

ELEVATOR ROPES



Tel: 0161 303 2333

Fax: 0161 303 2433

Email: info@totalropesolutions.co.uk

www.totalropesolutions.co.uk

STEEL WIRE LIFT ROPES TO BS 302/1987 & EN12385 SERIES

Rope Recommendations Table.

Application	Recommended Construction
SUSPENSION ROPES	6 X 19 (12/6/+6F/1) 8 X 19 (9/9/1)
COMPENSATING ROPES (Ancillary Ropes)	6 X 19 (12/6/+6F/1) 8 x 19 (9/9/1)

TENSILE GRADE OF WIRE

DUAL TENSILE ROPES.

Ropes are of Dual Tensile grade . This means that the wires used in manufacture are of the following Tensile strength.

OUTER WIRES	1370N/MM2
INNER WIRES	1770N/MM2

Rope (and Sheave) performance is normally influenced by the tensile strength of the outer wires. from a fatigue point of view, and within the normal lift rope wire tensile range, the higher the wire tensile range, the higher the wire tensile the greater the fatigue performance.

However this does not mean that only higher grades should be recommended as consideration must also be given to the shape of the groove profile and the HARDNESS of the sheave. For example ,it is inadvisable to operate a High tensile lift rope in a very low grade sheave casting incorporating a profile which exerts maximum pressure between rope and sheave material. This could lead to rapid wear of the groove and to the premature removal of the traction sheave.

A simple guide to the selection of the correct tensile grade would be

GROOVE PROFILE	TENSILE GRADE
'v'	1370/1770N/MM2
Undercut 'U'	1370/1770N/MM2
Full Cut 'U'	1370/1770N/mm2 or 1570N/mm2

Effect of Physical and Mechanical Properties on Rope performance.

Fatigue

There is very little difference in fatigue performance between 6x19 (12/6+6F/1) and 8x19 (9/9/1) constructions operating in undercut U and Full U grooves.

An Eight Strand rope is sometimes claimed to be easier to handle than a six strand rope. This Feature does not appear to improve its fatigue performance when fitted to the high sheave : rope diameter ratios experienced on lifts.

Although the strand diameter of an eight strand rope is smaller than that of a six strand rope, because of its more rigi construction , i.e., 9/9/1 , it is not very much more flexible than the 6x19(12/6+6F/1). For any given size of rope, the outer wire diameters of both constructions are approximately the same.

A simple guide to the selection of the correct construction rope would be;

GROOVE PROFILE	ROPE CONSTRUCTION
'V'	6X19 (12/6+6F/1)
Undercut U	6x19 (12/6+6F/1)
Full U	or 8x19 (9/9/1)

TRACTION

BASIC FORMULAE

From basic engineering knowledge , it can be shown that maximum available traction is dependant on three major factors;

- (i) angle of wrap of the ropes around the traction sheave
- (ii) shape of the groove profile
- (iii) coefficient of friction between rope and sheave material

i.e $T_1 = \mu' T_2 e^{\alpha}$ where T_1 = rope tension on heavier side (i.e. counterweight side with car empty, and T_2 = car side with car full.

T_2 = rope tension on lighter side.
 μ' = apparent coefficient of friction.
 α = angle of wrap.

(Note $\mu' = A \cdot \mu$ where μ = actual coefficient of friction \dagger ; A = groove coefficient)

BASIC TYPES OF GROOVES

The apparent coefficient of friction is dependant upon groove profile and the three basic types are considered below.

GROOVE PROFILE	A= cosec $\frac{\alpha}{2}$	Full 'U' A=4 π	Undercut 'U' A=4 (1-sin $\frac{\alpha}{2}$) $\pi - \alpha \sin \frac{\alpha}{2}$
'V' GROOVE	A= cosec $\frac{\alpha}{2}$	Full 'U' A=4 π	Undercut 'U' A=4 (1-sin $\frac{\alpha}{2}$) $\pi - \alpha \sin \frac{\alpha}{2}$

WEIGHT AND BREAKING LOAD TABLES For 6x19(12/6+6F/1)

Rope Diameter mm	tensile strength 1370/1770n in kN	Nominal Mass kg/100mt	Metallic area mm ²
6.5mm	23.20	15.50	16.80
8mm	35.10	23.60	25.40
10mm	54.90	36.80	39.70
11mm	66.40	44.50	48.10
13mm	92.80	62.20	67.20
16mm	141.00	94.20	102.00

WEIGHT AND BREAKING LOAD TABLES FOR 8X19(9/9/1)

Rope Diameter Mm	Tensile strength 1370/1770N/mm ² in kN	Nominal Mass kg/100mt	Metallic area mm ²
8mm	30.40	21.50	22.50
10mm	47.40	33.70	35.10
11mm	57.40	40.70	42.50
13mm	80.20	56.90	59.30
16mm	121.00	86.10	89.90

Byrom Works
knowl street
Stalybridge
Cheshire
SK15 3AW

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