

## Chapter 15: Ladder Rescue Systems

**Scope:** This *optional* chapter serves as an introduction to ladder rescue systems.

**Terminal Learning Objective (TLO):** At the end of this chapter, the student will be aware of using fire service ladders to quickly and safely move victims with a minimum amount of equipment.

**Enabling Learning Objectives (ELO):**

1. Describe ladder systems
2. Demonstrate how to construct and operate a moving ladder slide
3. Demonstrate how to construct and operate a ladder slide

Fire service ladders can be used to quickly and safely move victims with a minimum amount of equipment. We can traverse up and down short distances or span uneven terrain. With repeating spans, a litter can be attached to a straight ladder to bridge the repeating distances. With spans of less than 35 feet, ladders can be used as a rail system to slide litters up or down slopes. These ladder systems reduce the need for complex rope systems. All of the ladder rescue systems are intended for one-person loads. This chapter will introduce two ladder rescue systems: the moving ladder slide and the ladder slide.

### Moving Ladder Slide

Where the litter must be lifted or passed distances greater than a few feet between rescuers or more rescuers are needed to support the litter than can safely handle the litter, a moving ladder slide can be used.

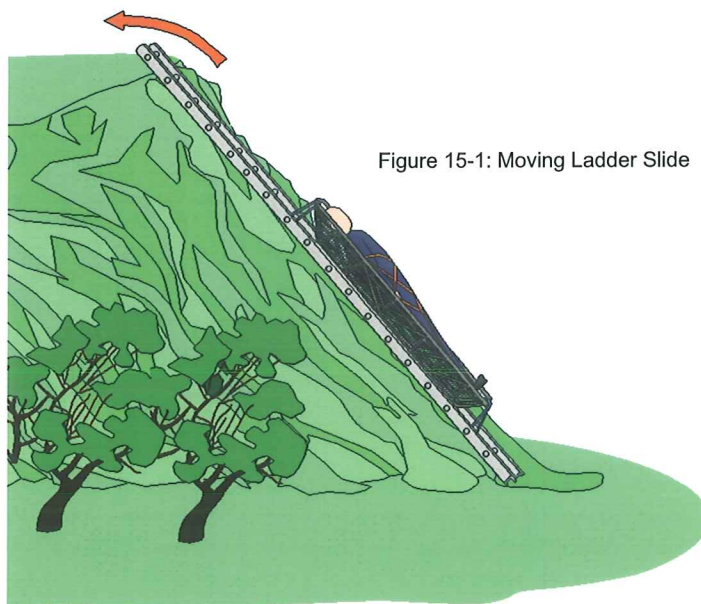


Figure 15-1: Moving Ladder Slide

The moving ladder slide extends the reach of the rescue crew. They are able to bridge recurrent distances or short distances easily without the need of other rope systems. The system works very well

when you need to cross several spans that have similar distances. A litter is attached to a fire service ladder. The attachment is done by lashing the litter rail to the ladder rung with 1" webbing.

## Configurations

Two moving ladder slide configurations are shown in this chapter. The litter may be lashed at the butt end of the ladder when negotiating grade changes and/or obstacles. When operating on level ground, the litter is lashed at the center of the ladder.

## Considerations

- Number of personnel available.
  - Can be as few as four.
- The need for a moving ladder slide.
  - Spread load due to weight or duration of carry.
  - Span obstacles.
  - Distance to travel.
- Applications.
  - Horizontal terrain and obstacles to traverse.
  - Vertical terrain and obstacles to traverse.

## Components

- One straight ladder or roof ladder.
- One rescue litter.
- Webbing for litter lashing.
  - Two 15-foot sections of webbing.

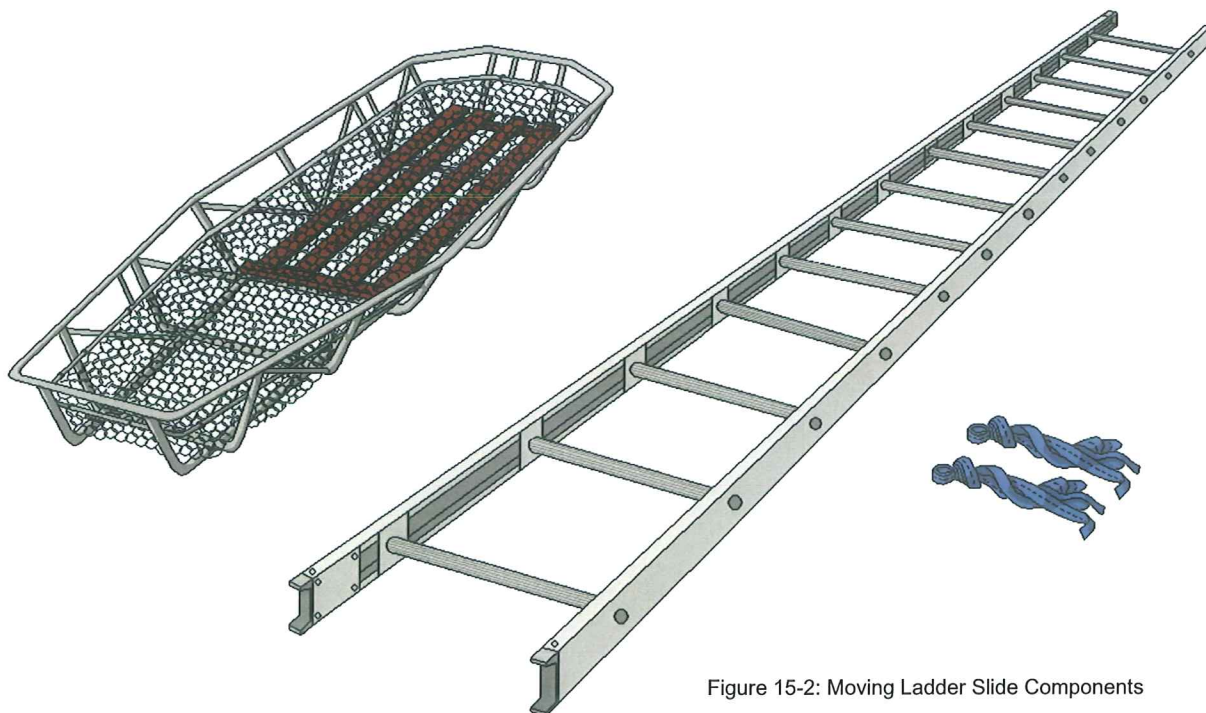


Figure 15-2: Moving Ladder Slide Components

## Optional Components

- Tag lines can be used to help raise and lower the system.
- Belay line as needed.

## Constructing a Moving Ladder Slide for Passing Up, Down, or Around Obstacles

1. Place the rescue litter at the foot of the ladder. (Figure 15-3)
2. Lash the foot of the litter to the second rung of the ladder. (Figure 15-4)
3. Tie a round turn and two half hitches to this rung. (Figure 15-5)
4. Wrap a minimum of six times.
5. The webbing should create a wide, stable fan.
6. Anchor the webbing to the rung using a round turn and two half hitches.
7. Lash the head of the litter to a corresponding rung in the same manner.

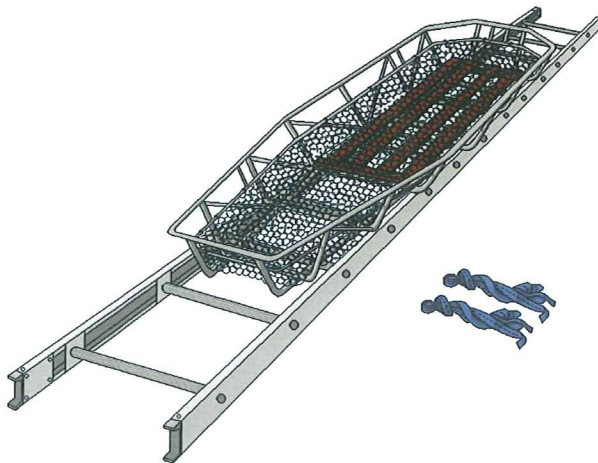


Figure 15-3: Rescue Litter at the Foot of the Ladder

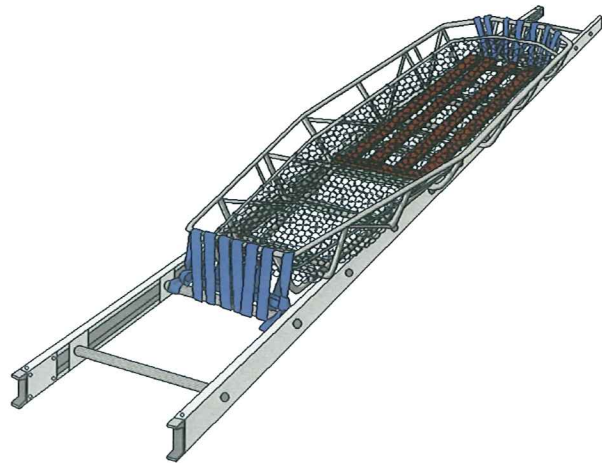


Figure 15-4: Lash the Litter to the Second Rung

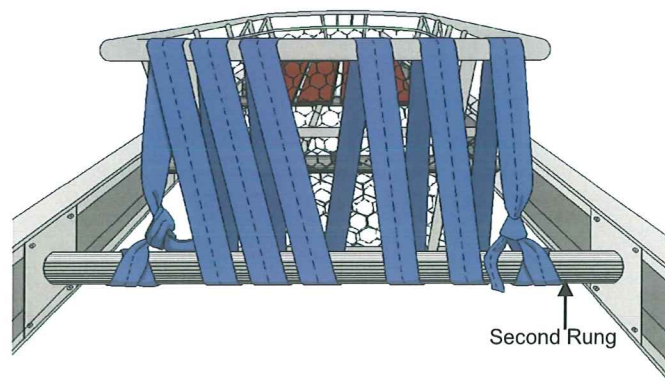


Figure 15-5: Tie a Round Turn and Two Half Hitches

## Operations

- Lifting the basket.
- Raising the basket.
- System is levered over.

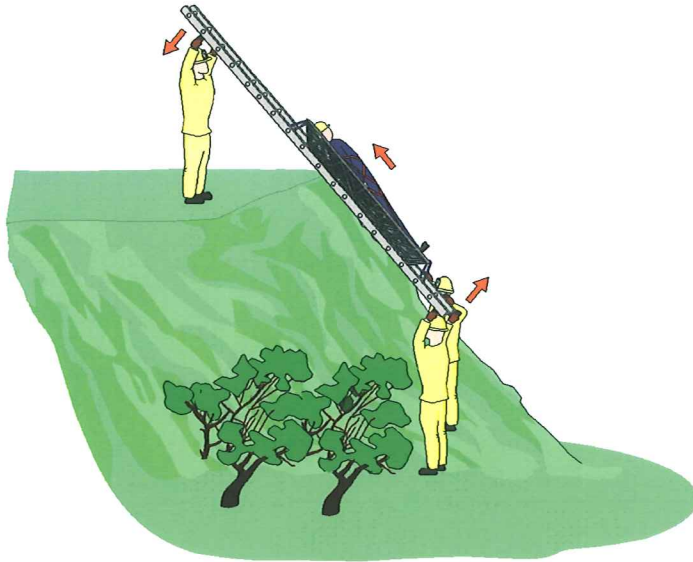


Figure 15-6: Levering the System

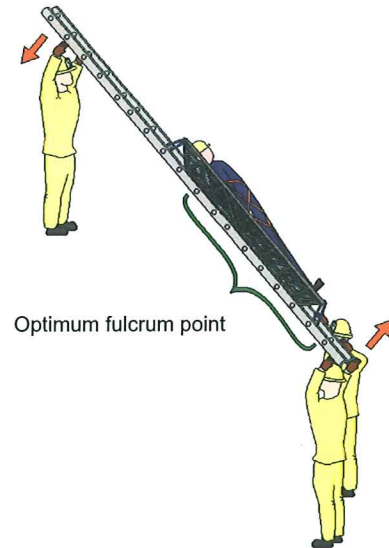


Figure 15-7: Swing System Up and Out

## Precautions

- Lash the litter to the foot end of the ladder for vertical applications. This prevents interference from the hooks of a roof ladder.
- Be aware of where the fulcrum point is located when levering the ladder. (Figure 15-7)

## Constructing a Moving Ladder Slide for Level Ground Walkouts

1. Mount the rescue litter in the middle of the ladder.
2. Tie a round turn and two half hitches to the rung. (Figure 15-5)
3. Wrap a minimum of six times.
4. The webbing should create a wide, stable fan.
5. Anchor the webbing to the rung using a round turn and two half hitches.
6. Lash the head of the litter to a corresponding rung in the same manner.

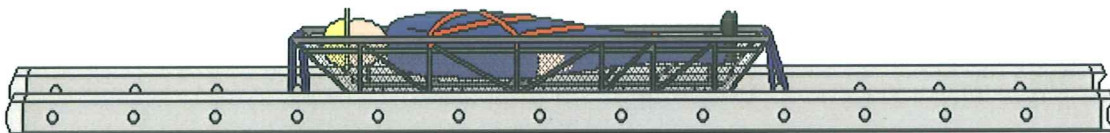


Figure 15-8: Level Ground Walkout (Litter in the Middle)

## Operations

- Lifting the basket.

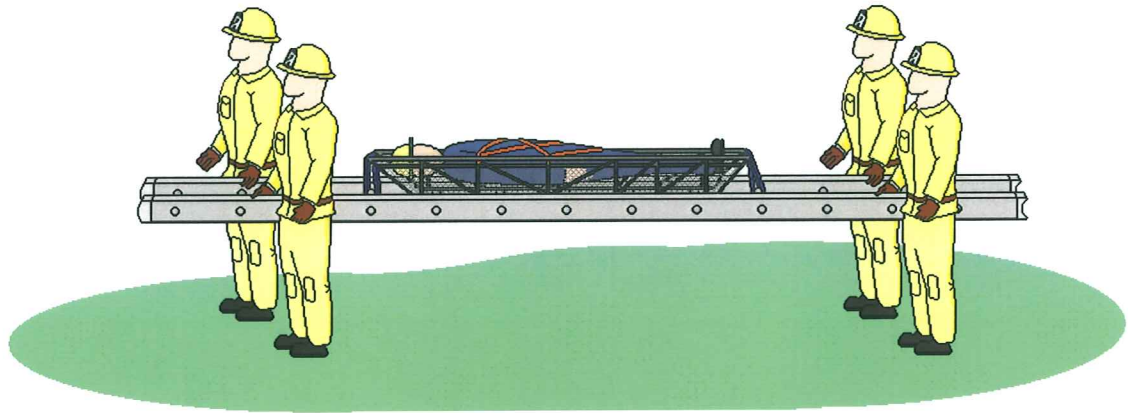


Figure 15-9: Lifting the Basket

## Ladder Slide

The ladder is used as a rail system on which the litter slides. The litter can be raised using a straight pull or a mechanical advantage system. The litter can be lowered using a friction device or a mechanical advantage system. Using a mechanical advantage system is beneficial if there will be repetitive uses of the system for multiple victims. The mechanical advantage system used is chosen by the rescuers depending upon the size of the victim, number of rescuers available, and the rescue scene.

Mechanical advantage systems that work well with ladder slides are the 3:1 pig rig (Chapter 11) and the 2:1 ladder rig (Figure 15-11), which is nothing more than the 3:1 pig rig inverted. The anchor carabiner and pulley of the 2:1 ladder rig attach to the head of the litter and become the mechanical advantage carabineer and pulley. The mechanical advantage carabiner and pulley of the 3:1 pig rig attach to the anchor and become a change of direction. If an extension ladder is used, the bed and fly sections should be secured together to avoid them from shifting during positioning or raising and lowering operations.

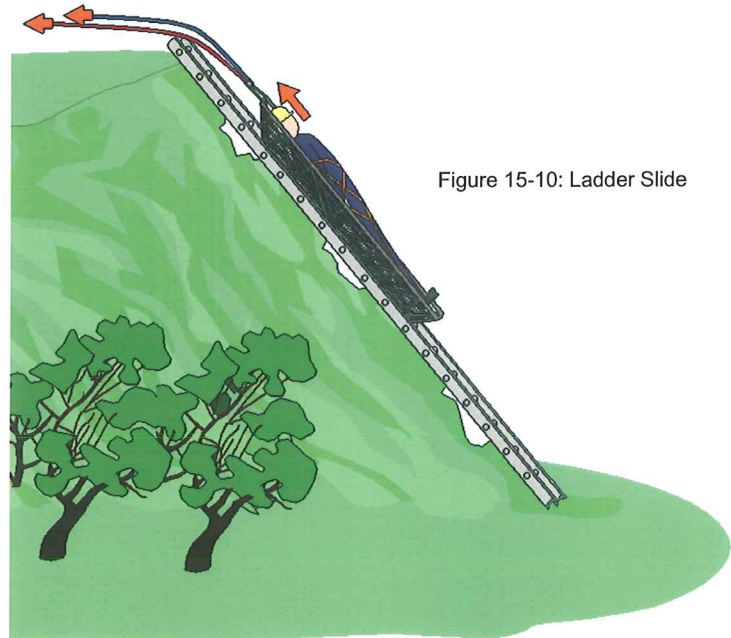


Figure 15-10: Ladder Slide

## Considerations

- Number of personnel available.
- Equipment available.
- The need for a ladder slide.
- The need for a more complex rope system.
- Distance to move the victim.

## Components

- One (1) straight ladder or extension ladder.
- One (1) 12-foot section of webbing for stabilizing the tip of the ladder.
- One (1) rescue litter.
- Head lashing for litter.
  - One (1) green or yellow webbing sling.
- Interior and exterior victim lashing.
  - Three (3) 20-foot webbing slings
- Belay/safety line system.
  - One (1) anchor sling.
  - Two (2) carabiners.
  - One (1) load-releasing device.
  - Tandem prusiks.
  - Lifeline.
- Mechanical advantage system.
  - One (1) anchor sling.
  - Two (2) pulleys.
  - Two (2) carabiners.
  - Lifeline.

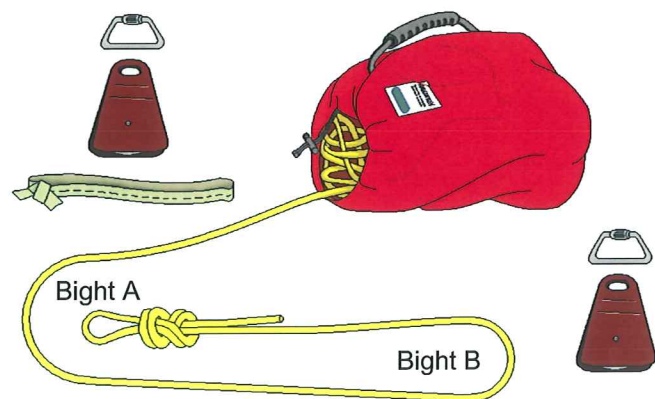


Figure 15-11: 2:1 Ladder Rig Components

## Constructing a 2:1 Ladder Rig

1. Tie a figure eight on a bight with a 4" loop in the end of the line.
2. Place rope on the ground, forming two bights as shown above.
3. Place bight "B" into pulley and connect a carabiner to this pulley.
4. Connect the load to this carabiner (head lashing of the litter).
5. Place bight "A" into pulley and connect a carabiner to this pulley.
6. Secure figure eight on a bight into this carabiner on top of the pulley.
7. Connect this carabiner to the anchor sling.

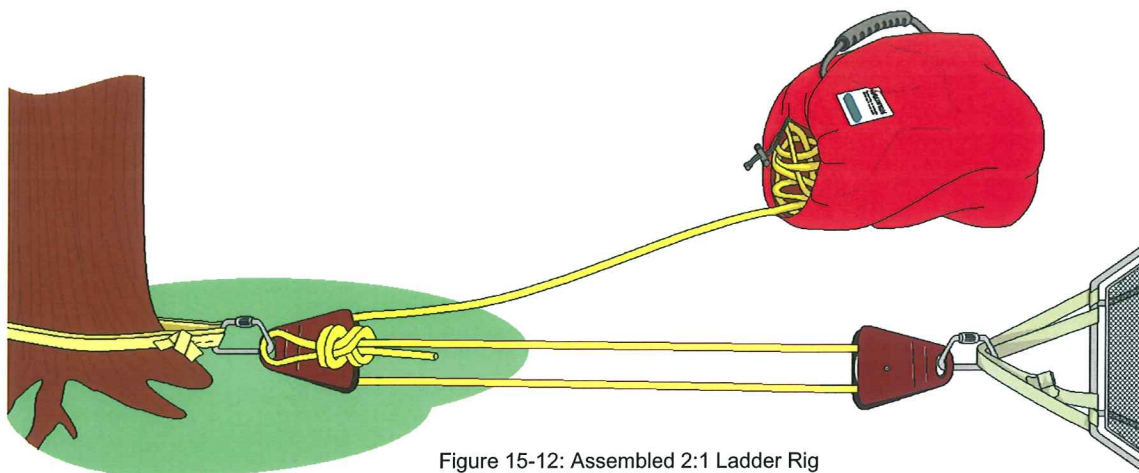


Figure 15-12: Assembled 2:1 Ladder Rig

## Constructing the Ladder Slide

- Litter
  - Form lashing to the head of the rescue litter.
- Position the ladder.
  - Fly out for lowers.

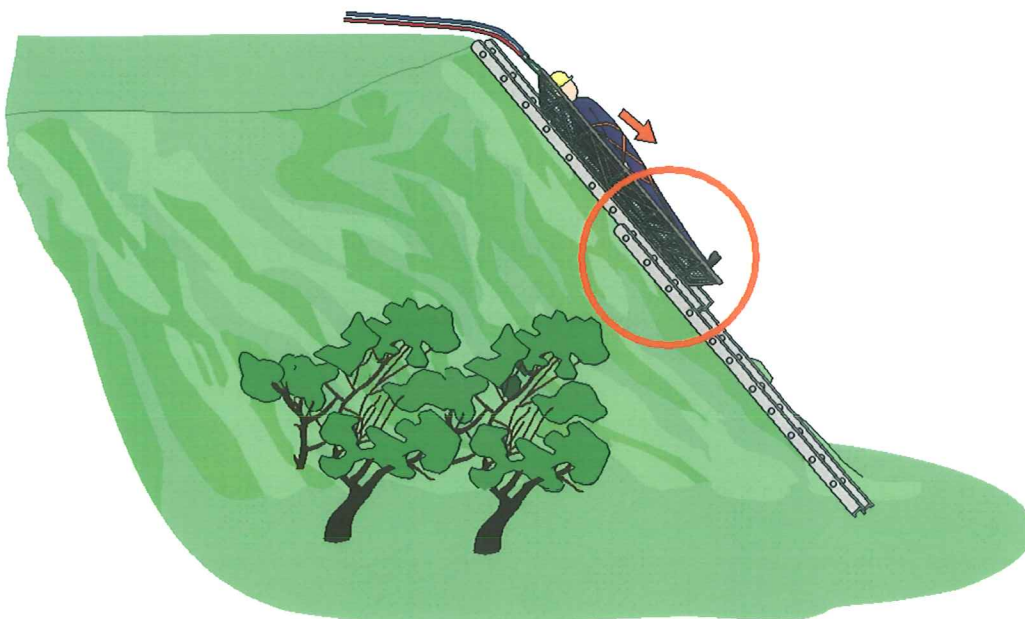


Figure 15-13: Fly Out for Lowers

- Fly in for raises.

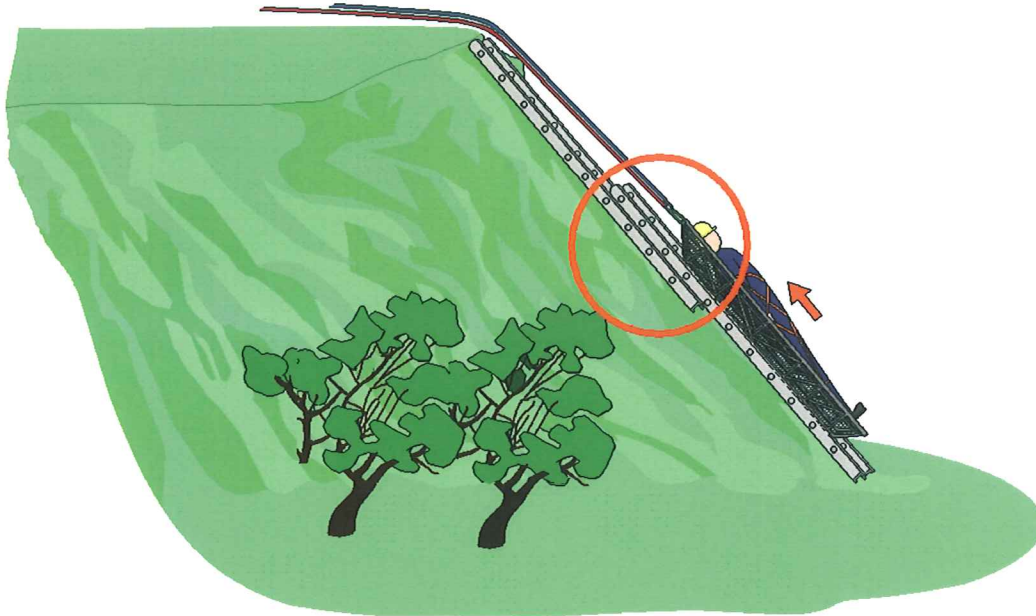


Figure 15-14: Fly In for Raises

- Position the ladder just below the edge of the departure point.
- Tie off the halyard if the ladder is extended and or use webbing to secure. (Figure 15-15)
- Secure the ladder using webbing or rope (12-15 feet).
  - Rescuers may foot the ladder if the terrain permits.

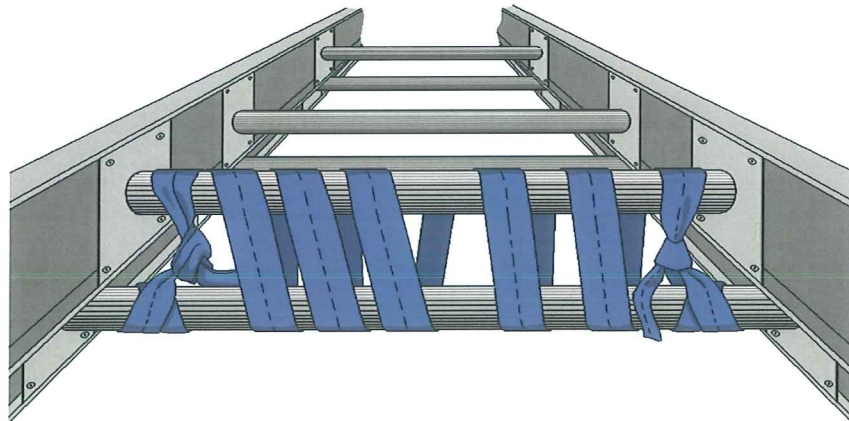


Figure 15-15: Lash Fly to the Bed of the Extension Ladder

- Build the main line and belay/safety line systems.
  - Friction device for lowering.
  - Mechanical advantage system for raising.



- Attach to the head lashing of the litter and anchors.

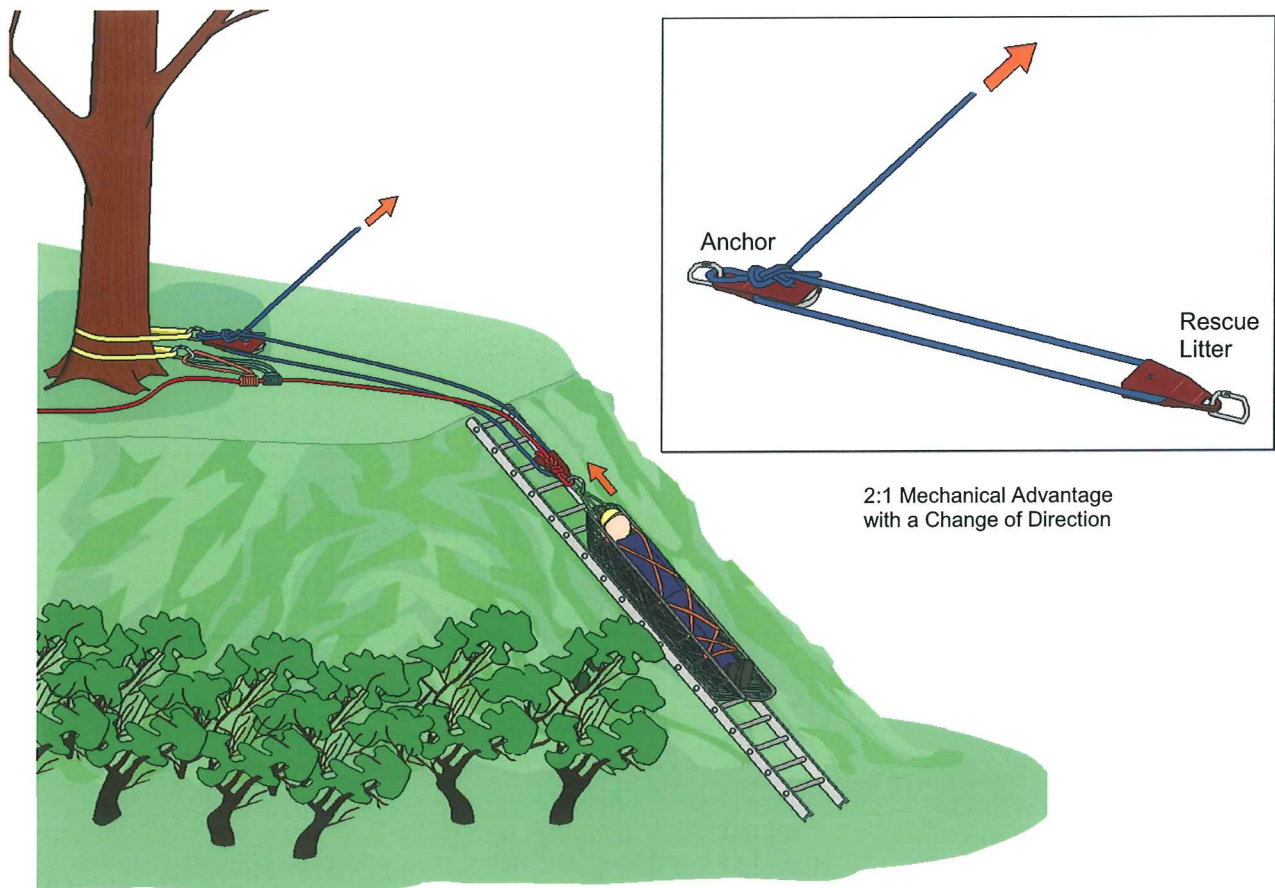


Figure 15-16: Ladder Slide with a 2:1 Ladder Rig

## Operational Safety Considerations

- All crewmembers working within 10 feet of a hazardous edge must have fall restraint.
- Wire litter can catch (hang up) on rails of ladders.
- Good body mechanics.
  - Protect your back.
  - Tag lines help.
  - Provide adequate edge protection for the ropes.
  - A rescuer can climb or descend the ladder at the foot of the rescue litter to assist the operation.