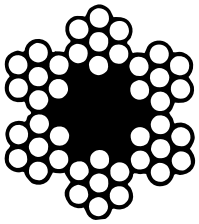
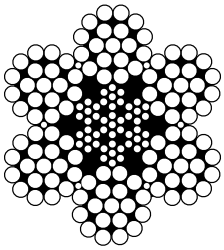
COMMON CLASSIFICATION OF WIRE ROPE

6 x 7 Class Wire Rope
6 strands, 7 wires per strand



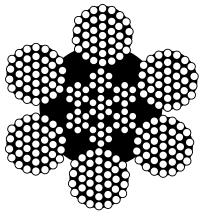
This construction is used where ropes are dragged over the ground or over rollers and resistance to wear abrasion are important factors. The wires are quite large and will stand a great deal or wear. The 6 x 7 is a stiff rope and needs sheaves and drums of large sizes. It will not stand bending stresses, as well as, ropes with a large number of wires.

6 x 19 Class Wire Rope
6 strands, nominally 19 main wire per strand



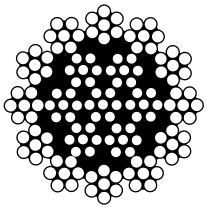
This class is most widely used and is found in its many variations throughout nearly all industries. With its combination of flexibility and wear resistance, rope in this class can be suited to the specific needs of diverse kinds of machinery and equipment. The designation of 6 x 19 is only nominal as the number of wires per strand ranges from 15 to 26.

6 x 37 Class Wire Rope
6 strands, 37 wires per strand



The 6 x 37 class of wire rope is characterized by the relatively large number of wires used in each strand. Ropes of this class are among the most flexible available, but their resistance to abrasion is less than the 6 x 19 class. The designation of 6 x 37 is only nominal as the number of wires per strand ranges from 27 to 49.

19 x 7 Rotation Resistant Wire Rope

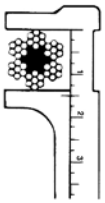


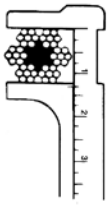
The 19 x 7 rotation resistant rope consists of an inner layer of 6 strands of 7 wires each, made left lang lay over a strand core, and an outer layer of 12 strands, each of 7 wires, made in right regular lay. It is this combination of opposing lays which enables the rope to resist the tendency to rotate when in service.

HOW TO CALIPER WIRE ROPE

Rope diameters are determined by measuring the circle that just touches the extreme outer limits of the strands – that is, the greatest dimension that can be measured with a pair of parallel-jawed calipers or machinists caliper square. A mistake could be made by measuring the smaller dimension.

CORRECT





INCORRECT

SELECTING WIRE ROPE

To get the best service of wire rope on any specific installation, the following five principal factors should generally be considered. The proper choice of rope could be made by correctly estimating the relative importance of each of these requirements. Finally the rope should be selected which would have the qualities most suitable to withstand the combined effect of the destructive factors which may be encountered.

TENSILE STRENGTH
After giving consideration to the factor of safety the rope should have sufficient strength to withstand, the maximum load to be applied.

ABRASIVE RESISTANCE
Abrasive wear removes metal from the cross section of outer wires of a wire rope where it is exposed. Larger diameter wires offer greater metallic area to withstand abrasive wear. Resistance to abrasive wear can be determined by three principal factors: (i) Diameter of outer wires, (ii) Grade of wire, (iii) Distribution of wearing surface. In short, resistance to abrasion wear in proportion to the severity of the abrasive factors, to which the rope is to be subjected, should be considered.

FATIGUE RESISTANCE
Bending fatigue is caused by the action of bending of wire rope around sheaves, drums, etc. Apart from load, speed which the wire rope has to encounter is also an important factor. There is a definite relationship between the diameter of outer wires of rope and diameter of the sheave or drums, etc. which effect the service life of rope. In short, ability to withstand the effects of bending and vibrations to be encountered, should be considered.

CRUSHING STRENGTH
There are two principal detrimental effects when wire ropes are subjected to the action of lateral forces. First, the wires become damaged by radial pressure and second, the cross section of wire becomes distorted. Ropes that vibrate in a span often strike repeatedly against external objects causing flattening of wires. When rope is repeatedly flexed, cracks develop in the hardened surface of wires. Wire breakage follows thereafter. In the second case, the wires, strands and the core are disturbed from their proper shapes and position resulting in premature wire breakage. Therefore, it is necessary to select a wire rope which has sufficient lateral stability to withstand the crushing forces it may have to encounter. Generally Regular or Ordinary lay ropes are preferable to Lang Lay ropes and similarly six strand ropes are recommended over eight strand ropes because of their more lateral stability.

CORROSION
A large number of wire ropes fail because of corrosion which may be either external, internal or both. Normally corrosion takes place because of acid or alkaline atmosphere which is due to sea, air, industrial fumes or other conditions. In most cases, corrosion cannot be completely eliminated but it can be resisted by cleaning and lubricating rope or by using galvanized ropes. In short, a rope which would have adequate resistance to corrosive factors should be selected. Though there would be a number of other factors which would influence the life of a rope, the above factors are generally important. In certain cases these properties are contradictory. For example, increasing the diameter of the outer wires of a rope increases resistance to abrasion, but decreases resistance to bending fatigue. It is, therefore, very important that the ultimate selection of rope must be a most acceptable compromise. Each of the desirable characteristics should be attained to the maximum degree possible without excessive sacrifice of the other required properties.

UNCOILING AND UNREELING WIRE ROPE

UNCOILING

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UNREELING

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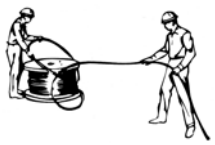

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BASIC INFORMATION REQUIRED TO PROPERLY USE WIRE ROPE

1. WIRE ROPE WILL FAIL IF WORN OUT, OVERLOADED, MISUSED, DAMAGED OR IMPROPERLY MAINTAINED.

2. When in service, wire rope loses strength and work capability. Abuse and misuse increases the rate of loss.

3. The nominal strength of wire rope applies only to new, unused wire rope.

4. The nominal strength of wire rope should be considered the straight line pull which will actually break a new, unused wire rope. The nominal strength of wire rope should NEVER BE USED AS ITS WORKING LOAD.

5. To determine the working load of a wire rope, the nominal strength must be reduced by a design factor (formerly called a safety factor). The design factor will vary depending upon the type of machine and installation, and the work performed. YOU must determine the applicable design factor for your use.

   For example, a Design Factor of "5" means that the nominal strength of the wire rope must be divided by five to determine the maximum load that can be applied to the rope system.

   Design factors have been established by OSHA, by ANSI, by ASME and similar government and industrial organizations.

   No wire rope or wire rope sling should ever be installed or used without full knowledge and consideration of the design factor for the application.

6. WIRE ROPES WEAR OUT. The strength of a wire rope begins to decrease when the rope is put in use and continues to decrease with each use.

7. NEVER OVERLOAD A WIRE ROPE. This means never use the rope where the load applied to it is greater than the working load determined by dividing the nominal strength of the rope by the appropriate design factor.

8. NEVER "SHOCK LOAD". A sudden application of force or load can cause both visible external damage and internal damage. There is no practical way to estimate the force applied by shock loading a rope. The sudden release of a load can also damage a wire rope.

9. Lubricant is applied to the wires and strands of a wire rope when it is manufactured. This lubricant is depleted when the rope is in service and should be replaced periodically.

10. REGULAR, PERIODIC INSPECTIONS of the wire rope, and keeping PERMANENT RECORDS SIGNED BY A QUALIFIED PERSON, are REQUIRED BY OSHA FOR ALMOST EVERY WIRE ROPE INSTALLATION. The purpose of inspection is to determine whether or not a wire rope or wire rope sling may continue to be safely used on that application. Inspection criteria, including number and location of broken wires, wear and elongation, have been established by OSHA, ANSI, ASME and similar organizations.

IF IN DOUBT, REPLACE THE ROPE
An inspection should include verification that none of the specified removal criteria for this usage are met by checking for such things as:

- Surface wear: Normal and unusual
- Broken wires: Number and location
- Reduction in diameter
- Rope stretch (elongation)
- Integrity of end attachments

In addition, an inspection should include the condition of sheaves, drums and other apparatus with which the rope makes contact.

11. When a wire rope has been removed from service because it is no longer suitable for use, IT MUST NOT BE REUSED ON ANOTHER APPLICATION.

12. Every wire rope user should be aware of the fact that each type of fitting attached to a wire rope has a specific efficiency rating which can reduce the working load of the rope assembly or rope system and this must be given due consideration to determine the capacity of a wire rope system.

13. Some conditions that can lead to problems in a wire rope system include:
    - Sheaves that are too small, worn or corrugated cause damage to a wire rope.
    - Broken wires mean a loss of strength.
    - Kinks permanently damage a wire rope and must be avoided.
    - Wire ropes are damaged by knots and wire ropes with knots must never be used.
    - Environmental factors such as corrosive conditions and heat can damage a wire rope.
    - Lack of lubrication can significantly shorten the useful service life of a wire rope.
    - Contact with electrical wires and the result in arcing will damage a wire rope.