

TABLE I  
CONSTRUCTION AND PHYSICAL PROPERTIES.

from Spec. AN-RR-C-43 of Dec. 13, 1940.  
"Cable Steel (Carbon) Flexible Pre-formed"

Construction	Tolerance on diameter (plus only)	Allowable increase in diameter at unseized end (Max)	Breaking strength of cable (Min)	Weight per 100 feet (approximate)
	Inch	Inch	Pounds	Pounds
by 7	0.010	0.009	480	0.75
"	.012	.010	920	1.53
by 19	.014	.011	2 000	2.90
"	.016	.017	2 800	4.44
"	.018	.019	4 200	6.47
"	.018	.020	5 600	9.50
"	.018	.021	7 000	12.00
"	.020	.023	8 000	14.56
"	.022	.024	9 800	17.71
"	.024	.025	12 500	22.53
6 by 19 (IWRC)	.026	.027	14 400	26.45
"	.030	.030	17 600	35.60
"	.033	.033	22 800	45.80
"	.036	.036	28 500	59.00
"	.039	.039	35 000	71.50
"	.045	.045	49 600	105.20
"	.048	.048	66 500	143.00
"	.050	.050	85 400	187.00
"	.054	.054	106 400	240.00
"	.057	.057	129 400	290.00
"	.060	.060	153 600	330.00
"	.062	.062	180 500	420.00

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As requested.

*Ed* 2/11/54

The ultimate tensile strength must not be less than a value of the manufacturer of the wire rope.

(c) *Torsion test.* A sample from each coil of wire shall be tested in torsion. The wire shall be twisted in a torsion machine until it breaks. It must stand, without breaking, the equivalent of 20 turns on a length equal to 100 times the diameter of the wire.

The wire shall twist uniformly throughout its length.

NOTE.—The Institution desires to call attention to the fact that this Specification is intended to include the technical provisions necessary for the supply of the material herein referred to, but does not purport to comprise all the necessary provisions of a contract.

## British Standards Institution.

Incorporated by Royal Charter.

FORMED IN 1901 AS THE ENGINEERING STANDARDS COMMITTEE.

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*British Standard Specification for Aircraft Material.*

### PREFORMED STEEL WIRE ROPE

*Other specifications in this series for wire ropes are*

- 6 W. 2. *Steel wire rope and straining cords (not preformed).*
- W. 10. *Non-corrodible steel wire rope (not preformed).*
- W. 11. *Preformed non-corrodible steel wire rope.*

#### PART I. STEEL WIRE FOR MANUFACTURE OF WIRE ROPE.

1. **Manufacture.** The steel wire for the manufacture of preformed steel wire rope shall be of British manufacture and made from steel obtained from an approved manufacturer.

2. **Chemical Analysis.** (a) The steel shall contain:—

Phosphorus	-	-	-	Not more than 0.04 per cent.
Sulphur	-	-	-	Not more than 0.04 per cent.

(b) The wire manufacturer shall supply to the inspector the analysis of each consignment of wire rods made from one cast.

3. **Size.** The diameter of the wire shall be within the limits given in columns 4 and 5 of the table on page 4.

4. **Freedom from defects.** The wire shall be free from defects.

5. **Coating.** To afford efficient protection against corrosion, all wires shall be coated by an approved method of galvanising and subsequently drawing to size.

6. **Tests on wires.** (a) The following tests shall be carried out at the works of the wire manufacturer to the satisfaction of the inspector.

(b) *Tensile test.* A sample from each coil of wire shall be tested in tension. The ultimate tensile strength must not be less than a value to be specified by the manufacturer of the wire rope.

(c) *Torsion test.* A sample from each coil of wire shall be tested in torsion. The wire shall be twisted in a torsion machine until it breaks. It must stand, without breaking, the equivalent of 20 turns on a length equal to 100 times the diameter of the wire.

The wire shall twist uniformly throughout its length.

(d) *Wrapping test.* When the wire is suspected of brittleness it shall be subjected to the following wrapping test:—

The wire shall be closely wrapped round its own diameter eight times and unwound with the exception of the last turn. The wire must withstand this test without fracture.

(e) Should a test piece fail to fulfil any of the tests specified, two further samples cut from the same coil of wire shall, if the wire manufacturer so desires, be submitted to the test under which failure occurred. If both these samples fulfil the tests the wire represented by them shall be accepted, but if either fail the wire represented shall be rejected.

7. **Marking.** The wire manufacturer shall be responsible for seeing that each coil of wire bears an approved tally marked with the following:—

- (i) The specification number and the diameter of the wire.
- (ii) The wire manufacturer's name or approved identification mark.
- (iii) The stamp of the inspector.

## PART II. FINISHED PREFORMED WIRE ROPE.

8. **Material.** (a) The steel wire used in the making of preformed wire rope shall comply with Part I of this specification.

(b) The wire rope manufacturer shall specify to the wire manufacturer the minimum ultimate tensile strength of the wire.

9. **Construction.** The construction, strength, diameter and weight of each size of rope, and the limits of diameter of the wires of which it is composed shall be in accordance with the table on page 4. The strands composing the rope shall be preformed in such a manner that the finished rope satisfies the test specified in clause 11 (c).

10. **Joints and defects.** (a) The jointing of wires shall be reasonably avoided. When it is necessary to introduce new lengths of wire the joints shall be distributed as far apart as possible. The ends shall be tucked in, and in no case shall more than one joint occur in a length of 30 feet of strand.

(b) Each length of finished rope shall be of uniform lay, free from kinks, open and unequally tensioned strands and other irregularities.

11. **Tests on ropes.** (a) The following tests on the rope shall be carried out at the works of the wire rope manufacturer to the satisfaction of the inspector:

(b) *Tensile test.* A sample selected as specified in clause 12, must give a breaking load not less than that specified in the table on page 4. The length of the test piece for the tensile test, measured between the points of security, shall be not less than four times the lay of the rope. If the rope breaks at a point of security the test may be neglected and repeated.

(c) *Test for preforming.* The preformed rope shall withstand the ends of the finished rope being mechanically cut or sheared, and then having two strands opposite to one another—unlaid for a distance of 10 rope diameters or 2 inches (whichever is the greater) and then relaid into position. The diameter of the rope shall then be measured at a distance of six rope diameters or 1 inch from the end (whichever is the greater), and the measurement shall not exceed the value laid down in column 6 of the table.

(d) Should any test piece fail to fulfil the requirements of the tests specified above in paragraphs (b) and (c), two further samples cut from the same piece of rope shall be tested if the wire rope manufacturer so desires. If both these samples fulfil the test the rope represented by them shall be accepted, but if either fail the rope represented shall be rejected.

12. **Selection of samples.** A sample shall be cut from each piece of rope, or at the discretion of the inspector one test piece may be taken to represent five pieces of rope provided these pieces have been made in one closing operation.

13. **Lengths.** The lengths of the pieces, after the samples for testing have been cut off, shall not be shorter nor more than 5 per cent longer than the lengths ordered.

14. **Weight.** The weight of the whole coil shall be used in determining the weight per 100 feet which must not exceed the figure given in column 7 of the table on page 4.

15. **Packing.** (a) The rope shall be wound on a reel. No reel shall be used which in its construction contains any of the following timbers:—

Oak, Sweet Chestnut or Western Red Cedar.

The face of the barrel and the inside of the reel flanges shall be lined with waterproof paper.

The diameter of the barrel shall be not less than 40 times the diameter of the rope.

(b) More than one piece may be wound on a reel if all the pieces on the same reel are of identical diameter and construction. The lengths of the pieces need not be equal.

(c) The ends of each piece of rope shall be whipped with wire or twine. The innermost end of each piece shall be passed through the side of the reel and left exposed.

(d) The wire rope on the reel shall be efficiently protected by means of a suitable covering from mechanical injury.

16. **Marking.** (a) The wire rope manufacturer shall be responsible for seeing that each piece of rope bears an approved tally or seal marked with the following:—

- (i) The specification number and the item number of the rope.
- (ii) The length of the piece (as measured by the drum of the closing machine).
- (iii) The manufacturer's name or approved identification mark.
- (iv) The test number.
- (v) The stamp of the inspector.

(b) Each piece shall have the tally attached to the inside end which is left exposed (see clause 15 (c)).

TABLE.

1 Item.	2 Minimum Breaking Load		3 Construction.	4 Diameter of Wire		6 Maximum Diameter of rope or cord.	7 Maximum Weight.
	cwts.	Equivalent Load in lb.		Min.	Max.		
				inch.	inch.	inch.	lb. per 100 feet.
1P	3	336	4 by 7	0.008	0.009	0.065	0.63
2P	5	560	4 by 7	0.010	0.011	0.08	1.00
4P	5	560	7 by 7	0.0080	0.0090	0.08	1.11
5P	10	1120	7 by 14	0.0080	0.0090	0.12	2.22
6P	15	1680	7 by 19	0.0090	0.0100	0.15	3.75
3P	20	2240	7 by 19	0.0100	0.0110	0.16	4.5
51P	25	2800	7 by 19	0.0110	0.0120	0.18	5.4
52P	35	3920	7 by 19	0.0125	0.0135	0.21	7.0
53P	45	5040	7 by 19	0.0145	0.0155	0.24	9.0
54P	60	6720	7 by 19	0.0165	0.0175	0.27	11.9
55P	70	7840	7 by 19	0.0175	0.0185	0.28	13.2
56P	80	8960	7 by 19	0.0195	0.0205	0.31	16.4
57P	100	11200	7 by 19	0.0215	0.0225	0.34	19.8
58P	120	13440	7 by 37	0.0175	0.0185	0.40	26.2
59P	140	15680	7 by 37	0.0185	0.0195	0.42	29.2
60P	160	17920	7 by 37	0.0195	0.0205	0.44	32.5
61P	180	20160	7 by 37	0.0215	0.0225	0.49	36.8
62P	200	22400	7 by 37	0.0225	0.0235	0.51	40.3

**APPENDIX.**  
**Handling of Ropes.**

The ropes in this specification need careful handling to ensure that the lays as manufactured are not disturbed, and further that the rope is not allowed to form a loop in itself which, if pulled tight, will produce a kink. In this class of rope the kink is shown by the centre strand or core leaving the rope's centre and either lying between the outer strands, or even protruding from the rope in the form of a small loop.

When unwinding a rope the reel should be mounted in a stand with an axle shaft through the centre hole of the reel, to enable the rope to be pulled off in a straight line. It is not advisable to pay off rope from a reel to make flat coils on the floor and then pull out the end for cutting to lengths. This latter practice is very conducive to core protrusion.

When the lengths have been cut off it is frequently necessary, owing to the length involved, to coil up the cut lengths by hand coiling. In such cases the hand coil should be of large diameter, say not less than 50 diameters of the rope involved, with a minimum of 6 inches diameter. When these hand made coils are run out, it should be done by the "wheeling" method, or rotating the coil so that the rope is paid out in a straight line. If when handling a length of rope the rope forms a loop on itself this indicates a localisation of turn. This must be eliminated by taking the turn out and never by pulling tight; the latter will produce the permanent malformation of core protrusion.

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This specification having been approved by the Aircraft Industry Committee and endorsed by the chairman of the Engineering Divisional Council, was published by the authority of the General Council of the Institution as a British Standard on 5th September, 1946.

NOTE.

*Wire ropes for general engineering purposes are covered by the following British Standards*

*B.S. 302 Round strand steel wire ropes for cranes.*

*B.S. 329 Round strand steel wire ropes for lifts and hoists.*

*B.S. 621 Wire ropes of special construction for engineering purposes, inclusive of cranes, lifts and excavators.*

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