Recreation Tech Tips

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Modifying Water Hydrant Handles To Make Them Safer

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The Woodford Manufacturing Co. (formerly Modern Kelley Corp.) MK–6 frost-free water hydrant is used at many recreation sites in the Southern and Eastern Regions of the U.S. Department of Agriculture, Forest Service. Although the MK–6 hydrants are no longer manufactured and do not meet current standards, they have been in use since the 1960s. The Southern Region uses thousands of these hydrants to provide drinking water at recreation sites. After several children's fingers were amputated when using these hydrants, the Missoula Technology and Development Center (MTDC) was asked to review the hydrant design and provide a simple, inexpensive way to modify the handle to prevent injuries.

Highlights...

- Although the Woodford Manufacturing Co. MK–6 frost-free water hydrant is no longer manufactured and does not meet current standards, thousands of these hydrants are still being used at Forest Service recreation sites, particularly in the South.
- Users who put their fingers in the handle opening when pulling the handle down may lose the end of their finger when the handle snaps into place.
- Milling out a small portion of the handle will leave room for a finger, reducing the risk of injury.

Users must pull the handle of the MK–6 hydrant down with a considerable amount of force, more than the 5-pound maximum specified in accessibility guidelines. The cam ears of the hydrant's handle sit on a large bonnet nut. The handle assembly is pinned through a stem that is attached to a compressed internal spring (figure 1). As the handle is pulled down, the cam ears pivot on the bonnet nut, compressing the spring.

Figure 1—The unmodified Woodford Manufacturing Co. MK–6 water hydrant and the handle after safety modifications.

For additional information, contact: *USDA Forest Service, MTDC; 5785 Hwy. 10 West; Missoula, MT 59808–9361. Phone: 406–329–3900; fax: 406–329–3719.*

Persons who aren't strong enough to pull the handle all the way down may place their fingers inside the handle opening to gain leverage. When the handle is nearly down, the opening's sharp edge snaps into place against the bonnet nut (figure 2) with enough force to amputate the end of a finger.

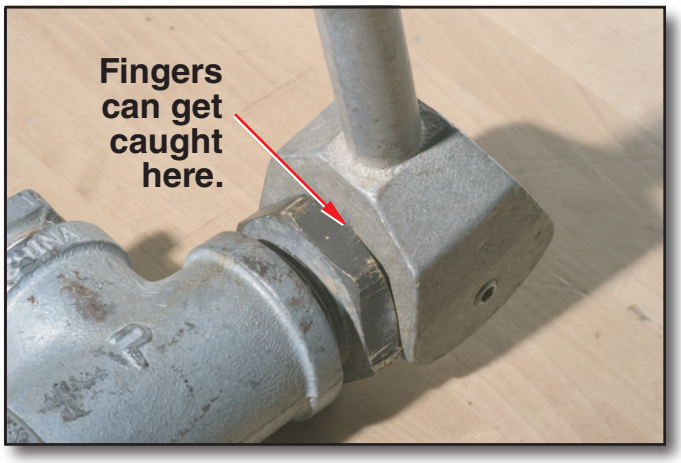

Figure 2—The MK–6 hydrant handle showing where fingers can get caught.

Finding a Solution

The first attempt to solve the problem enclosed the bottom portion of the handle and the bonnet nut with the universal boot from an automobile's constant-velocity joint (figure 3). The idea was to prevent users from placing their fingers in the handle opening. The boot was placed over the bonnet nut and pivoting handle ears and secured on the top and bottom with nylon tie clamps. Many sizes and shapes of boots were tried, but the camming action of the handle ears pulled the boots out of place every time.

Figure 3—A universal boot for an automotive constant-velocity (CV) joint.

Another solution tried in the field was to dull the handle's sharp edge where it contacts the bonnet nut. This method does not eliminate the risk of injury and is not recommended.

A better short-term solution is to modify the handle by milling away material, creating an opening between the handle and nut. The machine shop at MTDC used a milling machine to do so (figure 4). If users place their fingers on the nut when they pull the modified handle down, the opening leaves space for their fingers (figure 5). Figure 6a shows the difference between the original handle and the modified handle (figure 6b).

Figure 4—A milling machine was used to cut metal from the handle of the MK–6 hydrant.

Figure 5—The handle of the modified MK–6 hydrant has room for a finger.

Figure 6a—The original MK–6 hydrant.

Figure 6b—The MK–6 hydrant with the modified handle.

Modifying the Hydrant Handle

- Use a milling machine with a 1 $^{1}/_{16}$-inch end mill.
- Place the hydrant handle in a vase.
- Use a protractor to align the centerline of the handle at a 55-degree angle (figure 7) relative to the top of the vise.
- Mill out material to the edge of the handle collar (figure 8).
- Mill both sides of the handle.

Figure 7—Use a protractor to align the centerline of the handle at a 55-degree angle.

Figure 8—Mill material to the edge of the handle collar.

Conclusions

Milling out the handle core at a 55-degree angle leaves enough metal to maintain the structural integrity of the handle (figure 9). Several milled handles that were used in Forest Service campgrounds during the summer of 2005 did not show signs of fatigue.

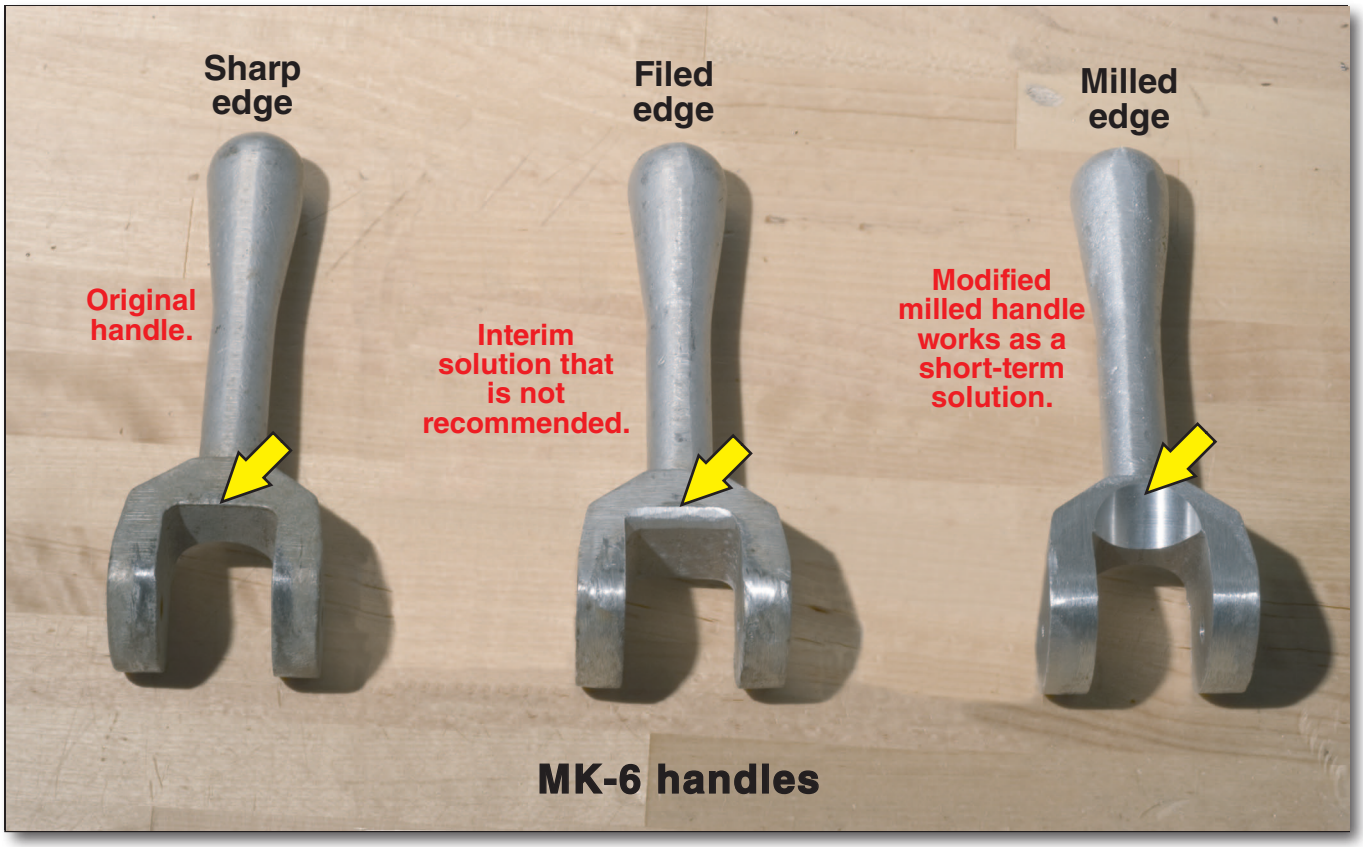

Figure 9—The original MK–6 handle with a sharp edge (left), a filed edge (middle), and the edge after milling (right), the recommended solution.

A machinist could modify about four hydrant handles an hour using a vise and protractor to establish the angle. A positioning fixture could increase the production rate to about 20 handles per hour.

At Forest Service recreation sites, all water hydrants and hose bibs require a backflow prevention device or another means to prevent a garden hose or other backflow hazard from being connected to the hydrant. All hydrants need to be outfitted with a double check valve backflow-prevention device approved in accordance with the American Society of Sanitary Engineers Standard 1052. Woodford Manufacturing Co. has designed an add-on, backflow-prevention device, Model 37HD1, for MK–6 hydrants.

Routine maintenance needs to be performed to ensure that hydrants operate properly and do not leak. Woodford Manufacturing Co. distributes the U150M and U200M hydrant models that replaced the MK–6 design. Replacement parts, such as O-rings and washers, are available for the MK–6 hydrants. See the Woodford Manufacturing Co. U150M and U200M model cut sheet (figure 10) for a parts list. Additional troubleshooting and maintenance information can be found at: *http://www.woodfordmfg.com/Woodford/Yard_Hydrant_Pages/techUtil.htm*.

For a long-term solution, replacement hydrants are available that meet accessibility guidelines. These hydrants operate with 5 pounds of force, meet Federal drinking water standards, and will not freeze (are frost free). Companies manufacturing hydrants that meet these criteria are Hoeptner Products, Most Dependable Fountains, Murdock (model BFH–M92_FS), and Woodford Manufacturing Co. (Model S4H). The tech tip, *Sanitary, Frost Free, Accessible Hydrants* (9923–1304–SDTDC) has further information about accessible hydrants manufactured by Murdock and Woodford Manufacturing Co.: *http://www.fs.fed.us/eng/pubs/pdf/99231304.pdf*.

Forest Service and Bureau of Land Management employees can find information on accessible hydrants manufactured by Hoeptner Products and Most Dependable Fountains, as well as other information on safe drinking water, at the Forest Service's Washington Office Engineering internal Web site: *http://fsweb.wo.fs.fed.us/eng/programs/water/documents/frz_flow.htm*.

WOODFORD

MODEL U150 & U200 PARTS LIST

ITEM	PART#	DESCRIPTION
1.	41025	MANUAL CLOSE HANDLE
2.	41201	SET SCREW
3.	41202	HANDLE PIN
4.	41029	PACKING NUT
5.	41014	O–RING
6.	41067	BONNET NUT
7.	41082	1–1/2 X 1–1/4 REDUCING PIPE BUSHING (U150)
8.	41094	2 X 1–1/4 REDUCING PIPE BUSHING (U200)
9.	41084	1–1/2–INCH NPT TEE (U150)
10.	41095	2–INCH NPT TEE (U200)
11.	–	1–1/2–INCH GALV. PIPE (U150)
12.	–	2–INCH GALV. PIPE (U200)
13.	41086	1–1/2–INCH VALVE BODY (U150)
14.	41097	2–INCH VALVE BODY (U200)
15.	41632	STEM
16.	41102	SPRING
17.	41625	1/4–INCH NPSM LOCKNUT
18.	41631	COUPLING
19.	**U150 OPERATING ROD (MANUAL CLOSE HANDLE)**	
	42127	1 Ft Bury (37–9/16–inch Long)
	42113	2 Ft Bury (49–9/16–inch Long)
	42114	3 Ft Bury (61–9/16–inch Long)
	42115	4 Ft Bury (73–9/16–inch Long)
	42116	5 Ft Bury (85–9/16–inch Long)
	42117	6 Ft Bury (97–9/16–inch Long)
	42118	7 Ft Bury (109–9/16–inch Long)
20.	**U200 OPERATING ROD (MANUAL CLOSE HANDLE)**	
	42177	1 Ft Bury (37–13/16–inch Long)
	42178	2 Ft Bury (49–13/16–inch Long)
	42179	3 Ft Bury (61–13/16–inch Long)
	42180	4 Ft Bury (73–13/16–inch Long)
	42181	5 Ft Bury (85–13/16–inch Long)
	42182	6 Ft Bury (97–13/16–inch Long)
	42183	7 Ft Bury (109–13/16–inch Long)
21.	41013	SWIVEL SCREW
22.	41012	SWIVEL COUPLING
23.	41078	PLUNGER (U150)
24.	41089	PLUNGER (U200)
25.	41079	O–RING (2 REQ'D)(U150)
26.	41090	O–RING (2 REQ'D)(U200)
27.	41080	RUBBER SEAT WASHER (U150)
28.	41091	RUBBER SEAT WASHER (U200)
29.	41081	BRASS WASHER (U150)
30.	41092	BRASS WASHER (U200)
31.	41059	SCREW

NOTE:
MK–6 PLUNGER REPAIR PARTS
CALL FOR INDIVIDUAL PRICING

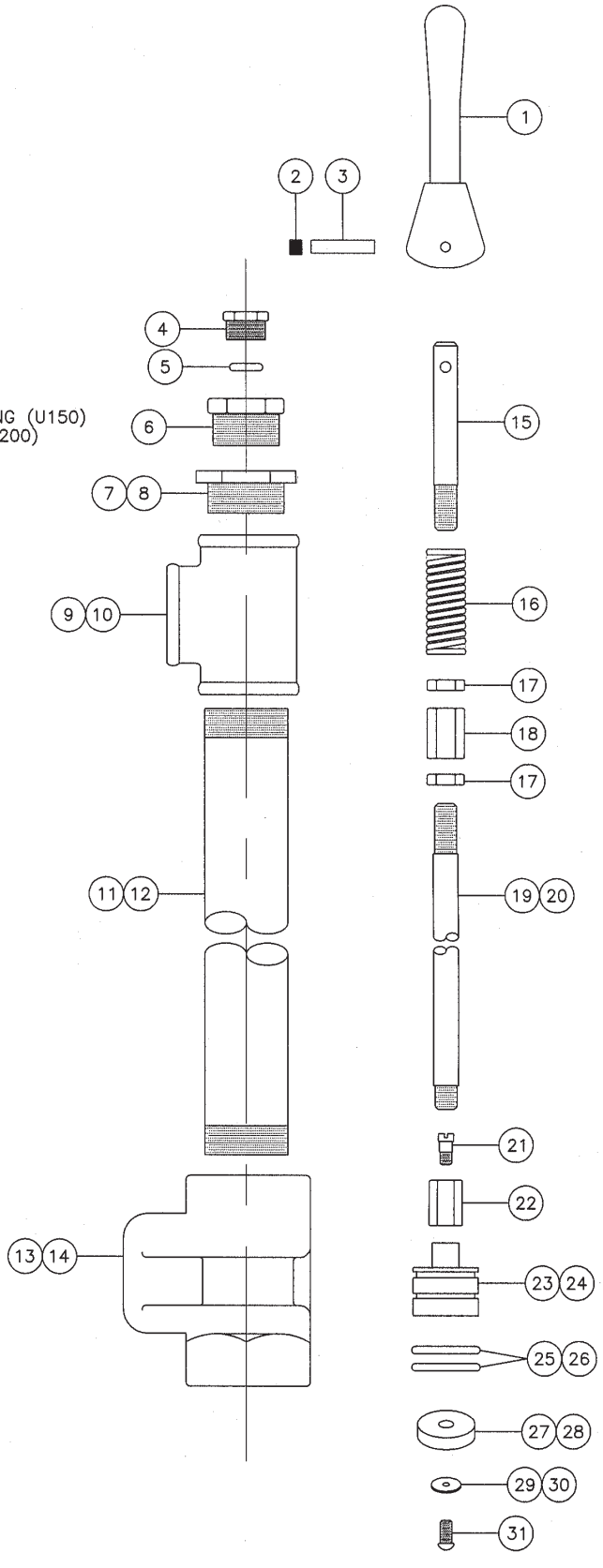

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Figure 10—Refer to the parts list when maintaining the MK–6 hydrant.

About the Authors

Mary Ann Davies received a bachelor's degree in mechanical engineering with a minor in industrial and management engineering from Montana State University in 1988. She worked in the Pacific Northwest Region as a facility engineer and as a tramway engineer. She has worked in fire management as a crewmember and as a crewboss. She worked for 5 years at the Rocky Mountain Research Station's Fire Sciences Laboratory in the fire chemistry and fire behavior groups before coming to MTDC in 1999.

Tyler Kuhn is a mechanical engineering technician. He began working at MTDC as an intern in 2000. He received a bachelor's degree in mechanical engineering from Montana State University in 2001 and has worked as a mechanical engineering technician since then.

Library Card

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Describes modifications to make the handle of the Woodford MK–6 frost-free hydrant safer to use. Although this hydrant is no longer manufactured, it is used extensively at Forest Service recreation sites in the Southern United States. The hydrant's handle closes with enough force to amputate the end of a finger. Metal can be milled away from the handle to leave enough room for a user's finger, preventing injuries.

Keywords: amputations, drinking water, safety

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