8MM TESTING

This presentation will focus on the testing of PMI 8mm accessory cord. We plan to present data on new and used PMI 8mm accessory cord tested in manner of function for structural and industrial rescue.

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The purpose of this presentation is to pass on information we have gathered while performing some testing of materials and techniques that we use. This presentation will focus on the testing of PMI 8mm accessory cord and PMI 10-mm rope, both new and used.

We tested new and used PMI 8mm accessory cord, which we use to tie our prusiks, and PMI 10mm rope, which is issued to each team member in 20 foot lengths. We felt the testing of used prusiks and ropes was relevant and possibly even more important than testing new, unused material. We don't have brand new cordage for each rescue or each training session. We reuse our ropes and our prusiks.

Let's start with our prusiks. First what is a correctly tied prusik loop? For our teams, we teach tying our prusiks with a double overhand bend that has 1-inch tails. That's 4 smooth coils on one side and a pair of x's that interlock on the other side. But what if our PMI 8mm accessory cord is mistied? What if the x's don't interlock? What if one side is mistied? What if both sides are mistied? By mistied, we mean the following: if 1 side is mistied it means there is only 1 x and on the other side the x is uncrossed. If both sides are mistied then both xs are uncrossed with the tails exiting away from the bend.

In some of our initial testing in April of 1996 we slow pull tested prusiks properly tied with a double overhand bend in new PMI 8mm accessory cord. We also tested where the xs did not interlock and with 1 side mistied. We repeated this testing in August of 1999. Some were properly tied, some with x's that did not interlock, some with one side mistied and some with 2 sides mistied. In all we tested 14 properly tied double overhand bends and 27 improperly tied double overhand bends. From our results it appears that an improperly tied double overhand bend is as strong or stronger than a properly tied double overhand bend in new PMI 8mm accessory cord. We came up with the same results in May of 1996 when we slow pull tested new PMI ½ inch rescue rope tied in a loop with properly and improperly tied double overhand bends. As interesting side note to this series of tests was that upon inspection after testing, all the prusiks with 1 side mistied or the prusiks with 2 sides mistied appeared to have corrected themselves and all the bends ended up with interlocking x's as if they were properly tied to begin with.

We will continue to teach the double overhand bend being properly tied with the x's crossed and interlocking and 4 smooth coils on the back. The strength of the bend is more than adequate and has been proven to perform satisfactorily over time and when you look at it, it's easy to recognize.

The benefits of the testing for us, are increased knowledge and awareness.

If a student or team member asks about a mistied double overhand bend we respond by saying that currently there is some testing being done on that subject and until we have further data we will continue to properly tie the double overhand bend and leave it at that. This is because the testing is incomplete and we have only done limited testing on PMI 8mm accessory cord and PMI ½ inch Easy Bend rope.

We also tested new and used 8-mm prusiks tied with a double overhand bend with no tails to see if the tails pull through or the prusiks fail early. First, we had already slow pull tested 28 properly tied prusiks and 27 mistied prusiks, all with 1 inch tails. Out of the 55 tests, only 7 failed in the bend. When we tested 7 properly tied prusiks with no tails, 6 out of the 7 failed at the bend with 2 that may have pulled through. But interesting enough the forces that they failed at were acceptable when compared to the forces that caused other properly tied prusiks to fail.

We use our 8mm prusiks with our 10-mm rope. We rely on these systems for edge protection, fall prevention, work positioning and to make our lanyard systems. We did slow pull testing in 1996, 98 and 99 and found that our failures occurred in the 3000 lbf area on 10 mm rope, unless we use black rope. On black rope the prusiks tended to slip and not grab the rope.

In 1997 we dropped 300 lbs on a used 8mm, 3-wrap prusik on a used 10-mm rope. It was a fall factor 1 of 36 inches. The first drop was a catch and the second drop failed the prusik. We repeated the test again with another used prusik on used 10-mm rope and caught 5 fall factor 1 drops ranging from 24-30 inches.

When we double our 10mm rope and attach our triple wrapped prusik , our slow pull failures occurred between 3500 lbf and 4700 lbf with 8 out of 11 tests occurring above 3800 lbf. Our low for this series of tests was 2870 lbf on a used 5 year old prusik. We also had a 5 year old prusik on new doubled 10mm rope catch 11 fall factor 1 drops and fail on the 12th drop of 300 lbs. But a word of caution. We had another 5 year old used prusik on a new doubled 10 mm rope fail in it's 1st attempt to catch a fall factor 1 of 36 inches with 300 lbs.

We have performed the same slow pull tests with our PMI 8mm prusiks on PMI ½ inch rope in 1996 and 1999. Our failures ranged from 3300 lbf to 3700lbf. And in drop tests we have participated in with Russ Born, we have observed a single PMI 8mm prusik on ½ inch PMI rope catch a fall factor 1 drop of approximately 520 lbs.

The 10-mm rope can also be used as anchor material. We did a wrap 2 pull 2 with new PMI 10-mm rope and stopped the test at 11,240 lbf. We then tested the same piece of rope in a wrap 1 pull 1 configuration. It failed at 7560 lbf, again that was after being pulled to 11,240 lbf. We then tested 2 new pieces of 10-mm rope in wrap1 pull 1 configuration and they failed at 8725 lbf and 8865 lbf.

When we tested some older, used prusiks with their bends set so hard they felt like concrete and could not be untied, we had a slow pull failure of 2170 lbf and another at 2575 lbf. The next 6 we tested all failed above 2900 lbf in our slow pull testing. None of the failures occurred in the bend, they all appeared to occur at the carabiner.

We use 8mm prusiks on our 10-mm rope to make lanyards for tower climbing. So we tested 8mm prusiks on 5/8 inch threaded rod as might be found on tower step bolts. Three of the 4 tests failed over the threaded rod with a low of 2660 lbf. The others failed at 2865 lbf, 2880 lbf, and 3350 lbf. If you recall from our presentation last year that the step bolts failed during a yield test at 1070 lbf.

In slow pull testing, our load release hitches, tied out of 10-mm rope, fail between 6000 lbf and 7800 lbf depending on the rate of pull being applied. In May of 1996 we participated in some drop testing with Russ Born at Bowling Green State Fire School, where we used the same 10-mm load release device during 11 fall factor 1 drops of 520 lbs. The load release hitch never failed and when it was removed from the system it was easy to untie.

In 1996 we slow pull tested ½ of a horizontal adjustable litter bridle made of 8mm accessory cord and 10-mm rope. We stopped the first test at 7630 lbf to save the intact sample to show team members. The second bridle failed at 8110 lbf.

Our testing gave us some insight into the strength of new and used prusiks and new and used 10mm rope in the systems we use. It also created new questions for us and begs for more testing.

There is always a danger when you present your findings that they may be misquoted, misused, or misinterpreted. Again, this testing was with PMI 8mm accessory cord and 10 and 12 mm rope. No other manufacturers and no other sizes were tested. As far as comparing test data goes, it can't be done. The prusiks we tested were used differently than the prusiks you use. The prusiks we tested were used at different times under different temperatures and conditions, with different rates of force.

We hope this encourages you to test the cordage you use and to share the results with all of us so that we, the rescue community, might benefit from your testing.

In conclusion, we would appreciate any comments or concerns you may have.

Jim Kovach