marking and labeling.- Shipments for the Air Force and Navy shall be marked in accordance with the requirements of the applicable publications indicated in Section 2. In addition, the following information shall be legibly marked on each reel:

CABLE; STEEL (CORROSION-RESISTING), FLEXIBLE, PREFORMED (FOR AERONAUTICAL USE)
MIL-C-5424
Size_____
Name of Manufacturer (if not same as contractor)
Quantity contained
Stock No._____(USAF or Navy, as applicable)
Name of Contractor
Contract or Order No._____

6. NOTES

6.1 Intended use.- The cable covered by this specification is intended for general aircraft use, where high resistance to corrosion is required.

6.2 Ordering data.- Requisitions, contracts, and orders should state the size and quantity to be furnished. Where minimum lengths greater than than 1,000 feet are required, or where lengths between 500 and 1,000 feet are not desired, the lengths to be furnished shall be specified. The type of packing, whether for domestic or overseas shipment shall be specified.

6.3 Definitions.-

TABLE III
Reels For Cable

Diameter of cable	Diameter of head	Traverse or distance between heads	Diameter of drum	Diameter of arbor hole	Diameter of head	Traverse or distance between heads	Diameter of drum	Diameter of arbor hole
	1 000 feet				3 000 feet			
Inch	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1/32	12	4	8	1-1/8	12	4	8	1-1/8
1/16	12	4	8	1-1/8	12	4	8	1-1/8
5/64	12	4	8	1-1/8	16	4	10	1-1/8
3/32	12	4	8	1-1/8	16	4	10	1-1/8
7/64	16	4	10	1-1/8	16	7	12	1-1/8
1/8	16	4	10	1-1/8	16	7	12	1-1/8
9/64	16	7	12	1-1/8	16	10	8	1-1/8
5/32	16	7	12	1-1/8	16	10	8	1-1/8
3/16	18	7	12	2-1/8	18	10	8	2-1/8
1/32	18	7	12	2-1/8	18	10	8	2-1/8
1/4	18	10	10	2-1/8	24	10	10	2-1/8
5/16	18	10	10	2-1/8	24	10	10	2-1/8
3/8	18	10	8	2-1/8	32	16	16	2-1/8
7/16	24	12	10	2-1/2	50	12	26	5
1/2	24	14	10	2-1/2	50	12	26	5
9/16	26	14	11	2-1/2	50	14	30	5
5/8	32	18	18	3	50	16	30	5
3/4	32	22	18	3	50	22	30	5
7/8	50	12	30	5	50	30	30	5
1-	50	14	30	5	60	24	30	5
	5 000 feet				10 000 feet			
Inch	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches
1/32	12	4	8	1-1/8	16	4	10	1-1/8
1/16	16	4	10	1-1/8	16	7	12	1-1/8
5/64	16	7	12	1-1/8	16	10	8	1-1/8
3/32	16	7	12	1-1/8	16	10	8	1-1/8
7/64	16	10	8	1-1/8	18	10	8	1-1/8
1/8	16	10	8	1-1/8	24	10	10	1-1/8
9/64	24	10	10	1-1/8	24	16	10	2-1/8
5/32	24	10	10	1-1/8	24	16	10	2-1/8
3/16	24	10	10	2-1/8	24	16	10	2-1/8
7/32	24	10	10	2-1/8	32	20	16	3-1/8
1/4	32	18	16	2-1/8	36	22	18	3-1/8
5/16	32	18	16	2-1/8	36	22	18	3-1/8
3/8	32	20	16	3-1/8	50	16	26	3-1/8
7/16	50	14	26	5	50	26	26	5
1/2	50	16	26	5	50	26	26	5
9/16	50	20	30	5	60	22	30	5
5/8	50	26	30	5	60	30	30	5
3/4	60	24	30	5	66	34	30	5
7/8	60	28	30	5	68	38	30	5
1-	60	36	30	5	76	40	30	5

6.3.1 Wire.- Each individual cylindrical steel rod or thread shall be designated as a wire.

6.3.2 Strand.- Each group of wires helically twisted or laid together shall be designated as a strand.

6.3.3 Cable or Wire Rope.- A group of strands helically twisted or laid about a central core shall be designated as a cable. The strands and the core shall act as a unit.

6.3.4 Preformed type.- Cable consisting of wires and strands shaped, prior to fabrication of the cable, to conform to the form or curvature which they take in the finished cable, shall be designated as preformed types.

6.3.5 Diameter.- The diameter of cable is the diameter of the circumscribing circle.

6.3.6 Lay or twist.- The helical form taken by the wires in the strand and by the strands in the cable is characterized as the lay or twist of the strand or cable respectively. In a right-hand lay the wires or strands are in the same direction as the thread on a right-hand screw, and for a left-hand lay they are in the opposite direction.

6.3.7 Pitch (or Length of Lay).- The distance, parallel to the axis of the strand or cable, in which a wire or strand makes one complete turn about the axis, is designated as the pitch (or length of lay) of the strand or cable respectively.

6.3.8 Wire center.- The center of all strands shall be an individual wire and shall be designated as a wire center.

6.3.9 Strand core.- A strand core shall consist of a single straight strand made of preformed wires, similar to the other strands comprising the cable in arrangement and number of wires.

6.3.10 Independent wire rope core (IWRC), 7 by 7.- A 7 by 7 independent wire rope core as specified herein shall consist of a cable or wire rope of 6 strands, of 7 wires each, twisted or laid around a strand core consisting of 7 wires.

Custodian:
Air Force

Other interest:
Navy - BuAer