

Test Set-up

All of the tests were conducted on an engineered drop testing tower owned by Jim Kovach of *All About Ropes, Inc.* 600lbs of elevator weights were suspended from a quick release device at the top of the tower. The belay system being tested was attached to the load with a figure 8 and steel carabiner. The belay rope ran from the load up through a COD pulley anchored at the top of the tower, down to a second COD pulley at the base of the tower, then over to a tree approximately forty feet away from the tower where it was rigged to the MPD or Tandem Prusik Belay. This set-up provided approximately seventy (70) feet of rope in service plus slack left in system for test. **See Pictures 1 & 2**

At the tree anchor, a load cell was used behind each belay system test to record the approximate forces at the anchor. At the load, a CMC *Enforcer* was used to record the approximate forces at the load.

Note: *The **fall arrest distance** was calculated by taking a measurement from the ground to the top of the load pre-drop and then making the same measurement post drop. The overall fall arrest distances below include the overall slack left in the system and rope elongation. See Pictures 3 & 4*

Test Components

For the MPD tests, a new 13mm CMC MPD was used.

For the Tandem Prusik Belay tests, 8mm PMI accessory cord was used for the Prusiks, an out of service Prusik minding pulley, out of service steel SMC carabiners and BC style load releasing hitch, tied from used 10mm PMI EZ Bend rope.

The ropes used for all of the tests were ½" PMI EZ Bend rope. One Blue/White with moderate use over 8 years, a Red/White with very little use and a solid Red that was put into service in the mid 1990s and used in an unknown number of rope training classes.

Tests Overview

A total of twelve (12) drop tests were conducted. Eight (8) on the MPD and four (4) on the Tandem Prusik Belay. We tested varying amounts of slack in the belay systems, ranging from two feet to six feet. Also looked at was how the MPD would perform with wet rope and with wet and muddy rope.

Test Results

#1 - This first test was set up differently than described on the previous page. For this test the MPD was anchored to a load cell at the top of the tower, no COD pulleys were used. This test was intended to replicate the British Columbia Council of Technical Rescue, Belay Competency Drop Test Criteria of a 1 meter fall on 3 meters of static rope. Note; the test mass was 610 lbs for this test.

- The MPD caught the load and was used to lower the load to the ground
- Fall arrest distance was 16 3/8"
- Approximate rope slippage 3"
- Force at anchor was 2495 lbs

#2 – MPD, pre-tensioned to approximately 211 lbs at the load cell on the tree anchor.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was not recorded
- Force at the load was 1062 lbs
- Force at load cell at tree anchor was 897 lbs

#3 – MPD, approximately two (2) feet of slack.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was 5' 10"
- Approximate rope slippage 2"
- Force at the load was 1624 lbs
- Force at load cell at tree anchor was 1645 lbs

#4 – MPD, approximately two (2) feet of slack.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was 6'
- Force at the load was 1852 lbs
- Force at load cell at tree anchor was not recorded

#5 - Tandem Prusik Belay, approximately two (2) feet of slack.

- The TPB caught the load
- The fall arrest distance was approximately 6' 4"
- Force at the load was 1700 lbs
- Force at load cell at tree anchor was 1475

#6 - Tandem Prusik Belay, approximately two (2) feet of slack.

- The TPB caught the load
- The fall arrest distance was approximately 6' 4"
- Force at the load was 1586 lbs
- Force at load cell at tree anchor was not recorded

#7 - Tandem Prusik Belay, approximately four (4) feet of slack.

- The TPB caught the load
- The fall arrest distance was approximately 9' 9"
- Force at the load was 1824 lbs
- Force at load cell at tree anchor was 1608 lbs

#8 - Tandem Prusik Belay, approximately four (4) feet of slack, no load releasing hitch.

- The TPB caught the load
- The fall arrest distance was approximately 8' 1"
- Force at the load was 1804 lbs
- Force at load cell at tree anchor was 1578 lbs

#9 – MPD, approximately four (4) feet of slack.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was approximately 8' 9"
- Approximate rope slippage 2-1/2"
- Force at the load was 1854 lbs
- Force at load cell at tree anchor was 1625

#10 – MPD, approximately four (4) feet of slack, wet rope.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was approximately 8' 3"
- Approximate rope slippage 2"
- Force at the load was 1840 lbs
- Force at load cell at tree anchor was 1619 lbs

#11 – MPD, approximately four (4) feet of slack, wet and muddy rope.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was approximately 7' 1"
- Approximate rope slippage 4"
- Force at the load was 1828 lbs
- Force at load cell at tree anchor was 1612 lbs

#12 – MPD, approximately six (6) feet of slack.

- The MPD caught the load and was used to lower the load to the ground.
- The fall arrest distance was approximately 9' 10"
- Approximate rope slippage 5"
- Force at the load was 2346 lbs
- Force at load cell at tree anchor was 2083 lbs

Picture 1



Picture 2



Picture 3



Picture 4

