



WAHSA PGN09

Practical Guidance Note 09

GUIDANCE ON SELECTION, USE, MAINTENANCE AND INSPECTION OF ROPES FOR WORK AT HEIGHT ACTIVITIES

A series of informative notes for all industries involved with work at height or rescue.

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INTRODUCTION

Rope forms an integral part of many work at height systems.

This information sheet is intended to give a brief overview of the main types of rope used for fall arrest and work positioning.

The information contained in this material has been compiled by the Working at Height Safety Association from information that is already in the public domain. The material is intended to provide guidance but does not interpret and apply the law to particular circumstances and cannot be relied upon as advice.

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01 TYPES OF ROPE

There are 3 Harmonised EN standards that cover ropes used as PPE for work at height, these are:

- EN 1891:1998 – *Personal protective equipment for the prevention of falls from a height - Low Stretch Kernmantle ropes*
- EN 892:2012 – *Mountaineering equipment – Dynamic mountaineering ropes – Safety requirements and test methods*
- EN 564:2014 – *Mountaineering equipment - Accessory cords – Safety requirements and test methods*

Ropes that are made to these standards can be CE or UKCA certified.

In addition to ropes that are themselves CE certified there are assemblies such as lanyards that are made from rope and are CE marked, although the rope used in these produces often complies with the standards listed above they do not have to comply as long as the complete assembly meets the relevant performance requirements.

02 LOW STRETCH KERNMANTLE ROPES

This type of rope is the most used rope in work at height situations. The standard, EN 1891, was written to ensure that ropes used in safety critical applications at height are reliably and consistently safe. The ropes are designed to be used with ascending and descending equipment for work positioning, raising or lowering casualties during rescue and as a means of ascent, descent and horizontal motion. The characteristics of the rope are low extension during normal working procedure but with the capacity to withstand forces generated by a fall.

Scope: EN 1891 covers ropes from 8.5mm to 16mm diameter, either in 'Type A' or 'Type B'. Type B ropes are typically smaller diameter such as 9mm and subsequently have lower performance requirements.

It is unusual to see Type B rope used for work at height, the exception is some arborist ropes where the use of the lighter 80kg drop mass allows ropes to be certified with lower elongation.

Materials: Ropes must be made from new materials with a melting point over 195 deg C. This requirement is to prevent the use of Polypropylene in the ropes which isn't considered suitable for rope that may be exposed to heat from friction.

Diameter: Measured at 10kg ref tension, Average of 6 measurements

Knotability: Must be less than 1.2 – This is a test to ensure the rope is flexible enough to be used with normal hardware and can be knotted.

Sheath Slippage: Measurement of relative movement between core and cover, ensures cover won't bunch up in use.

Elongation: Measured from 50kg to 150kg load – this is designed to simulate the loads when ascending the rope. This figure gives an indication of how 'bouncy' the rope will be in use. This must not be more than 5%.

Shrinkage: Gives an indication of how much a rope will shrink in service

Mass: Rope mass is measured at reference tension

Core/cover ratio: This requirement is designed to ensure the rope has a load bearing core and that the cover is sufficiently thick to provide protection.

Impact force: Peak load seen when 100kg (80 kg for type B) is dropped through a fall factor of 0.3 (distance dropped divided by the length of rope). This must not exceed 6kN.

Dynamic performance: The rope must survive at least 5 fall factor 1 drops with 100kg drop mass (80kg for type B).

Static strength without terminations: The rope must have a strength exceeding 22kN (18kN for type B).

Static strength with terminations: The rope must have a strength exceeding 15kN (12kN for type B), this test is done with a fig 8 knot in as ropes would typically be used. If a rope is supplied with other terminations such as sewn or spliced this is the strength requirement.

03 DYNAMIC CLIMBING ROPE

The standard is designed around ropes that are primarily designed to absorb the energy of a fall. Unlike EN 1891 which is for ropes that are used for work positioning and access. For this reason, there is not a strength requirement in this standard, the primary performance requirement is to pass the drop test. The standard assumes a rope of Kernmantle construction.

Dynamic ropes should be specified in any situation where there is potential for a fall of any distance prior to the rope arresting that fall. It is unusual that this situation can occur in normal planned work at height and so specifying this type of rope is rare. The most common use of Dynamic ropes for work at height is in the construction of Cows Tails.

Scope: EN 892 covers Dynamic climbing ropes.

The standard is for three types of rope:

- Single ropes - used on their own. Typically, 9-11mm diameter
- Half ropes- used as one of a pair where each rope can be clipped separately. Typically, 8-9mm.
- Twin ropes- used as a pair where the ropes remain parallel and are clipped together. Typically, 7.5-8.5mm.

Half and Twin ropes are not normally used for work at height.

Materials: Not specified, but it is likely that only Nylon ropes can meet the drop test requirements.

Diameter: Measured at 10kg ref tension for single rope and 6kg for half and 5kg for twin ropes, average of 6 measurements.

Sheath Slippage: Measurement of relative movement between core and cover, ensures cover won't bunch up in use.

Static Elongation: Measured from 5kg to 80kg load – this is designed to simulate the loads when resting mass of a climber is applied to the rope. This figure gives an indication of how much the rope will stretch in use. This must not be more than 10% for single and doubled twin rope and 12% for half rope.

Mass: Rope mass is measured at reference tension of 10kg for single rope and 6kg for half and 5kg for twin ropes.

Impact force: Peak load seen on the first drop when 80kg (55 kg for half rope) is dropped through a fall factor of 2 (distance dropped divided by the length of rope). This must not exceed 12kN. (8kN for half rope). In this test twin ropes are tested as a pair to the requirements of single ropes.

Dynamic performance: The rope must survive at least 5 fall factor 2 drops with 80kg drop mass (55kg for half rope). Twin ropes must survive at least 12 drops.

Dynamic Elongation: Peak elongation seen on the first drop must not exceed 40%.

04 ACCESSORY CORDS

Accessory cords are smaller diameter cords designed to withstand forces but are not designed to absorb energy. They would typically be used for applications like tool retention. However, it is common to find cords meeting this standard being used with the arborist industry for the construction of friction hitches used for ascent and work positioning.

Scope: EN 564 covers cords from 4mm to 8mm in a kernmantle construction.

Diameter: Must be one of the following diameters: 4mm, 5mm, 6mm, 7mm or 8mm. The standard does have a means of calculating strength requirements for diameters outside this range and so there are products available that are CE marked using EN 564 as a guide but that are outside the diameter scope of the standard.

Mass: Rope mass is measured at reference tension.

Tensile Strength: The rope must exceed the strength requirements of the standard. The test is done with the rope in a machine as described in ISO 2307. There is no requirement to test the rope with knots or other terminations.

05 MAINTENANCE, INSPECTION AND RETIREMENT

All of the rope types described in this document will be supplied with manufacturer's instructions, within this will be guidance on the shelf life of the rope and the need to inspect the rope prior to use. This manufacturer specific guidance takes precedence over the following general information.

Maintenance: In most cases there is no maintenance to be done with rope other than cleaning. If a rope is damaged it is normally retired from use.

Shelf life: Typically, this will be something like 10 years and will reflect not just the life of the rope but also the requirement of the manufacturer to maintain production records.

Working life: This can vary greatly depending on how the rope is used.

Inspection: This will normally entail visual inspection of the rope to identify areas of damage along with tactile inspection to feel for lumps, stiff sections or thin areas in the rope. In most cases if any of these are identified the rope should be retired from service.