



CMC Rescue Technical Report #1

ROPE LIFE: When to Retire Your Rescue Lifeline

The Climbing Sports Group of the Outdoor Recreation Coalition of America makes the following recommendation for retiring a climbing rope.

When in doubt, retire your rope. Generally, ropes should be discarded after holding a long, hard fall; if they have flat or soft spots; become stiff; or show sheath damage.

Retire climbing ropes after no more than four years of occasional use, two years of weekend climbing, or one year of active use. Retiring a rope after only six months of hard use isn't uncommon; some of the climbing gyms are finding that sheaths are wearing out after only a few weeks of intensive use. Also, multiple short lead falls, bounding rappels, and shock-loaded top-rope falls can have a negative accumulative effect of the rope's shock-absorbing capacity.

How does this apply to rescue ropes? The heavier sheaths on rescue ropes and fewer shock loads should allow a longer life than is expected from a rock climbing rope.

According to DuPont, the shelf life of their Nylon T707 (such as Wellington Commercial Cordage uses to make CMC Rescue Lifeline) should be indefinite unless altered by excessive exposure to certain chemicals, heat and sunlight. In the safety field, 1 to 2 years of use and 5 years of storage are recommended for synthetic ropes.¹

In June of 1990, Wellington Commercial Cordage tested samples of Rhino Rescue Rope stored for seven years by Bridger Coal's mine rescue team in Wyoming. The sample was 1/2-inch (12.7 mm) diameter, low-stretch kernmantle rope. The manufacturer's new rope tensile strength rating was 9,000 pounds (40.34 kN). For comparison, the independent lab tests on new Rhino Rescue Rope in 1983 averaged 10,495 pounds (47.04 kN). The test results from the Bridger Coal samples suggest minimal strength loss when the rope is properly stored.

Break #1	11,200 pounds (50.20 kN)
Break #2	10,600 pounds (47.51 kN)
Break #3	11,000 pounds (49.30 kN)
Average	10,933 pounds (49.00 kN)

Section 5.2.2 of ASTM F 1740 - 96 *Guide for Inspection of Nylon, Polyester, or Nylon/Polyester Blend, or Both Kernmantle Rope*, recommends ten years as a maximum rope life. How a rope is used and stored has a greater effect on rope life than any other factor.

In June of 1992, National City (CA) Fire Department sent us a rope they described as old and well used. It was the worst looking of the ropes they had in service and its acquisition preceded any record keeping. The marker tape indicated the rope was BlueWater II manufactured in 1983. BlueWater's catalog specifies a 7,600 pound (34.06 kN) tensile strength for 1/2 inch (12.7 mm) diameter BlueWater II. Tested by Wellington Commercial Cordage, the results showed an approximate 15% strength loss after nearly 10 years.

Break #1	6,400 pounds (28.69 kN)
Break #2	6,800 pounds (30.48 kN)
Average	6,600 pounds (29.58 kN)

Bruce Smith, co-author of *On Rope*, collected and broke over 100 samples of used caving rope. Using each rope's history, each sample was categorized as "like new", "used", or "abused". Like new ropes averaged a strength loss of 1.5 to 2 percent per year, and used ropes 3 to 4 percent per year. Smith observed that "care of the rope has a far greater impact on a rope's life than age."²

At this time the evidence suggests that with average use a rescue rope will lose 1.5 to 2 percent of its strength per year. Under hard use, a rope can lose 3 to 5 percent per year. Once you decide the minimum strength for your lifeline, you can calculate the expected service life.

Aside from shelf life and strength loss, the other reason for retirement is damage, or suspected damage. The inspection may find evidence of damage, or a team member may report that the rope suffered an impact load, was hit by a rock, or smashed between the stretcher and the wall. If you do decide to retire the rope, take it apart and look inside at the damaged area to get a better understanding of how much abuse the sheath can take and still protect the core. More often than not, no damage to the core can be seen.

Again, if you have any doubt about the integrity of your lifeline, retire it. Rope is just not expensive enough to risk a rescuer's life over.

▣ November 1998, CMC Rescue, Inc.

¹ Ellis, J. Nigel. *Introduction to Fall Safety*. Des Plaines, IL: American Society of Safety Engineers; 1998.

² Smith, Bruce. "Aging Rope." *Nylon Highway*. Issue No. 25. Huntsville, AL: Vertical Section, National Speleological Society; January, 1988.