

Lifeline rope

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When you're wearing fall protection, you trust your life to your lifeline. Make sure it can actually save your life. Make sure it's the right kind of rope.

Some types of rope are better than others for lifelines—and some types should never be used for lifelines at all. This article will help you make informed decisions when you're selecting rope for lifelines.

We'll look at two aspects of rope: its material and its design.

Rope material

Nylon, polyester, polypropylene, and polyethylene are common materials used when making rope. For lifelines, nylon, polyester, and a polypropylene/polyethylene



This three-strand twisted rope is made from a polypropylene/polyethylene blend. The different-coloured strand indicates that the material is a blend.

blend are good, but rope made of only polypropylene is not.

Nylon

Nylon is a good choice for a lifeline because of its strength and durability. It is usually more expensive than a polypropylene/polyethylene blend.

Polyester

Like nylon, polyester is also a good choice for a lifeline.

Polypropylene/polyethylene blend

A good choice for a lifeline is a polypropylene/polyethylene blend. The polyethylene makes the rope much stronger than one made with polypropylene only. It also makes the rope more resistant to abrasion and ultra-violet (UV) radiation than pure polypropylene.

The blend is less expensive than nylon and only slightly more expensive than polypropylene alone.

Polypropylene only

Do not use polypropylene rope for lifelines. Here's why.

At a standard 5/8" diameter, a polypropylene rope will usually not meet the 6000-pound strength requirement in CSA (Canadian Standards Association) standard Z259.2.1, *Fall Arresters, Vertical Lifelines and Rails*.

To meet the strength requirement, the manufacturer will often make the diameter slightly larger than 5/8". But if you use it in a rope grab, the extra diameter will mean more wear and tear, and the rope will be damaged quickly.

Polypropylene also degrades quicker than nylon and other materials when exposed to ultra-violet (UV) radiation and weathering. After a few months of the sun beating down on it, a polypropylene rope can lose a significant amount of its strength.

For these reasons, do not use polypropylene rope for lifelines.



Do not use utility rope for lifelines.

Rope design

The materials listed on the previous page can be made into rope according to several designs. There are generally three styles of rope design: twisted, kernmantle, and braided.

There are advantages and disadvantages to each design. Here are the details.

Twisted design

Twisted rope is an acceptable design for vertical lifelines, and it's certainly the most common. But a twisted design makes the rope vulnerable to abrasion, which decreases total rope strength.

Twisted rope is more likely than braided rope to get caught on things and rip or tear.

Twisted ropes are often made from a polypropylene/polyethylene blend. The design is usually three-strand twisted. Generally a twisted polypropylene/polyethylene blend rope intended for safety applications will have a single strand of a different colour to show that the material is a blend rather than just polypropylene alone. (See photos on page 4.)

If all three strands are the same colour, the rope is probably a

utility rope. **Do not use utility rope for lifelines.** Utility ropes are often spliced, which further decreases their strength. Lifelines must be made of continuous unspliced rope.

Kernmantle design

Kernmantle rope is the ideal choice for most lifeline situations. It consists of an inner core of synthetic fibre filaments running straight (they're not twisted or braided), and an outer braided sheath which surrounds and protects the filaments.

When attached to the rope, the load is held by the strength of the inner core filaments, while the outer sheath only protects the rope's core from dirt, UV radiation, and abrasion. The sturdy, sheathed design of kernmantle rope can be a disadvantage in certain applications (such as suspended access), because it's less flexible than other rope.

Although kernmantle rope is significantly more expensive than other rope, it usually has a longer service life.



Kernmantle rope is very durable. The fibres in the core run straight. All of the rope's strength is in the core, while the braided sheath protects the core.

Braided design

Braided rope is more resistant to abrasion than twisted rope, so it will not tear or rip as easily.

Solid braid design

Solid braid ropes are used mostly for window washing because they are very flexible. This allows them to be twisted around suspension devices.

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Lifeline rope

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A solid braid rope is very flexible. It can stretch under load.

Unlike kernmantle rope, however, all strands give the rope its strength. This means that any wear, cuts, or variations in size will drastically decrease the rope's strength.

Double braid design

Double braid ropes have a braided core protected by an outer braided sheath. This construction gives the rope good strength and the outer braid makes it resistant to abrasion.

With this design, however, the outer and inner braids can move freely and separately. This is a problem because with double braid rope, both the core and the sheath support the weight of the load. (This is not the case with kernmantle rope.)



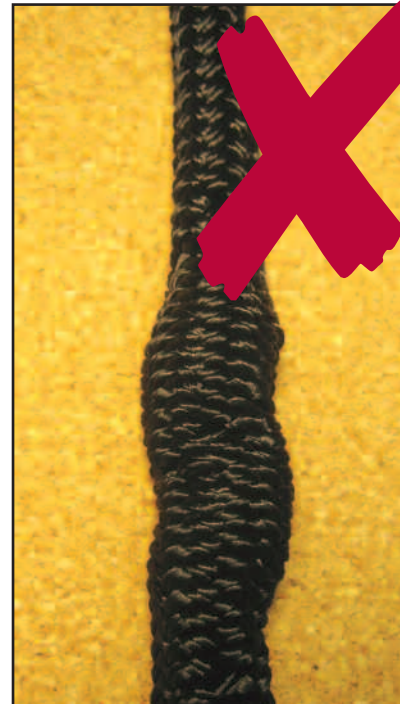
A double braid rope consists of a braided sheath covering a braided core. Both the core and sheath support the load, so they must be aligned. If the sheath bunches up, you decrease the rope's strength by 50%.

Both the core and the sheath must be aligned for the rope to maintain its total strength. Often, the outer braid becomes caught on something and bunches up, which decreases the rope's strength by 50 percent. When the sheath bunches up, the inner core supports all of the load. Unless you can ensure the two braids remain in the correct position, this rope is not suitable for safety applications.

Stretch

Other aspects of rope affect its safety performance, such as stretch.

Some ropes stretch more than others when subjected to a load.



If the core and sheath in double-braid rope are not aligned, the rope loses half of its strength. This photo shows how the sheath can bunch up.

Twisted and braided ropes stretch significantly while kernmantle ropes stretch very little. Wet conditions can make some ropes stretch more than others.

You need to take stretch into account when calculating possible free-fall distance. (See "Lifeline inspection" on the next page.)

Always check with the manufacturer to learn the advantages and disadvantages of the rope you're considering. ■

CSAO thanks Rob Ludwig from Cancord Inc. for providing information and rope samples.

Lifeline inspection

Inspect your lifeline and lifeline setup before each use.

1. Make sure you have the right type of rope for a lifeline (see article on page 5).
2. Look for the CSA (Canadian Standards Association) logo. Lifelines must be CSA certified. The logo will be on the rope, or on the reel if it came in bulk. If the rope is not CSA certified, do not use it for lifelines.



3. Inspect the rope to see if it is in good condition. If you find any of the following things, the lifeline is unsafe.
 - ✗ Tears or cuts.
 - ✗ Unequal strand size or shape variations.



- ✗ Discolouration.
- ✗ Broken or loose strands inside the rope (untwist the rope and check inside).
- ✗ Accumulated powder or dirt inside the rope (untwist the rope and check inside).
- ✗ Loose thimbles (ensure that thimble splices are in good condition).

- ✗ Decreased elasticity (a rope loses elasticity especially if it has been subjected to a load).

4. Never reuse a lifeline that has been used for any other purpose. Throw away a lifeline that has stopped a fall unless it has been recertified by the manufacturer.

5. A vertical lifeline must be used by only one person at a time.

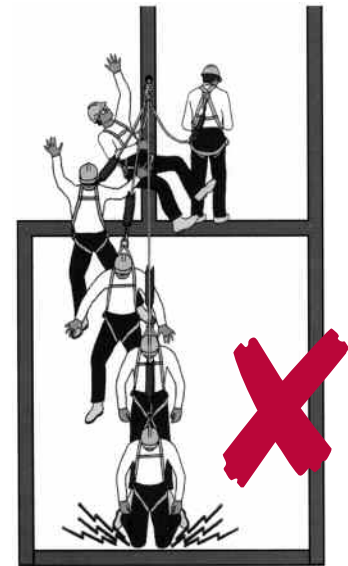
6. A vertical lifeline must reach the ground or a level above ground where you can safely exit if your fall is arrested.

7. Ensure that the rope grab is compatible with the type of rope you are using for your lifeline.



Check the rope-grab manufacturer's instructions for a compatible lifeline.

8. Consider the distance to the ground or level below when determining where you attach your rope grab. You do not want to strike a lower surface or hit an object before your fall is arrested. Calculate how long



Hitting the ground while tied off.

your lanyard will extend. Also, lifelines stretch under load. The CSA standard allows up to 22% stretch. Find out from the manufacturer how much your rope will stretch.

Take all of these factors into account when calculating distances.

9. A vertical lifeline must have a positive stop—a knot or device at the end of the rope to prevent the rope grab from slipping off the end.
10. Ensure that the lifeline is protected from abrasive or sharp edges.
11. Store lifelines
 - ✓ in a dry location
 - ✓ out of direct sunlight
 - ✓ away from sharp objects
 - ✓ away from corrosive chemicals. ■