

WIRE ROPE

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QUIZ

QUIZ WIRE ROPE

Technical Guidance



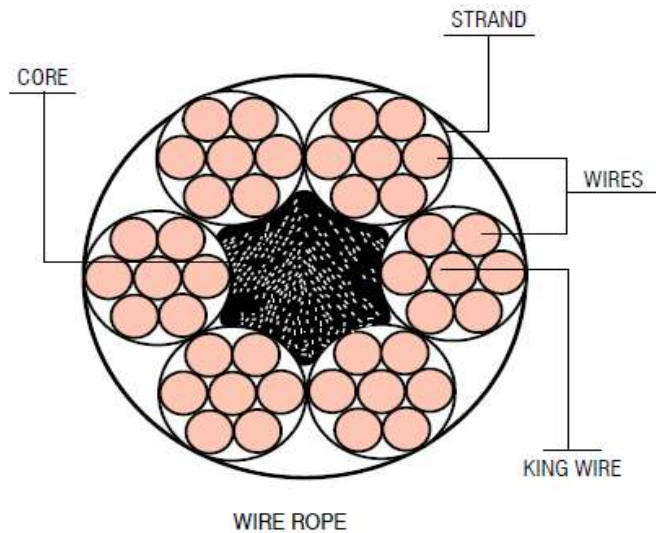
- ASME B30.9 (Chapter 11 : Wire Rope & Slings)
- Wire Rope Inspection & Examination, 1996 (R. Verret & W. Lindsay)
- Crane Wire Rope Damage & NDT Inspection Methods
- BS 466:1984
- DOE-STD-1090:2007 Chap 8 – 11

Wire Rope

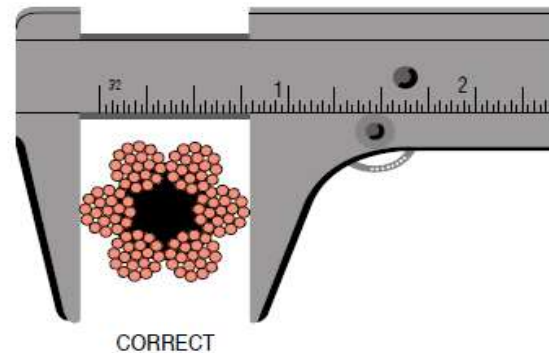


WIRE ROPE COMPONENTS

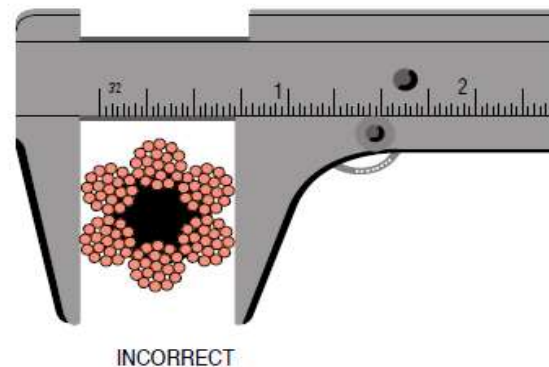
- WIRE
- STRAND
- CORE



ROPE SIZE



Measure the circle just touching the extreme outer limits (crown) of the strands.



Wire Rope Cores



- **Fibre Core (FC) or Sisal Core**
 - Smaller rope – cotton or jute
- **Independent Wire Rope Core (IWRC)**
 - Provide adequate support for strands
 - A separate small-diameter wire rope as a core for a larger wire rope
- **Strand Core**
 - Single strand as a core
 - May or may not have same cross section as surrounding strands

Wire Rope Lays



LAY

- Right Lay – strands twist to the right around the core and standard rope
- Left Lay – strands twist to the left and special purpose rope
- Lang Lay – strands and individual wires have the same lay direction
- Regular Lay – strands and individual wires have the opposite lay direction

Direction of Wire & Strand Helix



RIGHT HAND REGULAR LAY (RHRL/RHO/sZ)



LEFT HAND REGULAR LAY (LHRL/LHO/zS)



RIGHT HAND LANGS LAY (RHLL/RHL/zZ)



LEFT HAND LANGS LAY (LHLL/LHL/sS)



ALTERNATE LAY (COMBINATION OF LANGS & REGULAR)



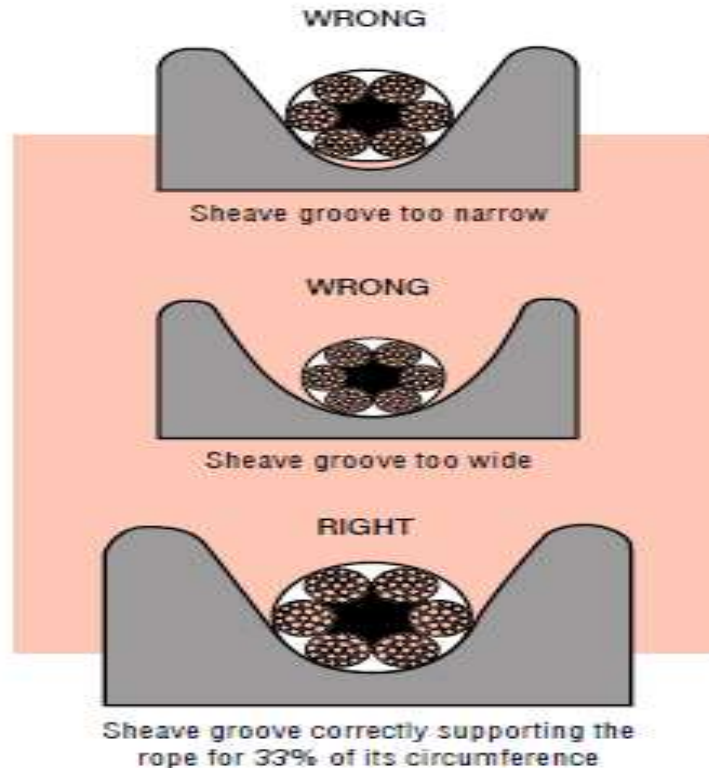
SPECIAL ALTERNATE LAY (2 LANGS 1 REGULAR)

Wire Rope



IDEAL PULLEY GROOVE

Greater contact area between the rope and the pulley reduces abrasion and enhances service life.



Wire Rope Slings



- Safety considerations for rope sling assembly:
 - proper rope selection
 - fittings suitable for the load
 - selecting the proper fastening method
 - proper selection of sling type
 - proper hitch selection
 - regular inspection and maintenance

Wire Rope Inspection



- Inspection shall be **based on such factors as expected rope life**, as determined by:
 - experience on the particular installations or similar installations,
 - severity of environment,
 - percentage of capacity lifts,
 - frequency rates of operation
 - exposure to shock loads

Wire Rope Inspection



- Visual observations should be concerned with discovering gross damage, as listed:
 - Broken/cut strands (Number/distribution, and type of visible broken wires)
 - General corrosion
 - Abrasion or wear – Wire rope diameter reduction
 - Distortion of the rope:
 - Waviness
 - Crushing
 - Kinking
 - Birdcaging

Wire Rope Inspection



- Replacement rope & connection:-
 - Same as the original rope & connections furnished by hoist manufacturer
 - Any deviation shall be specified by rope / hoist manufacturer or qualified person
- Make sure never use discarded rope for slings

Equipment for inspection



- List of discarded criteria
- Rope calliper / vernier gauge
- Steel tape
- White chalk / wax pencil
- Magnifying glass
- Cleaning cloth (smooth synthetic material)
- Wire brush
- Pair of gloves
- Previous Inspection record / mill certification of wire rope

Rope Clamping



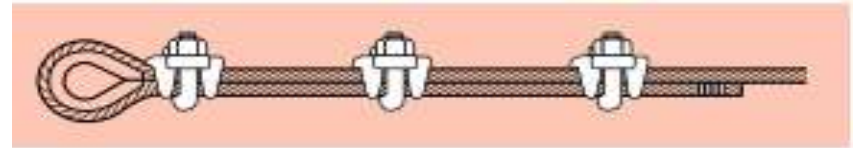
Rope Clamping



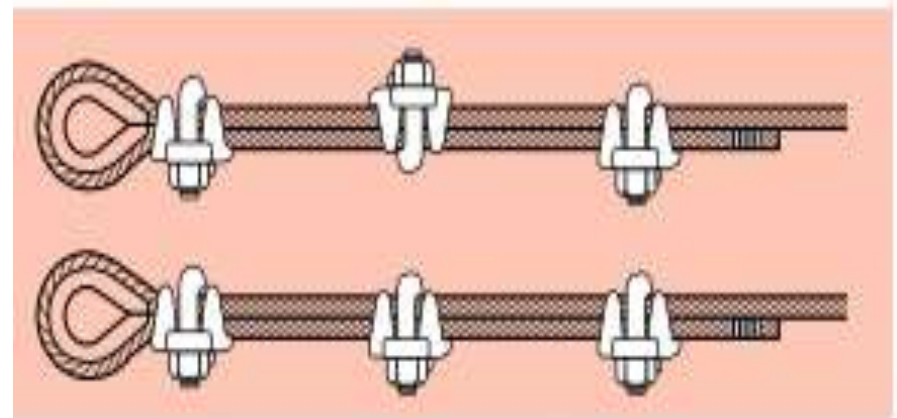
Rope Clamping



- Efficiency up to 80% of the minimum breaking load
- 'U' bolt presses against the dead end
- 'U' should not bear against the live end – possibility of the rope being kinked or crushed



The Right Way to Clip Wire Rope

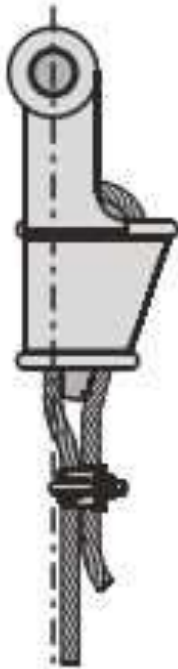


The Wrong Way to Clip Wire Rope

End Termination



Right



Wrong



Wrong



Broken Wires & Strands

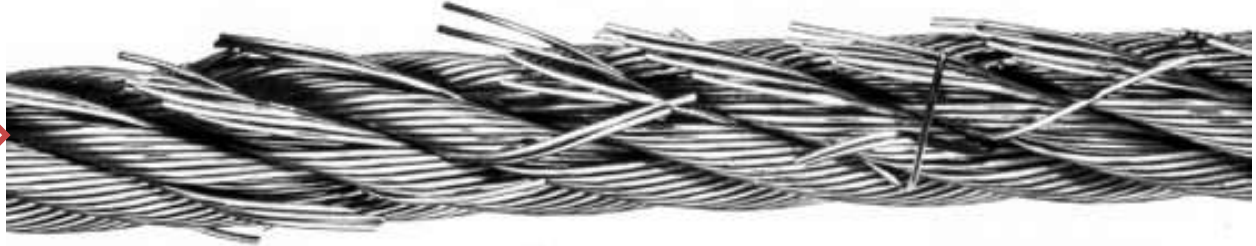


Crown Breaks



Abrasion-plus-fatigue patterns – caused when wire direct contact with a sheave / drum

Valley Breaks

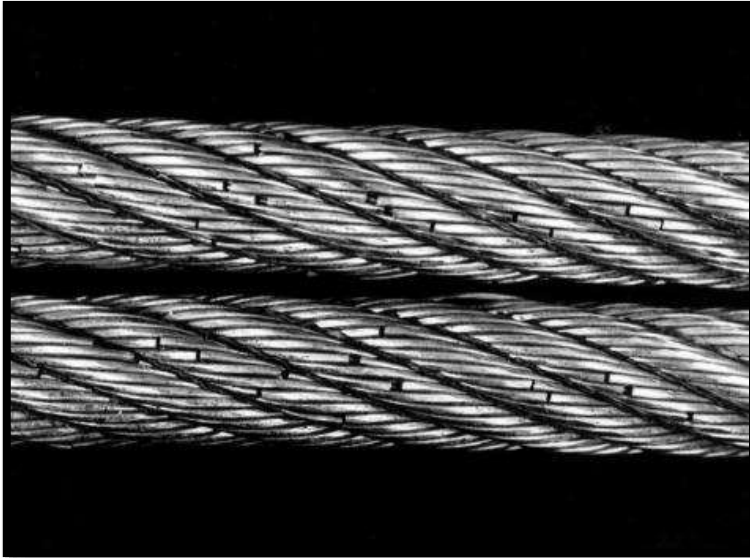


Broken Wires & Strands



- Can be spotted visually and detected by **running cloth over wire rope surface**
- ASME - Consider replacement if more than 12 randomly distributed broken wires within a single strand within a single lay
- BS Code - Length to inspect = 5% of $[10 \times d]$ (diameter of wire)]

Broken Wires & Strands

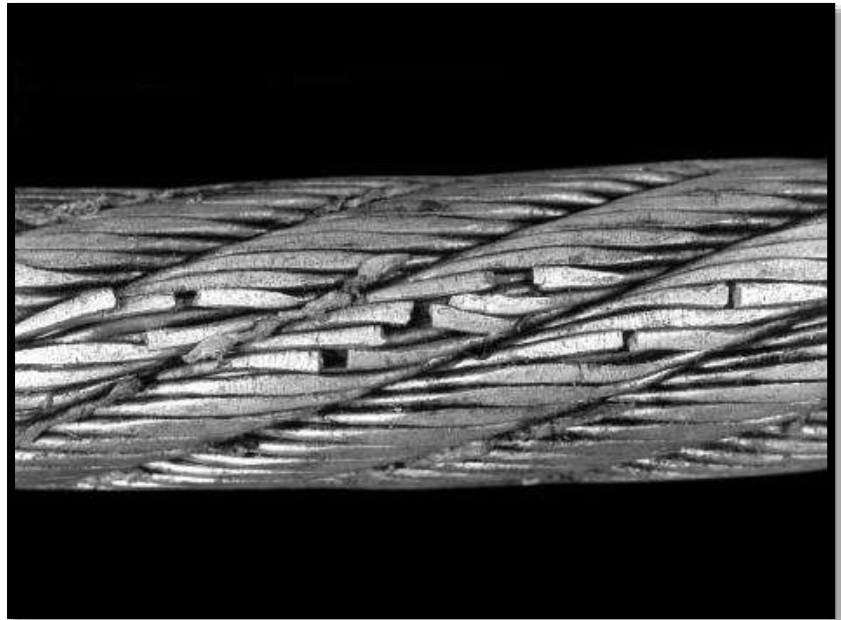
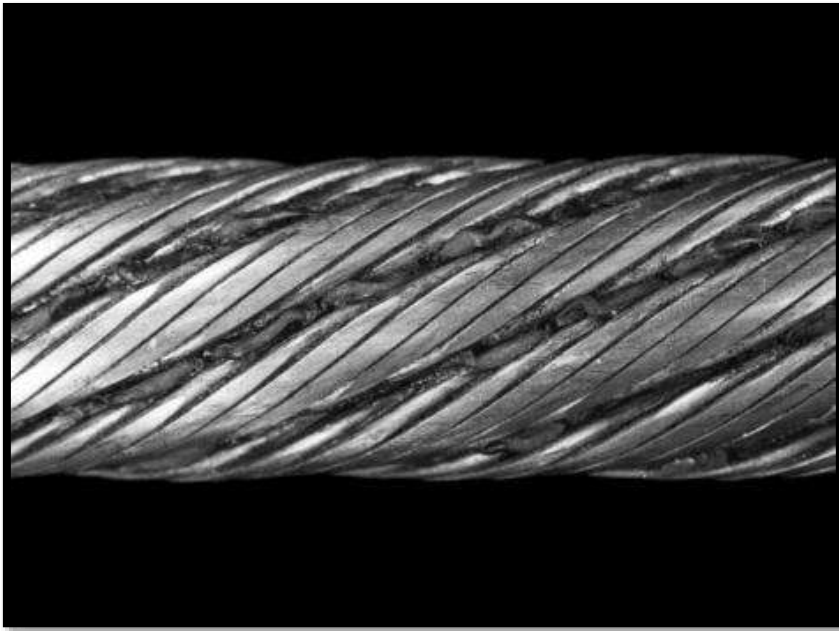


Abrasion & Wear



If diameter of wire rope have been reduced to 10%, it should be taken out of service

Abrasion & Wear



General Corrosion



- Corrosion of the rope both internally and/or externally can also result in a significant loss in metallic area.
- The rope strength is reduced to a level where it is unable to sustain the normal working load
- Review level and type of service dressing



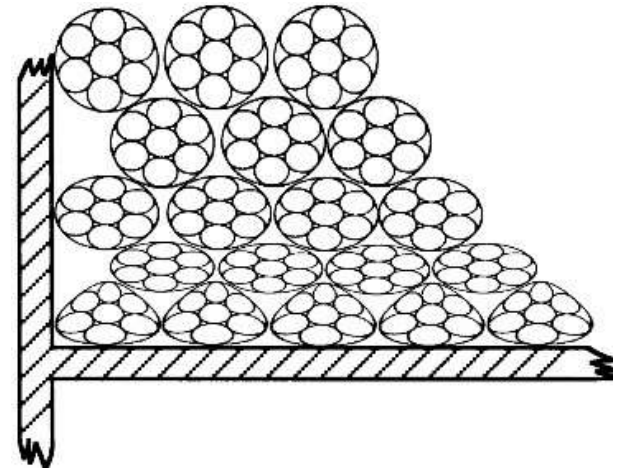
General Corrosion



Mechanical Damages



- Crushing
 - Loose winding on drum, rope was pulled in between underlying wraps and crushed out of shape

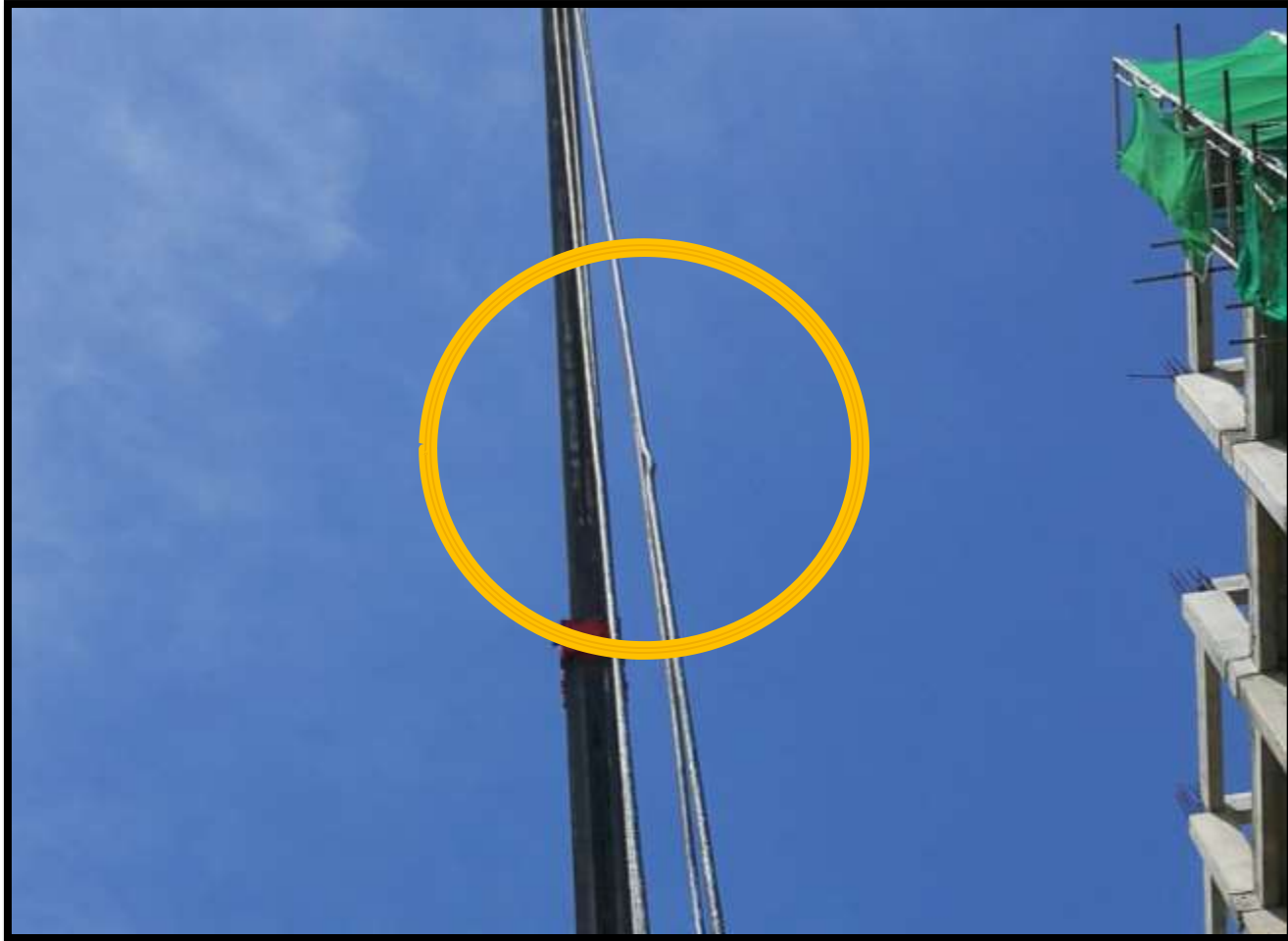


Mechanical Damages



- Kink
 - Kinks seriously reduce wire rope strength
 - A permanent deformation/reshaping of rope
 - Loops are pulled tight
 - Section with kinks should be cut off
 - Otherwise rope must be discarded

Mechanical Damages



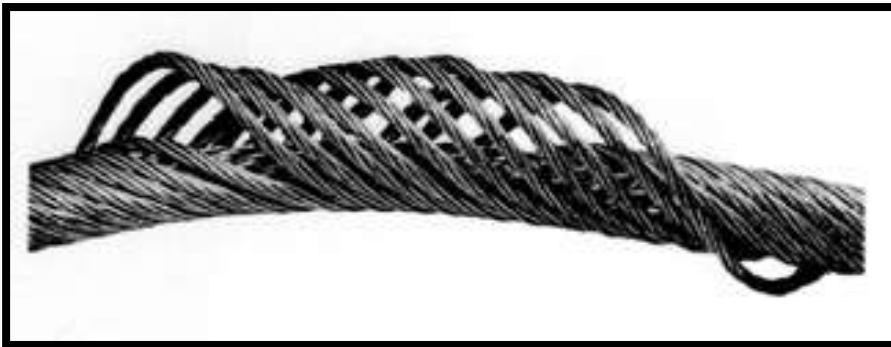
Mechanical Damages



Mechanical Damages

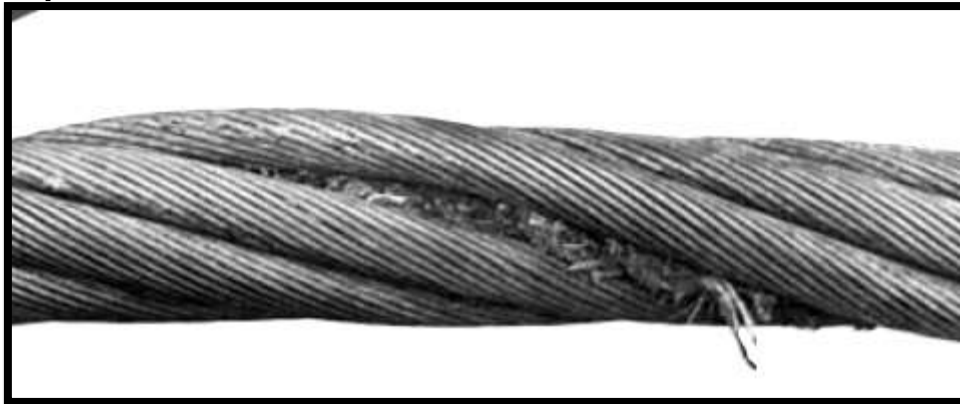


- Birdcaging
 - Caused by shock loading or sudden load release
 - Different in length between the rope core and the outer layer of strands (longer)
 - Incorrect fitting, tight sheaves, incorrect swivel



Mechanical Damages

- Nodes
 - Local increase in rope diameter with the core easily visible between several covering strands.
 - Caused by :
 - shock loading
 - absorption of moisture fibre main core



Mechanical Damages



- Loop formation
 - Caused by often and repetitive shock loading



Mechanical Damages



- Thinning
- Waviness
- Flat Areas
- Damage caused by heat
- Nicking
- Termination failure (Sling or at Rope Clamping)

Mechanical Damages



Wire Rope Sling Inspection



- Broken wires
- Metal Loss – wear or scraping 1/3 diameter
- Distortion
- Heat Damage – metallic discoloration or loss of internal lubricant caused by exposed to heat
- Bad End Attachment – cracked, bent or broken caused by abuse, wear or accident
- Bent Hook- <15% throat openings, measured at the narrowest point or twisting (10%)
- Metal Corrosion – rope or end attachments which has caused pitting or binding of wires
- Pulled Eye Splices - slipped, tucked strands have moved or pressed sleeves
- Unbalance – reducing it's strength

Safety Information



- Refer to applicable directives, regulations, standards and codes concerning inspection, examination and rope removal criteria
- Wire rope will fail if worn out, shock loaded, overloaded, misused, damaged, improperly maintained or abused
- Always inspect wire rope for wear, damage or abuse before use
- Never use a wire rope which is worn out, damaged, corroded or abused
- Never overload or shock load a wire rope

**THANK YOU FOR YOUR
ATTENTION AND SUPPORT**