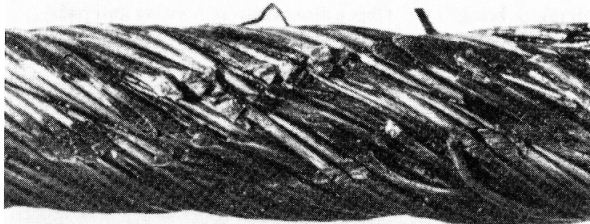


A wire rope is said to have failed when the condition of either the wire strands, core or termination has deteriorated to an unacceptable extent. Each application has to be considered individually in terms of the degree of degradation allowable; certain applications may allow for a greater degree of deterioration than others.

Complete wire rope failures rarely occur. The more common modes of failure/deterioration are described below.

## DETERIORATION

### Mechanical damage



#### Characteristics

Damage to exposed wires or complete strands, often associated with gross plastic deformation of the steel material. Damage may be localised or distributed along the length of the rope.

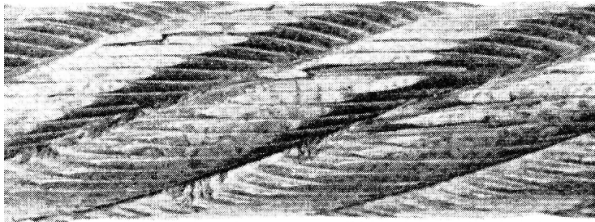
Inspection by visual means only.

#### Causes

There are many potential causes of mechanical damage, such as:

- rubbing against a static structure whilst under load
- impact or collision by a heavy object
- misuse or bad handling practices

### External wear



#### Characteristics

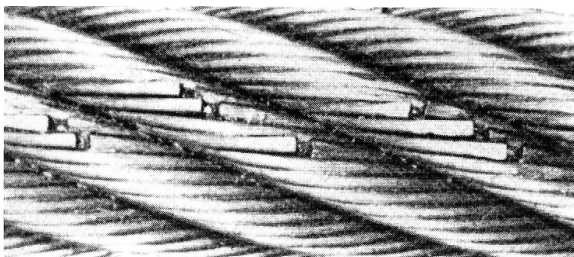
Flattened areas formed on outer wires. Wear may be distributed over the entire surface or concentrated in narrow axial zones. Severe loss of worn wires under direct tension. Choice of rope construction can be significant in increasing wear resistance (e.g. Lang's lay ropes are usually superior to ordinary lay ropes).

Assess condition visually and also by measuring the reduction in rope diameter.

#### Causes

Abrasive wear between rope and pulleys, or between successive rope layers in multi-coiled applications, particularly in dirty or contaminated conditions (e.g. mining). Small oscillations, as a result of vibration, can cause localised wear at pulley positions.

### External fatigue



#### Characteristics

Transverse fractures of individual wires which may subsequently become worn. Fatigue failures of individual wires occur at the position of maximum rope diameter ('crown' fractures).

Condition is assessed by counting the number of broken wires over a given length of rope (e.g. one lay length, 10 diameters, 1 metre).

#### Causes

Fatigue failures of wires is caused by cyclic stresses induced by bending, often superimposed on the direct stress under tension. Tight bend radii on pulleys increases the stresses and hence the risk of fatigue. Localised Hertzian stresses resulting from ropes operating in oversize or undersize grooves can also promote premature fatigue failures.