

Rope system testing at Unofficial Swiftwater Rescue Instructor meet

Norway July 2010



Testing was carried out on the 20.07.2010 at Rescue 3 Norge using a Digital load cell

There was an average air temp of 17°C

Prussik Testing:

The idea was to test two different ways of tying the standard three wrap prussik used in swiftwater rescue classes to find out if one way or the other was stronger or better.

Main line: Edelrid soft static 10.5mm - 10 years old - Good condition.

Prussik cord: Edelrid 7mm cord - 5 years old - New condition.

Test # 1

Standard "rescue 3" 3 wrap prussik system was loaded to 420kg with no problems

Photo of how knot was tied before loading



Test # 2

Standard "rescue 3" 3 wrap prussik
3cm Slippage occurred at 822kg loading
Prussik cord snapped at 1115kg loading

Photo of knot after cord snapped



Test # 3

Innsbruck 3 wrap prussik (knot over wraps)

Photo of how knot was tied before loading



2cm Slippage occurred at 402kg loading

3cm Slippage occurred at 702kg loading

Prussik cord stripped main line of sheath at 1055kg loading

Photo of knot after cord main line sheath stripped



Test # 4

In this test a length of rope was cut from the main line, the core removed and the sheath used as the prussik.

Dogtails wrap, 7 wraps with tape knot join.

2 cm Slippage occurred at 670kg loading

Prussik tape snapped at 895kg loading

Photo of how knot was tied before loading



Conclusions Prussik testing:

In these tests the standard 3-wrap prussik gripped better and had a higher loading than the other variations tested. However all Prussik knots will give different results depending on the Materials of the rope and cord, the construction of the rope and cord, the conditions at the time (wet / dry / icy / muddy) as well as the way the knots are tied.

Highline testing:

In this test we wanted to see what the real world values were for the tension in a high line both before and after loading. Is it safe enough to just give the advice that all lines should be tensioned to a PMA of 12? A single main line was fixed using a no knot to the tree and tensioned using standard swiftwater rescue equipment.

Length of span: 28m

Main line: Edelrid soft static 10.5mm - 10 years old - Good condition.

Tensioning system: External 4:1 compound MA system (Pig Rig)

Test # 5

Line tension with 3 people - 12 PMA (3 people x 4:1 system) 180.5kg

Mid point sag 0m

Line tension when loaded with test person A (Schrodi 95kg) 274.0kg

Mid point sag 2.5m

Line tension when loaded with test person B (Jan 92kg ?) 267.0kg

Mid point sag 2.5m

Test # 6

A pod was used 1/3 of the way along the span to decrease rope sag

Line tension with 3 people - 12 PMA and then pod placed 163.5kg

Line tension loaded with test person B (Jan 92kg ?) 219.0kg

Line tension loaded with test person A + B (187 kg ?) 256.0kg

Conclusions highline testing:

The 10.5mm main line that we used has a rated breaking strength of 30kN (3058kg) so we were still inside the 10:1 recommended safety factor on each loading.

When using twin main lines (recommended in europe for vertical rope rescue for system redundancy) the loading would be shared over both ropes, decreasing the rope sag and also sharing the loading over both ropes.

As always more testing could be carried out.

Current recommendations in the USA * are that a highline is only pre-tensioned with 2 PMA and then further tensioning is done (with a maximum of 12 PMA for an 11mm rope) when the load is on the line.

* Technical Rescue Riggers guide (2nd edition) by Rick Lipke