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Wire Rope

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**Wire Rope 101**

**Wire Rope Design & Construction**

Wire ropes are composed of independent parts—wires, strands and cores—that continuously interact with each other during service.

Wire rope engineers design those parts in differing steel grades, finishes and a variety of constructions to attain the best balance of strength, abrasion resistance, crush resistance, bending fatigue resistance and corrosion resistance for each application.

To select the best wire rope for each application, one must know the required performance characteristics for the job and enough about wire rope design to select the optimum combination of wire rope properties.

The following information is presented as a basic guide. Hanes Supply engineers and field service specialists are available to provide more specific recommendations.

**Strand Constructions**

Strands are designed with various combinations of wires and wire sizes to produce the desired resistance to fatigue and abrasion. Generally, a small number of large wires will be more abrasion resistant and less fatigue resistant than a large number of small wires.

![Single Size](image)

The basic strand construction has wires of the same size wound around a center.

![Seale](image)

Large outer wires with the same number of smaller inner wires around a core wire. Provides excellent abrasion resistance but less fatigue resistance. When used with an IWRC, it offers excellent crush resistance over drums.

![Filler Wire](image)

Small wires fill spaces between large wires to produce crush resistance and a good balance of strength, flexibility and resistance to abrasion.

![Warrington](image)

Outer layer of alternately large and small wires provides good flexibility and strength but low abrasion and crush resistance.

![Multiple Operation](image)

One of the above strand designs may be covered with one or more layers of uniform-sized wires.

![Finish](image)

Bright finish is suitable for most applications. Galvanized finish is available for corrosive environments. Plastic jacketing is also available on some constructions.

**Wire Grades**

The most common steel wire grades are: IPS (Improved Plow Steel), EIP (Extra Improved Plow Steel) and EEIP (Extra Extra Improved Plow Steel). Stainless Steels and other special grades are provided for special applications.

Most wire ropes are made with round wires. Both triangular and shaped wires are also used for special constructions. Generally, the higher the strength of the wire, the lower its ductility will be.

---

**What Wire Rope Is...**

A wire rope is a piece of flexible, multi-wired, stranded machinery made of many precision parts.

Usually a wire rope consists of a core member, around which a number of multi-wired strands are "laid" or helically bent. There are two general types of cores for wire rope - fiber cores an wire cores. The fiber core may be made from natural or synthetic fibers. The wire core can be an Independent Wire Rope Core (IWRC), or a Strand Core (SC).

The purpose of the core is to provide support and maintain the position of the outer strands during operation.

Any number of multi-wired strands may be laid around the core. The most popular arrangement is six strands around the core, as this combination gives the best balance.

The number of wires per strand may vary from 3 to 91, with the majority of wire ropes falling into the 7-wire, 19-wire, or 37-wire strand categories.

**The “lays” of Wire Rope**

"Lay" of a wire rope is simply a description of the way wires and strands are placed during construction. Right lay and left lay refer to the direction of strands. Right lay means that the strands pass from left to right across the rope. Left lay means just the opposite: strands pass from right to left.

Regular lay and lang lay describe the way wires are placed within each strand. Regular lay means that wires in the strands are laid opposite in direction to the lay of the strands. Lang lay means that wires are laid in the same direction as the lay of the strands.

Most of the wire rope used is right lay, regular lay. This specification has the widest range of applications and meets the requirements of most equipment. In fact, other lay specifications are considered exceptions and must be requested when ordering.

**Here are some exceptions**

Lang lay is recommended for many excavating, construction, and mining applications, including draglines, hoist lines, dredgelines and other similar lines. Here’s why: Lang lay ropes are more flexible than regular lay ropes. They also have greater wearing surface per wire than regular lay ropes.

Where properly recommended, installed and used, lang lay ropes can be used to greater advantage than regular lay ropes. However, lang lay ropes are more susceptible to the abuses of bending over small diameter sheaves, pinching in undersize sheave grooves, crushing when winding on drums, and failing due to excessive rotation. Left lay rope has greatest usage in oil fields on rod and tubing lines, blast hole rigs, and spudgers where rotation of right lay rope would loosen couplings. The rotation of a left lay rope tightens a standard coupling.
Wire Rope 101

Wire Rope Cross Sections (past & present)

- **6 x 7**
  - Poly Core
- **6 x 12**
  - (Marine Rope)
- **6 x 17**
  - Filler Wire
- **6 x 19**
  - Seale
- **6 x 21**
  - Filler Wire
- **6 x 24**
  - (Mooring Line)
- **6 x 25**
  - Filler Wire
- **6 x 26**
  - Warrington-Seale
- **6 x 27**
  - Warrington
- **6 x 31**
  - Warrington-Seale
- **6 x 36**
  - Filler Wire
- **6 x 36**
  - Warrington-Seale
- **6 x 37**
  - Warrington
- **6 x 31**
  - Filler Wire
- **6 x 31**
  - Warrington-Seale
- **6 x 36**
  - Filler Wire
- **6 x 36**
  - Warrington-Seale
- **6 x 49**
  - Filler Wire-Seale
- **6 x 49**
  - Warrington-Seale
- **6 x 55**
  - Seale-Warrington
- **6 x 42**
  - (Tiller Rope)
- **6 x 3 x 19**
  - (Marine Clad Rope)
- **6 x 3 x 19**
  - (Spring Lay Rope)
- **1 x 3**
  - Strand
- **1 x 7**
  - Strand
- **1 x 19**
  - Strand
- **1 x 37**
  - Strand
- **7 x 6 x 41**
  - IWRC Cable-Laid

* Not readily available any longer
Wire Rope 6 x 19 Class - 6 x 37 Class

Nominal Strengths & Weights

<table>
<thead>
<tr>
<th>Dia. (in)</th>
<th>Nominal Strength (Tons)</th>
<th>Approx. Wt/Ft (lbs)</th>
</tr>
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<tr>
<td>3/16</td>
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<td>.59</td>
</tr>
<tr>
<td>1/4</td>
<td>2.74</td>
<td>.105</td>
</tr>
<tr>
<td>5/32</td>
<td>4.26</td>
<td>.164</td>
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<tr>
<td>3/8</td>
<td>6.10</td>
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<td>7/16</td>
<td>8.27</td>
<td>.32</td>
</tr>
<tr>
<td>1/2</td>
<td>10.7</td>
<td>.42</td>
</tr>
<tr>
<td>9/16</td>
<td>13.5</td>
<td>.53</td>
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<tr>
<td>5/8</td>
<td>16.7</td>
<td>.66</td>
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<tr>
<td>3/4</td>
<td>23.8</td>
<td>.95</td>
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<tr>
<td>7/8</td>
<td>32.2</td>
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<td>1-1/16</td>
<td>41.8</td>
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<td>1-1/4</td>
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<td>1-1/2</td>
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<td>10.6</td>
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<td>2-5/8</td>
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<td>2-3/8</td>
<td>292.0</td>
<td>13.7</td>
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<td>2-7/8</td>
<td>317.0</td>
<td>14.0</td>
</tr>
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<td>3-1/8</td>
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</tr>
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<td>3-3/8</td>
<td>459.0</td>
<td>16.0</td>
</tr>
<tr>
<td>3-1/2</td>
<td>491.0</td>
<td>16.8</td>
</tr>
</tbody>
</table>

Available galvanized at 10% lower strengths, or in equivalent strengths on special request.

Inspection—The key to longer, safer wire rope use

Any wire rope in use should be inspected on a regular basis. You have too much at stake in lives and equipment to ignore thorough examination of the rope at prescribed intervals.

The purpose of inspection is to accurately estimate the service life and strength remaining in a rope so that maximum service can be had within the limits of safety. Results of the inspection should be recorded to provide a history of rope performance on a particular job. On most jobs wire rope must be replaced before there is any risk of failure. A rope broken in service can destroy machinery and curtail production. It can also kill.

Because of the great responsibility involved in ensuring safe rigging on the job, periodic inspection is essential in helping to decide when to replace wire rope.

When inspecting the rope, the condition of the drum, sheaves, guards, cable clamps and other end fittings should be noted. The condition of these parts affects rope wear: any defects detected should be repaired.

To ensure rope soundness between inspections, all workers should participate. The operator can be most helpful by watching the ropes under his own eyes and being observant. The equipment should be inspected before resuming operation.

The Occupational Safety and Health Act has made periodic inspection mandatory for most wire rope applications. We can help you locate regulations that apply to most applications, give us a call.

Just looking at the rope is not enough

When an inspector takes a look at a rope, he may see sections showing excessive wear. By flagging the rope, he can quickly determine where the rope is rubbing or contacting parts of the equipment, and then repair, replace, or modify the condition causing the wear.

Sheave Inspection

Inspection of sheaves is a relatively simple, yet very vital task. A sheave groove groove, usually obtainable from a wire rope manufacturer, is used to check the grooves in a sheave. Hold the groove perpendicular to the surface of the groove to observe properly the groove size and contour, as in this illustration.

Sheaves Should be Checked for:
1. Correct groove diameter
2. Roundness or contour to give proper support to the rope
3. Small holes, cracks, uneven surfaces, or other defects that might be detrimental to the rope
4. Extreme deep wear

A sheave should also be checked to make sure it turns freely. It is properly aligned, has no broken or cracked flanges, and has bearings that work properly.

Each sheave should also be inspected for signs of wear that could damage rope.

Plain-faced or smooth drums can develop grooves or impressions that prevent rope from winding properly. Repair by resurfacing the face or replacing the lagging.

Scrubbing will occur if the rope tends to close wind. If the tendency is to open winding, the rope will encounter abnormal abuse as the second layer forces itself down between the open wraps of the first layer on the drum.

Operating with a smooth drum calls for special care. Be sure the rope is always tightly wound and thread laid on the first layer. Any looseness of the line is easily observed as the winding will be bad and the rope will be coming off with a series of “bad spots.”

Grooved drums should be examined for tight or corrugated grooves and for differences in depth or pitch that could damage the second and subsequent layers. Worn grooves can develop extremely sharp edges that shave away small particles of steel from the rope. Correct this condition by grinding or filing a radius to replace the sharp edge.

Drum flanges, as well as the starter, filler and riser strips, should be checked. Excessive wear here often causes unnecessary rope abuse at the change of layers and cross-over points.

Other places of contact such as rollers, scrub boards, guides and end attachments should also be inspected.

Measure the widest diameter

Ropes and sheave grooves must be precisely fitted to each other to get the most service out of your wire rope dollar. Make measurement of rope diameter a normal part of your inspection program.

There’s only one right way to measure rope diameter: use machinist’s calipers and be sure to measure the widest diameter. These drawings compare the right way with the wrong way.

This method is not only useful for measuring the diameter of a new rope, but also for determining the amount of wear and compression that has occurred while the rope has been in use. Accurate recording of this information is essential in helping to decide when to replace wire rope.
Wire Rope 101

Abrasion and Bending
The “X-Chart” - Abrasion Resistance Vs. Bending Fatigue Resistance

While there is a possibility, there is little likelihood that an application can be found for which there is a precisely suitable wire rope--one that can satisfy every indicated requirement.

As with all engineering design problems, feasible solutions demand compromise to some degree. At times, it becomes necessary to settle for less than optimum resistance to abrasion in order to obtain maximum flexibility; in other cases, a more important consideration is the galling of wire rope. A typical example of this kind of trade-off would be in selecting a highly flexible rope on an overhead crane. Conversely, in a haulage installation, a rope with greater resistance to abrasion would be chosen despite the fact that such ropes are markedly less flexible.

Two compelling factors that govern most decisions as to the selection of a wire rope are abrasion resistance and resistance to bending fatigue. Striking a proper balance with respect to these two important characteristics demands judgment of a very high order. A graphic presentation of just such comparison of qualities between the most widely used rope constructions and others is given by means of X-chart.

Referring to this chart when selecting a rope, the mid-point (at the X) comes closest to an even balance between abrasion resistance and resistance to bending fatigue. Reading up or down along either leg of the X, the inverse relationship becomes more apparent as one quality increases and the other decreases.

Effect of Sheave Size
Wire ropes are manufactured in a great variety of constructions to meet the varying demands of wire rope usage. Where abrasion is an important factor, the rope must be made of a coarse construction containing relatively large wires. In other cases, the great amount of bending to which the rope is subjected is more important. Here, a more flexible construction, with smaller diameter of the sheave, the sooner the rope life becomes.

Another undesirable effect of small sheaves is accelerated wear of both rope and sheave groove. The pressure per unit area of rope on a small sheave groove for a given load is inversely proportional to the diameter of the sheave. In other words, the smaller the sheave, the greater the pressure per unit area on the groove. Both sheaves and rope life can obviously be prolonged by using the proper diameter sheave for the size and construction of rope.

Sheave diameter can also influence rope strength. When a wire rope is bent around a sheave, there is a loss of effective strength due to the inability of the individual strands and wires to adjust themselves entirely to their changed position. Tests show that rope strength efficiency decreases to a marked degree as the sheave diameter is reduced with respect to the diameter of the rope.

Therefore, it is evident that a definite relationship exists between rope service and sheave size. As a guide to rope users, wire rope manufacturers have established standards for sheave sizes to be used with various rope constructions. To secure the most economical service, it is important that the suggested size of sheaves given here be used.

Rope Strength Design Factors
The rope strength design factor is the ratio of the rated strength of the rope to its operating stress. If a particular rope has a rated strength of 100,000 lbs., and is working under an operating stress of 20,000 lbs., it has a rope strength design factor of 5. It is operating at one-fifth or 20% of its rated strength.

Many codes refer to this factor as the “Safety Factor” which is a misleading term, since this ratio obviously does not include the many facets of an operation which must be considered in determining safety.

Wire rope is an expendable item - a replacement part of a machine or installation. For economic and other reasons, some installations require ropes to operate at high stresses (low rope strength design factors). On some installations where high risk is involved, high rope strength design factors must be maintained. However, operating and safety codes exist for most applications and these codes give specific factors for usage. When a machine is working and large dynamic loadings (shock loadings) are imparted to the rope, the rope strength design factor will be reduced which could result in overstressing of the rope. Reduced rope strength design factors frequently result in reduced service life of wire rope.

O.S.H.A. (A.N.S.I.) Removal Criteria 5. ANSI Safety Codes, Standards and Requirements–rope must be removed from service when diameter loss or wire breakage occurs as follows:

** Diameter Loss

<table>
<thead>
<tr>
<th>Original Dia.</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/16 &amp; Smaller</td>
<td>3/8 - 1/2</td>
</tr>
<tr>
<td>9/16 - 3/4</td>
<td>7/8 - 1 1/8</td>
</tr>
<tr>
<td>1 1/4 - 1 1/2</td>
<td>1 1/8 - 1 1/4</td>
</tr>
</tbody>
</table>

No. of Wire Breaks

<table>
<thead>
<tr>
<th>ANSI No.</th>
<th>Equipment</th>
<th>In One</th>
<th>In One</th>
<th>At End</th>
</tr>
</thead>
<tbody>
<tr>
<td>B30.2</td>
<td>Overhead &amp; Bantry Cranes</td>
<td>12</td>
<td>4</td>
<td>NS**</td>
</tr>
<tr>
<td>B30.4</td>
<td>Portal, Tower &amp; Pillar Cranes</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>B30.5</td>
<td>Crawler, Locomotive &amp; Truck Cranes</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>B30.6</td>
<td>Derricks</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>B30.7</td>
<td>Base Mounted Drum Hoists</td>
<td>6</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>B30.8</td>
<td>Floating Cranes &amp; Derricks</td>
<td>6*</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>A10.4</td>
<td>Personal Hoists</td>
<td>6*</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>A10.5</td>
<td>Material Hoists</td>
<td>6*</td>
<td>NS**</td>
<td>NS**</td>
</tr>
</tbody>
</table>

* Also remove for 1 valley break. OSHA requires monthly record keeping of wire rope condition.

** NS – Not Specified

Note: Current industry recommendations & OSHA standards based upon the use of steel sheaves. The manufacturer of plastic or synthetic sheaves or liners should be consulted to their recommendation on the safe application of their product, and possible revision in rope inspection criteria when used with their product.

Block Twisting

Block twisting or “cabling” is one of the most frequently encountered wire rope problems in the construction field. When this problem occurs, the wire rope is most often blamed, and other equally important factors in the operation are overlooked.

Personal experienced with handling of wire rope know that conventional wire ropes will twist or unlay slightly, when a load is applied. In a reeved hoisting system, subjected to loading and unloading, such as a load hoisting line, this results in block twisting and possibly distortion of the wire rope. Cabling of the block most frequently occurs as the load in the wire rope is released, and the “falls” are in a lowered position. Cabling may be considered as the twisting of the block beyond one-half of a revolution (180°) of the traveling block. When this condition occurs, the operator shows good judgment in not making additional lifts, until the conditions causing the problem are corrected.

The following machine and site conditions should be investigated for possible improvement in block twisting.
Wire Rope 101

Block Twisting (cont.)
1. Reduce wire rope length. Longer rope lengths cause more twisting than short rope lengths. This applies particularly to the amount of wire rope in the “falls.”
2. Reduce the amount of load lifted. Heavily loaded ropes have more torque and twist than lightly loaded ropes. This condition would also apply to the speed of loading or “shock” loading, since this condition also causes higher wire rope loading.
3. Eliminate “odd-part” reeving, where the wire rope “dead-end” is on the traveling block. Wire rope torque, from the application of load, is greatest at the rope dead-end.
4. Relocate the rope dead-end at the boom, in order to increase the separation between the dead-end and the other rope parts. This applies a stabilizing load directly to the traveling block. The original equipment manufacturer should be consulted before making this modification.
5. Increase sheave size. This increases the amount of separation between wire rope parts and may improve the situation by applying stabilizing loads and reducing the amount of rope torque transmitted to the travel block.
6. Restrain the twisting block with a “tag” line. One or more of the foregoing suggestions may eliminate the problem without resorting to “specialized” wire rope which may not only be difficult to locate but expensive as well.

The use of special “rotation resistant” wire ropes will not likely be required unless the intended length of rope “falls” exceeds 100 feet, or the length of the load hoisting line exceeds 600 feet. In the event these latter conditions exist, the user should also anticipate using a combination of the “rotation resistant” wire rope and the foregoing field suggestions for the more severe problems.

Common Wire Rope Abuses
Neglect and abuse are the two chief enemies of wire rope life. One costly form of neglect is lack of proper field lubrication. Abuse takes many forms: improper reeling or unreeeling, wrong size or worn sheaves, improper storage, bad splicing are a few.

Condition of Machinery
Wire rope performance depends upon the condition of the equipment on which it operates; poorly maintained equipment will usually result in reduced rope life.

Effects of Shock-Loading and Vibration
The destructive effects of jerking or shock-loading are visually noticeable. Vibration has somewhat the same effect, and is equally destructive. An individual shock may be slight but many rapidly repeated slight shocks can have the effect of several large shocks.

Vibration which occurs directly above a load is often unavoidable. “Whipping” of the section of rope immediately above the load is also common. In these cases, rapid wire fatigue is possible. For reasons of safety, this section should be examined regularly.

Wire rope failure is usually cumulative. Each repeated overstress brings the rope nearer to failure. Thus, a wire rope may become fatigued to a point close to failure under a heavy load and actually fail under a much lighter load.

Overstressing
In any hoisting operation, there should be no slack in the wire rope when the load is applied. Otherwise, the resulting stress will be excessive.

Overstressing can also be the result of too-rapid acceleration or deceleration. Wire rope will withstand considerable stress if the load is applied slowly. As with ordinary twine, a quick snap will cause overstressing and breakage. This applies both when starting to lift a load, and when bringing it to a stop.

Corrosion
Corrosion can seriously shorten wire rope life, both by metal loss and by formation of corrosion pits in the wires. These pits act as stress-concentration points in the wires in much the same manner as do nicks. Wire rope left on machines shut down for long periods of time deteriorates rapidly. To preserve the rope for future use, it should be removed, cleaned and thoroughly lubricated.

Causes of Corrosion Damage
Pitting, erosion, and surface effects of many different types can all result in corrosion damage. Because they tend to increase corrosion, the following conditions should be considered and noted when applicable, during the ordering of wire rope - acid and alkaline solutions, gases, fumes, brine and salt air, sulphurous compounds, and high humidity and temperature. Lubricants are readily available to reduce the severity of attack of most of these conditions.

Effects of Severe Heat
Where wire rope is subjected to severe heat (e.g., foundry cranes) it will not give the service expected because it will deteriorate more quickly.

Wire ropes exposed to hot-metal handling or other extreme heat sometimes require independent wire rope cores.

Shifting Ropes From One Job to Another
Sometimes an idle wire rope from one operation is installed on another to keep the rope in continuous service. This extremely poor practice is an expensive “economy.”

Because wire rope tends to “set” to the conditions of its particular operatingjob, the differing bends, abrasions, and stresses of a new operation can produce premature failure. Therefore, for maximum life and efficiency, a rope should be used only on the job for which it has been specified.

Machinery Operation
Some operators are harder on their machinery than others and as a result they get shorter rope life. In certain instances, enough extra work is done to more than offset the additional wear-and-tear on equipment and wire rope. The operation may be more efficient from the production standpoint as a result, but those in charge of rope purchases should be made aware of the probable reduction in rope life and increased rope costs.

Examples of Common Wire Rope Abuses

- Crushing. Because of loose winding on drum, rope was pulled in between underlying wraps and crushed out of shape.
- Reverse bending. Running this rope over one sheave and under another caused fatigue breaks in wires.
- Excessive exposure to elements. Too much exposure combined with surface wear and loss of lubrication caused corrosion and pitting.
- Too sudden load release. The sudden release of a load cause birdcaging. Here individual strands open away from each other, displacing the core.
- Lack of lubrication. Premature breakage of wires resulted from “locking” of strands, which was caused by insufficient lubrication.
- Undersize sheave grooves. Sheaves were too small, causing strands to pinch. Wires then fail in the valley between the strands.
- Poor work procedures. Damage to strands and wires resulted from electric arcing.
- Lack of knowledge. Here’s what occurs when a loop which has been “pulled through” and lightened remains in service.
Wire Rope 101

**Physical Properties**

**Elastic Properties of Wire Rope**
The following discussion relates to conventional 6- or 8-strand ropes that have either fiber or steel cores; it is not applicable to rotation-resistant ropes since these constitute a separate case.

Wire rope is an elastic member; it stretches or elongates under load. This stretch derives from two sources:

1. **constructional**
2. **elastic**

In actuality, there may be a third source of stretching—a result of the rope rotating on its own axis. Such elongation, which may occur either as a result of using a swivel, or from the effect of a free-turning load, is brought about by the unlaying of the rope strands. Because the third source is a subject that is beyond the scope of this publication, discussion will be directed to constructional and elastic stretch.

**Construcional Stretch**
When a load is applied to wire rope, the helically-laid wires and strands act in a constricting manner thereby compressing the core and bringing all the rope elements into closer contact. The result is a slight reduction in diameter and an accompanying lengthening of the rope.

Construcional stretch is influenced by the following factors:

1. type of core (fiber or steel),
2. rope construction (6x7, 6x25 FW, 6x41 WS, 8x19 S, etc.),
3. length of lay,
4. material.

Ropes with wire strand core (WSC) or independent wire rope core (IWRC) have less constructional stretch than those with fiber core (FC). The reason for this is that the steel cannot compress as much as the fiber core.

Usually, constructional stretch will cease at an early stage in the rope’s life. However, some fiber core ropes, if lightly loaded (as in the case of elevator ropes), may display a degree of constructional stretch over a considerable portion of their life.

A definite value for determining constructional stretch cannot be assigned since it is influenced by several factors. The following table gives some idea of the approximate stretch as a percentage of rope under load.

**Elastic Stretch**
Elastic stretch results from recoverable deformation of the metal itself. Here, again, a quantity cannot be precisely calculated. However, the following equation can provide a reasonable approximation for a good many situations.

Changes in length (ft) = Change in load (lb) x Length (ft)
Area (inches²) x Modulus of Elasticity (psi)

The modulus of elasticity is given below.

**Approximate Modulus of Elasticity** (lbs. per square inch)

<table>
<thead>
<tr>
<th>Rope Classification</th>
<th>Zero through 20% Loading</th>
<th>21 to 65% Loading*</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 x 7 with fiber core</td>
<td>11,700,000</td>
<td>13,000,000</td>
</tr>
<tr>
<td>6 x 19 with fiber core</td>
<td>10,800,000</td>
<td>12,000,000</td>
</tr>
<tr>
<td>6 x 37 with fiber core</td>
<td>9,900,000</td>
<td>11,000,000</td>
</tr>
<tr>
<td>8 x 19 with fiber core</td>
<td>8,100,000</td>
<td>9,000,000</td>
</tr>
<tr>
<td>8 x 19 with IWRC</td>
<td>13,500,000</td>
<td>15,000,000</td>
</tr>
<tr>
<td>6 x 37 with IWRC</td>
<td>12,600,000</td>
<td>14,000,000</td>
</tr>
</tbody>
</table>

* Applicable to new rope, i.e., not previously loaded.

**General Guidelines for Wire Rope Selection**

Wire rope must have the strength required to handle the maximum load plus a design factor.

- speed of operation
- acceleration and deceleration
- length of rope

The design factor is the ratio of the breaking strength of the rope to the maximum working load, to establish the proper design factor, several operating characteristics should be considered:

**Fatigue Resistance**
Smaller wires are the key to bending performance when wire ropes are subjected to repeated bending over sheaves or drums. The more outer wires for a given size wire rope, the better the resistance to bending fatigue. The relative bending life factors of typical wire rope constructions are indicated in the following table. Ropes having a large number of small wires, however, should not be used where overwrapping on a drum takes place because they do not provide sufficient crush resistance.

**Abrasion Resistance**
Lang lay and large outer wires provide resistance to abrasion. The relationship between abrasion resistance and fatigue resistance is illustrated.

**Crush Resistance**
An IWRC (Independent Wire Rope Core) and large outer wires will provide best crush resistance. Constructex rope provides the best crush resistance of any wire rope.

**Flexibility**
Fiber core, lang lay and smaller wires provide a more flexible wire rope.

**Installation, Operation and Maintenance**

**Common Causes of Failure**
The primary factor in wire rope performance is selecting a wire rope with the best combination of properties for the job. The service life of that rope can be greatly extended by following a planned program of installation, operation, maintenance and inspection to avoid the most common causes of wire rope failure:

- **KINKING** will result in permanent rope deformation and localized wear. It is generally caused by allowing a loop to form in a slack line and then pulling the loop down to a tight permanent set.
- **OVERLOADING** results in accelerated wear, abrasion, rope crushing and distortion on drums and sheaves, and could result in complete rope failure.
- **DRAGGING** wire rope over a bank or some other object results in localized wear, which means shorter life.
- **IMPROPER SPOILING** results in crushed and distorted ropes and comes from careless installation and operation of the rope.
- **WHIPPING** a line, which results in many squared off broken wires, comes from jerking or running the line loose.

The following recommendations are general guides for getting the longest life from your wire rope. Our engineers and field service specialists are available to provide advice in specific situations.
Wire Rope 101

Installation, Operation and Maintenance
Recommendation (cont.)

Unloading, Unreeling and Uncoiling
Suitable precautions should be taken to prevent dropping of reels or coils during unloading and moving. If the reel should collapse, it may be impossible to remove the rope without serious damage.

- Special care should be taken in unrelling wire rope to avoid kinking, which can result in permanent damage to the rope. The reel should be mounted on jacks or a turntable so that it will move freely. It should be unreeled straight and under enough tension to keep it from starting a loop.

- A coil should be unwound by rolling along the floor like a hoop. Coils should never be laid flat and the free end pulled out.

Winding on a Drum

Proper practices for transferring rope from reel to drum:
- The reel should be placed as far from the drum as possible in order to avoid putting any turn into the rope.
- The rope should be wound from top-to-top or bottom-to-bottom to avoid reverse bends, which tend to make a rope harder to handle.
- Use enough tension to avoid kinking.

There is usually only one way to install rope on a grooved drum.

On ungrooved drums, the “rule of thumb” guides installation. The fist represents the drum; the index finger the wire rope; and the thumb the direction of the proper dead end location. Use the right hand for right lay ropes, the left hand for left lay ropes. For overwinding, the palm is down; for underwinding, the palm is up. Most drum anchors are set for right lay rope since it is the most common specification.

On installations where the rope passes over a sheave onto the drum, the maximum fleet angle (angle between the center line of the sheave and the rope) should be not more than 1-1/2 degrees for a smooth-faced drum and 2 degrees for a grooved drum. A 1-1/2 degree fleet angle is equivalent to 38 feet of lead for each foot of rope travel on either side of the center line of the sheave. Smaller fleet angles may result in the rope piling up on the drum. Larger fleet angles may cause excessive wear from rubbing against the flanges of the sheave as well as excessive crushing and abrasion of the rope on the drum.

Break In
A few trips through the working cycle at slow speed and light load will set the strands firmly in place for smooth, efficient operation.

- On applications using a wedge socket, such as drag and hoist ropes, it is also a good idea to cut off a short section of rope to allow twist to run out and to equalize the strands.

Operation
Skillful operation is important to wire rope performance. Rapid acceleration, shock loading and excessive vibration can cause premature rope failure. Smooth, steady application of power by the equipment operator can add significantly to wire rope service life.

Shifting Wear Points
Some sections of most wire ropes get more wear than others. A regular inspection program will identify points of wear and lead to wear-shift practices that will extend wire rope life.

- In many common situations, cutting short lengths of the rope will redistribute the points of maximum wear:
  - Rope on a drum with two or more layers will wear at the point where the rope starts each successive layer.
  - Crane ropes will fatigue at an equalizer sheave. Careful inspection is required to identify fatigue points.

- Hoist ropes will frequently fail from vibration fatigue at sockets, clips and dead end points.

On most installations, wear and fatigue are more severe on one half of the rope than the other. Changing a rope end-for-end more evenly distributes wear and fatigue from repeated bending and vibration.

Lubrication
Factory lubrication is not always sufficient to last the useful life of wire rope. Periodic field lubrication may be required to minimize friction and provide corrosion protection. Important guides for field lubrication:

- Ropes should be inspected frequently to determine the need for lubrication.
- Clean the rope thoroughly with a wire brush, scraper or compressed air to remove foreign material and old lubricant from the valleys between the strands and the spaces between the outer wires.
- The lubricant should be applied at a point where the rope is being bent in order to promote penetration within the strands. It may be applied by pouring, dripping or brushing.
- Used motor oil is not recommended as a wire rope lubricant.

Bronze Lube® is recommended for relubing ropes originally supplied with Bronze Lube. In other situations, the lubricant should be light bodied enough to penetrate the rope. It should also contain a corrosion inhibitor.

Matching the Wire Rope with Sheaves and Drums
The ratio of the diameter of the wire rope to the diameter of operating sheaves and drums (D/d ratio) is particularly important to service life. A sheave or drum that is too small for the rope diameter will cause premature failure due to bending stresses.

Bending Efficiency

Efficiency falls as the D/d ratio becomes smaller. This curve, based on static test data only, illustrates the decline of bending efficiency for 6x19 and 6x37 classification ropes as the D/d ratio is reduced.
Installation, Operation and Maintenance Recommendation (cont.)

Matching the Wire Rope with Sheaves and Drums (cont.)

Service life increases as the D/d ratio becomes larger. This curve, based on bending and tensile stresses only, illustrates the relative performance increase.

<table>
<thead>
<tr>
<th>Sheave Dia. Factors</th>
<th>*D/d Ratios</th>
<th>Min.</th>
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<tbody>
<tr>
<td>Rope Construction</td>
<td>Recommended</td>
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<tr>
<td>6 x 7</td>
<td>51</td>
<td>34</td>
</tr>
<tr>
<td>6 x 19</td>
<td>45</td>
<td>30</td>
</tr>
<tr>
<td>6 x 21 FW</td>
<td>30</td>
<td>26</td>
</tr>
<tr>
<td>6 x 36 WS</td>
<td>35</td>
<td>23</td>
</tr>
<tr>
<td>8 x 25 FW</td>
<td>32</td>
<td>21</td>
</tr>
<tr>
<td>8 x 41 WS</td>
<td>32</td>
<td>21</td>
</tr>
</tbody>
</table>

*Nominal Rope Dia.

To calculate the recommended or minimum sheave diameter for any given rope, find the rope construction and multiply the rope diameter by the value shown. (Ex.: Recommended sheave diameter for a 6 x 19 classification wire rope of 3/4" diameter would be 51 x .75 = 38-1/4")

Rope speed also affects fatigue life. Higher operating rates require larger sheaves.

Reverse bends from one sheave to another should be avoided. Other factors that affect bending fatigue life are load, number of cycles and condition of the sheaves and drums. Consult Hanes Supply for specific recommendations.

Matching Grooves to the Wire Rope

Grooves should be spaced so that one wrap of rope does not rub against the next wrap during operation.

Grooves in sheaves and drums should be slightly larger than the wire rope to permit the rope to adjust itself to the groove. Tight grooves will cause excessive wear to outer wires; large grooves do not support the rope properly.

Wire ropes are manufactured slightly larger than nominal size. Maximum allowable oversize tolerances are shown in the table.

As a rope is run through a groove, both become smaller. A used groove can be too small for a new rope; thus accelerating rope wear. A compromise between rope life and machining frequency must be made.

Grooves should have an arc of contact with the wire rope between 135 and 150 degrees. They should be tapered to permit the rope to enter and leave the groove smoothly. Field inspection groove gauges are made to the nominal diameter of the rope plus 1/2 of the allowable rope oversize tolerance. When the field inspection gauge fits perfectly, the groove is at the minimum permissible contour.

Calculating Drum Capacity

The length of rope that can be wound on a drum or reel may be calculated as follows. L = the length of rope in feet. All other dimensions are in inches.

<table>
<thead>
<tr>
<th>Rope Dia. (in)</th>
<th>K</th>
<th>Rope Dia. (in)</th>
<th>K</th>
</tr>
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<tbody>
<tr>
<td>1/4</td>
<td>3.39</td>
<td>1/8</td>
<td>.191</td>
</tr>
<tr>
<td>5/16</td>
<td>2.21</td>
<td>1/4</td>
<td>.152</td>
</tr>
<tr>
<td>3/8</td>
<td>1.58</td>
<td>3/8</td>
<td>.127</td>
</tr>
<tr>
<td>7/16</td>
<td>1.19</td>
<td>1/2</td>
<td>.107</td>
</tr>
<tr>
<td>1/2</td>
<td>.925</td>
<td>7/16</td>
<td>.0866</td>
</tr>
<tr>
<td>9/16</td>
<td>.741</td>
<td>1/4</td>
<td>.0770</td>
</tr>
<tr>
<td>3/4</td>
<td>.248</td>
<td>1/2</td>
<td>.0604</td>
</tr>
<tr>
<td>7/8</td>
<td>.208</td>
<td>3/4</td>
<td>.0597</td>
</tr>
<tr>
<td>1</td>
<td>.239</td>
<td>7/8</td>
<td>.0532</td>
</tr>
</tbody>
</table>

Inspection of Wire Rope & Structural Strand

**WIRE ROPE**

Carefully conducted inspections are necessary to ascertain the condition of wire rope at various stages of its useful life. The object of wire rope inspection is to allow for removal of the rope from service before the rope's condition, as a result of usage, could pose a hazard to continued normal operations.

The individual making the inspection should be familiar with the product and the operation as his judgment is a most critical factor. Various safety codes, regulations, and publications give inspection requirements for specific applications.

The following inspection procedure, taken from the ASME B-30 series, serves as a model of typical inspection requirements.
Wire Rope 101

Inspection of Wire Rope & Structural Strand (cont.)

Frequent Inspection
All running ropes and slings in service should be visually inspected once each working day. A visual inspection consists of observation of all rope and end connections which can reasonably be expected to be in use during daily operations. These visual observations should be concerned with discovering gross damage such as listed below, which may be an immediate hazard:

- Distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement or core protrusion.
- General corrosion.
- Broken or cut strands.
- Number, distribution and type of visible broken wires.
- Lubrication.

Special care should be taken when inspecting portions subjected to rapid deterioration such as flange points, crossover points and repetitive pickup points on drums.

Periodic Inspection
The inspection frequency should be determined by a qualified person and should be based on such factors as: expected rope life as determined by experience on the particular installation or similar installations, severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads.

Periodic inspections with a signed report should be performed by an appointed or authorized person. This inspection should cover the entire length of rope. The individual wires in the strands of the rope should be visible to this person during the inspection. Any deterioration resulting in appreciable loss of original strength, such as described below, should be noted and a determination made as to whether further use of the rope would constitute a hazard:

- Distortion of the rope such as kinking, birdcaging, crushing, unstranding, main strand displacement, or core protrusion.
- Reduction of rope diameter below normal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.
- Severely corroded or broken wires at end connections.
- Severely corroded, cracked, bent, worn, or improperly applied end connections.
- Lubrication.

Special care should be taken when inspecting portions subjected to rapid deterioration such as the following:

- Portions in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.
- Portions of the rope at or near terminal ends where corroded or broken wires may protrude.

Rope Replacement
No precise rules can be given for determination of the exact time for replacement of rope, since many variable factors are involved. Continued use in this respect depends largely upon good judgment by an appointed or authorized person in evaluating remaining strength in a used rope, after allowance for deterioration disclosed by inspection. Continued rope operation depends upon this remaining strength.

Conditions such as the following should be sufficient reason for questioning continued use of the rope or increasing the frequency of inspection:

- In running ropes, six randomly distributed broken wires in one lay, or three broken wires in one strand in one lay. (The number of wire breaks beyond which concern should be shown varies with rope usage and construction. For general application 6 and 3 are satisfactory. Ropes used on overhead and gantry cranes (as defined in ASME B-30, 2-1983) can be inspected to 12 and 4. Rotation resistant ropes should be inspected to 4 and 2.)

- One outer wire broken at the contact point with the core of the rope which has worked its way out of the rope structure and protrudes or loops out from the rope structure.
- Wear of one-third the original diameter of outside individual wires.
- Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.
- Evidence of any heat damage from any cause.
- Valley breaks.

Replacements from nominal rope diameter of more than:

<table>
<thead>
<tr>
<th>Reduction of (in)</th>
<th>Nominal Rope Dia. (in)</th>
</tr>
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<tbody>
<tr>
<td>1/64</td>
<td>Up to &amp; inc. 5/16</td>
</tr>
<tr>
<td>1/32</td>
<td>over 5/16 thru 1/2</td>
</tr>
<tr>
<td>3/64</td>
<td>over 1/2 thru 3/4</td>
</tr>
<tr>
<td>1/16</td>
<td>over 3/4 thru 1-1/8</td>
</tr>
<tr>
<td>3/32</td>
<td>over 1-1/8</td>
</tr>
</tbody>
</table>

- In standing ropes, more than two broken wires in one lay in section beyond end connections or more than one broken wire at an end connection.

Replacement rope shall have a strength rating at least as great as the original rope furnished by the equipment manufacturer or as originally specified. Any deviation from the original size, grade, or construction shall be specified by the equipment manufacturer, original design engineer, or a qualified person.

Ropes Not In Regular Use
All rope which has been idle for a period of a month or more due to shutdown or storage of equipment on which it is installed should be given inspections as previously described before being placed in service. This inspection should be for all types of deterioration and should be performed by an appointed or authorized person.

Inspection Records
Frequent inspection—no records required.

Periodic Inspection: In order to establish data as a basis for judging the proper time for replacement a signed report of rope condition at each periodic inspection should be kept on file. This report should include points of deterioration previously described.

A long range inspection program should be established and include records of examination of ropes removed from service so a relationship can be established between visual observation and actual condition of the internal structure.

GALVANIZED STRUCTURAL WIRE STRAND
Carefully conducted inspections performed and recorded on a regular basis are necessary to ascertain the condition of structural strand at various stages of its useful life. The object of inspection is to allow for removal of the strand from service before its condition, as a result of usage, could pose a hazard to continued normal operations.

The individual making the inspection should be familiar with the operation, as his judgment is a most critical factor. Special care should be taken at end terminations or at dampener devices, as these are generally the most critical areas. Conditions such as corrosion, number, type and distribution of broken wires, and diameter reduction should be evaluated and compared with previous inspection results.

The actual condition of the strand and inspection history together can then be used to decide if continued use of the product is advisable.

NOTE: Special methods and techniques may be used by wire rope engineers or qualified persons to determine the possible existence of internal corrosion or broken wires in structural strand or similar conditions which may exist out of sight in terminal connections.

EXAMPLE: Wire breaks may sometimes occur just inside the nose of the socket making visual inspection difficult. Judgments on wire integrity can be made by tapping or “sounding” the wire by a person experienced in this inspection technique. If you have doubt about the method to use for inspection, or the condition of the strand or fitting, contact Hanes Supply.

For assistance or more information on Wire Rope & Wire Rope Inspection give us a call - our qualified representatives can help!
### General Purpose Wire Rope

#### 6 x 7 Classification

6 x 7 Classification Wire Ropes give long service in operating conditions where ropes are dragged along the ground or over drums. Larger sheaves and drums (than those used for more flexible constructions) are required to avoid breakage from fatigue. 6 x 7 Classification Ropes contain 6 strands with 3 through 14 wires, no more than 9 of which are outside wires.

**Characteristics:** Excellent abrasion resistance; less bending fatigue resistance. Typical Applications: Draging and haulage in mines, inclined planes and tramways, sand lines. *IWRC shown: fiber core available*

**Order Guide:** 6 x 7 classification wire ropes may be ordered in diameters from 1/4" to 1-1/2", bright or galvanized... EIEP and IPS grades... fiber core or IWRC... right or left lay, regular or lang lay.

#### 6 x 19 Classification

6 x 19 Classification Wire Ropes provide an excellent balance between fatigue and wear resistance. They give excellent service with sheaves and drums of moderate size. 6 x 19 Classification Ropes contain 6 strands with 15 through 26 wires per strand, no more than 12 of which are outside wires.

**6 x 19 Seale Characteristics:** Resistant to abrasion and crushing; medium fatigue resistance. Typical Applications: Haulage rope, choker rope, rotary drilling line. *IWRC shown: fiber core available*

**6 x 21 Filler Wire Characteristics:** Less abrasion resistance; more bending fatigue resistance. Typical Applications: Pull Ropes, load lines, backhaul ropes, draglines. *IWRC shown: fiber core available*

**6 x 25 Filler Wire Characteristics:** Most flexible rope in classification; best balance of abrasion and fatigue resistance. Typical Applications: Most widely used of all wire ropes - crane hoist ropes. IWRC shown; fiber core available

**6 x 26 Warrington Seale Characteristics:** Good balance of abrasion and fatigue resistance. Typical Applications: Boom hoists, logging and tubing lines. *IWRC shown, fiber core available*

#### 6 x 37 Classification

6 x 37 Classification ropes contain 6 strands with 27 through 49 wires, no more than 18 of which are outside wires. More flexible but less abrasion resistant than the 6 x 19 classification. Each strand contains numerous small diameter wires. As the number of wires increases, flexibility increases. **Order Guide:** 6 x 37 classification wire ropes may be ordered in diameters from 1/4" to 5"... bright or galvanized... EIEP, EIP or IPS grades... IWRC or fiber core... right or left lay, regular or lang lay.

**6 x 31 Warrington Seal Characteristics:** 12 outside wires. Slightly more flexible than 6 x 25 rope with the same abrasion resistance. Typical Applications: Overhead crane and mobile crane hoist ropes; winch lines; large diameter towing lines. *IWRC shown: fiber core available*

**6 x 36 Warrington Seal Characteristics:** 14 outside wires. More fatigue resistance; but less abrasion resistance than 6 x 25 rope. Typical Applications: Overhead crane and mobile crane hoist ropes; shovel and dragline hoist ropes. *IWRC shown: fiber core available*

**6 x 41 Warrington Seal Characteristics:** 16 outside wires. Good combination of fatigue and abrasion resistance for operating ropes. Typical Applications: Overhead crane and mobile crane hoist ropes; shovel and dragline hoist ropes. *IWRC shown: fiber core available*

**6 x 41 Seale Filler Wire Characteristics:** Same characteristics and applications as 6 x 41 Warrington Seale. *IWRC shown: fiber core available*

**6 x 49 Seale Warrington Seal Characteristics:** 16 outside wires. Best fatigue resistance and abrasion resistance in 6 x 37 classification Typical Applications: Mooring, towing and anchor lines. *IWRC shown: fiber core available*

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### Wire Rope Nominal Strength

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| *Acceptance strength is not less than 2-1/2% below the nominal strengths listed.*

† Galvanizing: For class A galvanized wire rope (EIP and IPS grades only), deduct 10% from the nominal strength shown.
Wire Rope

Rotation Resistant Wire Rope

Rotation Resistant Ropes are available in a full range of sizes, grades and constructions:

- Standard constructions for single part and multi part lifting.
- Special wire rope constructions for increased service life in particularly demanding applications—DYFORM-18 HSLR, Dyform 34LR and 35LS.

**Note:**
1. Swivels are not recommended for use with rotation resistant ropes.
2. Although B30 standards permit rotation resistant ropes to be used under certain conditions at design factors of 3.5:1, we recommend a minimum design factor of 5:1 and a design factor of 7:1 for extended rope life.

**Order Guide:** 19 x 7 is a bright, IWRC, right regular wire rope. It may be ordered in diameters from 3/16” to 1-5/8”... EIP or IPS grade. 8 x 19 is a bright, IWRC, right regular lay wire rope. It may be ordered in diameters from 7/16” to 1-1/2”... EIP or IPS.

Dyform-18 HSLR is a bright, special grade, strand core, right regular lay wire rope. It may be ordered in diameters from 3/8” to 1-1/4”. Dyform 34LR and 35LS are specially constructed wire ropes.

### Dyform®-34LR & 35LS Rotation Resistance Rope

<table>
<thead>
<tr>
<th>Diameter (mm)</th>
<th>Min. Breaking Force* (Tons)</th>
<th>Approx. Wt./Ft. (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>8.3</td>
<td>.27</td>
</tr>
<tr>
<td>1/2</td>
<td>11.2</td>
<td>.37</td>
</tr>
<tr>
<td>5/16</td>
<td>18.5</td>
<td>.64</td>
</tr>
<tr>
<td>5/8</td>
<td>22.7</td>
<td>.79</td>
</tr>
<tr>
<td>3/4</td>
<td>32.4</td>
<td>1.1</td>
</tr>
<tr>
<td>7/8</td>
<td>43.8</td>
<td>1.5</td>
</tr>
<tr>
<td>1</td>
<td>57.5</td>
<td>2.0</td>
</tr>
<tr>
<td>1-1/8</td>
<td>71.5</td>
<td>2.5</td>
</tr>
<tr>
<td>1-1/4</td>
<td>87.9</td>
<td>3.1</td>
</tr>
</tbody>
</table>

* Acceptance strength is not less than 2% below the nominal breaking strength listed.

**Note:** These strengths apply only when a test is conducted with both ends fixed.

**DYFORM®-34LR**
- Characteristics: Strongest, most rotation resistant of all rotation resistant wire ropes; used for the most demanding hoisting applications.
- 35LS Characteristics: Same rotation resistance as Dyform-34LR; used for demanding applications where highest strength is not mandatory.

**DYFORM®-18 HSLR**
- Characteristics: Strongest, most rotation resistant wire rope.

**TOWER POWER - 35™**
- 35 x 7 Non-Rotating Bright (Tower Crane Rope)

**Greater Rotation Resistance:** The unique design of Tower Power 35™ is such that it produces lower torque than 19x7 rotation resistant wire ropes. The torque of the core and strands is minimized so that the tendency to turn does not occur at normal load ranges of 0-20% of the rope’s nominal strength.

**Greater Lifting Power:** The increased number of wires and strands, combined with its greater stability and balance, creates more metallic area and thus greater strength.

**Greater Fatigue Resistance:** The same increase in number of wires and strands with a given diameter, also creates greater ability to withstand reverse bending.

**Greater Service Life:** All of this allows the rope to have greater groove contact and reduced surface pressure. The result is increased service life.
Flattened Strand Rope

This rope is particularly suitable where severe conditions of crushing and abrasion are encountered on the drum or where a higher strength design factor is required than can be obtained with a similar round strand rope. The triangular strand shape not only provides better resistance to crushing, but also offers a greater exposed surface area for contact with sheaves, drums, or underlying layers of spooled rope. This feature, in connection with the use of lay lay construction, distributes the greater number and length of wires. The smooth surface of the rope also helps to minimize wear on drums and sheaves.

<table>
<thead>
<tr>
<th>Fiber Core</th>
<th>IWR/C</th>
<th>Approx. Wt./Ft.</th>
<th>Approx. Strength (Tons)</th>
<th>Approx. Strength (Tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPS</td>
<td>EIPS</td>
<td></td>
<td>IPS</td>
<td>EIPS</td>
</tr>
<tr>
<td>5/8</td>
<td>4.39</td>
<td>70</td>
<td>20.2</td>
<td>3.76</td>
</tr>
<tr>
<td>3/4</td>
<td>4.50</td>
<td>1.01</td>
<td>28.5</td>
<td>1.06</td>
</tr>
<tr>
<td>7/8</td>
<td>4.50</td>
<td>39.0</td>
<td>50.6</td>
<td>4.50</td>
</tr>
<tr>
<td>1</td>
<td>5.18</td>
<td>1.80</td>
<td>57.9</td>
<td>6.18</td>
</tr>
<tr>
<td>1-1/8</td>
<td>5.18</td>
<td>2.26</td>
<td>63.0</td>
<td>2.54</td>
</tr>
<tr>
<td>1-1/4</td>
<td>5.18</td>
<td>2.81</td>
<td>70.1</td>
<td>2.95</td>
</tr>
<tr>
<td>1-3/8</td>
<td>5.18</td>
<td>3.40</td>
<td>85.5</td>
<td>3.57</td>
</tr>
<tr>
<td>1-1/2</td>
<td>5.18</td>
<td>4.05</td>
<td>101.1</td>
<td>4.25</td>
</tr>
<tr>
<td>1-3/4</td>
<td>5.18</td>
<td>4.75</td>
<td>118.2</td>
<td>4.95</td>
</tr>
<tr>
<td>1-7/8</td>
<td>5.18</td>
<td>5.51</td>
<td>136.5</td>
<td>5.81</td>
</tr>
<tr>
<td>2</td>
<td>5.18</td>
<td>6.33</td>
<td>155.1</td>
<td>6.63</td>
</tr>
<tr>
<td>2-1/8</td>
<td>5.18</td>
<td>7.20</td>
<td>176.1</td>
<td>7.56</td>
</tr>
<tr>
<td>2-1/4</td>
<td>5.18</td>
<td>9.10</td>
<td>220.2</td>
<td>9.56</td>
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</table>

<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>5/8</th>
<th>3/4</th>
<th>7/8</th>
<th>1</th>
<th>1-1/8</th>
<th>1-1/4</th>
<th>1-3/8</th>
<th>1-1/2</th>
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<th>1-7/8</th>
<th>2</th>
<th>2-1/8</th>
<th>2-1/4</th>
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</thead>
<tbody>
<tr>
<td>Approx. Wt./Ft. (lbs)</td>
<td>57</td>
<td>101</td>
<td>139</td>
<td>190</td>
<td>221</td>
<td>247</td>
<td>274</td>
<td>310</td>
<td>361</td>
<td>412</td>
<td>500</td>
<td>570</td>
<td>630</td>
</tr>
<tr>
<td>Approx. Strength (Tons)</td>
<td>20.2</td>
<td>28.5</td>
<td>50.6</td>
<td>57.9</td>
<td>63.0</td>
<td>70.1</td>
<td>85.5</td>
<td>101.1</td>
<td>118.2</td>
<td>136.5</td>
<td>155.1</td>
<td>176.1</td>
<td>220.2</td>
</tr>
<tr>
<td>Approx. Strength (Tons)</td>
<td>74</td>
<td>1.06</td>
<td>4.50</td>
<td>6.18</td>
<td>2.54</td>
<td>2.95</td>
<td>3.57</td>
<td>4.25</td>
<td>4.95</td>
<td>5.81</td>
<td>6.63</td>
<td>7.56</td>
<td>9.56</td>
</tr>
</tbody>
</table>
Wire Rope

Wire Rope for Surface Mining & Excavation

6 & 8 Strand Hoist and Drag Ropes

<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>Nominal Strength (Tons)</th>
<th>Approx. Wt./Ft. (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>79.9</td>
<td>3.14</td>
</tr>
<tr>
<td>1/2</td>
<td>96.0</td>
<td>3.82</td>
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<tr>
<td>3/8</td>
<td>114.0</td>
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<td>5.27</td>
</tr>
<tr>
<td>3/16</td>
<td>153.0</td>
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</tr>
<tr>
<td>7/64</td>
<td>174.0</td>
<td>7.02</td>
</tr>
<tr>
<td>1/4</td>
<td>180.0</td>
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<td>5/32</td>
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<tr>
<td>3/16</td>
<td>247.0</td>
<td>10.10</td>
</tr>
<tr>
<td>7/64</td>
<td>274.0</td>
<td>11.20</td>
</tr>
<tr>
<td>1/4</td>
<td>302.0</td>
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<td>5/32</td>
<td>331.0</td>
<td>13.80</td>
</tr>
<tr>
<td>3/16</td>
<td>361.0</td>
<td>15.10</td>
</tr>
</tbody>
</table>


6 x 49 Seale Warrington Seale Tiger® Hoist and Drag Rope Characteristics: 16 outside wires. Used for large diameter shovel hoist, dragline hoist and drag ropes.

6 x 55 and 6 x 51* Seale Warrington Seale Tiger® Hoist and Drag Rope Characteristics: 18 outside wires. Used for mining ropes over 4 diameters. (*construction not shown)

Dyflex® Excavator Rope Characteristics: Combines the benefits of the Dyform manufacturing process with plastic jacketed, cushioned steel core-high strength, improved internal wear resistance, easier handling, greater bending fatigue and extended service life.

Tiger Blue Excavator Rope Characteristics: All standard Tiger Drag, Tiger Hoist & Dyex ropes can be manufactured as Tiger Blue. Tiger Blue is a combination steel/high impact thermoplastic pressure filled wire rope specially designed for applications requiring high performance.

8 x 19 Tiger® -8 Hoist and Drag Rope Characteristics: 8-strand wire ropes give longer life and reduced sheave wear because they have 33% greater bearing surface than 6-strand ropes of the same diameter. Different constructions are used to produce the optimum outside wire size for various applications.

8 x 37 Tiger® -8 Hoist and Drag Rope Characteristics: 8-strand wire ropes give longer life and reduced sheave wear because they have 33% greater bearing surface than 6-strand ropes of the same diameter. Improved abrasion resistance in combination with the structural stability of regular lay. It unites the best features of two types of wire rope.

Herringbone Wire Rope

Strands: 6
Wires per strand: 31
Core: IWRC
Standard Grade(s): Purple Plus
Finish: Bright

Herringbone is a 6-strand wire rope comprised of four Lang and two regular lay strands. The Lang lay strands are arranged in pairs, with each pair of Lang lay alternating with one strand of regular lay.

Herringbone wire rope has a Lang lay’s extra flexibility and abrasion resistance in combination with the structural stability of regular lay. It unites the best features of two types of wire rope.

Herringbone wire rope is made with relatively large outside wires to provide increased abrasion resistance to scrubbing against sheaves and drums. Finer inside wires add flexibility and enable Herringbone to absorb severe bending stresses. For these reasons it is well suited to winding applications where both crushing and abrasion occur.

Herringbone wire rope is suited for boom hoist applications and numerous types of excavating equipment (clamshell rigs, shovels, cranes, winches and scrapers).

Dyflex® Hoist and Drag Rope

<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>Nominal Strength (Tons)</th>
<th>Approx. Wt./Ft. (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>8 x 19</td>
<td>5.77</td>
</tr>
<tr>
<td>3/8</td>
<td>8 x 19</td>
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<td>7/64</td>
<td>8 x 19</td>
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<td>1/4</td>
<td>8 x 37</td>
<td>16.00</td>
</tr>
<tr>
<td>5/32</td>
<td>8 x 37</td>
<td>17.00</td>
</tr>
<tr>
<td>3/16</td>
<td>8 x 37</td>
<td>18.75</td>
</tr>
<tr>
<td>7/64</td>
<td>8 x 37</td>
<td>19.83</td>
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<td>5/32</td>
<td>8 x 37</td>
<td>22.00</td>
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<td>3/16</td>
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<td>23.00</td>
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<td>7/64</td>
<td>8 x 37</td>
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<tr>
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<td>8 x 37</td>
<td>27.00</td>
</tr>
<tr>
<td>3/16</td>
<td>8 x 37</td>
<td>28.10</td>
</tr>
<tr>
<td>7/64</td>
<td>8 x 37</td>
<td>30.00</td>
</tr>
<tr>
<td>1/4</td>
<td>8 x 37</td>
<td>31.00</td>
</tr>
<tr>
<td>5/32</td>
<td>8 x 37</td>
<td>33.00</td>
</tr>
<tr>
<td>3/16</td>
<td>8 x 37</td>
<td>35.00</td>
</tr>
</tbody>
</table>

Characteristics: All standard Tiger Drag, Tiger Hoist & Dyex ropes can be manufactured as Tiger Blue. Tiger Blue is a combination steel/high impact thermoplastic pressure filled wire rope specially designed for applications requiring high performance.

Nominal strength available on request.

† Other sizes available upon request
* Acceptance strength is not less than 2-1/2% below the nominal strengths listed

Nominal strength available on request.

Wire Rope

<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>Nominal Weight (lbs/ft)</th>
<th>Nominal Strengths* Purple Plus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>4.56</td>
<td>13.3</td>
</tr>
<tr>
<td>9/16</td>
<td>5.09</td>
<td>16.8</td>
</tr>
<tr>
<td>3/8</td>
<td>5.72</td>
<td>20.6</td>
</tr>
<tr>
<td>7/32</td>
<td>1.94</td>
<td>29.4</td>
</tr>
<tr>
<td>7/8</td>
<td>1.42</td>
<td>39.8</td>
</tr>
<tr>
<td>1</td>
<td>1.85</td>
<td>51.7</td>
</tr>
<tr>
<td>1-1/8</td>
<td>2.34</td>
<td>65.0</td>
</tr>
<tr>
<td>1-1/4</td>
<td>2.89</td>
<td>79.9</td>
</tr>
</tbody>
</table>

* Acceptance strength is not less than 2-1/2% below the nominal strengths listed. Tons of 2,000 lbs.
Wire Rope

Wire Rope for Underground Mining & Tramway Operation

Round Strand Hoist Rope
- Used extensively for single layer winding applications.
- Characteristics include greater strength and wear resistance.
- Ideal for inclined slopes, ropes with larger outer wires are used.

Dyform®-6 Hoist Rope
- Used where greater strength and wear characteristics are required.
- Suitable for friction hoist ropes to depths of 2,500 feet.

Flatlocked Strand Hoist Rope
- Triangular strand construction resists wearing and crushing in multi-layer drum hoists.
- Greater surface area and high strength make it suitable for friction hoist ropes.

Full Locked Coil Hoist Rope
- Best rotation resistant properties with greater strength, size-for-size, than stranded ropes.
- Best construction for friction hoist applications for all feasible depths.
- Also used for sinking and stage ropes.

Sinking and Counter Weight Ropes
- Because of their strength, resistance to bending, abrasion and crushing, 8x19, 18x7, 6x25 IWRC and 18x16 HSLR.
- Dyform-18 and higher strength Dyform-16 HSLR.
- Selection of the best construction for each application is based on present or proposed hoist ropes and conveyance centers to provide the best possible loop formation.

Balance Ropes
- Several wire rope constructions can be custom suited for friction hoist installations.
- Selection of the best construction for each application is based on present or proposed hoist ropes and conveyance centers to provide the best possible loop formation.

Wire Ropes for underground mine hoisting systems and aerial tramway operations are normally made custom designed for each individual installation. We offer specialized design service on single or double drum hoists as well as multi-rope friction hoisting systems - Call for complete details!

Traction Steel Elevator Ropes
- Specialized elevator ropes where flexibility & better traction are required.

Elevator Wire Ropes
- Made of low carbon wire; used as compensation, counterweight & governor ropes; also as hoist ropes on older installations.

Extra High Strength Traction Steel Elevator Ropes
- Recommended for high-rise service for added strength & wear resistance w/ the physical confines of a standard elevator rope design. May be used for both V-groove & U-Groove service.

Wire Rope for Marine & Electrical Construction Applications

6 x 37 Classification Hawser and Mooring Line
- Characteristics: Available in IWRC for strength and crush resistance; fiber core for flexibility; galvanized for corrosion resistance. IWRC shown, fiber core available.

Hawser and Anchor Line Characteristics
- Same as above, bright finish.

3-Strand Swaged Wire Ropes
- Characteristics: Used in transmission line pulling because smooth surface does not chew-up neoprene lined sheaves. Less torque than 6 strand ropes-resists kinking; better spooling. Good strength to diameter ratio. 3 x 21 Swaged Pulling Line

Order Guide: 6 x 37 Classification may be ordered in diameters from 1” through 3-1/2”. Bright or Galvanized... EIP or IPS grade... IWRC or fiber core (IPS grade only)... right or left lay, regular lay only.

3-Strand Swaged Wire Ropes are available in EIP grade and right lay only. They may be ordered in diameters from 3/8” to 1”... in three constructions... bright or galvanized.

Wire Ropes
Rochester Division:
585.235.0160
Albany/NE Division:
Buffalo - Headquarters:
716.826.2636
WWW.HANESSUPPLY.COM
Wire Rope

Wire Ropes for Logging

Logging Ropes are available in a full range of sizes, grades and constructions for logging applications in any type of terrain:

- Archline, boom loader, choker, haulback, inhaul, mainline, sawmill carriage, skidding, skyline, slackline, strawline, triple drum line and winch lines.
- 6 x 19 Seale Characteristics: Resistant to abrasion and crushing; medium fatigue resistance. Typical Applications: Mainline, haulback and straw lines

Wire Ropes for Oil/Gas Drilling & Well Servicing

Wire Ropes are available in a full range of sizes, grades and constructions:

- Standard constructions for on shore and offshore drilling.
- Special wire rope constructions for increased service life in particularly demanding applications—Dyex Compacted Wire Ropes and CONSTRUCTEX® for Rotary Drilling or Tubing Lines.

- 6 x 7 Sand and Swabbing Lines Characteristics: High abrasion resistance; spools evenly; resists kinking. Galvanized coating recommended for hydrogen sulfide, sour crude and salt water environments.

- 6 x 19 Seale Rotary Drilling Line Characteristics: Excellent balance between fatigue and wear resistance. Long service life with sheaves and drums of moderate size. IWRC shown; fiber core available.

- 6 x 21 Cable Tool Drilling Line Characteristics: Excellent resistance to bending fatigue.

Swaged Wire Ropes

Tuf-Swaged™ Logging Ropes

If your application requires an even stronger rope, Tuf-Swaged® rope can lead to longer service life. These ropes are designed to resist abrasion and drum crushing in logging applications. The compact design with smoother wire surfaces allows you to spool a greater length of rope onto drums than an unswaged rope of comparable strength.

6 x 19 and 6 x 36 Classification Swaged Wire Ropes

These ropes offer greater strength than standard ropes of the same diameter while providing greater resistance to drum crushing, scrubbing and similar surface wear. To enhance the performance of our swaged ropes in the field, we utilize a special wire chemistry in the outer wires of the strands. Then during production, the rope is swaged to produce a compact cross-section with minimal voids and greater surface area on outer wires. In addition to reducing rope surface wear, this compact design helps reduce wear to sheaves and minimizes crushing of the rope in the drum.

---

### Wire Rope Table

<table>
<thead>
<tr>
<th>Dia. (in.)</th>
<th>Nominal Strength* (Tons)</th>
<th>Approx. Wt/Ft (lbs.)</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/36</td>
<td>7/32</td>
<td>1/16</td>
<td>225.8</td>
</tr>
<tr>
<td>5/32</td>
<td>7/30</td>
<td>1/16</td>
<td>198.0</td>
</tr>
</tbody>
</table>

---

### Dyex Rotary Drilling Line Characteristics

- High density wire rope made with compacted strands. Meets or exceeds strength requirements of EIPS rope. Provides better bending life, crush resistance and abrasion resistance than EIPS rope.

- CONSTRUCTEX® Characteristics: Swaged to increase wearing surface and density. Can provide 1-1/2 to 2 times service life of other tubing lines due to its resistance to scrubbing and crushing and increased strength. Greater flexibility provides easier handling.

### Dyex™ Rotary Drilling Line Characteristics

- High density wire rope made with compacted strands. Meets or exceeds strength requirements of EIPS rope. Provides better bending life, crush resistance and abrasion resistance than EIPS rope.

### Wire Rope for Oil/Gas Drilling & Well Servicing

Wire Ropes are available in a full range of sizes, grades and constructions:

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---

### Wire Rope for Oil/Gas Drilling & Well Servicing

<table>
<thead>
<tr>
<th>Dia. (in.)</th>
<th>EIP</th>
<th>IPS</th>
<th>Approx. Wt/Ft (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>26.4</td>
<td>22.7</td>
<td>36.5</td>
</tr>
<tr>
<td>5/32</td>
<td>1/16</td>
<td>1/16</td>
<td>225.8</td>
</tr>
</tbody>
</table>

---

### Swaged Wire Ropes

Tuf-Swaged™ Logging Ropes

If your application requires an even stronger rope, Tuf-Swaged® rope can lead to longer service life. These ropes are designed to resist abrasion and drum crushing in logging applications. The compact design with smoother wire surfaces allows you to spool a greater length of rope onto drums than an unswaged rope of comparable strength.
We offer 726 wire ropes for many applications that currently use 6x19 or 6x36 classification ropes. Their operating characteristics are similar in many ways to 6x36 classification ropes. Typical applications such as container cranes, logging portal cranes and sawmill carriages have reported increased service life with the 726 rope.

The 7 strand construction offers improved resistance to bending fatigue compared to a 6x26 due to a combination of the outer wire size and the seventh strand. These products are also available in a TUF-KOTE® option to further enhance their service characteristics.

### Galvanized Structural Strand & Bridge Rope

**Characteristics:** Less flexible but stronger with a higher modulus of elasticity. Usually supplied prestressed, cut-to-length and paint stripped. Polyethylene jacketing also available. **Typical Applications:** Main cables of suspension bridges; boom supports, guys and suspension cables on large suspension bridges. Roof supports for large buildings.

**Order Guide:** Galvanized Structural Strand is a special grade strand. It may be ordered in diameters from 1/2" thru 4-3/4"... the galvanized finishes shown in the table above... and in right or left lay.

Galvanized Structural Bridge Rope is a special grade, right lay regular lay rope manufactured of high strength, class A zinc-coated wires. It may be ordered in diameters from 1/2" thru 4"... in several construction and cores.

---

### Wire Rope

**Nominal Dia. of Strand (In.)**
- 3/8
- 1/2
- 5/8
- 7/8
- 1
- 1-1/8
- 1-1/4

**Approx. Wt./Ft.**
- 0.26
- 0.46
- 0.59
- 0.72
- 1.04
- 1.42
- 2.34
- 2.89

**Nominal Strength (Tons)**
- 7.55
- 13.3
- 16.8
- 20.6
- 29.4
- 39.8
- 65.0
- 79.9

**7 Strand Wire Ropes 726 Wire Ropes**

**TUF-KOTE® option to are also available in a**

**Furnished prestressed with 20 x 10^6 psi min modulus. Manufactured with Class A zinc coated, high strength wires.**

**Main supporting cables on short-span suspension bridges; suspension cables on large suspension bridges. Roof supports for large buildings.**

---

### Galvanized Wire Strand to ASTM A-475

<table>
<thead>
<tr>
<th>Nominal Dia. of Strand (In.)</th>
<th>Approx. Wt./Ft. (lbs)</th>
<th>Nominal Strength (Tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8</td>
<td>0.26</td>
<td>7.55</td>
</tr>
<tr>
<td>1/2</td>
<td>0.46</td>
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<td>16.8</td>
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<td>7/8</td>
<td>0.72</td>
<td>20.6</td>
</tr>
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<td>9/16</td>
<td>1.04</td>
<td>29.4</td>
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<tr>
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<td>1.42</td>
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<td>1-1/8</td>
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</tr>
<tr>
<td>1-1/4</td>
<td>2.89</td>
<td>79.9</td>
</tr>
</tbody>
</table>

---

### Galvanized Structural Strand & Bridge Rope

**Characteristics:** Less flexible than structural rope; but stronger with a higher modulus of elasticity. Usually supplied prestressed, cut-to-length and paint stripped. Polyethylene jacketing also available. **Typical Applications:** Main cables of suspension bridges; boom supports, guys and suspension cables on large suspension bridges. Roof supports for large buildings.

---

**Order Guide:** Galvanized Structural Strand is a special grade strand. It may be ordered in diameters from 1/2" thru 4-3/4", the galvanized finishes shown in the table above... and in right or left lay.

Galvanized Structural Bridge Rope is a special grade, right lay regular lay rope manufactured of high strength, class A zinc-coated wires. It may be ordered in diameters from 1/2" thru 4"... in several construction and cores.
Plastic Filled Valley Wire Rope

Key to PFV® Wire Rope's benefits lie in its exclusive patented fabrication. Standard, lubricated Macwhyte® Wire Rope is constructed in the extrusion process where the "gaps" (or valleys) between the individual rope strands are impregnated with a sealing thermoplastic material. Each strand "valley" (or interstice) in the finished rope is equally filled with plastic. The finished rope may have a thin "skin coating" of plastic but this has no significant effect on the outside diameter of the PFV rope or its serviceability.

Result: PFV® Wire Rope is balanced, sealed-lubricated wire rope that delivers exceptional performance and service life, particularly on applications that produce severe operating conditions such as: whipping, pining, slapping, scrubbing, poor spooling and heavy bearing pressure. Additional advantages of PFV® Wire Rope include increased spark resistance (to reduce chance of fire or combustion)... noise reduction... and higher strength.

Plastic Filled Valley Wire Rope has less strength than stainless steel but is widely used for applications where resistance to salt water and atmospheric corrosion is important. Its non-sparking characteristic is also advantageous.

Corrosion Resistant Cable

Materials Used

**Carbon Steel** (Aircraft Cable), normally galvanized, has the highest strength and greatest fatigue resistance. Also available with tin coating. This material is the most widely used for small-diameter cables.

**Galvanized Iron**, actually low carbon steel, is relatively soft and is suitable for light-duty applications. It is not a suitable grade for hoisting or for use over pulleys.

**Stainless Steel** - 18-8 grade is generally as strong as galvanized aircraft cable with added corrosion resistance to many substances. Type 302 is the standard alloy for cables. Molybdenum-bearing stainless steel (Type 316) for extra corrosion resistance and non-magnetic stainless steel (Type 305) are also available. Their strengths are 10 to 15% less than Type 302 cables.

**Phosphor Bronze** has less strength than stainless steel but is widely used for applications where resistance to salt water and atmospheric corrosion is important. Its non-sparking characteristic is also advantageous.

Corrosion Resistant Cable Specifications

<table>
<thead>
<tr>
<th>Dia. (in)</th>
<th>6X19 IWRC</th>
<th>6X37 IWRC</th>
<th>7-FLEX IWRC</th>
<th>19X7</th>
</tr>
</thead>
<tbody>
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<td>N.W.</td>
<td>N.S.</td>
<td>N.W.</td>
<td>N.S.</td>
</tr>
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<td>.11</td>
<td>.11</td>
</tr>
<tr>
<td>1/8</td>
<td>.10</td>
<td>.10</td>
<td>.10</td>
<td>.10</td>
</tr>
<tr>
<td>5/32</td>
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<td>7/32</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
</tr>
</tbody>
</table>

N.S. - Nominal Strengths are listed in Tons of 2,000 pounds.

NOTE: Nominal strengths apply only to new, unused PFV wire rope. Any performance specifications are conditional on proper rope size, construction, and grade; on proper design and maintenance of mechanical equipment on which wire rope products are used; and on proper storage, handling, use, maintenance and periodic inspection of such products during the period of use.

**1Wire Rope**
### Aircraft Cable
Preformed, made in accordance with commercial specifications military and federal specification rope available.

#### Carbon Steel (Aircraft Cable)
- Galvanized cable has the highest strength and greatest fatigue life of the materials offered. It has good to fair corrosion resistance in rural to industrial atmosphere environments. This material is most widely used for small diameter cables. Tin over galvanized cable offers greater corrosion resistance and reduced friction over pulleys.

#### Galvanized Iron (Low Carbon Steel)
- This is relatively soft and suitable for light-duty applications. Very good for seizing, but not recommended for hoisting or use over pulleys.

### Cable

#### 7 x 7 Galvanized Stainless Steel

<table>
<thead>
<tr>
<th>Dia. (in)</th>
<th>Approx. Wt 1000 Ft/lbs</th>
<th>Galvanized Min. Breaking Strengths (lbs)</th>
<th>Stainless Steel Min. Breaking Strength (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16</td>
<td>7.5</td>
<td>480</td>
<td>480</td>
</tr>
<tr>
<td>3/32</td>
<td>16.</td>
<td>920</td>
<td>920</td>
</tr>
<tr>
<td>1/8</td>
<td>25.5</td>
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<td>1,700</td>
</tr>
<tr>
<td>3/16</td>
<td>43.</td>
<td>2,600</td>
<td>2,600</td>
</tr>
<tr>
<td>1/4</td>
<td>62.</td>
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<td>3,700</td>
</tr>
<tr>
<td>3/8</td>
<td>106.</td>
<td>6,100</td>
<td>6,100</td>
</tr>
<tr>
<td>5/16</td>
<td>167.</td>
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<td>9,200</td>
</tr>
<tr>
<td>3/16</td>
<td>236.</td>
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<td>13,300</td>
</tr>
</tbody>
</table>

#### 7 x 19 Galvanized Stainless Steel

<table>
<thead>
<tr>
<th>Dia. (in)</th>
<th>Approx. Wt 1000 Ft/lbs</th>
<th>Galvanized Min. Breaking Strengths (lbs)</th>
<th>Stainless Steel Min. Breaking Strength (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/32</td>
<td>17.</td>
<td>1,000</td>
<td>920</td>
</tr>
<tr>
<td>1/8</td>
<td>29.</td>
<td>2,000</td>
<td>1,760</td>
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<tr>
<td>5/32</td>
<td>45.</td>
<td>2,800</td>
<td>2,000</td>
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<tr>
<td>3/16</td>
<td>65.</td>
<td>4,200</td>
<td>3,700</td>
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<tr>
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<td>86.</td>
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<td>5,000</td>
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<td>6,400</td>
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<tr>
<td>9/32</td>
<td>139.</td>
<td>8,000</td>
<td>7,000</td>
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<tr>
<td>5/16</td>
<td>173.</td>
<td>9,800</td>
<td>9,000</td>
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<tr>
<td>3/8</td>
<td>243.</td>
<td>14,400</td>
<td>12,000</td>
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</table>

#### 1 x 19 Galvanized Stainless Steel

<table>
<thead>
<tr>
<th>Dia. (in)</th>
<th>Approx. Wt 1000 Ft/lbs</th>
<th>Galvanized Min. Breaking Strengths (lbs)</th>
<th>Stainless Steel Min. Breaking Strength (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16</td>
<td>8.5</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>3/32</td>
<td>20.</td>
<td>1,200</td>
<td>1,200</td>
</tr>
<tr>
<td>1/8</td>
<td>35.</td>
<td>2,100</td>
<td>2,100</td>
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<tr>
<td>5/32</td>
<td>55.</td>
<td>3,300</td>
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<tr>
<td>3/16</td>
<td>77.</td>
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<tr>
<td>1/4</td>
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<td>300.</td>
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#### Vinyl Coated Galvanized Aircraft Cable

<table>
<thead>
<tr>
<th>Dia. (in)</th>
<th>Coated to (in)</th>
<th>Construction</th>
<th>Approx. Wt/Ft (lbs)</th>
<th>Min. Breaking Strength (lbs)</th>
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<td>3/16</td>
<td>7 x 7</td>
<td>32</td>
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<td>1/8</td>
<td>3/16</td>
<td>7 x 7</td>
<td>39</td>
<td>1,700</td>
</tr>
<tr>
<td>3/16</td>
<td>1/4</td>
<td>7 x 19</td>
<td>78</td>
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<tr>
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<td>7/16</td>
<td>7 x 19</td>
<td>272</td>
<td>14,400</td>
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</table>

#### Galvanized Extra High Strength Strand

<table>
<thead>
<tr>
<th>Nominal Dia. Strand (in)</th>
<th>No. of Wires in Strand</th>
<th>Approx. Wt of Strand lb/1000 ft</th>
<th>Min. Breaking Strength of Strand (lbs) Extra High Strength Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8</td>
<td>1 x 7</td>
<td>32</td>
<td>1,830</td>
</tr>
<tr>
<td>5/32</td>
<td>1 x 7</td>
<td>51</td>
<td>2,940</td>
</tr>
<tr>
<td>3/16</td>
<td>1 x 7</td>
<td>73</td>
<td>3,990</td>
</tr>
<tr>
<td>7/32</td>
<td>1 x 7</td>
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</tr>
<tr>
<td>1/4</td>
<td>1 x 7</td>
<td>121</td>
<td>6,650</td>
</tr>
<tr>
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</tr>
<tr>
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<td>205</td>
<td>11,200</td>
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<tr>
<td>3/8</td>
<td>1 x 7</td>
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<td>1 x 7</td>
<td>671</td>
<td>35,000</td>
</tr>
<tr>
<td>3/4</td>
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<td>1 x 19</td>
<td>1155</td>
<td>58,300</td>
</tr>
</tbody>
</table>
Stainless Steel Cables

Type 302/304 - Type 302/304 stainless steel is the standard alloy for cable. It has about the same strength as galvanized aircraft cable and much better corrosion resistance. It has excellent corrosion resistance in most industrial atmospheres, and good corrosion resistance in sea water and marine atmospheres. Type 302/304 also has very good corrosion resistance to many chemicals including nitric acid.

Type 305 - Type 305 has better corrosion resistance than Type 302 with 10-15% lower strength. This alloy is primarily used for nonmagnetic cable applications. When sufficiently cold worked, this alloy does not become magnetic.

Type 316 - Type 316 is the standard high corrosion resistant alloy for cable. It is resistant to many of the chemicals in the paper pulp, photographic, food processing and textiles industries. It has the best pitting resistance in marine use of the commonly used stainless steels. The breaking strength is 10-15% below Type 302. Excellent scale resistance allows its continuous use at temperatures up to 800°F.

Corrosion Resistance - Chromium in stainless steels is the primary reason for their corrosion resistance. The chrome protects the surface by quickly forming an impervious, tenacious oxide film. This acts as a protective barrier against attack. Nickel improves the oxide forming ability of chromium and also gives the stainless steel a broader range of corrosion resistance.

### Wire Rope

<table>
<thead>
<tr>
<th>Diameter (in)</th>
<th>Breaking Strength (lbs)</th>
<th>Wt (lbs)</th>
<th>M Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16</td>
<td>500</td>
<td>8.5</td>
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</tr>
<tr>
<td>5/32</td>
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<tr>
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<td>6000</td>
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<td></td>
</tr>
<tr>
<td>7/32</td>
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</tr>
<tr>
<td>9/32</td>
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<td>220.0</td>
<td></td>
</tr>
<tr>
<td>5/16</td>
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<td>340.0</td>
<td></td>
</tr>
<tr>
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</tr>
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<tr>
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### Cable

<table>
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<tr>
<th>Diameter (in)</th>
<th>Breaking Strength (lbs)</th>
<th>Wt (lbs)</th>
<th>M Feet</th>
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<tbody>
<tr>
<td>1/16</td>
<td>480</td>
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</tr>
<tr>
<td>1/8</td>
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<td>220.0</td>
<td></td>
</tr>
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### 3 x 3 Wire Rope

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<th>Wt (lbs)</th>
<th>M Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/16</td>
<td>500</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>5/32</td>
<td>3000</td>
<td>55.0</td>
<td></td>
</tr>
<tr>
<td>3/16</td>
<td>6000</td>
<td>110.0</td>
<td></td>
</tr>
<tr>
<td>7/32</td>
<td>9000</td>
<td>167.0</td>
<td></td>
</tr>
<tr>
<td>9/32</td>
<td>12000</td>
<td>220.0</td>
<td></td>
</tr>
<tr>
<td>5/16</td>
<td>15600</td>
<td>340.0</td>
<td></td>
</tr>
<tr>
<td>3/8</td>
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</tr>
<tr>
<td>7/16</td>
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<tr>
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<td>30000</td>
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<td>9/16</td>
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<tr>
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### 6 x 7 Wire Rope

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<th>Wt (lbs)</th>
<th>M Feet</th>
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</thead>
<tbody>
<tr>
<td>1/16</td>
<td>500</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>5/32</td>
<td>3000</td>
<td>55.0</td>
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</tr>
<tr>
<td>3/16</td>
<td>6000</td>
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<tr>
<td>7/32</td>
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</tr>
<tr>
<td>5/16</td>
<td>15600</td>
<td>340.0</td>
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<td>5/8</td>
<td>47000</td>
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</table>
Other Alloys
Phosphor Bronze - Has less strength than stainless steel, and is often used in marine applications. It will tarnish, but has good corrosion resistance to saltwater. Bronze cable is also used for antenna applications. Its non-sparking property is advantageous in hazardous locations. Grade E is the standard material for phosphor bronze cables. When Federal Specification RR-M-1016 is called for, Grade A Bronze material is required. Monel - Has a slightly higher strength than phosphor bronze and has very good corrosion resistance to many chemicals that attack stainless steels. Monel is used in hydrofluoric acid, caustic solutions and high velocity seawater applications.

Specialty Alloys - Other grades of stainless steel, inconel or other alloys are available for cable production, where unusual factors justify their manufacture. Inquire for price, availability, and delivery.

<table>
<thead>
<tr>
<th>Diameter (In)</th>
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<th>Wt (lbs) M Feet</th>
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Coated Cable

The coating of cables with nylon or other plastic offers a number of advantages. It lengthens the life of a cable by protecting the wires from abrasion; it seals in cable lubricant and seals out dirt, grit and moisture. It protects pulleys and drums from abrasion. It also protects hands, clothing, fabrics or other soft materials which may come in contact with or be used in conjunction with cable. Nylon is the strongest and toughest coating material. It is available in several grades, depending on whether flexibility, toughness, hardness, outdoor exposure, high or low temperature or chemical resistance is the primary consideration. Vinyl coatings offer additional advantages. Generally, compared with nylon, they are more flexible, have better resistance to sunlight and are less expensive. Mechanically, however, their uses are somewhat more limited.

<table>
<thead>
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<th>Diameter (In)</th>
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<th>Wt (lbs) M Feet</th>
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Extra-Quality NYLON-COATED Stainless Steel Cable*

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<tr>
<th>Dia. Bare Cable</th>
<th>Dia. Nylon O.D. Construction</th>
<th>Strength (lbs)</th>
<th>Wt (lbs) 1000 ft</th>
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</tr>
<tr>
<td>1/4</td>
<td>3/8</td>
<td>7 x 19</td>
<td>6400</td>
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</tbody>
</table>
Glossary

ABRASION Frictional surface wear on the wires of a wire rope.

ACCELERATION STRESS The additional stress that is imposed on a wire rope as a result of an increase in the load velocity.

AGGREGATE STRENGTH The strength derived by totalling the individual breaking strengths of the elements of the strand or rope. This strength does not recognize the upper limit of strength resulting from the angularity of the elements in the rope, or other factors that may affect efficiency.

AIRCRAFT CABLES Strands, cords and wire ropes made of high-strength wire, designed primarily for use in various aircraft industry applications.

AREA, METALLIC Sum of the cross-sectional areas of all the wires either in a wire rope or in a strand.

BAIL a) U-shaped member of a bucket, or b) U-shaped portion of a socket or other fitting used on wire rope.

BASKET OF SOCKET The conical portion of a socket into which a broomed-rope-end is inserted and then secured.

BECKET An end attachment to facilitate wire rope installation.

BECKET LOOP A loop of small rope or strand fastened to the end of a larger wire rope. Its function is to facilitate wire rope installation.

BENDING STRESS Stress that is imposed on the wires of a strand or rope by a bending or curving action.

BIRDCAVE A colloquialism descriptive of the appearance of a wire rope forced into compression. The outer strands form a cage and, at times, displace the core.

BLOCK A term applied to a wire rope sheave (pulley) end with two eyes and fitted with some attachment such as a hook or shackles.

BOOM HOIST LINE Wire rope that operates the boom hoist system of derricks, cranes, draglines, shovels, etc.

BOOM PENDANTS A non-operating rope or strand with end termination to support the boom.

BREAKING STRENGTH Breaking Strength is the ultimate load at which a tensile failure occurs in the sample of wire rope being tested. (Note: The term breaking strength is synonymous with actual strength.) Minimum Acceptance Strength is that strength which is 2-1/2% lower than the catalog or nominal strength. This tolerance is used to offset variables that occur during a sample preparation and actual physical test of a wire rope. Nominal Strength is the published (catalog) strength calculated by a standard procedure that is accepted by the wire rope industry. The wire rope manufacturer designs wire rope to this strength, and the user should consider this strength when making design calculations.

BRIDGE CABLE [Structural Rope or Strand] The all-metallic wire rope or strand used as the catenary and suspenders on a suspension bridge.

BRIDGE SOCKET A wire rope or strand end termination made of forged or cast steel that is designed with baskets-having-adjustable-bolts-for securing rope ends. There are two styles: 1) the closed type has a U-bolt with or without a bearing block in the U of the bolt, and 2) the open type has two eye-bolts and a pin.

BRIGHT ROPE Wire rope fabricated from wires that are not coated or drawn.

CABLE A term loosely applied to wire rope, wire strand and electrical conductors.

CABLE- LAID WIRE ROPE A type of wire rope consisting of several wires laid together in a single wire rope, (e.g., 6x42 [6x6x7] tiler rope).

CABLE TOOL DRILLING LINE The wire rope used to operate the cutting tools in the cable tool drilling method (i.e., rope drilling).

CENTER The axial member of a strand about which the wires are laid.

CHOKER ROPE A short wire rope sling that forms a slip noose around an object that is to be moved or lifted.

CLASSIFICATION Group, or family designation based on wire rope constructions with common strengths and weights listed under the broad designation.

CLIP Fitting for clamping two parts of wire rope to each other.

CLOSED SOCKET A wire rope end termination consisting of basket and bail made integral.

CLOSER A machine that lays strands around a core to form rope.

CLOSING LINE Wire rope that performs two functions: 1) closes a clamshell or orange peel bucket, and 2) operates as a hoisting rope.

COIL Circular bundle or package of wire rope that is not affixed to a reel.

CONSTRUCTION Geometric design description of the wire rope’s elements includes the number of STRANDS, the number of WIRES per strand and the pattern of wire arrangement in each STRAND.

CONSTRUCTIONAL STRETCH The stretch that occurs when the rope is loaded-is due to the helically laid wires and strands creating a constricting action that compresses the core and generally brings all of the rope’s elements into close contact.

CORE The axial member of a wire rope about which the strands are laid.

CORROSION Chemical decomposition of the wires in a rope through the action of moisture, acids, alkalines or other destructive agents.

CORROSION-RESISTING STEEL Chrome-nickel steel alloys designed for increased resistance to corrosion.

CORRUGATED Term used to describe the grooves of a SHEAVE or DRUM after these have been worn down to a point where they show an impression of a wire rope.

CREEP The unique movement of a wire rope with respect to a drum surface or sheave surface resulting from the asymmetrical load between one side of the sheave (drum) and the other. It is not dissimilar to the action of a caterpillar moving over a flat surface. It should be distinguished from slip which is yet another type of relative movement between rope and the sheave or drum surface.

CROWD ROPE A wire rope used to drive or force a power shovelf bucket into the material that is to be handled.

DEAD-LINE In drilling, it is the end of the rotary drilling line fastened to the anchor or dead-line clamp.

DECLERATION STRESS The additional stress that is imposed on a wire rope as a result of a decrease in the load velocity.

DESIGN FACTOR In a wire rope, it is the ratio of the nominal strength to the total working load. The term “factor of safety” is no longer used since it implies a permanent existence for this ratio when, in actuality, the rope strength begins to reduce the moment it is placed in service. See DESIGN FACTOR.

DESTRUCTION The treatment at the end or ends of a length of wire rope, usually made by forming an eye or attaching a fitting and designed to be the permanent end termination on the wire rope that connects it to the load.

ENDLESS ROPE Rope with ends spliced together to form a single continuous loop.

EQUALIZING SHEAVE The sheave at the center of the rope system over which no rope movement occurs other than equalizing movement. It is frequently overlooked during crane inspections, with disastrous consequences. It can be a source of severe degradation.

EXTRA IMPROVED PLOW, STEEL ROPE A specific wire rope grade.

EYE OR EYE SPLICE A loop, with or without a thimble, formed at the end of a wire rope.

FACTOR OF SAFETY In the wire rope industry, this term was originally used to express the ratio of nominal strength to the total working load. The term is no longer used since it implies a permanent existence for this ratio when, in actuality, the rope strength begins to reduce the moment it is placed in service. See DESIGN FACTOR.

FATIGUE As applied to wire rope, the term usually refers to the process of progressive fracture resulting from the bending of individual wires. These fractures may and usually do occur at stresses well below the ultimate strength of the material; it is not an abnormality although it may be accelerated due to conditions in the rope such as rust or lack of lubrication.

FIBER CENTER Cord or rope of vegetable or synthetic fiber used as the axial member of a strand.

FIBER CORE Cord or rope of vegetable or synthetic fiber used as the axial member of a strand.

FILLER WIRE Small spacer wires within a strand which help position and support other wires. Also the name for the type of strand pattern utilizing filler wires.

FITTING Any functional accessory attached to a wire rope.

FLAT ROPE Wire rope that is made of a series of parallel, alternating right-lay and left-lay ropes, sewn together with relatively soft wires.

FLATTENED STRAND ROPE Wire rope that is made either of oval or triangular shaped strands in order to form a flattened rope surface.

FLEET ANGLE That angle between the rope’s position at the extreme end wrap on a drum, and a line drawn perpendicular to the axis of the drum through the center of the nearest fixed sheave. See DRUM and SHEAVE.

GALVANIZED Zinc coating for corrosion resistance.

GRADE Wire rope or strand classification by strength and/or type of material, i.e., Improved Plow Steel, Type 302 Stainless, Phosphor Bronze, etc. It does not imply a strength of the basic wire used to meet the general requirements of a grade.

GRADES, ROPE Classification of wire rope by the wire’s metallic composition and the rope’s nominal strength.

GROMMET An endless circle or ring fabricated from the continuous lay strand of a wire rope.

GROOVED DRUM Drum with a grooved surface that accommodates the rope and guides it for proper winding.

GROOVED DEPRESSIONS-Helical or parallel-in the surface of a sheave or drum that are shaped to position and support the rope.

GUIDE LINE Strap or rope, usually galvanized, for stabilizing or maintaining a structure in fixed position.

HAULAGE ROPE Wire Rope used for pulling movable devices such as cars that roll on a track.

HAWSER Wire rope, usually galvanized, used for towing or mooring marine vessels.

HOLDING LINE Wire rope on a clamshell or orange peel bucket that suspends the bucket while the closing line is released to dump its load.

IDLER Sheave or roller used to guide or support a rope.
**Glossary**

**Wire Rope**

**IMPROVED PLOW STEEL ROPE** A specific grade of wire rope.

**INDEPENDENT WIRE ROPE CORE (IWRC)** A wire rope used as the axial member of a larger wire rope.

**INNER WIRES** All wires of a strand except the outer or cover wires.

**INTERNALLY LUBRICATED** Wire rope or strand having all of its wire components coated with lubricants.

**KINK** A unique deformation of a wire rope caused by a loop of rope being pulled down tight. It represents irreparable damage to and an indeterminable loss of strength in the rope.

**LAGGING a)** External wood covering on a reel to protect the wire rope or strand, or b) the grooved shell of a drum.

**LAY a)** The manner in which the wires in a strand or the strands in a rope are helically laid, or b) the distance measured parallel to the axis of the rope (or strand) in which a strand (or wire) makes one complete helical convolution about the core (or center). In this connection, lay is also referred to as LAY LENGTH or PITCH.

**LAY TYPES**

1) **Right Lay**: The direction of strand or wire helix corresponding to that of a right hand screw thread.

2) **Left Lay**: The direction of strand or wire helix corresponding to that of a left hand screw thread.

3) **Cross Lay**: Rope or strand in which one or more operations are performed in opposite directions. A multiple operation product is described according to the place of lay.

4) **Regular Lay**: The type of rope wherein the lay of the wires in the strand is in the opposite direction to the lay of the strand in the rope. The crowns of the wires appear to be parallel to the axis of the rope.

5) **Lang Lay**: The type of rope in which the lay of the wires in the strand is in the same direction as the lay of the strand in the rope. The crowns of the wires appear to be at an angle to the axis of the rope.

6) **Alternate Lay**: Lay of a wire rope in which the strands are alternately regular and lang lay.

7) **Alberts Lay**: An old, rarely used term for lang lay.

8) **Reverse Lay**: Another term for alternate lay.

9) **Spring Lay**: This is not definable as a unique lay; rather, it is a modification of alternately large and small wires.

**NON-PREFORMED** Rope or strand that is not pre-formed. See PREFORMED STRANDS and PREFORMED ROPE.

**NON-ROTATING WIRE ROPE** Term, now aban-doned, referring to 19 x 7 or 18 x 7 rope.

**NON-SPINNING WIRE ROPE** See ROTATION RESISTANT ROPE.

**OPEN SOCKET** A wire rope fitting that consists of a basket and two ears with a pin. See FITTING.

**OUTER WIRES** Outermost wires or strands of a rope.

**PEENING** Permanent distortion resulting from cold plastic metal deformation of the outer wires. Usually caused by pounding against a sheave or machine member, or by heavy operating pressure between rope and sheave, rope and drum, or rope and adja-cent wrap of rope.

**PLOW STEEL ROPE** A specific grade of wire rope.

**PREFORMED STRAND** Strand in which the wires are permanently formed during fabrication into the helical shape they will assume in the strand.

**PREFORMED WIRE ROPE** Wire rope in which the strands are permanently formed during fabrication into the helical shape they will assume in the wire rope.

**PRESTRESSING** An incorrect reference to PRE-STRETCHING.

**PRE-STRETCHING** Subjecting a wire rope or strand to tension prior to its intended application, for an extended period of time sufficient to remove most of the CONSTRUCTIONAL STRETCH.

**PROPORTIONAL LIMIT** As used in the rope industry, this term means the same as ELASTIC LIMIT. It is the end of the load versus elongation relationship at which an increase in load no longer produces a proportional increase in elongation and from which point recovery to the rope’s original length is unlikely.

**RATED CAPACITY** The load which a new wire rope or rope sling may handle under given operating conditions and at an assumed DESIGN FACTOR.

**REEL** A flanged spool on which wire rope or strand is wound for storage or shipment.

**REEVE** To pass a rope through a hole or around a system of sheaves.

**RESERVE STRENGTH** The strength of a rope exclusive of the outer wires.

**REVERSE BEND** Reeling a rope over sheaves and drums so that it bends in opposing directions.

**ROLLERS** Relatively small-diameter cylinders, or wide-faced sheaves, that serve as support for ropes.

**ROTARY LINE** On a rotary drilling rig, it is the wire rope used for raising and lowering the drill pipe, as well as for controlling its position.

**ROTATION-RESISTANT ROPE** A rope wire consisting of an inner layer of strand laid in one direction covered by a layer of strand laid in the opposite direction. This has the effect of counteracting torque by reducing the tendency of finished rope to rotate.

**ROUND-WIRE TRACK STRAND** Strand composed of concentric layers of round WIRES, used as TRACK CABLE.

**SAFE WORKING LOAD** This term is potentially misleading and is, therefore, in disfavor. Essentially, it refers to that portion of the nominal rope strength that can be applied either to move or sustain a load. It is misleading because it is only valid when the rope is new and equipment is in good condition. See RATED CAPACITY.

**SAND LINE** In well drilling, it is the wire rope that operates the bailer that removes water and drill cuttings.

**SEAL** The name for a type of strand pattern that has two adjacent layers laid in one operation with any number of uniform sized wires in the outer layer and with the same number of uniform but smaller sized wires in the inner layer.

**SEIZE** To make a secure binding at the end of a wire rope or strand with SEIZING WIRE or SEIZING STRAND.

**SERVE** To cover the surface of a wire rope or strand with a fiber cord or wire wrapping.

**SHACKLE** A U-or anchor-shaped fitting with pin.

**SHEAVE** A grooved pulley for wire rope.

**SLING, WIRE ROPE** An assembly fabricated from WIRE ROPE which connects the load to the lifting device.

**SLING, BRAided** A flexible sling, the body of which is made up of two or more WIRE ROPES braided together. See SLINGS.

**SMOOTH-FACED DRUM** Drum with a plain, ungrooved surface. See DRUM.

**SOCKET** Generic name for a type of wire rope fitting.

**SPIN RESISTANT** An abandoned term referring to a ROTATION-RESISTANT rope of the 8 x 19 classification.

**SPIRAL GROOVE** A continuous helical groove that follows a path on and around a drum face, similar to a screw thread. See DRUM.

**SPlicing** 1) Making a loop or eye in the end of a rope by tucking the ends of the strands back into the main body of the rope.

2) Formation of loops or eyes in a rope by means of mechanical attachments pressed onto the rope.

3) Joining of two rope ends so as to form a long or shorter rope.

**STAINLESS STEEL ROPE** Wire rope made up of corrosion resistant steel wires.

**STRAND** A plurality of round or shaped wires helically laid about an axis.

**STRANDER** A machine that lays wires together helically to form a strand.

**STRESS** The force or resistance within any solid body against alteration of form; in the case of a solid wire it would be the load on the rope divided by the cross-sectional area of the wire.

**STRETCH** The elongation of a wire rope under load.

**SWAGED FITTING** Fitting into which wire rope can be inserted and then permanently attached by cold drawing (swaging) the shank that encloses the rope.

**TAG LINE** A small wire rope used to prevent rotation of a load.

**THIMBLE** Grooved metal fitting to protect the eye, or fastening loop of a wire rope.

**TRACK CABLE** On an aerial system it is the suspended wire rope or strand along which the carriers move.

**TRACTION ROPE** On an aerial conveyor or haulage system it is the wire rope that propels the conveyor.

**TRACTION STEEL ROPE** A specific grade of wire rope.

**TRAMWAY** An aerial conveying system for transporting multiple loads.

**TURN** Synonymous with the term WRAP; it signifies a single wrap around a drum.

**WARRIINGTON** The name for a type of strand pattern that is characterized by having one of its wire layers (usually the outer) made up of an arrangement of alternately large and small wires.

**WEDGE SOCKET** Wire rope fittings wherein the rope end is secured by a wedge.

**WIRE (ROUND)** A single, continuous length of metal, with a circular cross-section that is cold-drawn from rod.

**WIRE ROPE** A plurality of wire strands helically laid about an axis.

**WIRE STRAND CORE (WSC)** A wire strand used as the axial member of a wire rope.

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