

Rope Wrench System Recommendation.

Background

The Singing Tree/ISC Rope Wrench is a device that allows DRT (doubled rope techniques) to be performed whilst using a single rope. This is achieved by creating a bend above the climber's hitch, which with the addition of the stiff tether creates a 'contained doubled rope system' that travels throughout the tree allowing for a level of consistency of friction, impossible to replicate in doubled rope climbing.

The plan is to introduce this system into the competition environment, even though it is being used extensively already in 'production' environments. This is a relatively 'safe' environment which allows for experienced users to try new techniques. Before being able to introduce this system into competition the system needs to be 'approved' by the ISA Technical and Rules Committee. There is no specific standard that covers this type of system, so it has been agreed that the most prudent method is to check that the system meets the requirements of BS EN12841:2006 "Personal fall protection equipment. Rope Access Systems. Rope adjustment devices" – in line with other accepted devices.

The ISC Ropewrench system configuration.

- RP280 Rope Wrench.
- RT270 270mm Sterling tether .
- Yale Kernmaster rope 11mm
- Schwabisch hitch (prepared using Yale beeline 10mm cord)
- RP281 Rope Wrench pulley.
- KH204SS triple-action aluminium HMS karabiner.

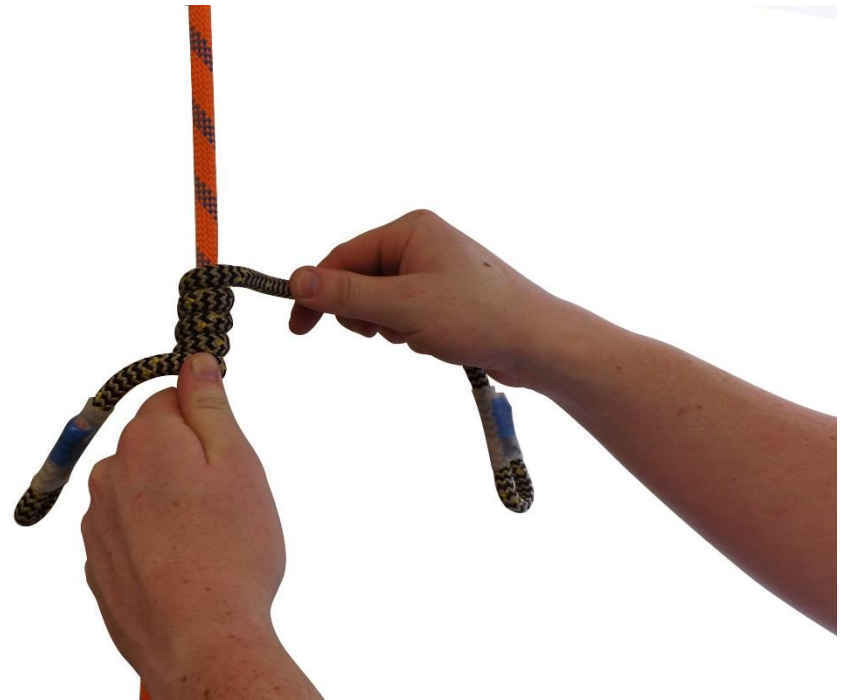


Producing a Schwabisch hitch.

Step 1 – place 10mm Yale Beeline in front of the climbing line (Yale Kernmaster 11mm).



Step 2 – wrap the cord around the climbing line 4 times



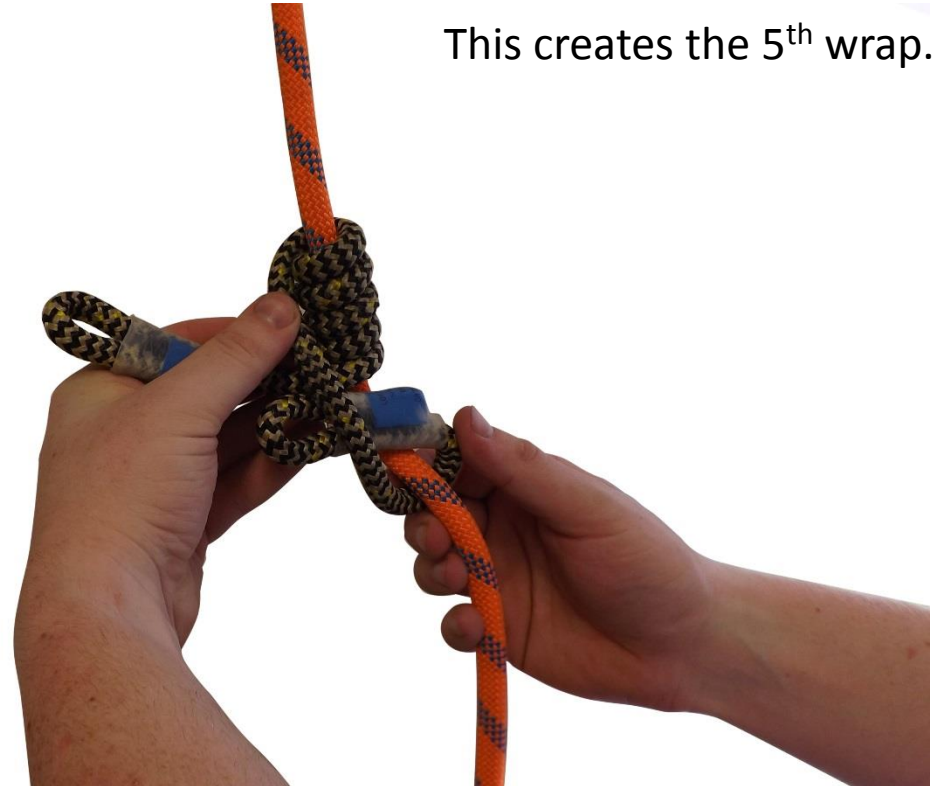
Producing a Schwabisch hitch – continued.

Step 3 – bring the long length of cord down in front of the start point.



Step 4 – feed the long end around the back of the climbing line and back under the cord.

This creates the 5th wrap.



Producing a Schwabisch hitch – continued.



Step 5 – Pull both eyes down ensuring the hitch is tight around the climbing line and that any loads will be equalised through the karabiner.

BS EN 12841:2006 Definitions.

Type B rope adjustment device: working line ascender

Manually operated rope adjustment device which, when attached to a working line, locks under load in one direction and slides freely in the opposite direction.

Type C rope adjustment device: working line descender

Manually operated, friction inducing rope adjustment device which allows the user to achieve a controlled downward motion and a stop, with hands off, anywhere on the working line.

BS EN 12841:2006 Test requirements.

Type B rope adjustment device

4.3.3 Minimum working strength

Type B rope adjustment devices on an anchor line shall withstand a force of 4kN for 3 min with a maximum slippage of 100mm when tested in accordance with 5.5.2.

No part of the Type B rope adjustment device shall show signs of permanent deformation that would affect its function, and the anchor line shall not show any signs of tearing or breaking.

4.3.4 Dynamic strength

Type B rope adjustment devices shall not release the mass when tested as described in 5.6.3 with a rigid steel mass of 100kg or a mass equivalent to the maximum rated load, whichever is the greater, and the arrest distance H shall be a maximum of 2m.

Type C rope adjustment device

4.4.3 Minimum working strength

Type C rope adjustment devices on an anchor line, with the hands-free locking element enabled, shall withstand a force of 3kN for 3 min with a maximum slippage of 300mm when tested in accordance with 5.5.2. No part of the Type C rope adjustment device shall show signs of permanent deformation that would affect its function, and the anchor line shall not show any signs of tearing or breaking.

4.4.4 Minimum static strength

Type C rope adjustment devices shall withstand a force of 12kN for 3 min when tested on an anchor line in accordance with 5.5.3.

4.4.5 Dynamic strength

Type C rope adjustment devices shall not release the mass when tested in accordance with 5.6.3 with a rigid steel mass of 100kg or a mass equivalent to the maximum rated load, whichever is the greater.

4.4.6 Residual strength

When tested in accordance with 5.6.3.5 Type C rope adjustment devices shall have a minimum residual strength of 3kN for 3 min.

4.4.7 Descent velocity

When tested in accordance with 5.7 with a minimum mass of 100kg or a mass equivalent to the maximum rated load, whichever is the greater, it shall be possible to limit the descent velocity of Type C rope adjustment devices to 2m/s.

4.4.8 Effect on the anchor line

When tested in accordance with 5.7 with a minimum mass of 100kg or a mass equivalent to the maximum rated load, whichever is the greater, Type C rope adjustment devices shall not cause permanent deformation or damage to the anchor line.

4.4.9 Temperature rise

The temperature of Type C rope adjustment devices shall not rise to a point where the function of the rope adjustment device is affected. When tested in accordance with 5.7 with a minimum mass of 100kg or a mass equivalent to the maximum rated load, whichever is the greater, none of the parts of Type C rope adjustment devices handled by the user to control the descent, when operated as described in the information supplied by the manufacturer, shall develop a temperature higher than 480C on uncoated metal during the descents.

BS EN 12841:2006 Test methods.

5.5.2 Minimum working strength

Connect one end of the adjustable anchor line to a suitable anchor, and adjust the rope adjustment device so that it is at least 300mm from the anchor. With a connector fitted to the attachment point of the rope adjustment device, ensure that the rope adjustment device is locked to the anchor line (see Figure 2). Apply a force of 1kN to the connector and mark the anchor line at the point at which it enters the rope adjustment device. Increase the force to that specified in 4.2.3, 4.3.3 or 4.4.3 as appropriate, without shock.

Maintain the force for 3 min and make a new mark on the anchor line at the point at which it enters the rope adjustment device. While maintaining the same force, measure the slippage along the anchor line as the difference between the two marks.

Verify by visual and tactile examination that there is no damage to the rope adjustment device or signs of tearing or breaking of the anchor line, and that the rope adjustment device still functions as intended on the anchor line.

5.5.3 Minimum static strength test

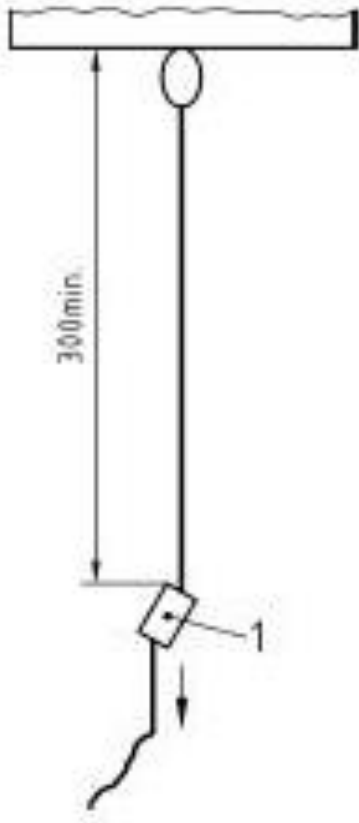
Make a stopper knot (See Figure 3) on the rope below the rope adjustment device to prevent sliding of the rope adjustment device on the anchor line. If necessary, an appropriate stopper device of steel may be inserted between the knot and the rope adjustment device to prevent the knot entering the rope adjustment device. Apply the specified force at a constant rate of 100mm/min to the attachment point of the rope adjustment device. Observe that the requirements are met.

BS EN 12841:2006 Dynamic tests

5.6.1.2 Test lanyard

A test lanyard is required for the dynamic strength tests of Type B and C rope adjustment devices (see 5.6.1.4). The test lanyard shall be constructed in accordance with Figure 5. It shall be made from an unused sample of mountaineering rope conforming to EN892 for single rope, have a nominal diameter of 11mm and be known to have an impact force of 9kN in the first impact test of that standard. When subject to a load of 100kg (as shown in Figure 5) the length of the test lanyard including the eyes formed at each end shall be 1000mm; and the length of each termination loop including the knot shall not exceed 200mm.

Static Strength testing



Function tests – Locking test.

3kN held for 3 minutes, up to 100mm slippage allowed.

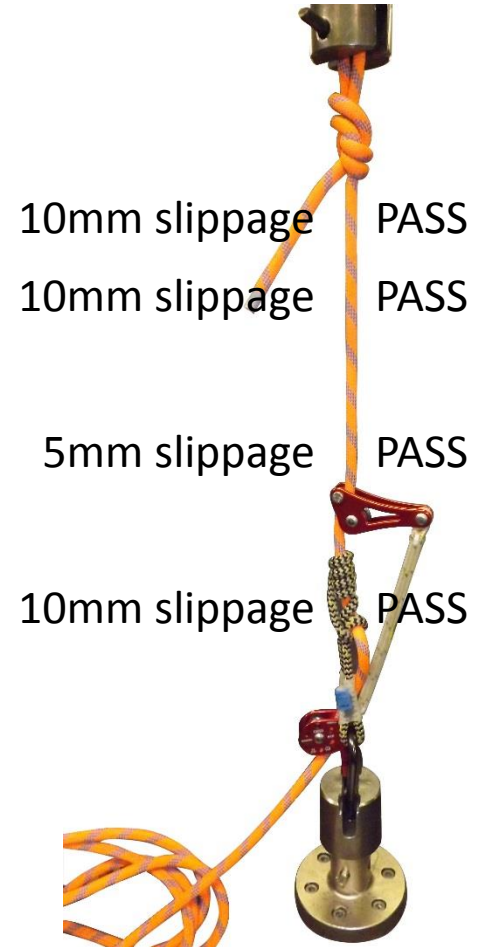
4kN held for 3 minutes, up to 300mm slippage allowed.

Function tests after conditioning with moisture.

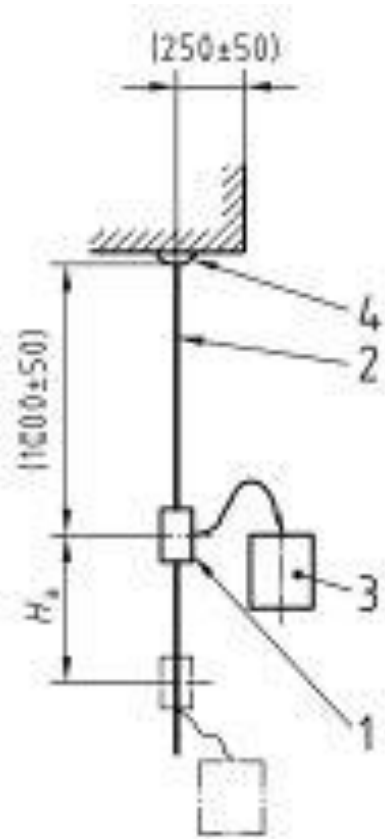
3kN held for 3 minutes, up to 100mm slippage allowed.

Function tests after conditioning with cold (-20°C).

3kN held for 3 minutes, up to 100mm slippage allowed.



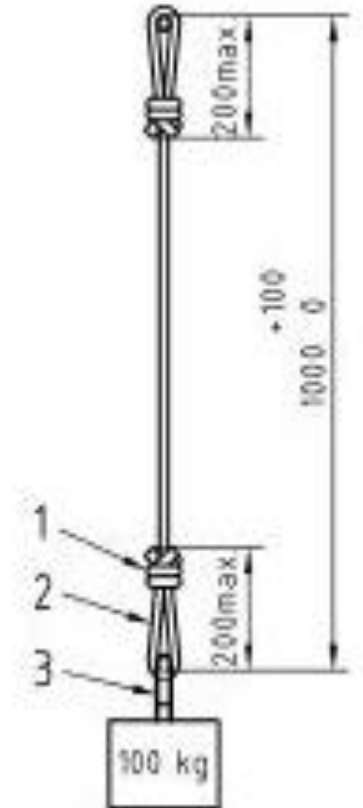
Dynamic Strength test



Dynamic performance test (Type C device).

1m fall of 140kg mass on 1m of rope using 1m dynamic lanyard. Mass must not be released.

	FAD	Outcome	Result
Drop 1	100mm	Mass not released.	PASS
Drop 2	70mm	Mass not released.	PASS



Conclusions.

As of yet we have not completed the testing of the system over a 50m distance. Various tests have been carried out over shorter distances and have met the requirements of the standard. We will update this report when we find a suitable test facility on which to carry out this testing.

Recommendations.

Based on the Standards testing carried out by ISC and years of field-use by the designer as well as hundreds of production climbers, ISC are happy to recommend this system configuration.

ISC approve the above mentioned configuration to be introduced for competition use. This configuration is already in use by many arborists, including our very own Rich Hattier who is a well-respected 'Masters' climber.