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Handling and Storing- Inspection

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All wire ropes will wear out eventually and gradually lose work capability throughout their service life. That's why periodic inspections are critical. Applicable industry standards such as ASME B30.2 for overhead and gantry cranes or federal regulations such as OSHA refer to specific inspection criteria for varied applications.

Three purposes for inspection.

Regular inspection of wire rope and equipment should be performed for three good reasons:

- It reveals the rope's condition and indicates the need for replacement.
- It can indicate if you're using the most suitable type of rope.
- It makes possible the discovery and correction of faults in equipment or operation that can cause costly accelerated rope wear.

How often.

All wire ropes should be thoroughly inspected at regular intervals. The longer it has been in service or the more severe the service, the more thoroughly and frequently it should be inspected. Be sure to maintain records of each inspection.

Appoint a qualified person to inspect.

Inspections should be carried out by a person who has learned through special training or practical experience what to look for and who knows how to judge the importance of any abnormal conditions they may discover. It is the inspector's responsibility to obtain and follow the proper inspection criteria for each application inspected.

For information on inspection methods and techniques, ask us for Techreport 107: Wire Rope Inspection. If you need further assistance, contact our Product Engineering Department.

What to look for.

Here's what happens when a wire breaks under tensile load exceeding its strength. It's typically recognized by the "cup and cone" appearance at the point of failure. The necking down of the wire at the point of failure to form the cup and cone indicates failure has occurred while the wire retained its ductility.



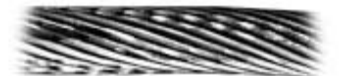
This is a wire with a distinct fatigue break. It's recognized by the square end perpendicular to the wire. This break was produced by a torsion machine that's used to measure the ductility. This break is similar to wire failures in the field caused by fatigue.



A wire rope that has been subjected to repeated bending over sheaves under normal loads. This results in fatigue breaks in individual wires - these breaks are square and usually in the crown of the strands.



An example of fatigue failure of a wire rope subjected to heavy loads over small sheaves. The breaks in the valleys of the strands are caused by "strand nicking." There may be crown breaks, too.



Here you see a single strand removed from a wire rope subjected to "strand nicking." This condition is a result of adjacent strands rubbing against one another. While this is normal in a rope's operation, the nicking can be accentuated by high loads, small sheaves or loss of core support. The ultimate result will be individual wire breaks in the valleys of the strands.



Typical evidence of wear and abuse.

A "birdcage" is caused by sudden release of tension and the resulting rebound of rope. These strands and wires will not be returned to their original positions. The rope should be replaced immediately.



A typical failure of a rotary drill line with a poor cutoff practice. These wires have been subjected to continued peening, causing fatigue type failures. A predetermined, regularly scheduled cutoff practice can help eliminate this type of problem.



This is localized wear over an equalized sheave. The danger here is that it's invisible during the rope's operation, and that's why you need to inspect this portion of an operating rope regularly. The rope should be pulled off the sheave during inspection and bent to check for broken wires.



This is a wire rope with a high strand - a condition in which one or more strands are worn before adjoining strands. This is caused by improper socketing or seizing, kinks or dog-legs. At top, you see a close-up of the concentration of wear. At bottom, you see how it recurs every sixth strand in a 6 strand rope.



A kinked wire rope is shown here. It's caused by pulling down a loop in a slack line during handling, installation or operation. Note the distortion of the strands and individual wires. This rope must be replaced.



Here's a wire rope that has jumped a sheave. The rope "curled" as it went over the edge of the sheave. When you study the wires, you'll see two types of breaks here: tensile "cup and cone" breaks and shear breaks that appear to have been cut on an angle.



Drum crushing is caused by small drums, high loads and multiple winding conditions.



Removal criteria.

A major portion of any wire rope inspection is the detection of broken wires. The number and type of broken wires are an indication of the rope's general condition and a benchmark for its replacement.

Frequent inspections and written records help determine the rate at which wires are breaking. Replace the rope when the values given in the table below are reached.

Valley wire breaks - where the wire fractures between strands or a broken wire protrudes between strands - are treated differently than those that occur on the outer surface of the rope. When there is more than one valley break, replace the rope.

Broken wire removal criteria cited in many standards and specifications, like those listed below, apply to wire ropes operating on steel sheaves and drums. For wire ropes operating on sheaves and drums made with material other than steel, please contact the sheave, drum or equipment manufacturer or a qualified person for proper broken wire removal criteria.



Broken Wire Removal Criteria

Standard	Equipment		# OF BROKEN WIRES III RUNNING ROPES			# OF BROKEN WIRES III STANDING ROPES	
			In one rope lay	In one strand	At end connection	In one rope lay	At end ion
ASME/B30.2	Overhead and gantry cranes		12**	4	Not specified	Not specified	
ASME/B30.4	Portal, tower and pillar cranes		6**	3	2	3	2
ASME/B30.5	Mobile and locomotive cranes	Running ropes	6**	3	2	3	2
		Rotation-resistant ropes	2 randomly distributed broken wires in 6 rope diameters or 4 randomly distributed broken wires in 30 rope diameters.**				
ASME/B30.6	Derricks		6**	3	2	3	2
ASME/B30.7	Base-mounted drum hoists		6**	3	2	3	2
ASME/B30.8	Floating cranes and derricks		6**	3	2	3	2
ASME/B30.16	Overhead hoists		12**	4	Not specified	Not specified	
ANSI/A10.4	Personnel hoists		6**	3	2	2**	2
ANSI/A10.5	Material hoists		6**	Not specified		Not specified	

**Also remove for 1 valley break.