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## TRR Skill: Purcell Prussik Building



### The Purcell Prusik System

A set of Purcell Prusiks is one of the handiest tools available to the rescuer. It has multiple uses, the primary

one being to serve as an ascending/descending means. The Purcell Prusik System is only one of many types of ascending/descending systems, but is probably the most versatile, lightest in weight, and least expensive of the available options. It also has the unique advantage of allowing a rescuer to ascend or descend in either a free-hanging or sloping environment.

The Purcells can also be used to secure a rescuer to an anchor system, an edge safety line, or a litter master point. And, they can be used as an adjustable tie-in link in securing a patient to a litter.



The Purcell Prusik System,  
Fig 1

The Purcell Prusik System shown in Figure 1 is comprised of three Prusiks: two Foot Prusiks and one Harness Prusik. The two Foot Prusiks allow easier movement in free-hanging terrain. Also, if one Foot Prusik is being used as an adjustable tie-in (e.g. attendant tie-in), then the other can be used to ascend a short distance when required.

### Sizing of Purcell Prusiks

The three Prusiks are different lengths: short, medium, and long. With the Long Foot Prusik tightened over a boot, the top of the Figure of Eight on a Bight should reach the chest/nipple height of the rescuer, and the Medium Foot Prusik should reach the height of the rescuer's iliac crest (top of hip bone.) The Short Harness

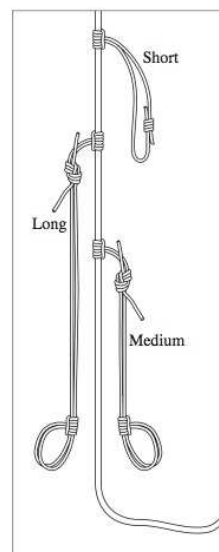


Figure 2 - Placement

Prusik should reach from the chest/ nipple line to a height about 4 inches above the top of the helmet. See Figure 1. The reason for the different Foot Prusik lengths is to allow enough room to move them up the rope without having them interfere with each other. The Short Harness Prusik length is long enough to enable the rescuer to bypass a descent device, such as a rescue eight, if changing over from a rappel, but not so long that the top is out of arm's reach.

### Placement on Rope

Triple-wrap Prusik Hitches are used to attach the Foot Prusiks and Short Harness Prusik to the Mainline as shown in Figure 2. A gentle loosening of the back of the triple-wrap Prusik Hitch before advancing up the rope will make this operation go easier.

From bottom up, the order in which the Purcell Prusiks are to be placed on the rope are: Medium, Long, and Short as shown in Figure 2. To help remember this order, the mnemonic "MiLeS" can be memorized ( as in "Seems like there are MiLeS of rope to ascend.") While the Medium and Long Prusiks are used as Foot Prusiks, the Short Prusik is clipped to the top chest D-ring of an NFPA Class III full body harness. Ascending techniques using the Purcell Prusik System are covered further at the end of this article.

Height of Rescuer in Inches	Length of Long Foot Purcell Cord in inches	Length of Medium Foot Purcell Cord in inches	Length of Short Harness Purcell Cord in inches
60	155	135	64
61	157	137	65
62	159	138	65
63	160	139	66
64	162	140	67
65	163	141	67
66	165	142	68
67	166	144	68
68	168	145	69
69	169	146	70
70	171	147	70
71	172	148	71
72	174	149	72
73	175	151	72
74	177	152	73
75	178	153	73
76	180	154	74
77	181	155	75
78	183	156	75
79	184	158	76

Figure 3 - Lengths to be cut from 6 mm nylon kernmantle accessory cord

## Constructing Purcell Prusiks

Start by finding your height on the table in Figure 3. Read across this line to find the lengths of the Long Foot Prusik, Medium Foot Prusik, and Short Harness Prusik cords. Cut three pieces to these three lengths from good quality nylon kernmantle accessory cord that is 6 or 7 millimeters in diameter, having a manufacturer's rated breaking strength of at least 7.5 kiloNewtons.

Begin by constructing the **Long Foot Prusik**: 1. On a flat surface, lay out the longest of the three pieces of cord you cut, as shown in Figure 4, taking care to measure accurately.

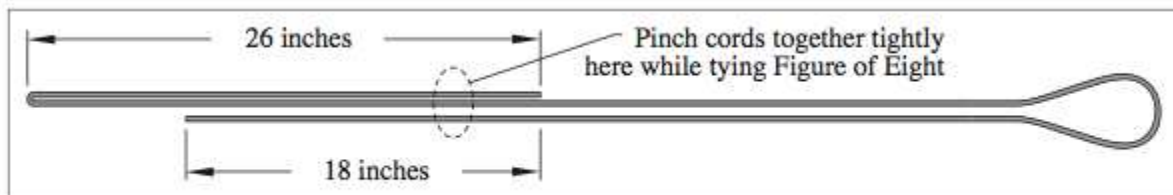


Figure 4 - Sizing the cord for constructing the Figure of Eight on a Bight

2. While pinching tightly all three strands together, at the location shown in Figure 4, tie a Figure of Eight on a Bight, as shown in Figure 5, so that you end up with two 4-inch tails. Take time to dress out the knot.

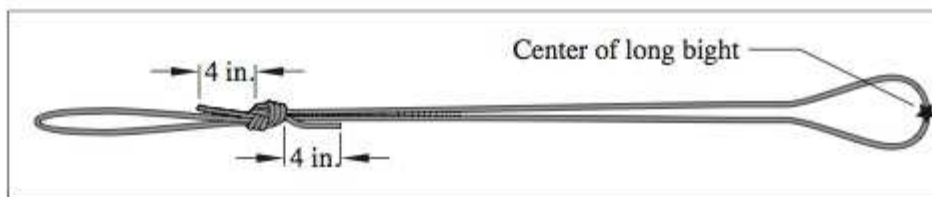
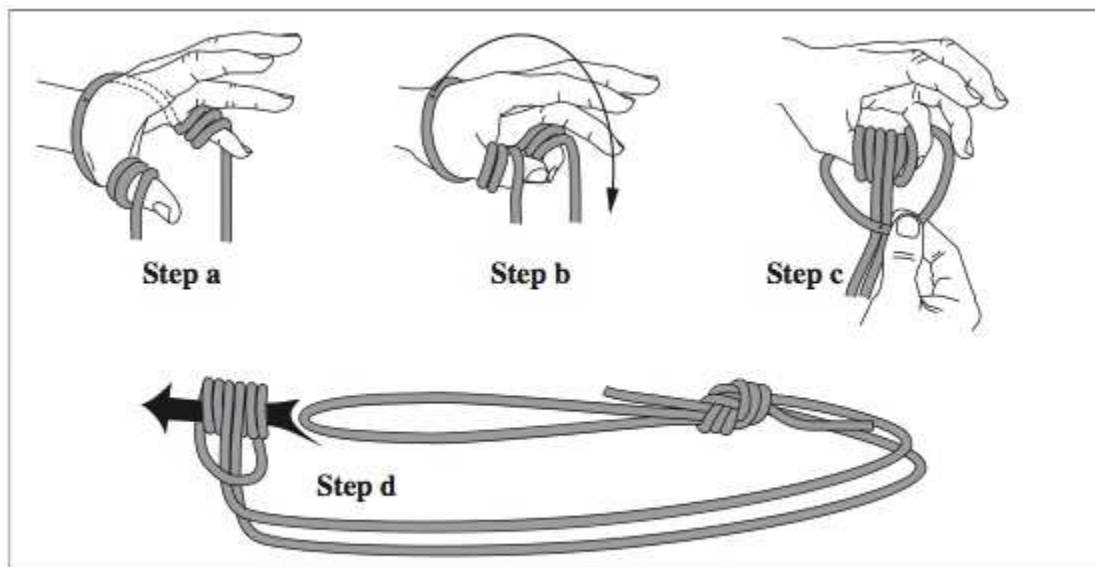


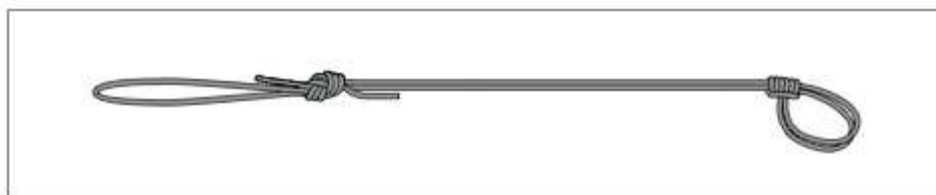
Figure 5 - The Finished Figure of Eight on a Bight

3. To make a Prusik hitch upon itself, follow the steps described here and shown in Figure 6.

- a. Lay the cord across the back of your hand with the center of the long bight centered on the back of your hand. Wrap one end around your thumb three times and the other around your pinky three times as shown.
- b. Close your thumb and pinky tightly together. c. Lift the loop of cord off the back of your hand and flip it over the top forming an "air" Prusik. d. Open up the prusik and feed the Figure of Eight on a Bight back through the Prusik. e. Dress the Prusik down tightly so that the two loops of cord exiting it are of the same size.



*Figure 6 - Creating the Prusik Hitch on the Foot Prusik cord*



*Figure 7 - The finished Foot Purcell Prusik*

4. If you did these steps correctly, then when you slip your foot into the foot loop and cinch it down, the loop at the other end of the Long Foot Prusik should reach the level of your chest/nipple line.

Now, construct the **Medium Foot Prusik** by following the same steps that you did for the Long Foot Prusik, only this time using the medium length of accessory cord.

Finally, after finishing the two Foot Prusiks, construct the **Short Harness Prusik** as shown in Figure 1 by tying the ends of your shortest length of accessory cord with a double fisherman bend (grapevine bend) with two 4-inch tails.

### Ascending Techniques

Generally, there are two types of terrain in which a rescuer may have to ascend a rope. The first is a completely free-hang wherein no contact is made with the cliff or building face by the rescuer. The second type is on terrain which is less than vertical, wherein the rescuer will have contact with the cliff or building face.

The free-hang technique resembles that of an inchworm. The Long and Medium Foot Prusiks are moved up the rope to the point where both feet are at the same elevation. The Short Harness prusik is then slid up the rope as the rescuer smoothly stands up on the Foot Prusiks. This process is repeated to ascend up the rope in a free-hang. To descend, the rescuer simply reverses the process.

In less than vertical terrain (“slab” in climber’s lingo), the technique used is referred to as the “toe-in technique,” which more closely resembles the movements of climbing up a ladder. The body is kept vertical,

and the Long and Medium Foot Prusiks are advanced alternately between advancement of the Short Harness Prusik.

Competent instruction should be sought in both the free-hang and the toe-in techniques, as well as in techniques to pass knots, ascend over an edge, and/or change over from rappelling to ascending, or from ascending to rappelling. When you ascend or descend using the Purcell system you should ***always*** have an independent belay also connected to yourself.

### **Final Adjustments**


Once you have ascended a rope with your Purcell Prusik System using both the free-hang and the toe-in techniques, you can make any minor adjustments in lengths to make the Purcells work best for you.

Article by Rick Webber.


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