

Fire Management Tech Tips

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A Temporary Fix for Leaky Forestry Hose

by

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Introduction

Traditionally, Forest Service, U.S. Department of Agriculture, engine crews have addressed hose ruptures by isolating the offending section of hose with hose clamps and replacing the stick of hose with a new line. The hose clamps would be removed to charge the hose. The drawbacks to this approach include the following:

1. Depending on the location of the hose, it may take significant time for a firefighter to hike replacement hose to the location.
2. Replacing hose adds additional stress on resources.
3. Wasting water that may be in limited supply.

In 2009, the San Dimas Technology and Development Center (SDTDC) evaluated three products for a quick in-the-field solution to compromised hose in an existing hose lay: (1) a stainless steel hose mender from Wildfire Group®, (2) an aluminum fixed-shape hose mender from Wildfire Group®, and (3) compressive self-fusing tape from Rescue Tape (figures 1a and 1b). All three products are similar in one fundamental way—they are a temporary fix that allows the compromised hose to remain in operation.



Figure 1a—Hose menders: 1-inch stainless steel; 1-1/2-inch aluminum; 1-1/2-inch stainless steel.

Rescue Tape is a self-fusing silicone tape for emergency and all-purpose repairs. Made in the USA to military specifications, Rescue Tape is the most versatile and easy-to-use emergency repair product available. You can quickly repair leaks on plumbing and hoses, use to insulate electrical wiring or as shrink wrap, waterproof connections, wrap tool handles, and much, much more.

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Rescue Tape is the Ultimate Multi-Purpose Self-Fusing Repair Tape!

Rescue Tape ...

- Is Self-Fusing!
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- Insulates 8,000 Volts per layer!
- Withstands 500° F Degrees of heat! (260° C)
- Remains flexible to -85° F! (-60° C)

Rescue Tape ...

- Creates a Permanent Air-Tight, Water-Tight Seal in seconds!
- Never gets gummy or sticky like electrical or duct tape - No messy cleanup!
- Has an unbelievably long shelf life!
- Is extremely versatile!
- Resists: Fuels, Oils, Acids, Solvents, Salt Water, Road Salt, UV Rays

A photograph showing several rolls of Rescue Tape in various colors (blue, yellow, green, red) stacked together.

Figure 1b—Rescue Tape.

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Implementation

Each product's implementation is slightly different and each comes with its own pros and cons. Table 1 shows the costs associated with each product.

Table 1—Product cost

Product	Size	Company	Cost (\$)
Stainless steel hose mender	1-1/2 in	Wildfire Group®	9
Stainless steel hose mender	1 in	Wildfire Group®	8
Aluminum hose mender	1-1/2 in	Wildfire Group®	11
Self-fusing tape	1 in by 0.02 in by 12 ft	Rescue Tape	12.48

Stainless Steel Hose Mender (1 inch and 1-1/2 inch)

To use this hose mender, the section of hose with the leak must be isolated and the water inside expelled. Without water pressure filling the hose, the hose can be compressed lengthwise and slipped into the hose mender. The hose mender is just 0.03 inches thick, which allows the hose mender to be pulled open large enough for the hose to pass through. The line is then charged, the hose filled, and the leak restricted as the internal water pressure pushes against the jacket and the hose mender effectively creating a seal.

The clasp is more difficult to latch than it first appears to be. One problem is that pulling open the hose mender to accept the hose distorts the hose-mender shape and makes it difficult to align the clasps for full closure. Moreover, the detailed maneuvering of the clasp for closure can be quite difficult with wet hose and may not be accomplished easily with gloves—a concern because the edges of the stainless steel hose mender are sharp enough to cut into bare skin (as evidenced by the SDTDC technician's cut hands).

Aluminum Hose Mender (1-1/2 inch)

Using the aluminum hose mender is similar to using the stainless steel product except for the fitting of the hose mender onto the hose. The aluminum hose mender is a solid, nonflexible tool that does not fully wrap around a hose. Instead, it has a fixed 0.59-inch opening that allows the compressed hose to pass through. By virtue of the fixed shape and opening, the aluminum hose mender was much easier to install on the hose than the stainless steel version. The Wildfire Group® produces only 1-1/2-inch aluminum hose menders.

Self-fusing Compressive Tape

Self-fusing tape can be used on pressurized hose even under wet or dirty conditions. Directions for use came from the manufacturer's Web site. In trials and performance testing conducted by SDTDC, the leaking hose was wrapped in a manner consistent with manufacturer directions. All tests with the self-fusing tape (unless specifically noted) were wrapped with three layers and 3 inches in each direction from the leak.

The actual wrapping of the hose proved to be more labor intensive than expected. The self-fusing tape comes with a clear plastic backing to prevent prefusing of the tape while in the roll. This backing must be separated from the tape even as the spool goes around the hose; the plastic backing clustered and accumulated, making it difficult to quickly deploy the tape. The process of taping the section of hose took approximately 5 minutes.

Testing and Observations

SDTDC tested the products under similar conditions; each product was tested on samples of type I (white) and type II (yellow) pruruptured forestry hose under three pressures (100 pounds per square inch (psi), 200 psi, and 300 psi). Hole sizes were not held consistent; the leak flow rate ranged from 0.06 gallons per minute to 3 gallons per minute (figure 2). The volume of water per minute collected from the hose with the installed product was compared with the volume of water per minute collected solely from the leak under the same pressures.



Figures 2a and 2b—Collecting and measuring volumes of water from the leak.

For both types of 1-1/2 inch hose, performance between the aluminum hose mender and the stainless steel hose mender was comparable, with average percent blockage numbers up to 76 percent (in the case of type II hose) for the aluminum hose mender and 74 percent for the stainless steel hose mender (appendix A). From SDTDC's limited testing, it also appears that both hose mendes were more "efficient" with larger ruptures, consistently restricting a higher percentage of the leak.

Self-fusing compressive tape, however, failed to make a strong statement in performance testing. In some of the configurations under lesser pressures (100 psi), the leakage flow actually increased after application of the tape. The best results for the tape came under impractical circumstances; a high reduction in leak flow rate was achieved only after allowing the tape to cure for 17 hours in a compressed state (no flow running through that section of hose) and only for pressures higher than 100 psi. Other configurations for tape indicated middling performance, rarely reducing the leak flow rate more than 50 percent (appendix A).

Conclusion

From the various tests performed, self-fusing tape, while potentially useful in low-pressure situations and for other applications, cannot be recommended as a temporary fix for blown forestry hose. Not only did the tests indicate that the tape failed to perform as well as the metal hose mendes, but also application of the tape was difficult and time consuming (approximately 5 minutes for each of the tests).

While the aluminum and the stainless steel hose mendes both performed comparably, the nod must go to the aluminum hose mender for ease of use. The aluminum hose mender bypasses the shortcomings of the stainless steel hose mender by using a solid, fixed shape that does not need a latch to be reengaged nor stand as a potential hazard with sharp edges. SDTDC recommends the aluminum hose mender as a temporary fix for 1-1/2-inch hose.

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For additional information on repairing leaky forestry hose, contact Sam Wu at SDTDC. Phone: 909-599-1267 ext 292. Email: swu@fs.fed.us.

Appendix A

Reduction of leakage

	1 Inch Type I	1-1/2 Inch Type I	1 Inch Type II	1-1/2 Inch Type II
Configuration	Average	Average	Average	Average
Aluminum		65%		76%
Aluminum				
Stainless Steel	71%	53%	53%	74%
Stainless Steel				
Tape – wrapped at 100 psi, instant test	-1%	55%	-1%	49%
Tape – wrapped at 100 psi, cure at 0 psi, 17 hours	68%	82%		69%
Tape – wrapped at 300 psi, instant test	-41%			
Tape – wrapped at 300 psi, cure at 0 psi at 2-3 min	46%			
Tape – wrapped at 100 psi, cure at 0 psi, 17 hours	-22%			69%
Tape – wrapped at 0 psi, cure at 0 psi, 5 min	64%			

psi-pounds per square inch
min-minutes

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