Crane Rope Brunton Shaw

The following guidelines are principally directed towards crane operators who need to periodically replace steel wire ropes and to crane designers who are required to specify ropes for new build projects.

When replacing a steel wire rope on any crane or appliance reference should be made to the relevant original equipment manufacturers manual, the wire rope manufacturers test certificate originally supplied with the crane or appliance and to any other relevant documentation.

In order to ensure safe and efficient operation Brunton Shaw UK recommend that any replacement wire rope should conform with the specified nominal diameter and at least equal the required strength originally specified by the manufacturer of the machine or appliance.

Additionally the wire rope construction selected should provide an equal or greater resistance to rotation, bend fatigue, crushing, abrasive wear, and corrosion when compared to the originally specified rope.

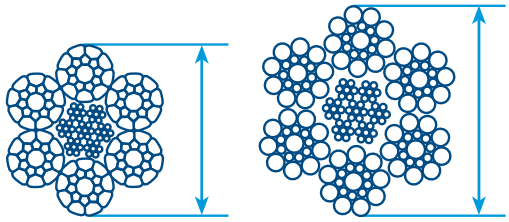
STRENGTH

Wire rope strength is normally referred to as minimum breaking force or minimum breaking load. The minimum breaking load of any given rope diameter can be increased in two basic ways:

An increase in the tensile strength of the wire used to manufacture the rope will increase the minimum breaking load of the final rope. Typical tensile grades of wire used for crane rope manufacture are 1770N/mm^2, 1960N/mm^2 and 2160N/mm^2.

Additionally it is possible to increase the steel fill factor of the wire rope. Fill factor measures the ratio between the sum of the nominal cross sectional areas of all the wires in the rope and the circumscribed area of the rope based on its nominal diameter. More simply it measures the metallic cross sectional area of the rope.

It is possible to marginally increase the fill factor by varying the construction i.e. adding small filler wires. More effectively the individual strands of the rope can be compacted.



Compacted rope minimum breaking load = Conventional rope minimum breaking load

The resultant rope has a very high steel fill factor and consequently a relatively high minimum breaking load for any given diameter when compared with a conventional rope.

CRANEMASTER

Brunton Shaw compacted crane ropes are referred to as Cranemaster®.

CRANESTAR

Brunton Shaw non compacted crane ropes are referred to as Cranestar®.

Specification of Crane Ropes

Every rope manufactured by Brunton Shaw UK will satisfy the **Loadrite** strength testing requirement. This means that a sample from each production length is tested to destruction and must either equal or exceed the published minimum breaking load.

The high breaking load to diameter relationship offered by Cranemaster® ropes can allow crane manufacturers to optimise the design of crane components such as winding drums and sheaves whilst still complying with international crane design standards.

Lower stress levels which occur when crane operators replace a conventional rope with an identical diameter of high strength Cranemaster® rope can lead to more 'comfortable' operation and longer rope life.

DIAMETER

Correct and consistent wire rope diameter is critical to performance on a modern crane and a rope which is too large, or too small, for the drum and sheaves in which it is operating can cause premature rope failure.

It is not only important to select a rope which has the correct nominal diameter according to the original equipment operating manual but it is also important that the diameter of the rope is consistent throughout its entire length. Inconsistency in diameter, particularly short lengths where the rope is oversize, can cause premature localised wire breaks and short rope life.

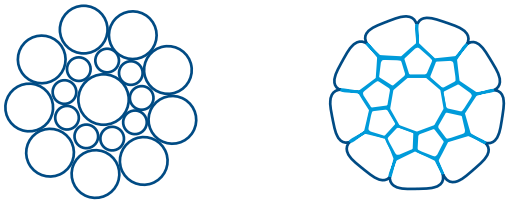
Brunton Shaw UK ensure correct and consistent diameter during manufacture by applying the rigorous **Sizerite** regime of diameter measurement throughout the production process.

BEND FATIGUE RESISTANCE

Bend fatigue resistance is the ability of the wire rope to withstand repeated bending under constant or fluctuating loads. As the load increases in any reeving system so the rate of fatigue will increase. As the bending radii decrease in a reeving system so the rate of fatigue will increase.

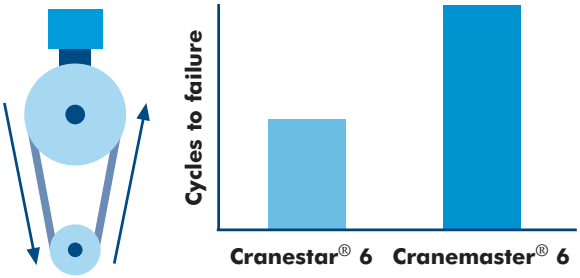
A wire rope which has an increased number of wires such as a 6x36 construction will have greater resistance to fatigue than a 6x19 construction.

Extra fatigue life can be achieved by moving to Cranemaster® compacted rope.



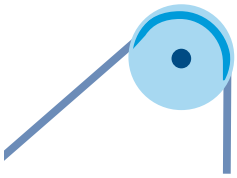
Conventional Compacted

The Cranemaster® strand has very favourable internal and external contact conditions when compared with the point contact of round wires within a conventional strand. The smooth surface of Cranemaster® rope offers a wider bearing surface to the sheave or drum groove. Increased fill factor, lowering internal stress levels, combined with improved internal and external contact conditions lead to longer rope life.



Laboratory fatigue testing indicates that it is possible to achieve up to two times normal rope life when comparing Cranemaster® rope with a conventional rope of equivalent construction.

Crane Rope - Crush Resistance



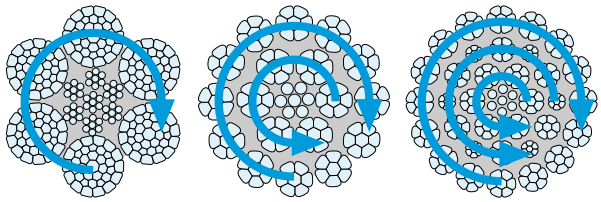
The smooth external surface of Cranemaster® rope can also lead to less wear on the sheave and winding drum.

ROTATION RESISTANCE

Each wire rope construction will have an inherent torque characteristic where both ends of the rope are secured and an applied force will generate torque at the fixing points. Each wire rope construction will have an inherent turn characteristic where one end of the rope is free to rotate and an applied force will cause the free end of the rope to turn.

The torque or turn generated will depend upon the magnitude of the force applied and also upon the construction of the wire rope selected.

In terms of resistance to rotation wire ropes can be divided into three basic categories.



Single Layer 2 Layer 3 Layer

Single layer ropes have a much greater tendency to rotate under load than the two or three layer ropes which are often referred to as rotation resistant. Similarly the three layer rope will have less tendency to rotate when compared with the two layer rope.

Both the two layer and three layer ropes depend on torsional balance between the outer and inner layers to create rotational stability. With correct rope selection rotation should not cause a problem in service provided that the rope has been correctly balanced in design and manufacture. The complete range of rotation resistant ropes manufactured by Brunton Shaw UK must satisfy the **Balancerite** rotational stability test which ensures that the rope design and manufacturing process produce a wire rope which has optimum rotational stability.

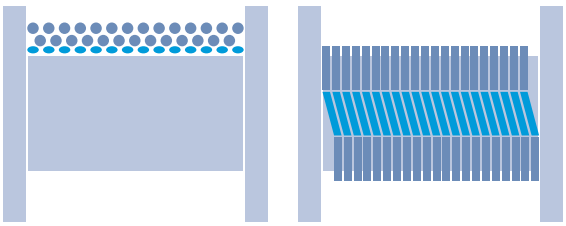
Before selecting a rotation resistant rope consideration should be given to a single layer construction. If the application/duty in question does not require the rope to resist rotation then it is possible that a single layer rope can represent a more robust and more effective solution.

Brunton Shaw UK would be pleased to offer advice on any problems associated with rope rotation or selection of the correct rotation resistant rope.

Safety note – Single layer Langs lay ropes (where the direction of strand lay is the same as the direction of rope lay) have exceptionally bad rotational characteristics and must only be used in applications where both ends of the rope are securely fixed.

CRUSH RESISTANCE

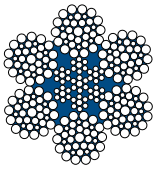
Selection of a rope with an independent wire rope core or wire strand core as opposed to a fibre core rope can improve resistance to crushing.



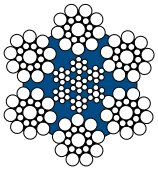
In multi-layer coiling situations where crushing of lower layers particularly at crossover points is unavoidable Brunton Shaw UK would recommend the use of a Cranemaster® compacted rope. The high steel fill factor, which is a feature of the compaction process, will offer greater resistance to crushing than an equivalent conventional rope.

RESISTANCE TO WEAR & ABRASION

Larger external wires can provide greater resistance to wear and abrasion therefore a 6x19 construction might be selected in preference to a 6x36 construction in a situation in which wear and abrasion rather than bend fatigue are the principle cause of rope deterioration.

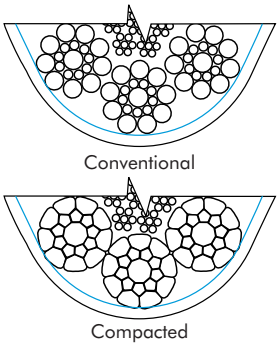


Cranestar® 6x36

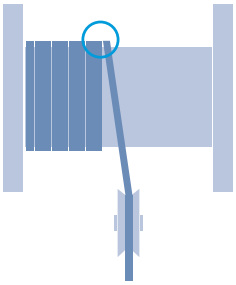


Cranestar® 6x19

Maximum resistance to wear and abrasion can be achieved by selecting a Cranemaster® rope



The smooth surface of the Cranemaster® rope offers a wider bearing surface to the sheave or drum groove resulting in improved resistance to wear and abrasion.



Abrasive wear can occur between the rope and any ancillary equipment such as sheaves and the surface of the winding drum but probably the most significant cause of abrasive wear on cranes takes place between adjacent laps of rope where the rope moves on and off the winding drum.

Selection of a Cranemaster® wire rope with its smooth external surface and very good contact condition will minimise abrasive wear between the rope and ancillary equipment and also between adjacent laps of rope. Where a rotation resistant rope is required maximum resistance to abrasive wear can be achieved by specifying a Cranemaster® compacted rope in Langs lay.

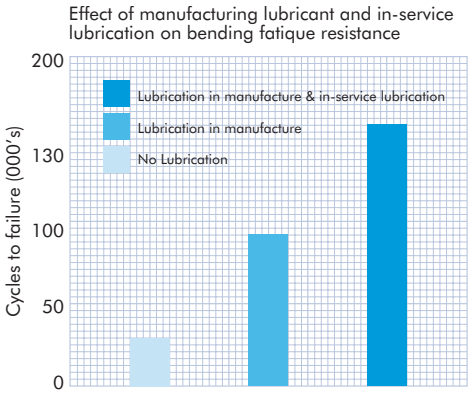
Cranemaster® single layer ropes such as Cranemaster® 6 will give exceptionally good resistance to abrasive wear even in ordinary lay.

CORROSION RESISTANCE

It is normal to select a rope with galvanised finish if it is likely to be used in a corrosive environment. Plastic impregnation of the entire rope (PIR) or plastic coating of the core can also help to prevent corrosion.

LUBRICATION

Effective lubrication with the correct rope lubricant can extend fatigue life, minimise abrasive wear and help to minimise corrosion.



Laboratory bend fatigue tests show the significant effect which high performance manufacturing lubricant and in-service lubrication has on rope life.

In-service lubrication with a suitable lubricant should be carried out wherever possible however the best opportunity to introduce lubricant into the rope is during manufacture.

Luberite ensures that during manufacture Brunton Shaw UK Cranemaster® and Cranestar® ropes are fully impregnated with a controlled amount of high performance lubricant designed to minimise corrosion and maximise rope life.