Recreation Tech Tips

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Portable Backcountry Rigging Tripod

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Trail crews and others working on backcountry maintenance and construction projects have to move heavy objects. Often, the work has to be done in areas without large trees that could be rigged with cables to support the operation. Portable steel tripod towers can help in such situations. When these towers are used with steel cable and a Griphoist winch (figure 1), heavy loads can be moved (figure 2).

Figure 1—The portable tripod was used to move rocks downhill in this skyline operation with the load suspended from a cable. The operator used a Griphoist winch to control the cable tension. The tarp protects the cable from being damaged by the rocks.

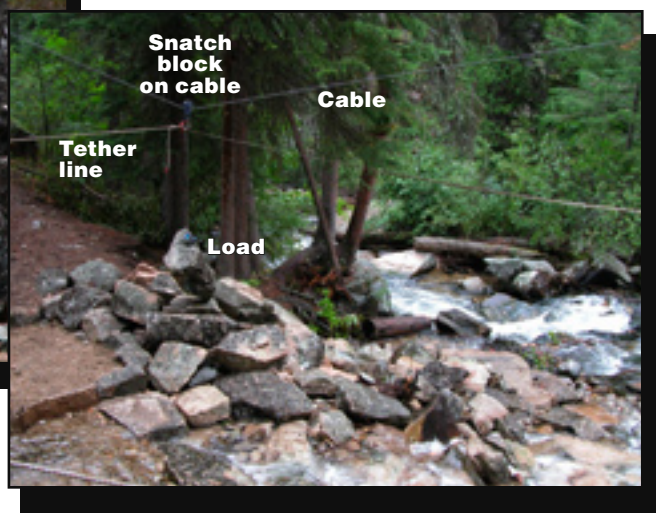

Figure 2—It is easy to move and place a heavy load when the portable tripod is used for rigging. Tether lines are used to control the load's descent and to place the load.

Highlights...

- Rigging can be used to move heavy loads in the backcountry.
- Sometimes trees are not available to serve as anchors when setting up rigging.
- Portable tripods can be used when trees are not available.
- A welder could use MTDC Drawing No. 1035 to fabricate portable tripods that can be packed on a horse or mule.
- Operators must follow all OSHA guidelines for rigging operations.

Development of the Portable Tripod

During 1999, the Bitterroot National Forest's Steve Bull watched trail crews in Rocky Mountain National Park use a portable tripod. The tripod was designed to move relatively small rocks above timberline. That tripod was designed by Lester Kenway of Trail Services, Inc., Bangor, ME. The design used legs similar to those of the portable tripod, but did not have a top plate assembly. Instead, a bent length of "allthread"

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rod and nuts were used to bind the legs together and hang the snatch block.

In 2003, the Bitterroot National Forest trails program needed a portable tripod to install bridge stringers weighing more than 1,000 pounds that were being packed by stock to a remote location. Steve Bull created a conceptual design for a tripod head with the assistance of Charlie Mabbott and the leadership of Nick Hazelbaker. Sam Allsop of California State Parks had a top plate assembly design of his own. Bull created a modified design based on Allsop's design.

Later, engineer Dick Karsky at MTDC was asked to provide material strength data to assure that the tripod system could handle heavy loads safely. Kent Niles, a local welder and fabricator, built a set of tripods. Niles altered the top plate assembly design slightly (figure 3), made the foot and plate assembly one piece, and used trailer hitch pins with locking hairpin cotters (figure 4) to adjust the legs. Niles delivered the tripods during the summer of 2003.

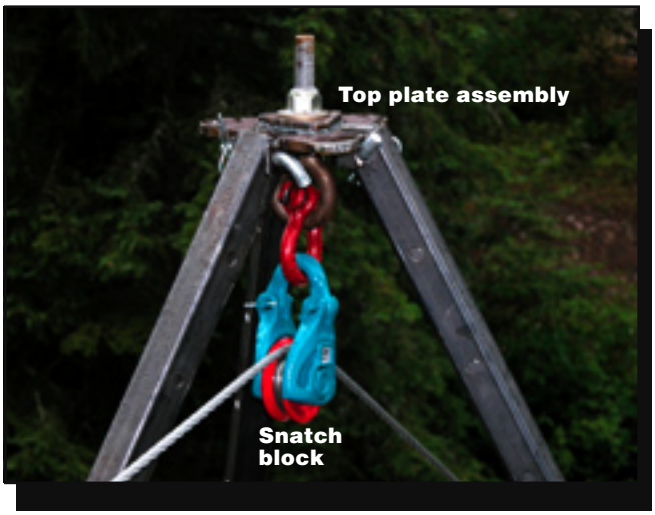


Figure 3—The tripod's headplate with a snatch block and cable hanging below it. Operators must follow all Occupational Safety and Health Administration regulations for rigging operations.

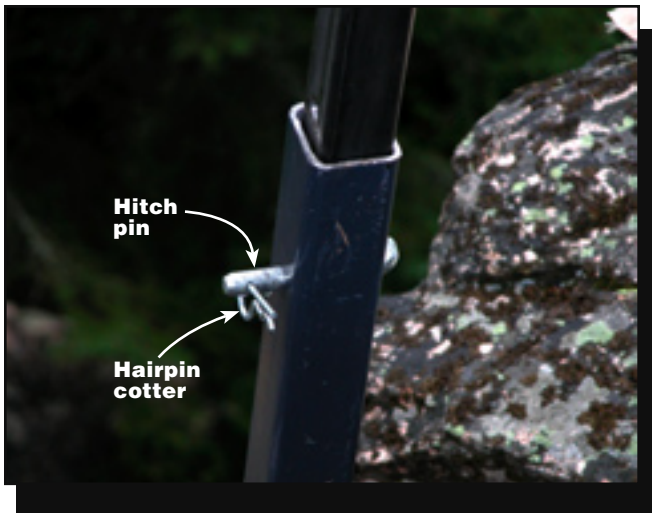


Figure 4—The tripod's adjustable legs are locked in place using hitch pins with locking hairpin cotters.

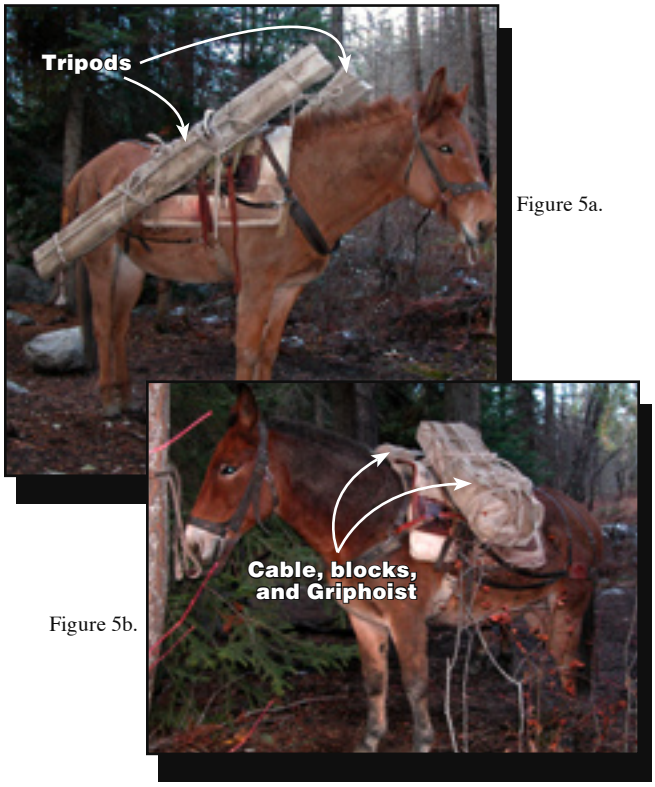


Figure 5a.

Figure 5b.

Figures 5a and 5b—The portable tripod can be transported into the backcountry by mules. One mule carries the tripod while another mule carries the block, Griphoist, and cables.

Bitterroot National Forest employees have used these tripods many times, transporting loads weighing up to 1,200 pounds. Any organization that needs to move heavy loads over short distances using equipment that can be packed to a remote location (figures 5a and 5b) should consider trying this versatile piece of equipment.

Safety and Training

Rigging operations can be dangerous. Equipment failure can lead to serious injury or death. Equipment must be inspected frequently to ensure it is in good, safe working condition. Pay special attention to frayed, bent, or kinked cables. They need to be repaired or replaced.

Employees working on or near rigging operations must be informed of the hazards and receive proper training. A Job Hazard Analysis must be completed and signed before starting a rigging operation and a safety briefing should be held before the start of each day's work.

Currently, the Forest Service does not have a certified Rigging Training Program. On-the-job training should be done by only those experienced in the type of rigging operations required and using equipment with which they are familiar. All rigging operations will follow applicable OSHA guidelines, such as 1910 Subpart N—Materials Handling and Storage. Private industry, State, or local technical schools may offer training or classes in rigging operations. Consult with your forest's safety officer before conducting a rigging operation.

Building and Using the Portable Tripod

The tripod is made from steel tubing and plates that are welded. It breaks down into sections that can be transported easily and that can be reassembled quickly using hitch pins with locking hairpin cotters. The leg sections are just 6 feet long so they can be packed on a horse or mule.

MTDC Drawing No. 1035 was prepared based on the Bitterroot National Forest's tripods. Fabricators must adhere to accepted welding practices and comply with the callouts in the drawing's materials list to assure that the tripod can support heavy loads safely.

The tripod was designed to be used with a materials handling winch, such as the Griphoist-Tirfor model TU–28 (pulling capacity of 4,000 pounds). Operators must ensure that the wire rope, blocks and fittings, and anchor points are in good working condition and are compatible with this load. They must observe all Occupational Safety and Health Administration guidelines for the use of cable clamps, safety latches, chains, and slings.

When two tripods are needed, snatch blocks should be used to suspend the cable from the top of the tripods. The blocks reduce wear on the cable and help prevent the tripods from being pulled over as the winch pulls in cable. The wire rope cable between the tripods must always have some deflection. Post signs to warn people of the dangerous work (figure 6a) and tie flagging on rigging cables (figure 6b).

Figure 6a.

Figure 6b.

Figures 6a and 6b—Signs should warn people about work occurring in the area. Rigging support cables must be flagged so workers do not trip over them or walk into them.

Tripods can lift heavy objects, but are dangerous when loads pull to the side. Crews should not attempt to pick up or drag heavy loads that are not directly under the overhead cable (figure 7). If the load is off to the side of the cable, the tripods should be moved so that the load is directly beneath the cable. Otherwise, one or both of the tripods may tip over.

Figure 7—One portable tripod can be used by itself when lifting heavy objects, such as one end of a log bridge. The safety chain around the bottom prevents the legs from spreading too far apart. Hooks welded near the bottom of each leg hold the chain in place.

Assembling and Setting Up the Tripods

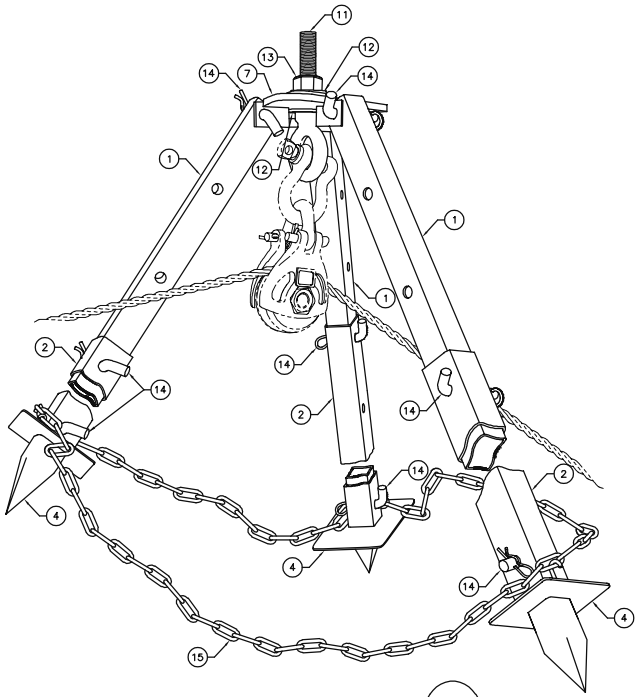
The part numbers are shown on MTDC Drawing No. 1035. Before assembling a tripod, gather all the parts. Run the cable through the snatch block and choose a location where the cable can be anchored near each of the tripods.

Assembly Steps

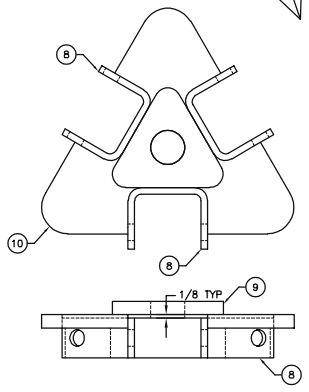
1 Attach the eyebolt (No. 11) to the top plate assembly (No. 7).
2. Attach the three legs (No. 1) to the top plate assembly (No. 7) using the hitch pins and hairpin cotters (No. 14).
3. Attach a sleeve (No. 2) to the bottom of each leg (No. 1) using a hitch pin and hairpin cotter (No. 14). The sleeve allows the length of the tripod's legs to be adjusted.
4. Depending on the type of ground under the tripod, attach the foot and plate assembly (No. 4) to each leg (No. 1) using a hitch pin and locking hairpin cotter (No. 14).
5. Attach the snatch block (with the cable running through it) to the eyebolt.
6. With the assembled tripod lying on the ground and with plenty of slack in the cable, have one person pull one leg of the tripod forward while two persons push the other two legs up until the tripod is standing.
7. Adjust the lengths of the legs until the tripod head is relatively level, keeping the legs evenly spaced.
8. Using a level, make small adjustments to the legs so the tripod head is level, keeping the legs evenly spaced.
9. Attach the chain to the hook on each of the foot and plate assemblies. The chain prevents the legs from spreading.
10. After completing the rigging setup (connecting the cable to the anchors, attaching the Griphoist to the cable, attaching the load to the snatchblock, and attaching a tether line to the load) load the cable slowly and gently. If the tripods shift, repeat steps 7 and 8 until the tripods are loaded and level.

Drawing

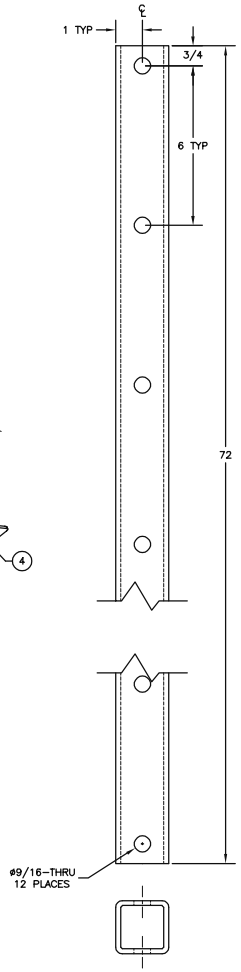
MTDC Drawing No. 1035, which follows, shows how to construct the portable tripods.



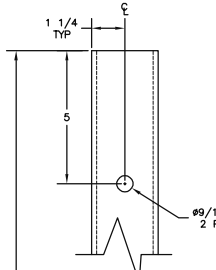
4 FOOT & PLATE ASSEMBLY



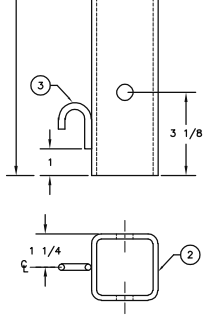
7 TOP PLATE ASSEMBLY



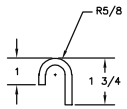
1 LEG



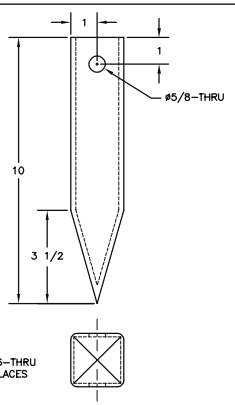
5 FOOT



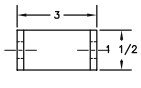
2 SLEEVE

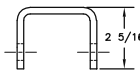


3 HOOK

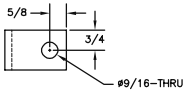


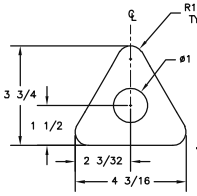
5 FOOT





8 BRACKET





9 SPACER

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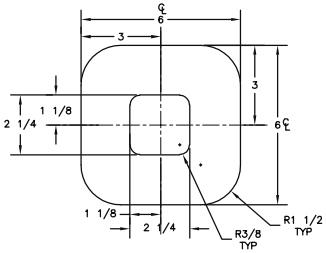
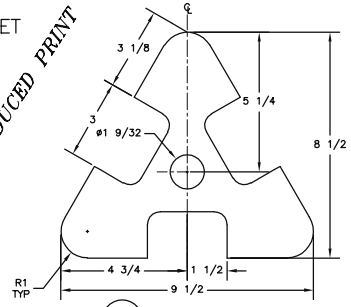


6 PLATE



10 TOP PLATE

MATERIAL LIST

NO	PART NAME	REQD	MATERIAL–DESCRIPTION
1	LEG	3	3/16 X 2 SQUARE MECH. TUBING, STEEL
2	SLEEVE	3	3/16 X 2–1/2 SQUARE MECH. TUBING, STEEL
3	HOOK	3	1/4–INCH ROUND ROD, STEEL
4	FOOT & PLATE	3	PARTS 5 & 6
	ASSEMBLY		
5	FOOT	3	3/16 X 2 SQUARE MECH. TUBING, STEEL
6	PLATE	3	1/4–INCH FLAT, STEEL
7	TOP PLATE	1	PARTS 8 THRU 10
	ASSEMBLY		
8	BRACKET	3	1/4 X 3 SQUARE MECH. TUBING, STEEL
9	SPACER	1	1/2–INCH PLATE, STEEL
10	TOP PLATE	1	1/2–INCH PLATE, STEEL
11	EYE BOLT	1	1–1/4–7NC X 3 EYE BOLT, CROSBY
			PART NO. 9900262 OR EQUAL
12	WASHER	2	1–1/4 ID X 2–1/2 OD X 1/8 THICK FLAT WASHER
13	NUT	1	1–1/4–7NC GRADE 5 HEX LOCK NUT, McMASTER–CARR
			PART NO. 90619A465 OR EQUAL
14	PIN	9	1/2–INCH BENT PULL HITCH PIN w/HAIRPIN COTTER
			McMASTER–CARR PART NO. 90146A211 OR EQUAL
15	CHAIN	AR	1/0 STRAIGHT LINK GENERAL UTILITY STEEL CHAIN,
			McMASTER–CARR PART NO. 3593T16 OR EQUAL

WELDED CONSTRUCTION
SPECIFIC WELDS NOTED

UNLESS OTHERWISE SPECIFIED
TOLERANCES:
FRACTIONS +/– ___
DECIMALS +/– ___
ANGLES +/– ___
DIMENSIONS ARE IN INCHES
BREAK SHARP EDGES

DATE	REVISION	BY

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FOREST SERVICE
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DESIGNED	STEVE BULL
CHECKED	T.KUHN
APPROVED	D.KARSKY
SCALE	1/2
DATE	FEB 2005

TITLE
TRIPOD

1035–01.dwg

SHEET 1 OF 1 | MTDC–1035

About the Author

Bob Beckley received a bachelor's degree in political science from the University of Montana in 1982. He began his Forest Service career as a timber technician on the Nez Perce National Forest. Bob was a smokejumper when he joined MTDC in 1990. He works as a project leader, public affairs specialist, and blaster.

Library Card

Beckley, Bob. 2005. Portable backcountry rigging tripod. Tech Tip 0523–2341–MTDC. Missoula, MT: U.S. Department of Agriculture Forest Service, Missoula Technology and Development Center. 6 p.

Explains how to assemble and use a tripod to move heavy loads in the backcountry. The tripod's legs are just 6 feet long, allowing it to be packed by a horse or mule. The tripod was developed by the Bitterroot National Forest. The Missoula Technology and Development Center prepared a mechanical drawing (No. 1035) that would allow a welder to fabricate the tripod.

Keywords: cables, hoists, loads, mechanical drawings, safety at work, trail maintenance, trails

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