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(JSSC)

Wire ropes for structure

ICS 77.140.65

Descriptors : steel-wire ropes, wires, structural steels, structures

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G 3549 : 2000

Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee as proposed for this Standard to be established from Japan Society of Steel Construction (JSSC) with preparing a draft industrial standard based on the association standards of JSS II 03 : 1994, JSS II 04 : 1994 and JSS II 05 : 1994, in accordance with the provision of Clause 1, Article 12 in the Industrial Standardization Law.

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Wire ropes for structure

1 Scope This Japanese Industrial Standard specifies wire ropes, composed of galvanized steel wires spun together, to be used for a component of bridges, buildings, steel towers, etc. (hereafter referred to as "ropes").

Remarks : Other standards of wire ropes not covered by this Standard are listed as follows:

JIS G 3525 *Wire ropes*

JIS G 3535 *Wire ropes for aircraft control*

JIS G 3540 *Wire ropes for mechanical control*

JIS G 3546 *Wire ropes with profile wires*

JIS G 7301 *Steel wire ropes for general purposes—Characteristics*

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 3502 *Piano wire rods*

JIS G 3506 *High carbon steel wire rods*

JIS H 0401 *Methods of test for hot dip galvanized coatings*

JIS H 2107 *Zinc ingots*

3 Definitions For the purposes of this Standard the following definitions apply.

- a) **wire** Galvanized steel wires composing the rope.
- b) **shaped wire** A generic term for Z-shaped and trapezoidal (T) wires to be applied to the outer layer of locked coil ropes.
- c) **strand** An element of rope consisting of several wires spun helically.
- d) **core** A generic term of rope core and strand core.
 - 1) **rope core** A centre-fitting wire rope centering the rope. To be constructed in 7×7 , and symbolized as CFRC.
 - 2) **strand core** A strand centering the rope. To be of the same construction as the outer strands. If necessary, it may be symbolized as IWSC.

Ropes with a strand core are referred to as identical core strand ropes.

- e) **rope** Wire ropes composed of an assembly wound strands around a strand core (identical core strand rope) or around a rope core, or those composed of an assembly wound outer wires around a king wire (spiral rope and locked coil rope).
- f) **rope diameter** Diameter of the circle circumscribed the rope at an optional cross-section. It is parted into the nominal diameter and the measured (actual) diameter.

g) **lay length**

- 1) **lay length in rope** Pitch of the helix shaped by the strand or wire in the outer layer of rope (see Fig. 1).
- 2) **lay length in strand** Pitch of the helix shaped by the wire in the outer layer of strand.

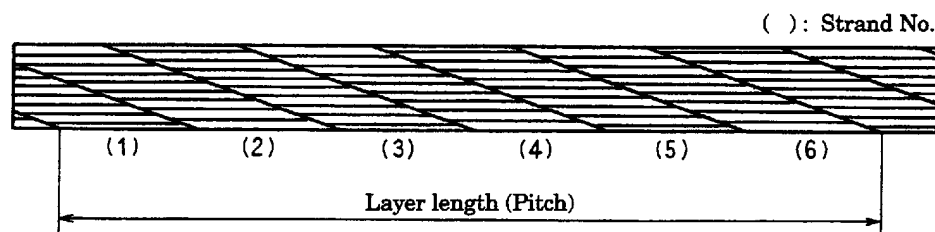


Fig. 1 Lay length (Informative example: In case of strand rope)

- h) **direction of lay** The direction in which the wire is stranded or the strand is closed. There are Z-lay and S-lay (see Figs. 2 and 3).

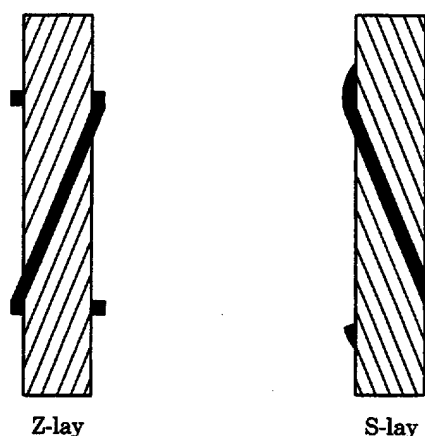


Fig. 2 Direction of lay (Informative example: In case of strand, spiral rope or locked coil rope)

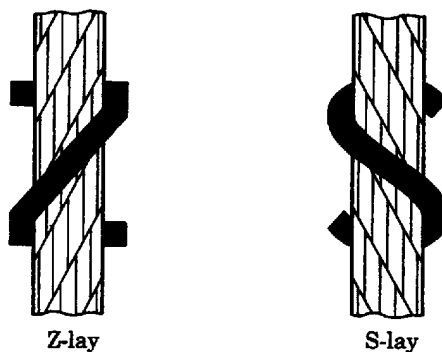


Fig. 3 Direction of lay (Informative example: In case of strand rope)

- i) **proof stress** An alternative characteristic to the yield point, which is the quantitative value of the load at a total elongation of 0.7 % attained in the tensile test divided by the nominal sectional area of the wire (N/mm^2).

- j) **breaking load** The maximum load to destruction of test piece in the tensile test.
- k) **tensile strength** Value of the breaking load of wire divided by the nominal wire cross-sectional area (N/mm^2).
- l) **elongation** The permanent set after destruction of the test piece in the tensile test.
- m) **modulus of elasticity** A physical constant (N/mm^2) calculated from the stress and strain, which may be called Young's modulus.
- n) **grade** Division of breaking load of ropes based on the nominal tensile strength of the wire composing a rope.
- o) **free length between grips** The distance l (see Fig. 4) between the inner ends of test piece grips by chucking and the like in the tensile or torsion test of wires or the tensile test of ropes.

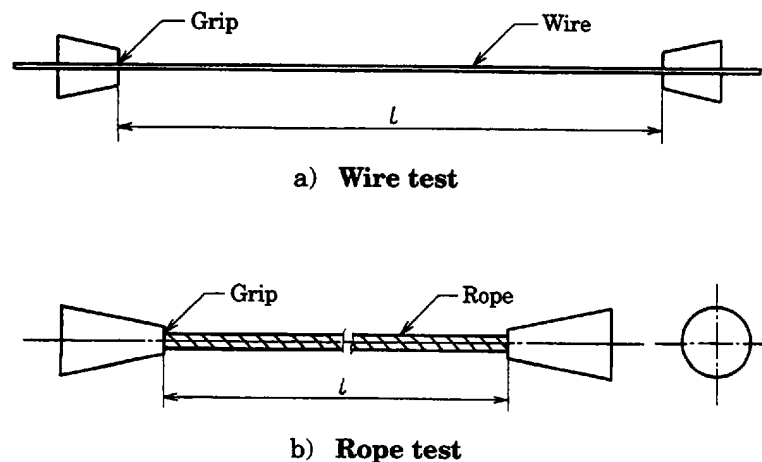


Fig. 4 Free length between grips

- p) **indication** A work or its mark of painting and the like on the rope surface for clearly indicating attaching position of end sockets or midway fittings and so forth.

4 Classification Ropes shall be classified as follows:

- a) **Division by construction** To divide ropes into 19 types according to the designation, constructional symbol and cross-section as shown in Table 1.
- b) **Division by direction of lay** To divide ropes into Z-lay and S-lay by the direction of lay as shown in Figs. 2 and 3.
- c) **Division by tensile strength of wires** To divide ropes into 3 grades of ST1470 ($1\,470\text{ N/mm}^2$), ST1570 ($1\,570\text{ N/mm}^2$) and ST1670 ($1\,670\text{ N/mm}^2$) by the tensile strength of wires. The locked coil ropes are not graded by the tensile strength of wires.

Table 1 Designation, construction and cross-section

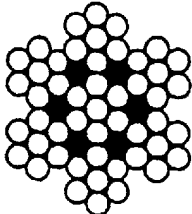
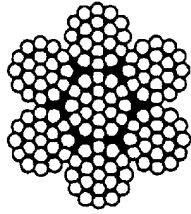
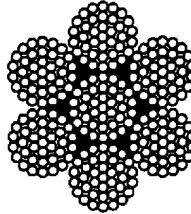
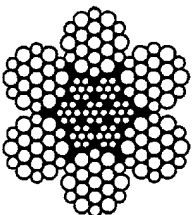
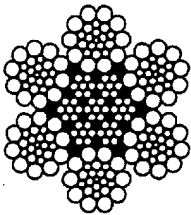
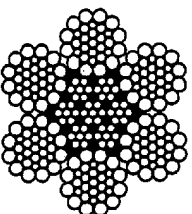
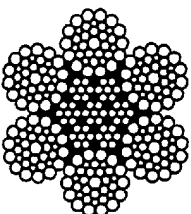
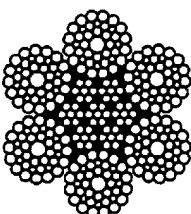
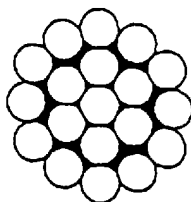
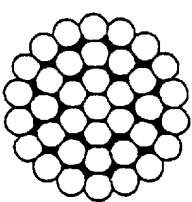
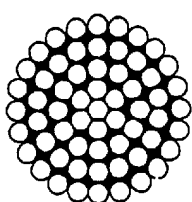
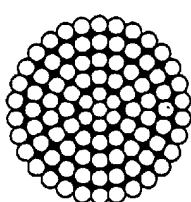
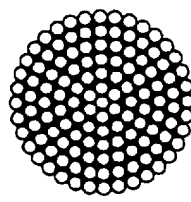
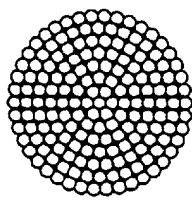
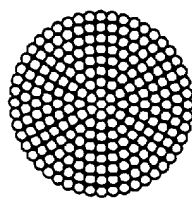
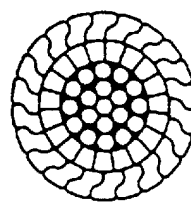
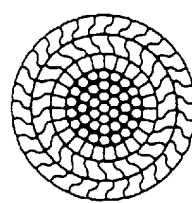
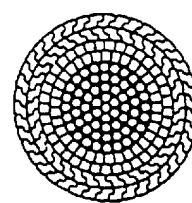
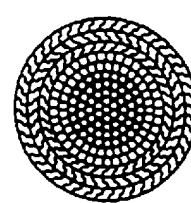
Designation	Identical core strand rope		
Construction	6 strands of 7 wires with strand core	6 strands of 19 wires with strand core	6 strands of 37 wires with strand core
Constructional symbol	7×7	7×19	7×37
Cross-section			
Designation	CFRC strand rope (6×19 group)		
Construction	Warrington rope 6 strands of 19 wires with centre fitting rope core	Warrington-Seale rope 6 strands of 26 wires with centre fitting rope core	
Constructional symbol	CFRC 6×W(19)	CFRC 6×WS(26)	
Cross-section			
Designation	CFRC strand rope (6×37 group)		
Construction	Warrington-Seale rope 6 strands of 31 wires with centre fitting rope core	Warrington-Seale rope 6 strands of 36 wires with centre fitting rope core	Warrington-Seale rope 6 strands of 41 wires with centre fitting rope core
Constructional symbol	CFRC 6×WS(31)	CFRC 6×WS(36)	CFRC 6×WS(41)
Cross-section			

Table 1 (concluded)

Designation	Spiral rope			
Construction	19 wires	37 wires	61 wires	91 wires
Constructional symbol	1 × 19	1 × 37	1 × 61	1 × 91
Cross-section				
Construction	127 wires	169 wires	217 wires	
Constructional symbol	1 × 127	1 × 169	1 × 217	
Cross-section				
Designation	Locked coil rope			
Construction	Round wire layers + 1 T-wire layer + 1 Z-wire layer	Round wire layers + 1 T-wire layer + 2 Z-wire layers	Round wire layers + 2 T-wire layers + 2 Z-wire layers	Round wire layers + 2 T-wire layers + 3 Z-wire layers
Constructional symbol	LCR-C	LCR-D	LCR-E	LCR-F
Cross-section				

5 Mechanical properties

5.1 Wire

5.1.1 Value of tensile property Every wire in the same diameter group composing a rope, when tested by 11.1 b), shall have the values of tensile property given in Table 2.

For shaped wires in locked coil ropes the proof stress is not specified.

5.1.2 Torsional property For the torsional property of wires, when tested by 11.1 c), the minimum number of twists shall be as given in Table 3.

Table 2 Values for tensile property of wire

Division	Grade	Nominal wire diameter mm	Tensile strength N/mm ²	Proof stress N/mm ²	Elongation %
Round wire	ST1470	≤ 2.80	≥ 1 470 but ≤ 1 720	1 080 min.	3.0 min.
		> 2.80	≥ 1 470 but ≤ 1 720	1 080 min.	4.0 min.
	ST1570	≤ 2.80	≥ 1 570 but ≤ 1 810	1 160 min.	2.0 min.
		> 2.80	≥ 1 570 but ≤ 1 810	1 160 min.	4.0 min.
	ST1670	≤ 2.80	≥ 1 670 but ≤ 1 910	1 220 min.	2.0 min.
		> 2.80	≥ 1 670 but ≤ 1 910	1 220 min.	4.0 min.
T-wire	—	—	≥ 1 370 but ≤ 1 620	—	2.0 min.
Z-wire	—	—	≥ 1 270 but ≤ 1 520	—	2.0 min.

Table 3 Minimum number of twists

Unit: cycle

Division	Nominal wire diameter mm	Grade		
		ST1470	ST1570	ST1670
Round wire	≤ 2.30	20	16	14
	> 2.30 but ≤ 3.70	18	14	12
	> 3.70 but ≤ 4.50	16	12	10
	> 4.50	14	10	8
T-wire	≤ 4.90	10		
	> 4.90	7		
Z-wire	≤ 4.90	6		
	> 4.90 but ≤ 5.90	5		
	> 5.90	4		

Remarks : The nominal wire diameter of shaped wires shall be expressed by the height measured in the radial direction of the rope in which the wire has been laid.