STEEL WIRE ROPES

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INTRODUCTION

When rope is to be selected for a duty, it is necessary to evaluate the particular characteristics required for the application and to choose the rope possessing the qualities in the best combination. In order to choose the rope you must first have an idea of how a rope is constructed, its features and how to identify it.

In the mining industry, winder ropes are the life-line in a mine's production chain. Without this life-line it would be impossible to raise the ore to surface or transport men and materials to and from the working places. It is therefore essential that you are fully conversant with all types of ropes used in the mining industry.

In this module we will discuss the following:

STEEL WIRE ROPES

- Number of strands and size
- Number of wires per stand
- Arrangement of wires in a strand
- Type of rope cores
- Lay of rope
- Finish of ropes
- Non-spin ropes

STEEL WIRE ROPES

A rope can be constructed in many different ways, which is certainly the next most important feature after the diameter of the rope. Let us discuss in more detail the construction of a steel wire rope.

Number of Strands and Size

A steel wire rope is normally constructed of a number of strands laid up helically around a central core;

Number of Wires per Stand

The number of wires per strand is the information required when specifying a rope after you have specified the nominal diameter and the number strands.

Arrangement of Wires in a Strand

The next item that must be specified is the arrangement of the wires in a strand.
Firstly begin from the outside. There are 12 wires laid over six wires which, in turn, are laid over a single inner wire.

The sum of 12 + 6 + 1 equals 19. So, when you specify the arrangement of the wires in a strand for this rope you would do it as follows:
You might have heard of triangular strand rope. This means that the wires in a strand are so arranged that each strand approximate to an equilateral triangle with rounded corners and sides. In this arrangement we have 12 wires, starting from the outside, laid over 12 wires (of smaller diameter than the outer wires), laid over 6 inner wires.

The sum of 12 + 12 + 6 equals 30 wires which are laid up in a triangular shape. To specify this arrangement you write it as follows: 30(12/12/6σ). The triangular symbol (σ) which follows the 6 shows you that the strand is triangular shape.
One more strand construction to come. This is the arrangement of the wires in a ribbon construction.
Ribbon strands are used as outer strands in certain non-spin rope construction and normally comprise of 6 to 10 wires laid up in ribbon formation.

Type of Rope Cores

The rope core normally consists of one of the following three materials:
Fiber, polypropylene or steel wire. The rope serves as a shock absorber and to lubricate the rope where the core is made of fiber.
When specifying a rope there is usually an abbreviation at the end to indicate the material used for the core which are as follows:

F	for Fiber.
P	for Polypropylene
W. M C	for Wire Main Core
I.W.R.C.	for Independent Wire Rope Core

Summarize this far:

To specify a rope you must state:

© Nominal diameter.

- Number of strands.
- Number of wires per strand.
- Arrangement of wires in strand.
- Type of rope core.

Lay Of Rope

There are two general methods of laying up wire rope, namely ORDINARY LAY AND LANG'S LAY. In the Ordinary Lay rope the wires of the strands are laid in one direction and the strands are laid into the rope in the opposite direction. Ropes laid up in this manner are suitable for all general purposes.

A Lang.'s Lay rope should not under any circumstances be used for hoisting vertically without guides, as in the case of cranes or similar duties where the load is suspended from a free end and the rope is able to rotate.
Whether a rope is Ordinary Lay or Lang.'s Lay it can be either left-hand lay or right-hand lay. Right-hand lay is the usual standard for ropes. The use of left-hand lay rope is usually confined to ropes used for drilling purposes to prevent unscrewing of rods or in conjunction with right-hand lay ropes on cranes or elevators to counteract.

Finish Of Ropes

Depending on the environment where a rope is to be used, the steel part of the rope can be drawn galvanized, hot dipped galvanized or ungalvanised.
It is obvious that when a rope is to use in a wet environment it may be galvanized to protect it from corrosion.

Non-Spin Ropes

When tension is applied to a single layer rope, i.e. a rope made of a number of strands lay over a central core; it tends to untwist when the end of the rope is not constrained from rotating.

If this condition is undesirable a non-spin rope must be used. A non-spin rope consists of a single layer rope over which an additional layer (or layers) of strands are laid in the opposite direction.

The description of the non-spin rope is:

18-strand non-spin rope 12 x 7(6/1)/6 x 7(6/1)F.

Types of Winder Ropes

Now that you know how a steel wire rope is identified and how the specification is written, let us move on to ropes used for winding purposes. The type of rope to be used for winding depends on factors such as depth of wind, whether the winder is used for men/material or rock hoisting, type of winder installed and the shaft environment. Normally a compound triangular six-strand rope is used on a large drum winder. The rope diameter ranges from 40 mm to 51 mm and the number of wires per strand range from 28 to 33. The tensile grade depends on the depth of wind and can be from 1 800 MPa to 2 300 MPa. For sizes, number of wires and tensile grades refer to the rope charts given in this module.

A simple triangular six-strand rope with diameters ranging from 26 mm to 29 mm is normally used on small drum winders. The number of wires per strand range from 13 to 15 and the tensile grade from 1 600 MPa to 1 800 MPa.

With Blair multi-rope winders compound triangular six-strand ropes are used. The ropes are used in pairs and are connected to the conveyance by means of a compensating wheel. For a pair of ropes installed the one rope must have a right-hand lay and the other a left-hand lay to compensate for the spin set up in the rope during normal winding operations. Non-spin ropes with 15 or 18 strands are normally used on Koepe winders. Depending on the shaft environment, the ropes used can be ungalvanised or galvanized. The rope charts at the back of this module are for your information regarding the types of ropes used their construction, diameters available and tensile grade of steel. No questions will be asked on these charts.