

**Report Date:** 08 May 2014

**Summary Report for Individual Task**  
**052-247-1302**  
**Construct a Simple Rope Mechanical Advantage System for Rope Rescues**  
**Status: Approved**

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**Distribution Restriction:** Approved for public release; distribution is unlimited.

**Destruction Notice:** None

**Foreign Disclosure: FD1** - The materials contained in this course have been reviewed by the course developers in coordination with the Ft Leonard Wood, MO/MSCOE foreign disclosure authority. This course is releasable to students from all requesting foreign countries without restrictions.

**Condition:** You are a member of an Urban Search and Rescue (US&R) team and are given life safety rope, a fixed anchor system attached to an anchor plate, webbing, prusik cord, carabiners, pulleys, progress capture devices (PCD). This task should not be trained in MOPP 4.

**Standard:** Construct a simple rope mechanical advantage system ensuring the system is efficient, can accommodate the load, is connected to an anchor system and the load in accordance with (IAW) National Fire Protection Association (NFPA) 1006.

**Special Condition:** None

**Safety Risk:** Low

**MOPP 4:** Never

<b>Task Statements</b>
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**Cue:** None

<b>DANGER</b>
None

<b>WARNING</b>
None

<b>CAUTION</b>
None

**Remarks:** All required references and technical manuals will be provided by the local US&R Command.

**Notes:** An additional carabiner may be used to attach PCDs, prusiks and pulleys to the mechanical advantage system.

## Performance Steps

1. Construct a 2:1 mechanical advantage system.
  - a. Tie a figure eight on a bight knot on the running end of the rope.
  - b. Attach the completed figure eight on a bight knot to the anchor plate with a carabiner.
  - c. Reave the rope around the sheave of a traveling pulley.
  - d. Connect the traveling pulley to the load with a carabiner.
  - e. Reave the rope around a fixed pulley and attach it to the anchor plate with a carabiner.
  - f. Attach a Progress Capture Device (PCD) to the haul line.
  - g. Attach the PCD to the anchor plate with a carabiner.

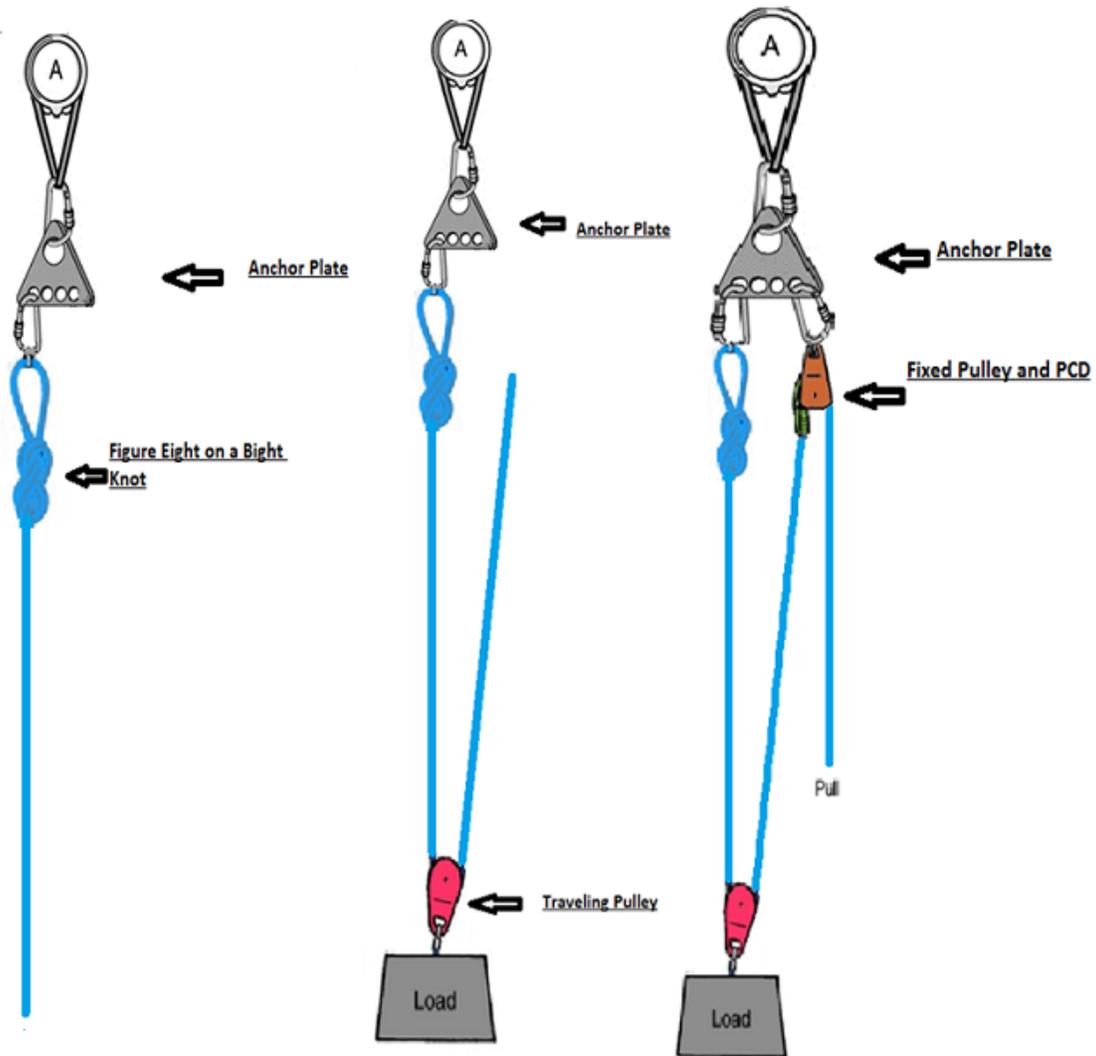


Figure 052-247-1302-1  
2:1 Mechanical Advantage System

2. Construct a 3:1 mechanical advantage system.

- a. Tie a figure eight on a bight knot on the running end of the rope.
- b. Attach the completed figure eight on a bight knot to the load with a carabiner.
- c. Reave the rope around the sheave of a stationary pulley and attach the pulley to the anchor plate with a carabiner.
- d. Attach a PCD to the anchor plate with a carabiner.
- e. Reave the rope around the sheave of a traveling pulley.
- f. Attach a prusik to the load line.
- g. Attach the forward pulley to the rope with a PCD.
- h. Connect the traveling pulley to the prusik with a carabiner.

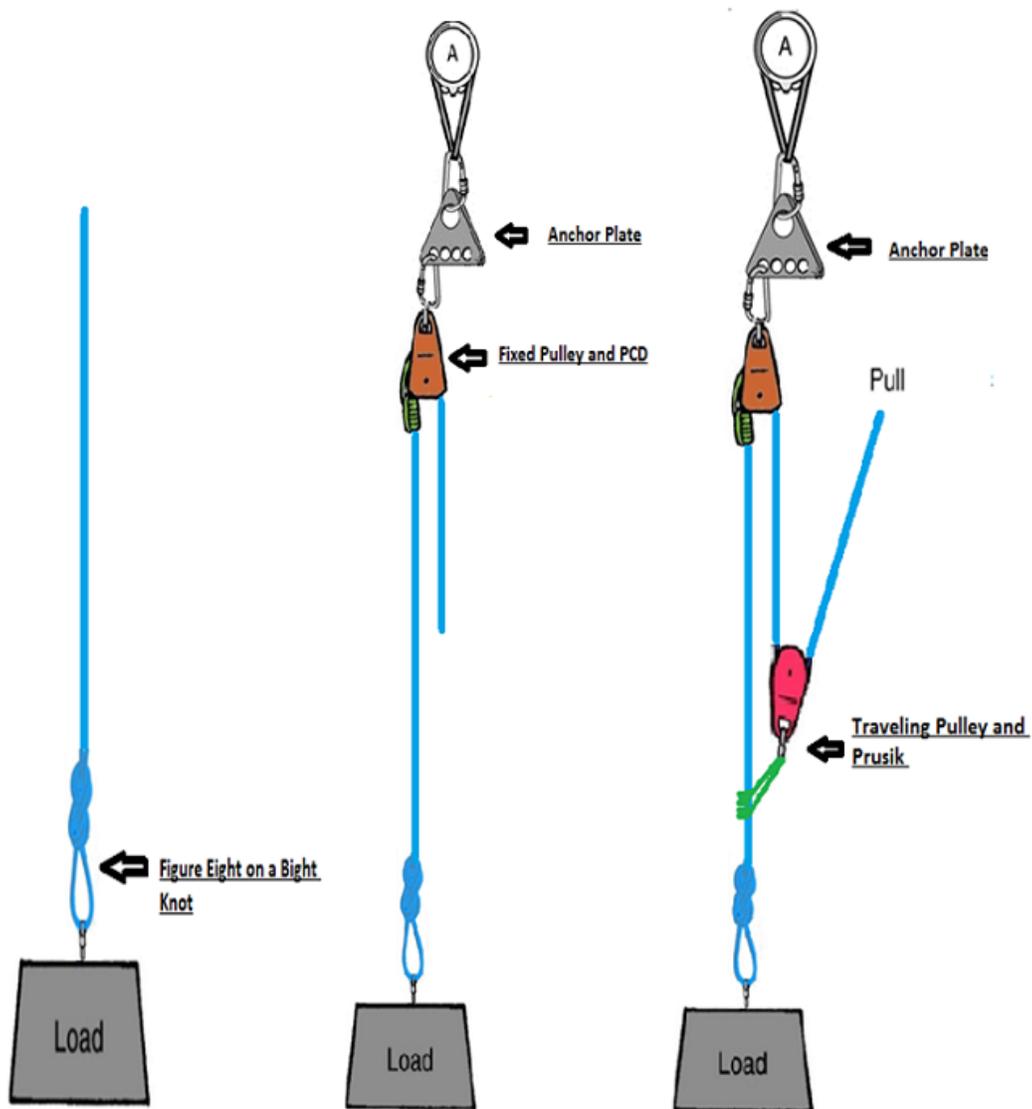


Figure 052-247-1302-2  
3:1 Mechanical Advantage System

3. Construct a 4:1 block and tackle mechanical advantage system.

a. Tie a figure eight on a bight knot on the running end of the rope.

b. Lay the pulleys out as shown and attach the completed figure eight on a bight knot to the becket attachment on the double pulley with a carabiner.

c. Reave the rope around the bottom sheaves.

Note: Ensure there is no crossing of the rope lines as they travel around pulleys. To avoid crossing the lines, build the system using a continuous clockwise motion.

d. Continue reaving the rope around the top sheaves.

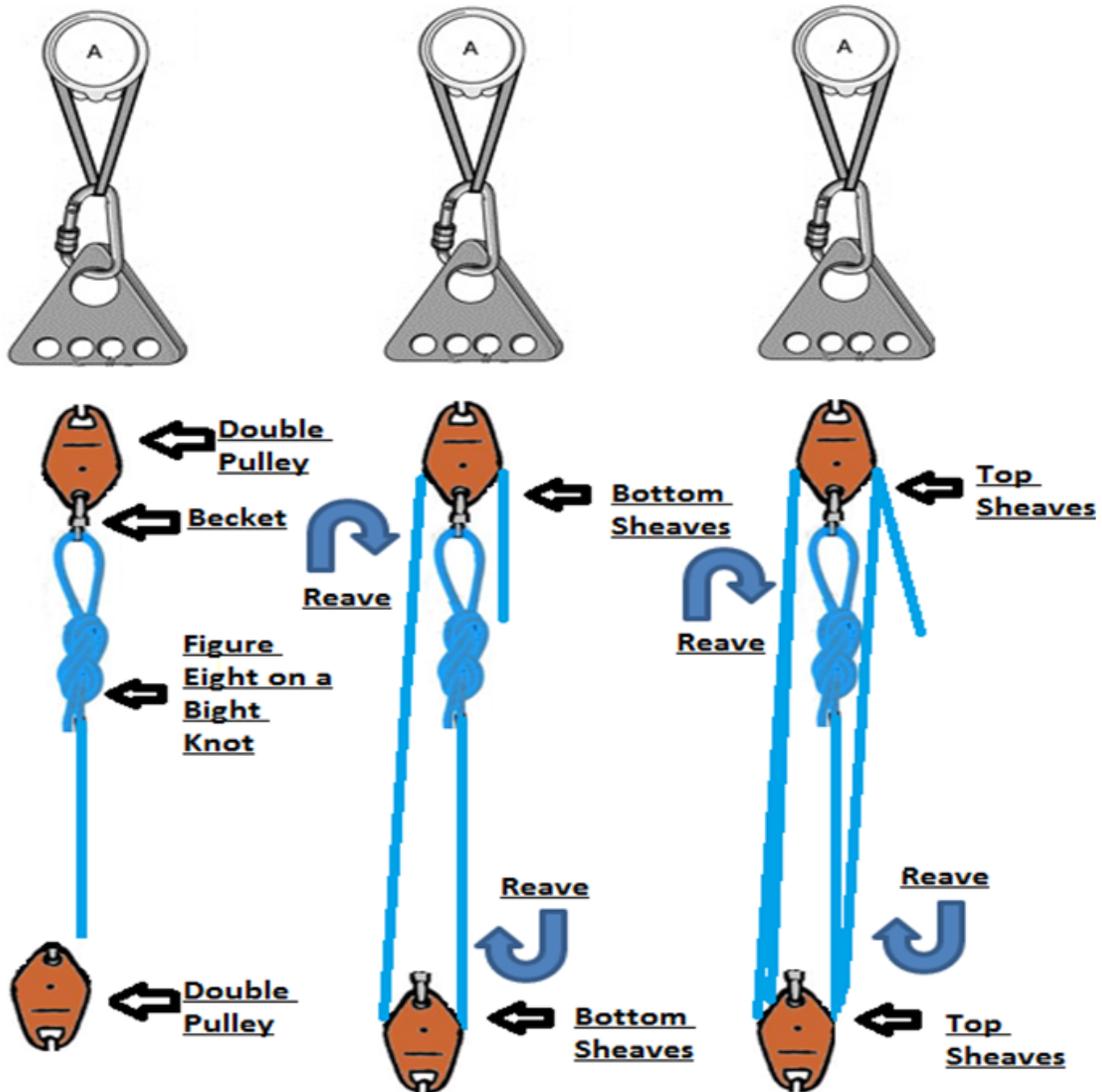


Figure 052-247-1302-3  
4:1 Mechanical Advantage System

e. Connect the anchor pulley to the anchor plate with a carabiner.

f. Connect the opposite pulley to the load with a carabiner.

g. Attach a PCD to haul side of retrieval line and connect it to the anchor plate with a carabiner.

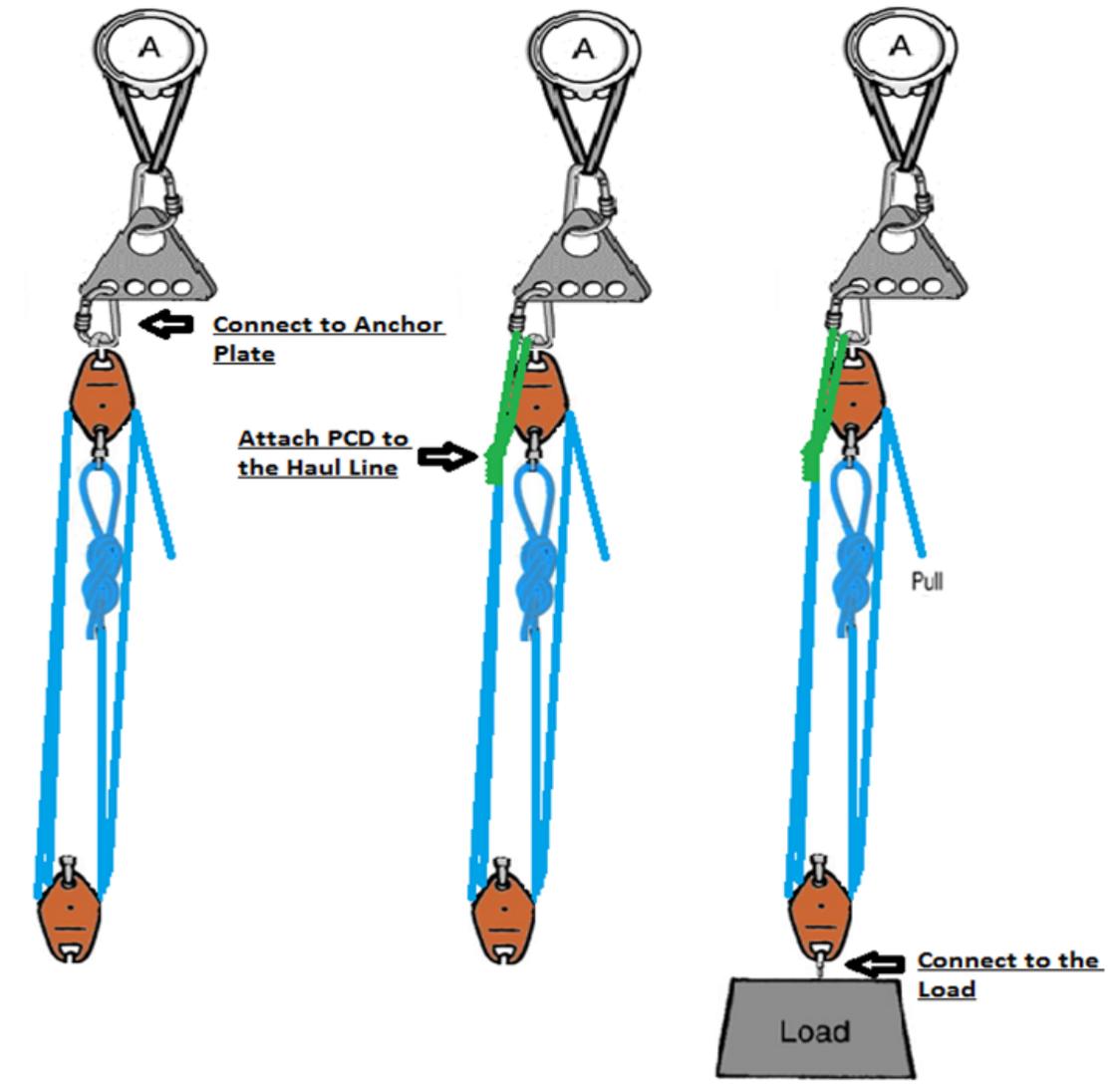


Figure 052-247-1302-4  
4:1 Mechanical Advantage System (Continuation)

4. Construct a 5:1 mechanical advantage system.
  - a. Construct a 3:1 mechanical advantage system.
  - b. Reave the rope around the sheave of a fixed pulley and connect it to the anchor plate with a carabiner.

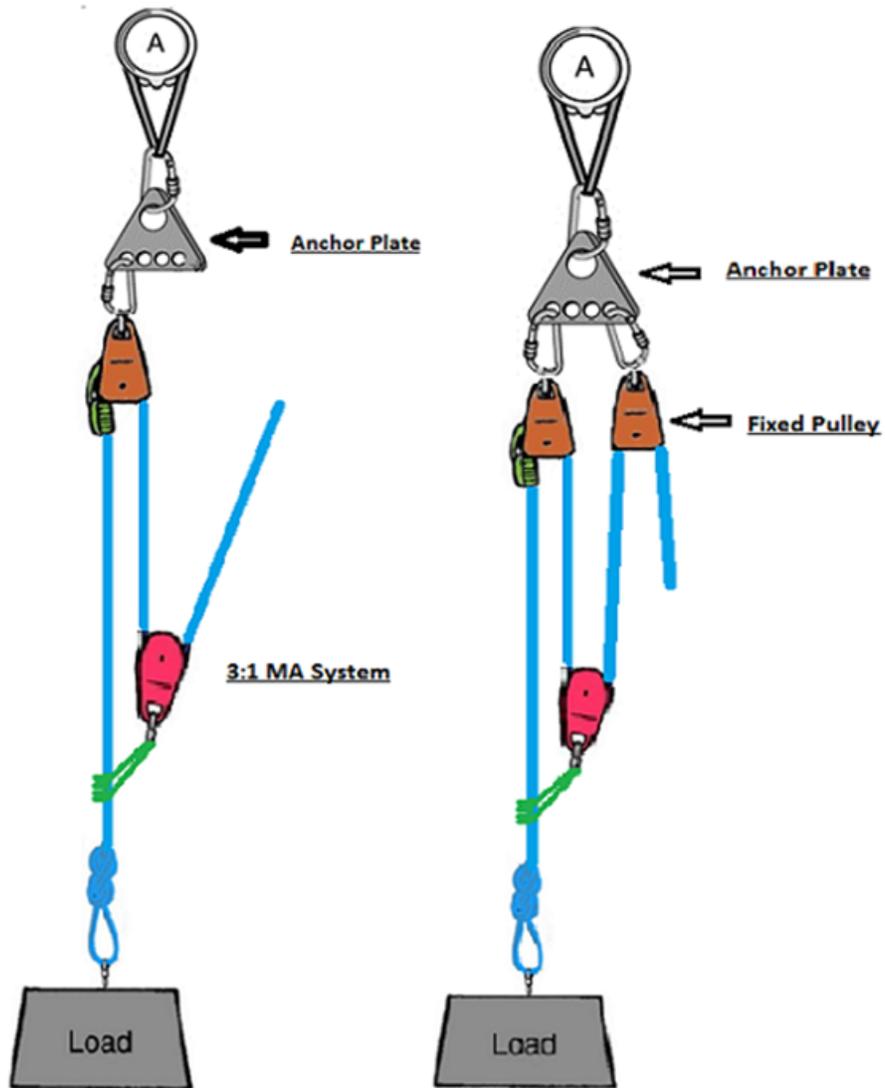


Figure 052-247-1302-5  
5:1 Mechanical Advantage System

- c. Reave the rope around the sheave of a traveling pulley.
- d. Attach the traveling pulley to the other traveling pulley with a carabiner.
- e. Attach a prusik to the haul line and connect it to the carabiner connecting the two traveling pulleys.

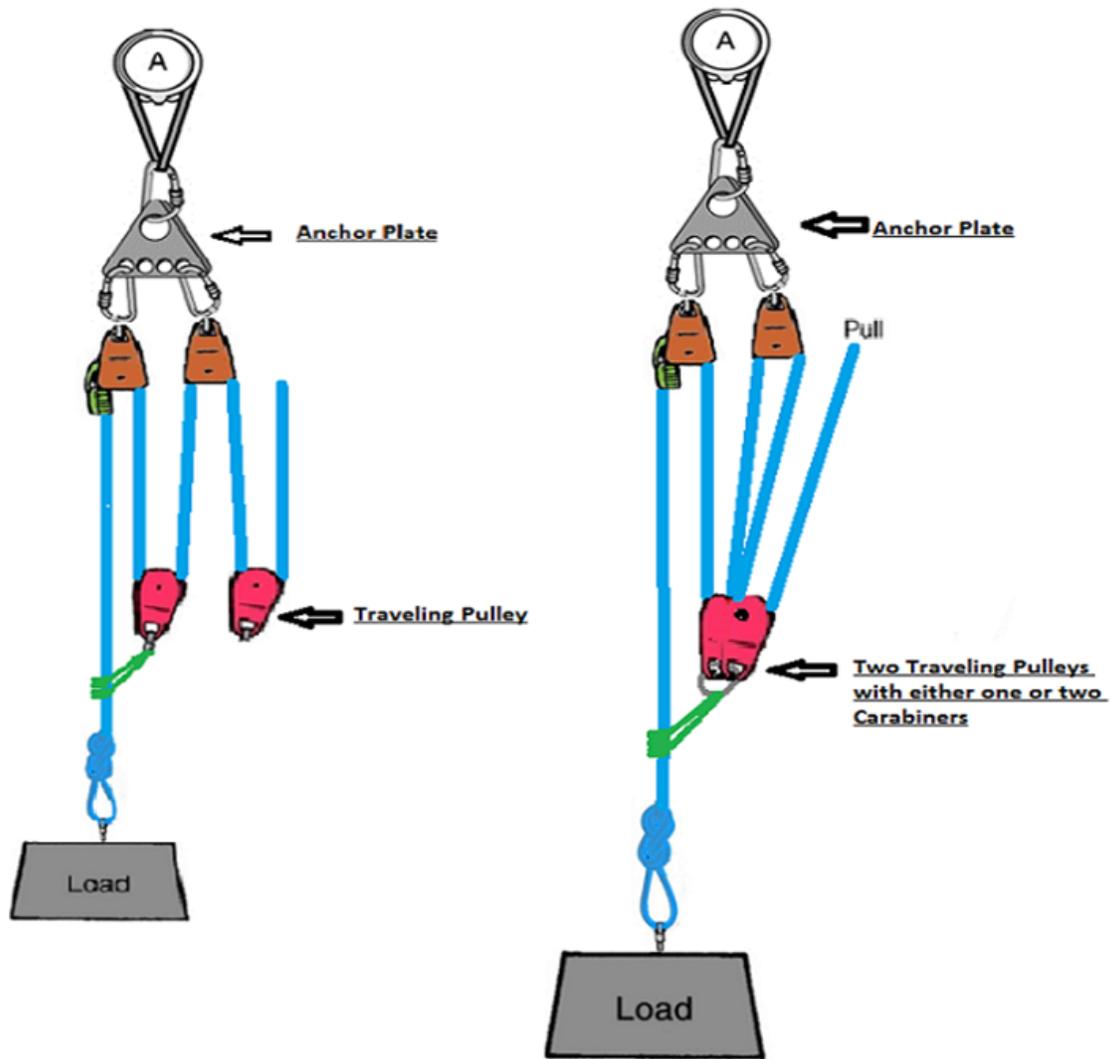


Figure 052-247-1302-6  
5:1 Mechanical Advantage System (Continuation)

5. Conduct a system safety check. (See task 031-627-2152)

(Asterisks indicates a leader performance step.)

**Evaluation Guidance:** Score the Soldier GO if all measures are passed (P). Score the Soldier NO-GO if any measure is failed (F). If the Soldier fails any measure, show him how to do it correctly.

**Evaluation Preparation:** Setup: Provide the Soldier with all the items listed in the conditions.

Brief Soldier: Tell the Soldier to construct a simple rope mechanical advantage system.

PERFORMANCE MEASURES	GO	NO-GO	N/A
1. Constructed a 2:1 mechanical advantage system.			
2. Constructed a 3:1 mechanical advantage system.			
3. Constructed a 4:1 Block and Tackle mechanical advantage system.			
4. Constructed a 5:1 mechanical advantage system.			
5. Conducted a system safety check. (See task 031-627-2152)			

**Supporting Reference(s):**

Step Number	Reference ID	Reference Name	Required	Primary
	IFSTA	International Fire Service Training Association ( IFSTA) Fire Service Search and Rescue, 7th Edition	No	No
	IFSTA - 1st Edition	IFSTA Technical Rescue for Structural Collapse, 1st Edition	No	No
	NFPA 1006	Standard for Rescue Technician Professional Qualifications	Yes	Yes

**Environment:** Environmental protection is not just the law but the right thing to do. It is a continual process and starts with deliberate planning. Always be alert to ways to protect our environment during training and missions. In doing so, you will contribute to the sustainment of our training resources while protecting people and the environment from harmful effects. Refer to FM 3-34.5 Environmental Considerations and GTA 05-08-002 ENVIRONMENTAL-RELATED RISK ASSESSMENT.

**Safety:** In a training environment, leaders must perform a risk assessment in accordance with FM 5-19, Risk Management. Leaders will complete a DA Form 7566 COMPOSITE RISK MANAGEMENT WORKSHEET during the planning and completion of each task and sub-task by assessing mission, enemy, terrain and weather, troops and support available-time available and civil considerations, (METT-TC). Note: During MOPP training, leaders must ensure personnel are monitored for potential heat injury. Local policies and procedures must be followed during times of increased heat category in order to avoid heat related injury. Consider the MOPP work/rest cycles and water replacement guidelines IAW FM 3-11.4, Multiservice Tactics, Techniques, and Procedures for Nuclear, Biological, and Chemical (NBC) Protection, FM 3-11.5, Multiservice Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Decontamination.

**Prerequisite Individual Tasks :** None

**Supporting Individual Tasks :**

Task Number	Title	Proponent	Status
052-247-1305	Construct a Load Sharing Anchor System	052 - Engineer (Individual)	Reviewed
031-627-2152	Conduct a System Safety Check	031 - CBRN (Individual)	Approved
031-627-2148	Construct a Single Point Anchor System	031 - CBRN (Individual)	Approved
052-247-1301	Tie Knots, Bends, and Hitches for Rope Rescues	052 - Engineer (Individual)	Reviewed

**Supported Individual Tasks :**

Task Number	Title	Proponent	Status
052-247-1226	Conduct Lifting Operations for a Structural Collapse	052 - Engineer (Individual)	Analysis
052-247-1331	Operate a Raising System	052 - Engineer (Individual)	Reviewed
052-247-1301	Tie Knots, Bends, and Hitches for Rope Rescues	052 - Engineer (Individual)	Reviewed
052-247-1307	Ascend a Fixed Rope System	052 - Engineer (Individual)	Approved
052-247-1215	Construct a Confined Space Retrieval System	052 - Engineer (Individual)	Analysis
052-247-1208	Perform Litter Tender Duties for a Low Angle Rescue	052 - Engineer (Individual)	Approved
052-247-1306	Construct a Compound Rope Mechanical Advantage System for Rope Rescues	052 - Engineer (Individual)	Approved

**Supported Collective Tasks :**

Task Number	Title	Proponent	Status
05-3-8012	Perform Trench Rescue Operations	05 - Engineers (Collective)	Approved
05-3-8011	Perform Rope Rescue Operations	05 - Engineers (Collective)	Approved
05-3-8014	Perform a Structural Collapse Rescue Operation	05 - Engineers (Collective)	Approved

05-3-8013	Perform Confined Space Rescue Operations	05 - Engineers (Collective)	Approved
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