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Specification for

Preformed zinc coated carbon steel wire rope (metric and inch series)

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Aerospace Standards Policy Committee (ACE/-) to Technical Committee ACE/14, upon which the following bodies were represented:

- British Independent Steel Producers' Association
- Civil Aviation Authority (Airworthiness Division)
- Federation of Wire Rope Manufacturers of Great Britain
- Ministry of Defence
- Society of British Aerospace Companies Limited
- Stainless Steel Wire Export Group

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Foreword

This British Standard, prepared under the direction of the Aerospace Standards Policy Committee, is a revision of BS W12:1968, which is withdrawn, and it supersedes BS 2W 9:1965, which is also withdrawn.

This British Standard specifies requirements for carbon steel wire used in the manufacture of wire ropes, and requirements for preformed zinc coated wire rope for aerospace applications. It complies with ISO 2020 published by the International Organization for Standardization (ISO) in respect of wire rope diameters and strengths in metric units, and also specifies the requirements for preformed “P” series zinc coated wire rope in imperial units that do not comply with ISO 2020.

In order to meet the severe conditions in which wire rope operates in the control systems of modern aircraft, some requirements are more fully specified than in earlier standards. The composition of the wire, examination for decarburization and compliance with certain requirements of BS 2763 are now specified, together with dimensional tolerances and an elongation test to establish that the elongation is within limits at stated increments of force.

This standard is in three sections, the first covering scope and definitions, the second specifies the properties of the wire from which the rope is manufactured, whilst the third specifies the requirements for the wire rope.

Tests to be performed on both the wire and the rope are given, together with information on construction, storage and handling of wire ropes.

NOTE Manufacturers of wire rope to this standard will be expected to operate a quality control system at least equivalent to BS 5750-2.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This British Standard specifies the material properties, mechanical properties and test requirements for zinc coated carbon steel wire used in the manufacture of wire ropes (section 2) and the construction, mechanical properties and test requirements for preformed zinc coated carbon steel wire ropes (metric and inch series) (section 3).

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions apply.

2.1 wire

a single continuous length of steel, cold drawn from rod

2.2 strand

an assembly of wires spun helically, in one or more layers, around a core

2.3 wire rope

an assembly of strands spun helically, in one or more layers, around a core

2.4 preformed wire rope

a wire rope in which the finished strands are formed into the helical shape they will assume in the finished rope, thus lying naturally in their true position without constraint

2.5 nominal diameter

the value by which the diameter of the wire or rope is designated

2.6 actual diameter

the measured diameter of the wire or rope

2.7 lay

the designation of the direction in which the wires are spun in the strand and the strands are spun in the rope. It will be either right-hand (RH) or left-hand (LH)

2.8 lay length

that distance in a strand or rope, measured parallel to the longitudinal axis, in which the wire in the strand or the strand in the rope makes one complete turn (or helix) about the axis of the strand or rope

2.9 king wire (core wire)

a single wire forming the core of a strand

2.10 core

the central member of a strand or rope

2.11 elongation

that length by which the rope extends between defined upper and lower limits of force (i.e. between first and second reading), expressed as a percentage of the gauge length measured at the lower limit

Section 2. Zinc coated carbon steel wire used in the manufacture of wire rope

3 Material

3.1 Grade

The wire used in the manufacture of wire ropes shall comply with section 1 and section 3 of BS 2763:1982 except for wire diameters.

3.2 Cast analysis

The cast analysis of the wire shall comply with Table 1.

Table 1 — Cast analysis

Element(s)	Min.	Max.
	%	%
Carbon	0.5	0.85
Silicon	—	0.35
Manganese	0.4	0.9
Phosphorus	—	0.030
Sulphur	—	0.035

3.3 Zinc coating

3.3.1 The wire shall be uniformly zinc coated by either the hot dip process or the electrolytic process. If the hot dip process is used the purity of the slab zinc shall be not less than 98.5 %.

3.3.2 The weight of the zinc coating shall be determined by one of the methods given in section 2 of BS 443:1982, and shall comply with class Z requirements of BS 2763.

3.3.3 The adhesion of the zinc coating shall comply with BS 443.

4 Manufacture

4.1 The wire shall be manufactured to circular section within the range of diameters shown in Table 2 by cold drawing from rod complying with **3.1** and **3.2**, and which is free from surface defects when tested in accordance with Appendix A. The wire shall be supplied in the zinc coated condition complying with **3.3**.

NOTE The decarburization test (see **6.4**) should be carried out before the zinc coating is applied.

4.2 The finished wire shall be free from harmful defects.

5 Dimensional tolerances on diameter

5.1 The finished wire shall comply with the tolerances shown in Table 2. Individual measurements shall lie within the tolerance given in Table 2.

5.2 The diameter shall be taken as the mean of two measurements made at right angles to each other on a straight piece of wire.

Table 2 — Tolerances on diameter

Nominal wire diameter		Tolerance	
From	Up to but excluding	Plus	Minus
mm	mm	mm	mm
0.20	0.40	0.01	0.01
0.40	0.80	0.015	0.015

6 Performance requirements

6.1 Selection of test pieces

Samples for all tests shall be cut from each end of each coil of finished wire as drawn.

6.2 Tensile strength test

6.2.1 When tested in accordance with BS 4545 the tensile strength of the wire, calculated on the nominal diameter, shall meet the requirements of grade 1860 or 1960 of BS 2763.

6.2.2 The tensile strength of the wire shall be specified by the rope maker.

6.2.3 The tensile strength of any wire shall meet the limits shown in Table 3 for the appropriate tensile grade numbers and nominal wire diameters.

Table 3 — Tensile strength limits

Nominal wire diameter		Plus tolerance
From	Up to but excluding	
mm	mm	N/mm ²
0.20	0.25	340
0.25	0.40	300
0.40	0.80	260

6.3 Torsional test

When tested in accordance with BS 4545 the test piece shall withstand the number of twists shown in Table 4. When failure occurs, the primary fracture shall be perpendicular to the longitudinal axis of the wire.

Table 4 — Torsional limits

Tensile grade: average tensile strength	Number of twists
N/mm ² (minimum)	
1 860	$\frac{L}{100d} \times 25$
1 960	$\frac{L}{100d} \times 22$
where	
<i>L</i> is the free length between grips (in mm);	
<i>d</i> is the nominal diameter of wire (in mm).	