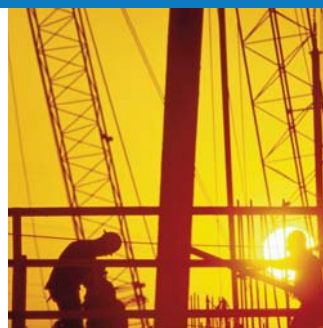


CRANE WIRE ROPE

Installation and Inspection Guide

[How to order](#) | [How to install mobile crane ropes](#) | [How to inspect](#)



Brought to you in cooperation with Python America



Criteria Required to order Wire Rope

When you ask your supplier for a wire rope these are the criteria required you must communicate:

Diameter:

Must be given in either metric or imperial, e. g. 14mm or 9/16". Do NOT convert metric to imperial or vice versa yourself. Look in your crane book and use the OEM stated size.

Construction or Class

This is the construction of wire rope which takes the form of # of outer strands x # of wires per strand, e.g. 6x36 or 35x7. There are many types and it is important to understand the difference between class and construction. For example, if you ask for 6x19 wire rope, any construction within this class, 6x19, 6x25, 6x26, is acceptable for your supplier to ship to you. If you want a particular CONSTRUCTION you MUST specify the exact type.

Grade:

This is the tensile grade of the wires used to make the wire rope and is designated as follows:

IPS (Improved Plow Steel)	or	1770 N/mm ²	or	Grade 110/120
EIPS (Extra Improved Plow Steel)	or	1960 N/mm ²	or	Grade 115/125
EEIPS (Extra Extra Improved Plow Steel)	or	2160 N/mm ²	or	Grade 130/140

Core Type:

IWRC (Independent Wire Rope Core) or **FC** (Fiber Core)

Lay Direction / Lay Type:

Lay direction is either left or right and the type can be lang(s) or regular lay. It will be written as follows:

RRL = Right Regular Lay
LRL = Left Regular Lay
LLL = Left Lang Lay
RLL = Right Lang Lay

In some instances the international designation will be used: These are equivalent to N.A. designations as follows:

Right Regular Lay = sZ
Left Regular Lay = zS
Left Lang Lay = sS
Right Lang Lay = zZ
Alternate Lay = A

Finish

Bright or Galvanized

Installation of Wire Rope

Foreword

In order to fully achieve the service life potential of high performance and standard wire rope for demanding crane jobs these step by step instructions should be followed. They are intended to prevent rope damage caused by kinks, untwisting, and loose strands, during handling and installation.

We realize that the 'real world' is not perfect. This applies also to wire rope installation.

It is impossible to cover ALL imaginable installation situations, location difficulties, and crane set ups. You will also find that these instructions are not very different from the installation procedures of traditional style 6-strand or 19x7 ropes. Many experienced Riggers may find some of the following "old hat". If you notice any omissions or have ideas that we can incorporate into this brochure we will be most appreciative.

For a complete version of our Inspection-, Handling-, Installation-, and Instruction Guide please e-mail us at pythonrope@aol.com

If you have to field cut a rope

Usually, you do not need to re-cut a wire rope. However, you may encounter situations where it becomes necessary to shorten the rope.

In cutting any wire rope special care **MUST** be taken in seizing the rope end.

Two methods are suggested:

- 1) Seizing the rope end with soft iron wire.
- 2) Seizing the rope end with hose clamps.

After cutting the rope it is good practice to braze or weld the rope ends to ensure that they don't unravel. Leave the seizing on the rope for added holding strength. Be careful not to damage the seizing while brazing.

Cutting a rope with a torch may result in both uneven ends and damage to the seizing causing the strands to open up.

Rope diameter up to 14 mm (9/16") may be cut with a FELCO C16 hand cutter.



After attaching 3 hose clamps on either side of the cut mark, blade cut the rope.



Do not use a grinding wheel but a steel cutting blade; e.g. Elastic # 80EHT230-2.



After blade cutting mount upright in a vice



Carefully melt and fuse together all individual wires.



Properly fused wire rope end. If not damaged during the fusing procedure clamps shall be left attached to the rope.



If hose clamps got damaged or are too bulky for the installation you need to replace all 3 of them with a wire seizing.



In comparison, these are factory fused and tapered ends done with a specialized machine.

Unreeling of Wire Rope

When removing the rope from the shipping reel or coil, the reel or coil **MUST** rotate as the rope unwinds. Any attempt to unwind a rope from stationary reel or coil **WILL** result in a kinked rope that is ruined beyond repair.

The following illustrations demonstrate the right and wrong way of unreeling a rope.

Special care must be taken **not** to drag the rope over obstacles, over a deflection shaft, or around corners.

Avoid large fleet angles between the shipping reel and the first sheave. The rope may roll in the sheave causing the rope to unlay. This is particularly important for all DoPar-, langs lay, and non-rotating rope constructions.

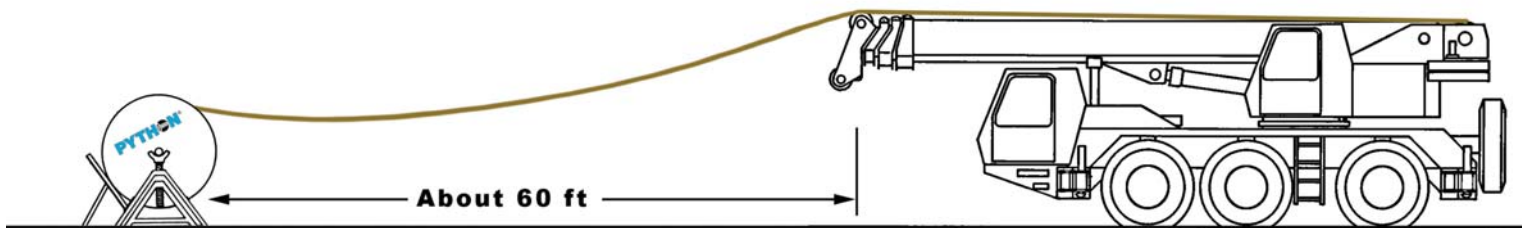
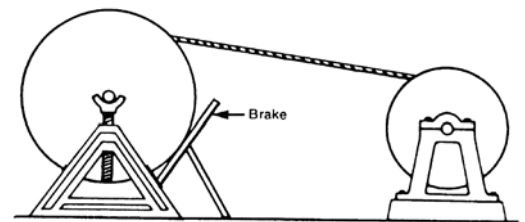
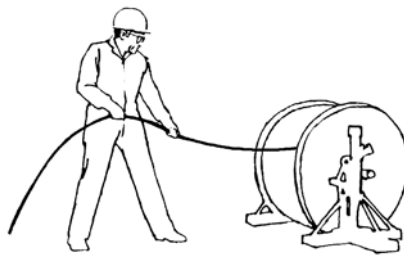
Avoid reeving the rope through small deflection sheaves and avoid changing the plane from vertical to horizontal direction.

If you have to unspool large and heavy wire rope, use a brake to keep a slight tension on the rope. **NEVER** let the rope go slack and form loops.

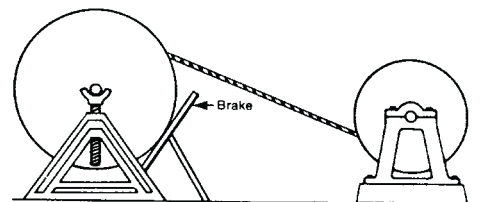
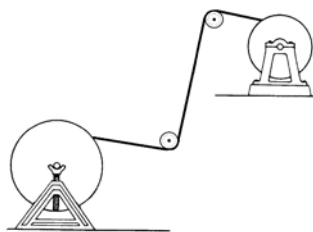
All of these precautions apply to high performance as well as to standard 6-strand-, 19x7, 19x19, and 34x7 wire ropes.

If in doubt, contact your nearest factory authorized wire rope distributor.

RIGHT



WRONG



Measuring the rope diameter

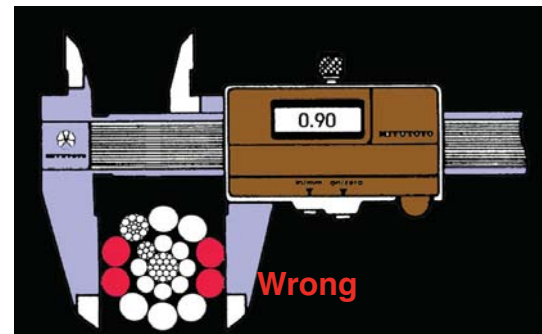
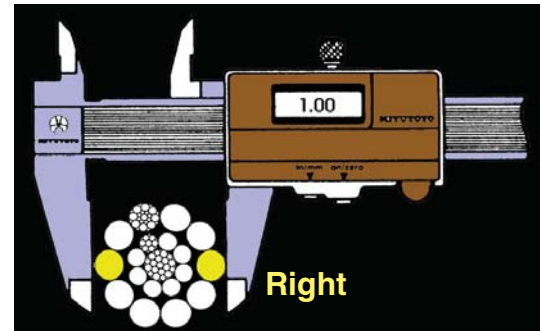
Before you start anything, make sure the diameter of the new rope you are about to install is the correct one for your crane.

Remember that most wire ropes measure slightly over their nominal diameter. Wire rope is allowed to measure up to 5% over it's nominal diameter however, some drum systems (e.g. Lebus) require a tighter tolerance (see below).

Keep a record of the new rope diameter for future references. You will be asked to determine how much the rope diameter has decreased in service and you MUST know the ACTUAL diameter of the wire rope after the break in period.

When measuring the rope, don't measure the layer on the reel. Pull a couple of feet off the reel and measure the rope when straight. It is advisable to take 4 measurements of the rope round it's axis and average the results.

If the rope is used on multiple layer drums with a 'Lebus' or 'parallel' lagging system the rope diameter should have an oversize tolerance of between 2% and 3%.



Use of Cable Grips

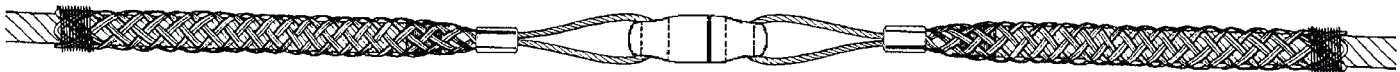
The most common method to install a wire rope. The type of cable grip depends on the rope type and construction.

Non-rotating rope should be installed with a swivel between old and new ropes. The old rope may have developed torque during it's working life and we must ensure that this torque is not transferred to the new rope.



When using cable grips, the end of the grips have to be tightly seized on to the rope body to prevent accidental slip-out of the rope. Alternately, you may wrap the grip end with a strong reinforced industrial strength adhesive tape.

Two cable grips with eye, connected to two ropes with a swivel. Use with non-rotating rope.



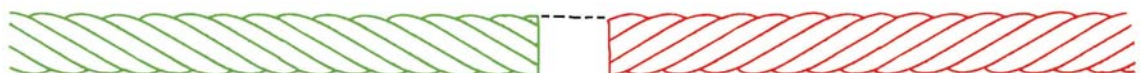
Two cable grips with eye, connected to two ropes with a suitable length of fiber rope or a rope sling.



Open-end cable grip connected to two ropes. Most common for light ropes.



NEVER attach a RIGHT hand lay rope to a LEFT hand lay rope



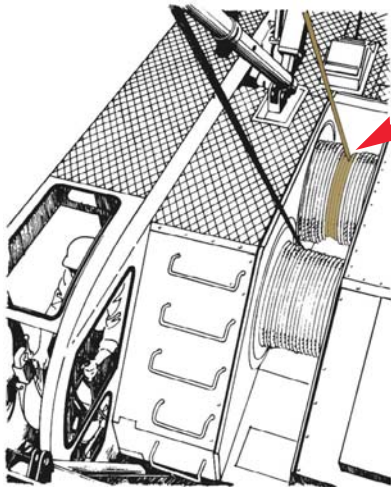
Winding the Rope onto the Drum

Today, nearly all mobile cranes spool the rope in multiple layers onto a grooved drum. After installation it is very important to apply a sufficient pre-tension (5-10% of the rope's WLL is a good measure). If wound with no tension at all, the rope is subjected to premature crushing and flattening caused by the 'under load' top layers.

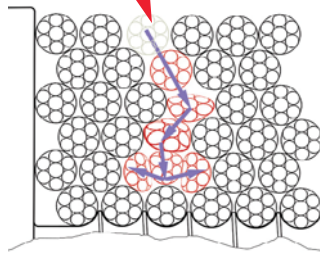
If the first layer, or layers, are only used from time to time, they will loose their tension on the drum and start to flatten out due to the high pressures of the loaded layers. Repeat this pre-tensioning procedure regularly.

Whatever you do, **DO NOT** run the rope through a 'tightening' device (see picture), e.g. two wooden blocks clamped together. **YOU WILL DESTROY THE ROPE !**

Note: If your crane does have a 'smooth-' or 'flat' faced drum please ask for our detailed instructions.

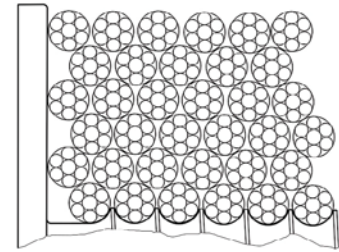


The rope has 'pulled-in' between the lower wraps. Most often this happens when a 'slack' line was spooled and the next 'heavy' lift was spooled on top of such 'slack' wraps.

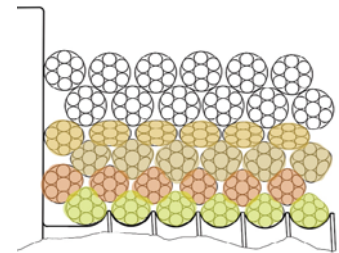


The lower layers have collapsed, got pushed sideways allowing the upper wraps to fill this gap ... the rope has 'pulled-in'.

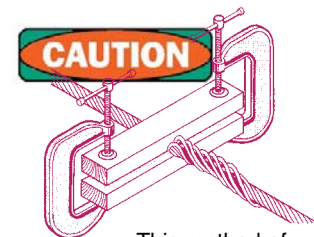
Proper rope pre-tensioning between light- and heavy lifts will minimize such spooling problems.



Rope is installed with proper pre-tension onto the drum. All layers are 'hard' wound and retain their round shape.



The first 4 layers have lost their tension and begin to deform and get crushed by the 'hard' wound top layers. Regular pre-tensioning of ALL layers will minimize the crushing effect.



CAUTION
This method of tightening the rope on to the drum **WILL** destroy the rope.

Break-in Period Tensioning Rope Windings

After installing the rope and with the boom fully extended run the rope through its operating cycle several times under light load and at reduced speed. Repeat this with increasing load and speed a couple of times. This allows the rope to adjust itself to the working conditions and enable all strands and wires to become seated.

Make sure you unspool the entire rope length down to the 3 safety wraps to pre-tension or pre-tightening the rope to 5-10% of the rope's WLL. This may also be required after the crane has been working using only a portion of the rope length.

Ideally, you should disconnect the rope end after the break-in-period to allow any possible torque and twists which may have developed during installation and the break-in-period to be released at the end connection. When using non-rotating high performance wire rope constructions you may want to ask your rope supplier if it is permitted to install a swivel between the rope end connection and the crane.

There are several reasons why a sheave block starts to rotate around itself.

- a: Odd-part reeving is much less stable than even part reeving; e.g. a 3-part line reeve is less stable than a 4-part line reeve.
- b: During rope installation torque or twist was introduced into the rope.
- c: For the lifting height the chosen rope type is not rotation resistant enough.
- d: Sheaves which are too tight and/or fleet angles are too large.

Relieving the rope twist when using non-rotating wire rope:

Method A)

Disconnect the rope end and rotate the rope end in the OPPOSITE direction of the block twist. If the block twisted 1/2 revolution (as in the illustration) rotate the rope end 180°. If the block twisted 3 full revolutions rotate the rope end 3 times around itself. Re-attach the rope end and run the rope (with no load attached) through the entire reeving to distribute the counter-turns.

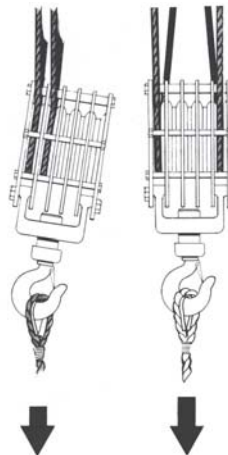
Method B)

If you use high performance rope constructions AND your rope supplier allows the use of a swivel you can install a one between the rope end fitting and the crane boom. A swivel will aid in relieving any possible twist. Once the twist is taken out of the rope you may lock the swivel, remove it entirely, or leave it permanently installed.



Block Tilting

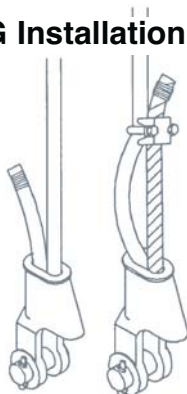
Block tilting results in increased rope fleet angle causing rope rotation and thus block twisting; aside from severe sheave wear. Multipart lines should be reeved symmetrically to avoid tilting.



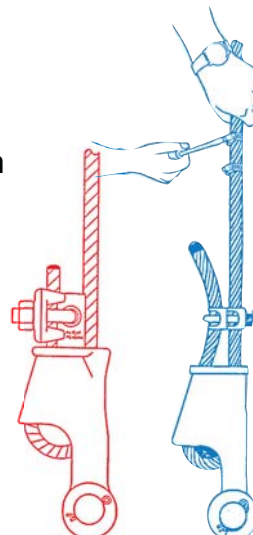
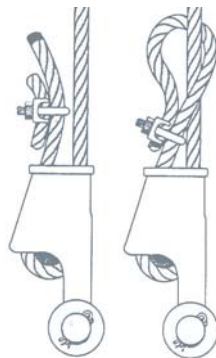
Wedge Socket Installation

Make sure the LOAD end of the rope is installed in line with the pin; that is the STRAIGHT portion of the socket bowl. The 'Terminator' style wedge socket (red) is a preferred method.

WRONG Installation



RIGHT Installation



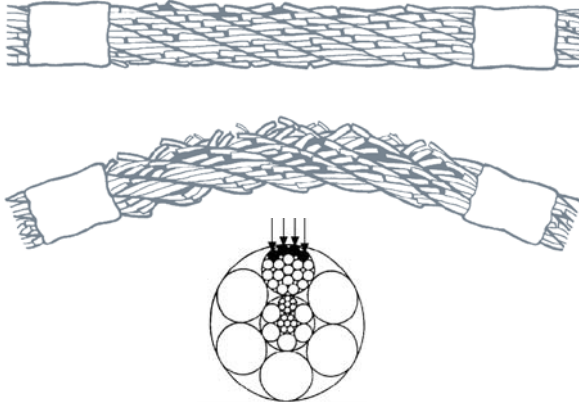
Non-Rotating Ropes

Attach hose clamp to all rotation-resistant and non-rotating wire rope to prevent any slack caused by the socket installation of outer- or inner strands from travelling along the entire rope length

Inspection of Wire Rope

Under normal operating conditions single wires will break due to material fatigue on the **CROWN** of a strand. **ALL wire rope removal/retirement criteria are based on FATIGUE wire breaks located at the CROWN of a strand.** Tables see next page.

CROWN Fatigue Wire Breaks



Example: Severe crown wire breaks on a 10-strand overhead crane wire rope. Crown breaks originate at the **OUTSIDE** of the rope at the contact point between rope and sheave/drum.

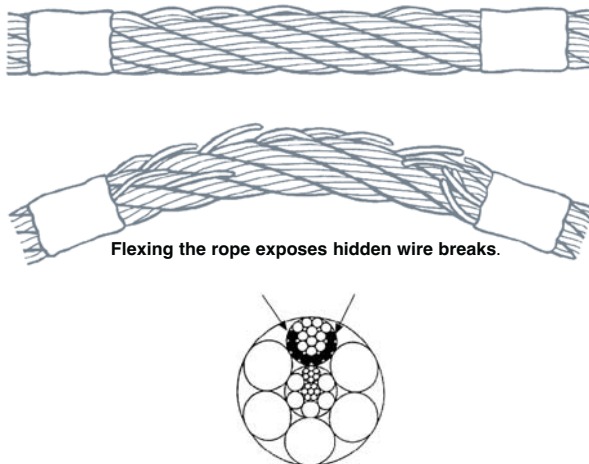


Crown wire breaks on a Python® Lift non-rotating wire rope

DANGER

Remove wire rope from service if even if you detect a **SINGLE valley wire break ONLY**. Valley breaks hide internal wire failures at the core or at the contact between strand and core.

VALLEY Wire Breaks

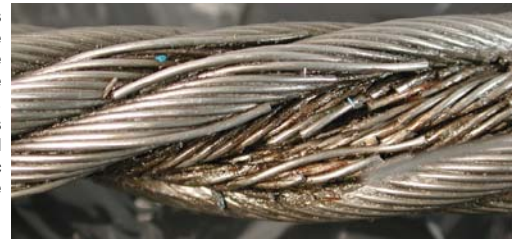


Flexing the rope exposes hidden wire breaks.



Example: Valley wire breaks on a 8-strand overhead crane wire rope

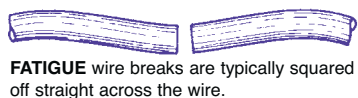
Valley breaks originate **INSIDE** the rope. Condition of the inner strands of the same rope as above. The core has completely failed and imminent catastrophic rope failure will be the result.



A single valley wire break on a 19x7 rotation resistant rope.



Condition of core under that same single valley break. Note the extreme notching of individual wire and the countless wire breaks. Such a condition is hidden under just a single (1) valley break !



FATIGUE wire breaks are typically squared off straight across the wire.



TENSILE wire breaks are characterized by their typical 'cup and cone' appearance.

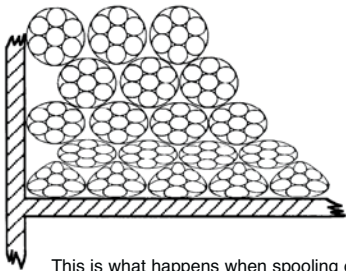


On the right and left a typical cut -and-cone break pattern. The wires in the center of the photo are a combination of fatigue and shear break.

Inspection of Wire Rope



These 3 picture show what happens when you connect a left-lay rope to a right-lay rope, as done with this boom pendant extension. Both ropes are opening up to the point where the strands are nearly parallel to each other; they completely untwisted themselves and developed excessive wire breaks.



This is what happens when spooling on multiple layer drums was not properly tensioned.



The result of such non-tensioning of the layers are looping of individual wires, completely crushed strands, total deterioration of a non-rotating rope due to gross neglect of inspection procedure.



All removal criteria are based on the use of steel sheave.

Standard	Version	Equipment	Running Ropes*		Rotation Resistant*		Standing Ropes*	
			Number of allowable broken wires in	Number of allowable broken wires in	Number of allowable broken wires in	Number of allowable broken wires in	Number of allowable broken wires in	Number of allowable broken wires in
			one rope lay	one strand in one lay	6 x rope dia.	30 x rope dia.	in one lay	at end connection
AMSE B30.2	2011	Overhead and Gantry Cranes	12	4	-	-	-	-
AMSE B30.3	2012	Tower Cranes	12	4	2	4	-	-
ASME B30.4	2010	Portal and Pedestal Cranes	6	3	4	See below 2	-	2
AMSE B30.5	2011	Mobile and Locomotive Cranes	6	3	2	4	-	2
AMSE B30.6	2010	Derricks	6	3	Consult rope manufacturer		3	2
AMSE B30.7	2011	Winches	6	3	6	4	3	2
AMSE B30.8	2010	Floating Cranes and Derricks	6	3	-	4	3	2
AMSE B30.16	2007	Overhead Hoists (Underhung)	12	4	2	4	-	-
ASME B30.29	2012	Self Erecting Tower Cranes	6	3	2	4	3	2

*) Also remove if you detect one (1) wire broken at the contact point with the core or adjacent strand; so called 'valley' breaks.

4 in one lay 2 in one strand in one lay



Regular single-layer and parallel type (e.g. DoPar®) Wire Rope

Reference: ISO 4309:2010
Number of wire breaks, reached or exceeded, of visible broken wires

Number of load bearing wires in outer strands ^a	Examples of rope constructions and types	Number of visible broken wires ^b					
		Sections of rope working in steel sheaves and/or spooling on a single layer drum (wire breaks randomly distributed)				Sections of rope spooling on a multiple-layer drum ^c	
		Classes M1 to M4 or class unknown ^d				All Classes	
		Regular Lay		Langs Lay		Regular and Langs Lay	
		Over a length of 6xd ^e	Over a length of 30xd ^e	Over a length of 6xd ^e	Over a length of 30xd ^e	Over a length of 6xd ^e	Over a length of 30xd ^e
under 50	6x7, 7x7	2	4	1	2	4	8
51 to 75	6x19 Seale*	3	6	2	3	6	12
76 to 100		4	8	2	4	8	16
101 to 120	6x26, 6x25, 8x19 Seale	5	10	2	5	10	19
121 to 140		6	11	3	6	11	22
141 to 160	8x19 Filler, Python® Super 8	6	13	3	6	13	26
161 to 180	6x36*, Python® Power 9	7	14	4	7	14	29
181 to 200	Python® Multi, Ultra	8	16	4	8	16	32
201 to 220	6x41*	9	18	4	9	18	38
221 to 240		10	19	5	10	19	38
241 to 260	8x36*	10	21	5	10	21	42
261 to 280		11	22	6	11	22	45
281 to 300		12	24	6	12	24	48
300 and over		0.04n	0.08n	0.02n	0.04n	0.08n	0.16n

Ropes having outer strands of Seale construction where the number of wires in each strand is 19 or less (e.g. 6x19 Seale) are placed in this table two rows **above** that row in which the construction would normally be placed based on the number of load bearing wires in the outer layer of strands.

^a Filler wires are not regarded as load-bearing wires and are not included in the number of total wires in the outer strands.

^b A broken wire has two ends (counted as one wire break)

^c The discard criteria for ropes spooling on to multiple layer drums applies to deterioration that occurs at the cross-over zones and interference between wraps due to fleet angle effects and NOT to sections of rope which only work in sheaves and do NOT spool onto the drum.

^d Twice the number of broken wires listed may be applied to ropes on mechanisms whose ISO classification is known to be M5 to M8

^e d = nominal rope diameter

Rotation-Resistant and Non-Rotating Wire Rope or Category I, and II according to ASTM 1023

Reference: ISO 4309:2010**Number of wire breaks, reached or exceeded, of visible broken wires**

Number of load bearing wires in outer strands ^a	Examples of rope constructions and types	Number of visible broken wires ^b			
		Sections of rope working in steel sheaves and/or spooling on a single layer drum (wire breaks randomly distributed)		Sections of rope spooling on a multiple-layer drum ^c	
		All Classes		All Classes	
		Over a length of 6xd ^e	Over a length of 30xd ^e	Over a length of 6xd ^e	Over a length of 30xd ^e
4 strands ≤ 100	4x29F	2	4	2	4
3 or 4 strands ≥ 100	4x26 WS, K3x40	2	4	4	8
At least 11 outer strands					
71 to 100	19x7	2	4	4	8
101 to 120	34x7	3	5	5	10
121 to 140	39x7	3	5	6	11
141 to 160		3	6	6	13
161 to 180		4	7	7	14
181 to 200	19x19S	4	8	8	16
201 to 220		4	9	9	18
221 to 240	35x17S	5	10	10	19
241 to 260		5	10	10	21
261 to 280		6	11	11	22
281 to 300		6	12	12	24
300 and over	35x31WS, 35x25F, 35x19W	6	12	12	24

Ropes having outer strands of Seale construction where the number of wires in each strand is 19 or less (e.g. 6x19 Seale) are placed in this table two rows **above** that row in which the construction would normally be placed based on the number of load bearing wires in the outer layer of strands.

^a Filler wires are not regarded as load-bearing wires and are not included in the number of total wires in the outer strands.

^b A broken wire has two ends (counted as one wire break)

^c The discard criteria for ropes spooling on to multiple layer drums applies to deterioration that occurs at the cross-over zones and interference between wraps due to fleet angle effects and NOT to sections of rope which only work in sheaves and do NOT spool onto the drum.

^d Twice the number of broken wires listed may be applied to ropes on mechanisms whose ISO classification is known to be M5 to M8

^e d = nominal rope diameter

Inspection of Wire Rope

Worn and abraded wires

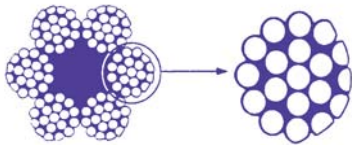
Wear, due to friction on sheaves, rollers, drums, etc., eventually causes outer wire abrasion.

Before any inspection is made, determine what type of wire rope you have in service. Many of today's wire ropes are 'compacted', 'calibrated', or 'die formed'. This manufacturing process purposely flattens the outer wires and for an inexperienced inspector these ropes may appear to be already abraded when indeed they are brand new. If you are in doubt about what type of rope you are about to inspect, have a look at a section of the rope which was not subjected to any abrasive work; e.g. like the safety wraps on the drum or a section just behind the end connection.

The round outer wires of standard wire rope will become flat on the outside due to friction when in contact with drums, sheaves, or other abrasive matter like sand or gravel. This is part of normal service deterioration and in most crane installations relatively even abrasion will occur. **The rope must be replaced, however, if this wear exceeds 1/3 of the diameter of the wire.**

It is good practice to compare a section of the rope which was NOT subjected to any bending work (e.g. the safety wraps, or a short section behind the end fitting) to the rope section to be inspected.

The same applies when evaluating any possible reduced rope diameter during service. (See next column)



When the surface wires are worn by 1/3 or more of their diameter the rope must be replaced.



Abrasion caused by dragging the rope over a sharp object (steel corner, sharp plate, abrasive surface etc.)



Peening and subsequent wire break caused by high fleet angle and rope vibration.



Rope abrasion caused by normal operating condition on a high cycle crane. Rope must be retired.

Reduction in wire rope diameter

As already discussed on page -5- 'Measuring the rope diameter' and on page -6- 'Break-In-Period' shortly after installation the wire rope diameter will slightly decrease. This is normal and is caused by the adjustment of all rope elements when loaded the first time. To evaluate the diameter reduction, you have to measure the rope when new, and you also have to measure the rope after the break in period at a specified load. This gives you a good indication of the magnitude of the initial diameter reduction in your specific application. The diameter reading you took after the break in period should now become your 'gauge'. Do not compare the rope diameter you are about to take with the 'catalogue' diameter. It may give you a false indication, since wire rope may have a plus tolerance of up to 4% to 5% over the 'catalogue' diameter.

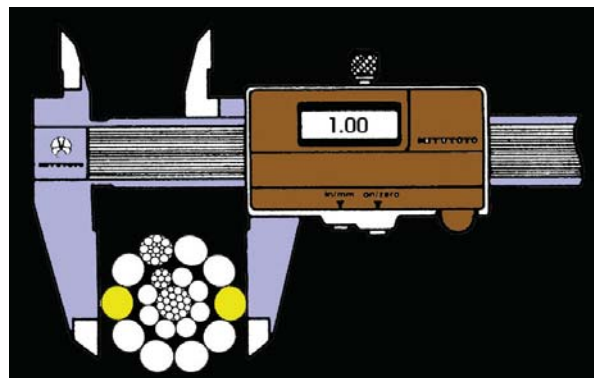
If you detect a further diameter reduction when measuring the rope under the same load condition as after the break in period, it is often due to excessive abrasion of the outside wires, loss of core support, internal or external corrosion, inner wire failures, and/or inner wire abrasion. However, there will always be a normal continuous small decrease in diameter throughout the rope's service life.

Core deterioration, when it occurs, is revealed by a more rapid reduction in diameter, and when observed, it is time for removal.

Deciding whether or not a rope is safe is not always a simple matter. A number of different but interrelated conditions must be evaluated. It would be dangerously unwise for an inspector to declare a rope 'safe' for continued service simply because its diameter had not reached a certain minimum diameter if, at the same time, other observations led to a different conclusion.

Because the removal criteria are much varied for different rope constructions and types of cores, a table of minimum diameters has been deliberately omitted from this publication.

(See: Core Wire Breaks page -11-)



Take measurement of rope diameter AFTER the Break In Period.

Inspection of Wire Rope

Rope Stretch

Constructional Stretch

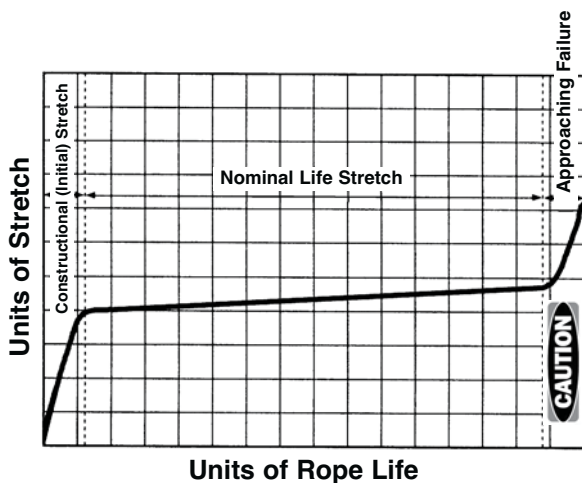
All ropes will stretch to varying degrees when loads are initially applied. This stretch is known as the 'constructional stretch' (see also: page -12- Run-In Period)

This stretch occurs in three phases:

1) Initial or constructional stretch during the early period (Run-In) of rope service, caused by the rope adjusting to the operating conditions.

2) Following the run-in period there is an extended period -the longest part of the rope's service life- during which a slight increase in stretch takes place over an extended time. This results from normal wear, fatigue etc. On a graph this portion would almost be a horizontal straight line inclined slightly upward from its initial level.

3) Thereafter, the stretch occurs at a quicker rate. This means that the rope has reached the point of rapid degradation; a result of prolonged subjection to abrasive wear, fatigue, and inner undetected wire breaks, etc. This second upturn of the curve is a warning indicating that the rope should be removed to avoid sudden catastrophic rope failures.



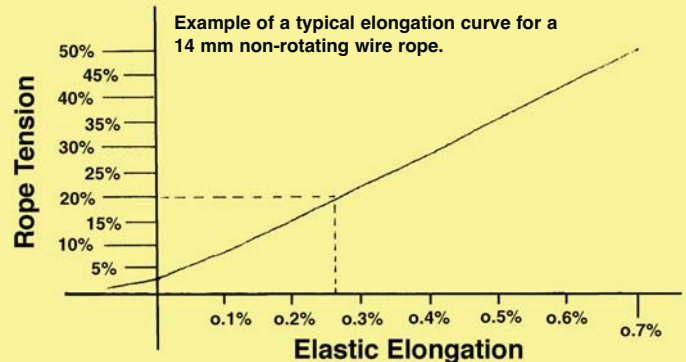
Elastic Stretch / Elastic Limit

Elastic stretch of wire rope occurs as soon as a load is applied. When the load is released the rope returns to its initial length, hence the term 'elastic' stretch. This stretch is caused by the elastic deformation of the steel itself (the individual steel wires) and also by the lay of the rope which could be compared to resemble a coil spring. With other words, the longer the lay length of a rope becomes, the less elastic stretch it will develop. Elastic stretch in a wire rope is a desired feature. The ability of a rope to stretch under load means that the rope is capable to absorb energy; the term here is 'energy absorption capability'.

In many instances it is not easy to clearly distinguish between (the remains of) constructional stretch and elastic stretch as they may occur together especially when the rope is new.

The values for Elastic Stretch are dependent on rope construction, lay length and type, steel material, tensile strength of wires etc. An approximation is 0.25% to 0.6% at WLL (or lifting capacity). The E-module varies similarly from about 11 Million to 16 Million lbs/inch². For exact values please contact us for further information.

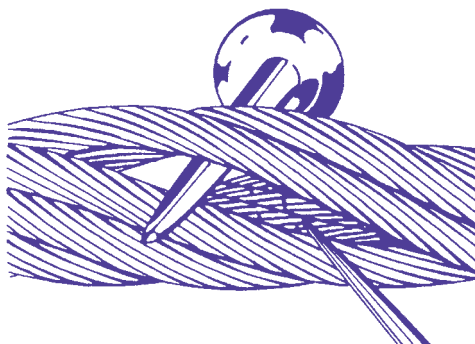
Elastic stretch turns into a 'permanent' stretch when the rope is loaded beyond 55%-60% of its breaking strength (or beyond 2-1/2 to 3 times its WLL). At that point the steel material elongates and deforms permanently and renders the rope inoperable as the individual wires will have lost much of their mechanical properties to withstand material fatigue.



Core Wire Breaks

The most difficult to detect wire rope deterioration. Core wire breaks are more likely to appear in 6 & 8-strand and 19x7/19x19 ropes, rather than in multi-strand plastic coated core wire rope. We have had examples where 8x36 and 19x7 ropes broke showing no externally visible removal criteria, yet the core was completely broken to pieces. Once the core breaks, the resultant sudden shock load on the outer strands may cause the rope to fail in a catastrophic, unpredictable manner.

Core wire breaks in plastic coated core ropes are not likely to appear due



to the cushioning effect of the plastic layer. To inspect the core of a 6- or 8-strand wire rope, the rope must be completely unloaded.

Carefully insert a spike through one or two strands and turn the spike with the rope lay. If the core is heavily lubricated you need good lighting to see broken wires! You may also wish to use an air gun to blow excessive lubricant off the core, but be sure to re-lube the core after your inspection.

As with any rotation resistant or non-rotating rope we recommend to leave such internal inspections to the expert as such inspections can permanently damage the rope.

Inspection of Wire Rope

Mechanical Damages

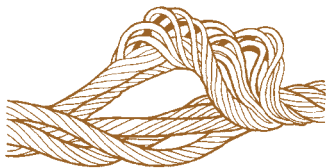
It is nearly impossible to list all variations of mechanical damage a rope might be subjected to. Therefore, the following list should only be taken as a guideline. None of these damages are repairable. However, the magnitude of the damages may vary from a slight cosmetic damage to total destruction of the wire rope. If you are not sure about the extent of the damage, change the rope, or call us for technical assistance and advice.



Bird Cage (6-strand rope)
caused by shock loading.



Bird Cage (non-rotating rope)
caused by worn sheave
grooves.



Bird Cage forced through a
tight sheave.



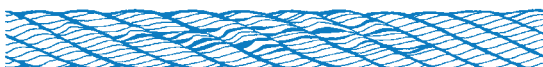
Protruding Core because of
shock loading, torque build-up
during installation, tight
sheaves, or incorrect rope
design.



Actual example of a wire rope which jumped out of the sheave. Note the imprint of the sheave flange.



Wire rope rolled off a sheave



Multiple drum winding: Layer-to-Layer Crushing



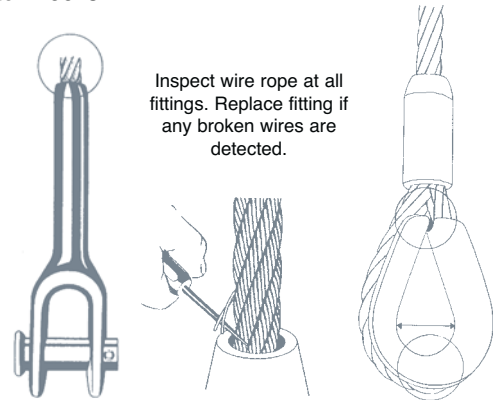
Smooth drum winding: Rubbing between drumwraps



Smooth drum winding: Crushing at Crossover Points

Fittings

Inspect the fittings on your rope and look for wire breaks at the shank of sockets or sleeves. Inspect the fittings for wear, distortion, cracks, and corrosion. Follow the inspection criteria of the fitting manufacturer and **DO NOT ATTEMPT TO REPAIR ANY WIRE ROPE FITTING YOURSELF !** Watch for missing hook latches and install new ones if necessary. If latches wear out too rapidly, ask us for special Heavy Duty latches which may fit your hook. Some hook manufacturers offer self-locking and special Gate Latch hooks.



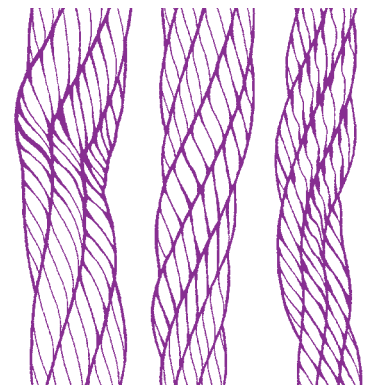
Actual example of a rotation resistant wire rope which was forced to run in too tight sheave grooves. Result is so called 'core popping'.

Kinks

Kinked wire rope due to improper installation procedure.



Kinked wire ropes
which have been
used. Kinks are pulled
tight and caused
distortion and failure.



Inspection of Sheaves and Drums

Inspection

Proper maintenance of the equipment on which the ropes operate has an important bearing on rope life. Worn grooves, poor alignment of sheaves and worn parts resulting in shock loads and excessive vibration will have a deteriorating effect.

Sheaves should be checked periodically for wear in the grooves which may cause pinching, abrasion, and bird-caging of the rope. If the groove shows signs of rope imprints the sheave must be replaced or re-machined and re-hardened. The same should be done on drums showing similar effect.

Poor alignment of sheaves will result in rope wear and wear on the sheave flange. This should be corrected immediately.

Excessive wear in the sheave bearings can cause rope fatigue from vibration.

Large fleet angles will cause severe abrasion of the rope as it winds onto the drum. Furthermore, the rope will roll into the sheave groove introducing torque and twist which may cause high stranding and bird-cages.

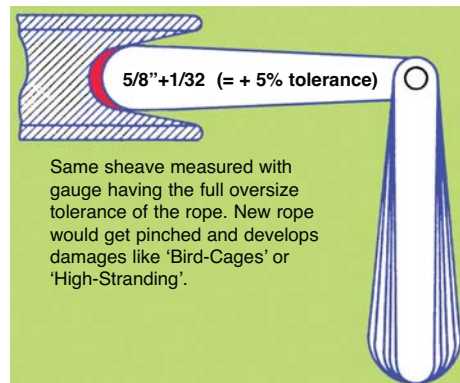
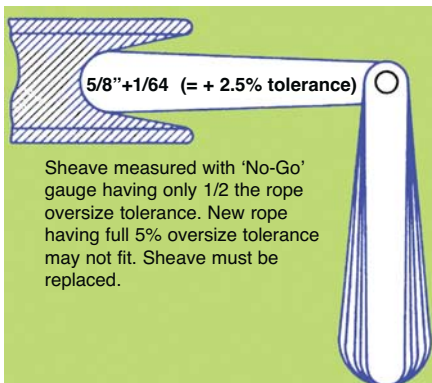
Dimension of the Groove Radius

The very first item to be checked when examining sheaves and drums, is the condition of the grooves. To check size, contour and amount of wear, a groove gauge is used.

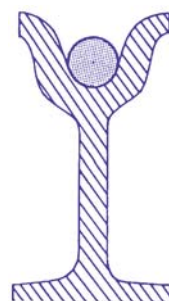
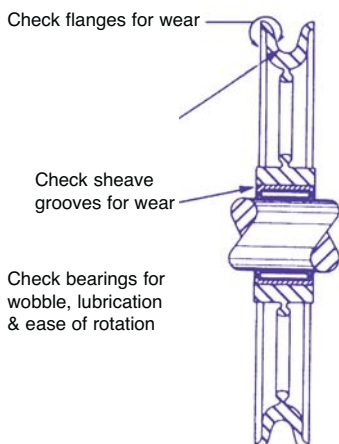
Two types of groove gauges are in general use and it is important to note which of these is being used. The two differ in their percentage over the Nominal Rope Diameter.

For new or remachined grooves, and for inspection of fitness for new ropes, the groove gauge should be 1% over the maximum allowable Plus Tolerance of the new rope; alternately, the sheave groove must measure 1% over the Actual Rope Diameter intended to be installed.

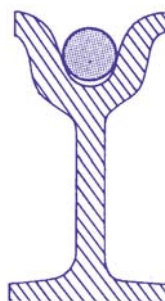
Many groove gauges on the market are so called 'No-Go' gauges and are made with Nominal plus 1/2 of permissible rope Plus Tolerance. If you use these gauges be sure that the existing rope is **SMALLER** than this gauge. A rope operating in an even slightly undersized groove, deteriorates faster and may develop bird-cages.



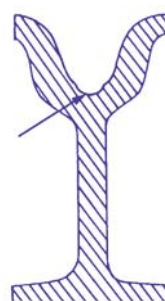
Correctly + 5% sized sheave gauges available from us.



Properly matched rope & sheave groove



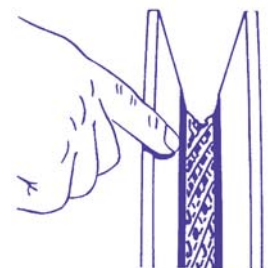
Sheave groove too small



Sheave groove is undercut



New rope will get damaged beyond repair.



A sheave corrugated by the rope's 'print'. This sheave will damage the rope.

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