

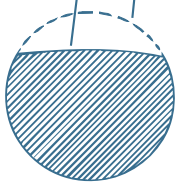
# Choose the right wire rope for your application

**W**ith each application, your choices of wire ropes can be many. How do you know which one will work best for you? All wire ropes have a combination of characteristics that give them specific performance abilities. Before you choose, it pays to match the requirements of an application with the characteristics of the rope.

## The three major rope characteristics in mining

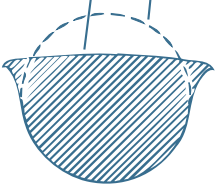
### CROSS-SECTION OF A WORN WIRE

- > Original cross-section
- > Worn surface



### CROSS-SECTION OF A PEENED WIRE

- > Original cross-section
- > Peened surface



In the operating ropes of large surface mining equipment, not all characteristics have equal importance. There are two characteristics – resistance to metal loss and deformation and fatigue resistance – that are usually the main considerations. Most applications require a balance of these two characteristics. The strength of the ropes can also be important of course, when considering a different rope construction.

### METAL LOSS AND DEFORMATION

**METAL LOSS** refers to the actual wearing away of metal from the outer wires of a rope. Metal deformation is the changing of the shape of a rope's outer wire. Both frequently occur at the same time, although one usually predominates.

In general, resistance to metal loss by abrasion (also called "abrasion resistance") refers to a rope's ability to withstand metal being worn away along its exterior. This is due to the rope having sliding contact with another hard object. The resulting loss of steel reduces the wire rope's strength and can accelerate the occurrence of broken wires.

In most cases, metal loss has two main causes:

- 1. An improper rope fleet angle.** As the rope enters or leaves a sheave, it contacts the sheave flange, causing wear to both the rope and sheave. This can occur on drum grooves, too.
- 2. Grooves that are too small in a sheave.** The rope slides between the flanges as it seats in the groove, causing rope wear.

**METAL DEFORMATION** (also called "peening" – see illustration at left) is the flattening of the wire's external surface caused by slapping against a hard object such as a rock, sheave or a roller. The steel is not worn away, but pushed to the side. The distorted shape of the wires affects – and shortens – the rope's fatigue life.

### FATIGUE RESISTANCE

**FATIGUE RESISTANCE** involves metal fatigue of the wires that make up a wire rope. Fatigue is normal and will occur in areas of the rope that:

**1. Repeatedly bend over sheaves and drums.**

**2. Dampen vibrations** (near end attachments or other points of rope restriction).

**3. Are subjected to changes in load.**

In general, a rope made of many wires will have greater fatigue resistance than a rope made of fewer, larger wires because smaller wires have greater ability to bend as the rope passes over sheaves or around drums. Lang lay ropes are more fatigue-resistant than regular lay rope. **PFV**<sup>®</sup> ropes and special **TUF-MAX**<sup>™</sup> ropes are also more fatigue resistant than standard ropes.

Every rope is subject to metal fatigue from bending stress while in operation, and therefore the rope's strength gradually diminishes as the rope is used.

**STRENGTH**

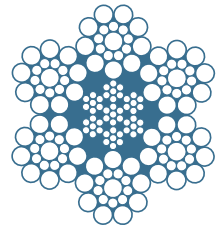
The published minimum breaking force (MBF) or nominal (catalog) **STRENGTH** is the calculated strength figure that has been accepted by the wire rope industry.

This applies to new, unused rope and is usually measured in tons of 2,000 pounds.

A rope should never operate at – or near – its minimum breaking force. The minimum breaking force must be divided by the required design factor to determine the working load. During its useful life, a rope gradually loses strength due to factors such as surface wear and metal fatigue.

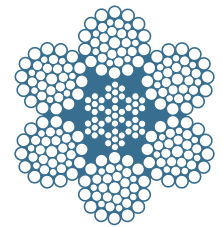
Because different rope types have different minimum breaking forces, you must check it whenever you consider a change in rope types.

**Note:** when a decision is made to try a different rope construction, it is normally best to use several sets of the selected rope construction to determine its average service. This way, you can compare the cost per hour (ton or yard) to the other construction's cost to determine the best rope construction for your application.



**IF YOU NEED ABRASION RESISTANCE**

> Abrasion resistance increases with fewer, larger outside wires per strand.



**IF YOU NEED FATIGUE RESISTANCE**

> Fatigue resistance increases with more, smaller outside wires per strand.