

# Ties and Anchors





This course doesn't teach technical rescue.



# Life Safety Rope Systems

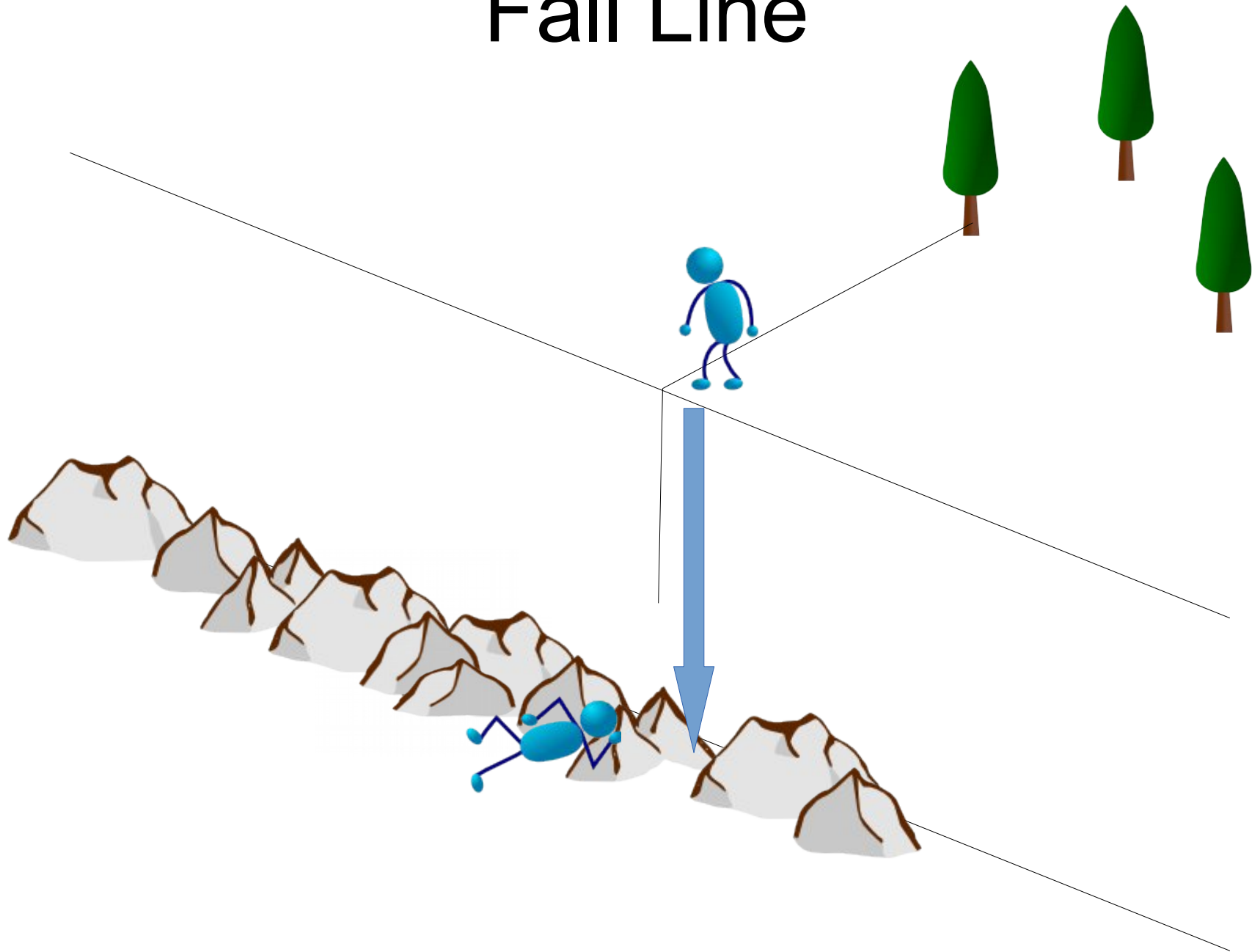
- Mainline
  - Supports the load
- Belay
  - Redundant, takes up the load in case of a failure on the mainline portion of the system.
  - Limited slack, limited shock loads.

# Some factors in system design

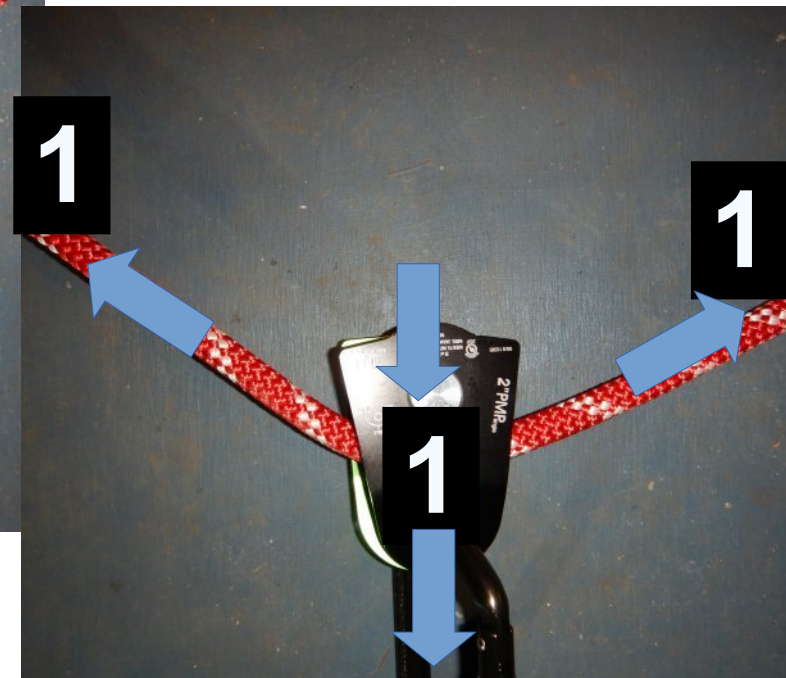
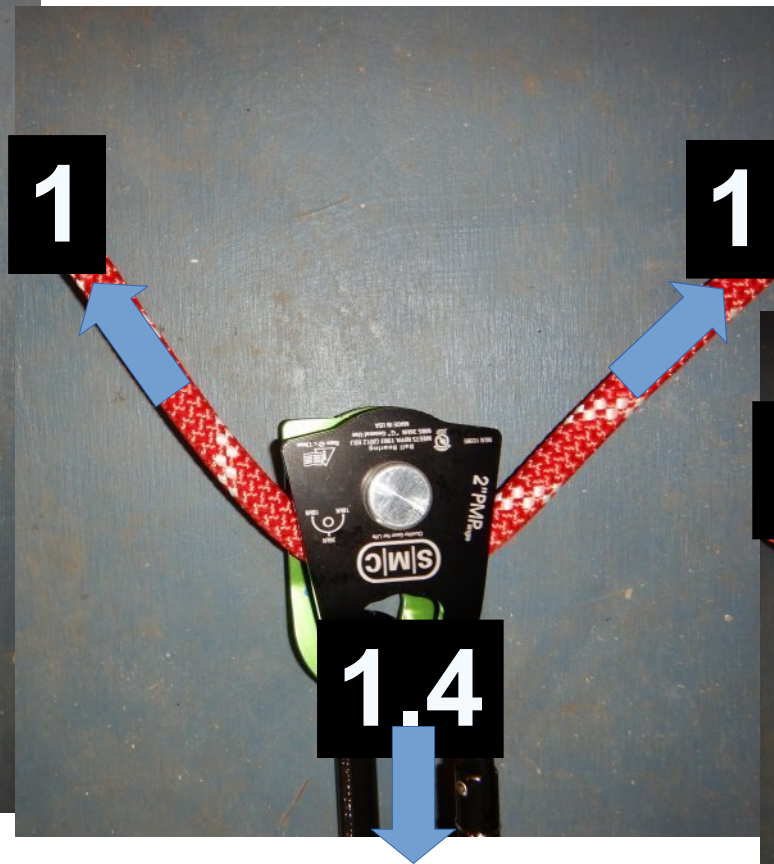
- Loads and Forces
  - System safety factor (10:1 or 15:1)
- Friction
- Anchors
- Fall Line
- Backup/Belay system



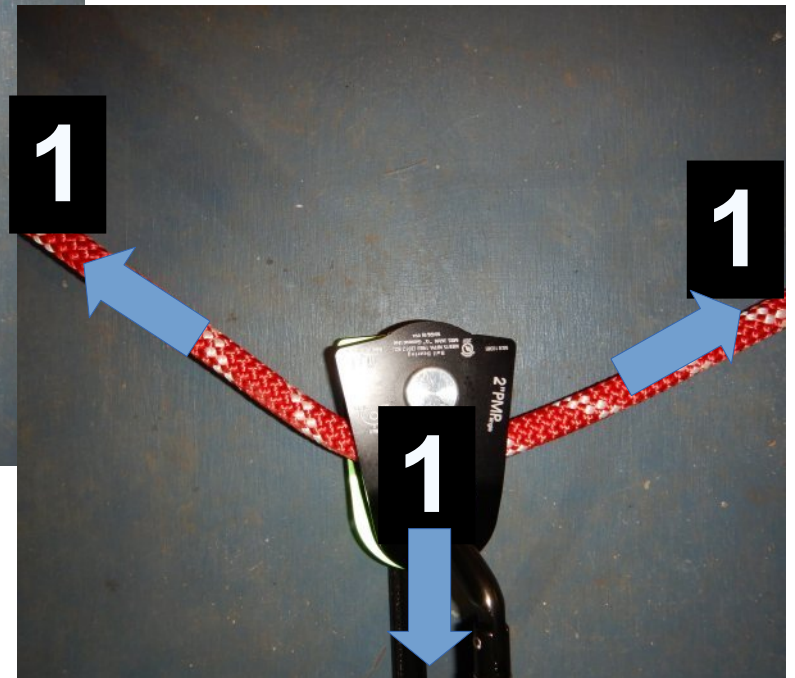
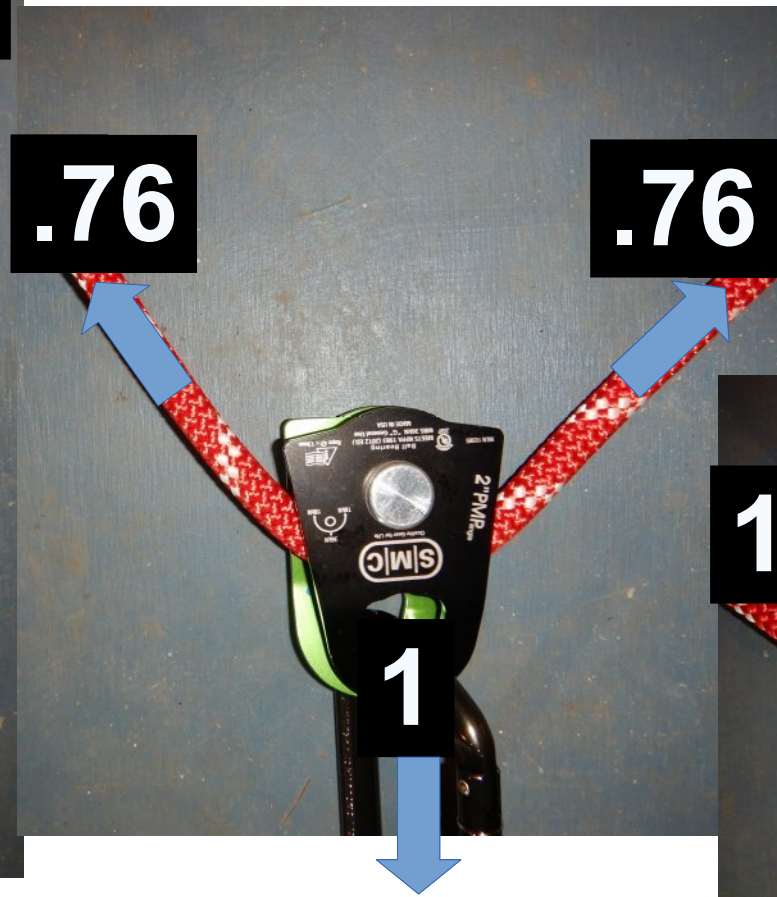
# Fall Line



# Angles and Forces



# Angles and Forces





# Factors in Rescue Efficiency

- Available personnel.
- Terrain.
- Weather.
- Darkness.
- Rope rescuer condition.
- Subject condition.
- Accuracy.
- Speed.

# Practice Ties

- Figure 8 on a bight, with barrel knot safety.
- Figure 8 follow through (tie in), with barrel knot safety.
- Alpine Butterfly
- Double overhand bend.
- Prusik hitch.
- Water knot.
- Square knot.
- Expedient Harness (Swiss seat).
- High strength anchor.

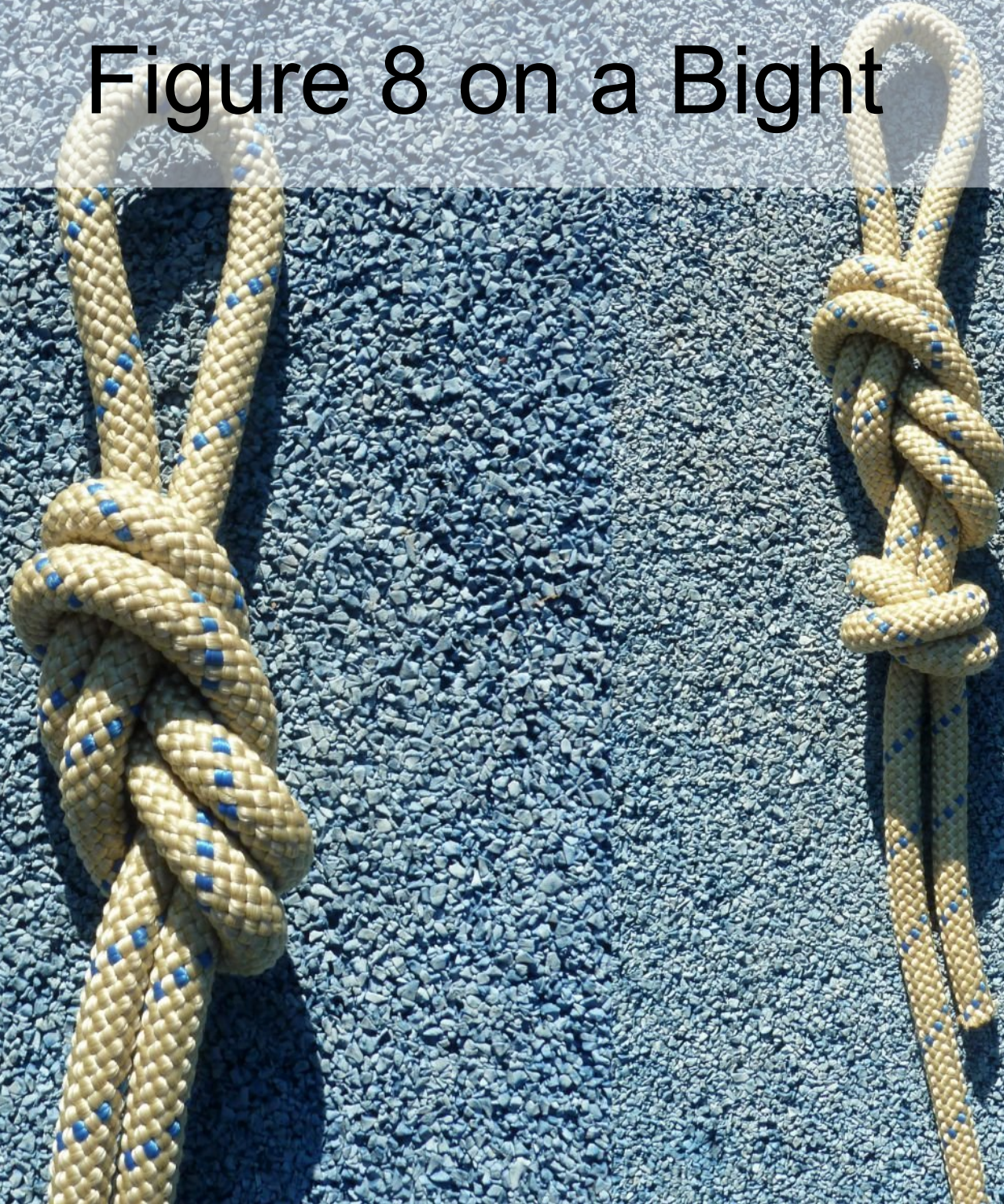


Figure 8





# Figure 8 on a Bight





# Barrel Knot Safety







Figure 8 Follow Through



# Figure 8 Follow Through

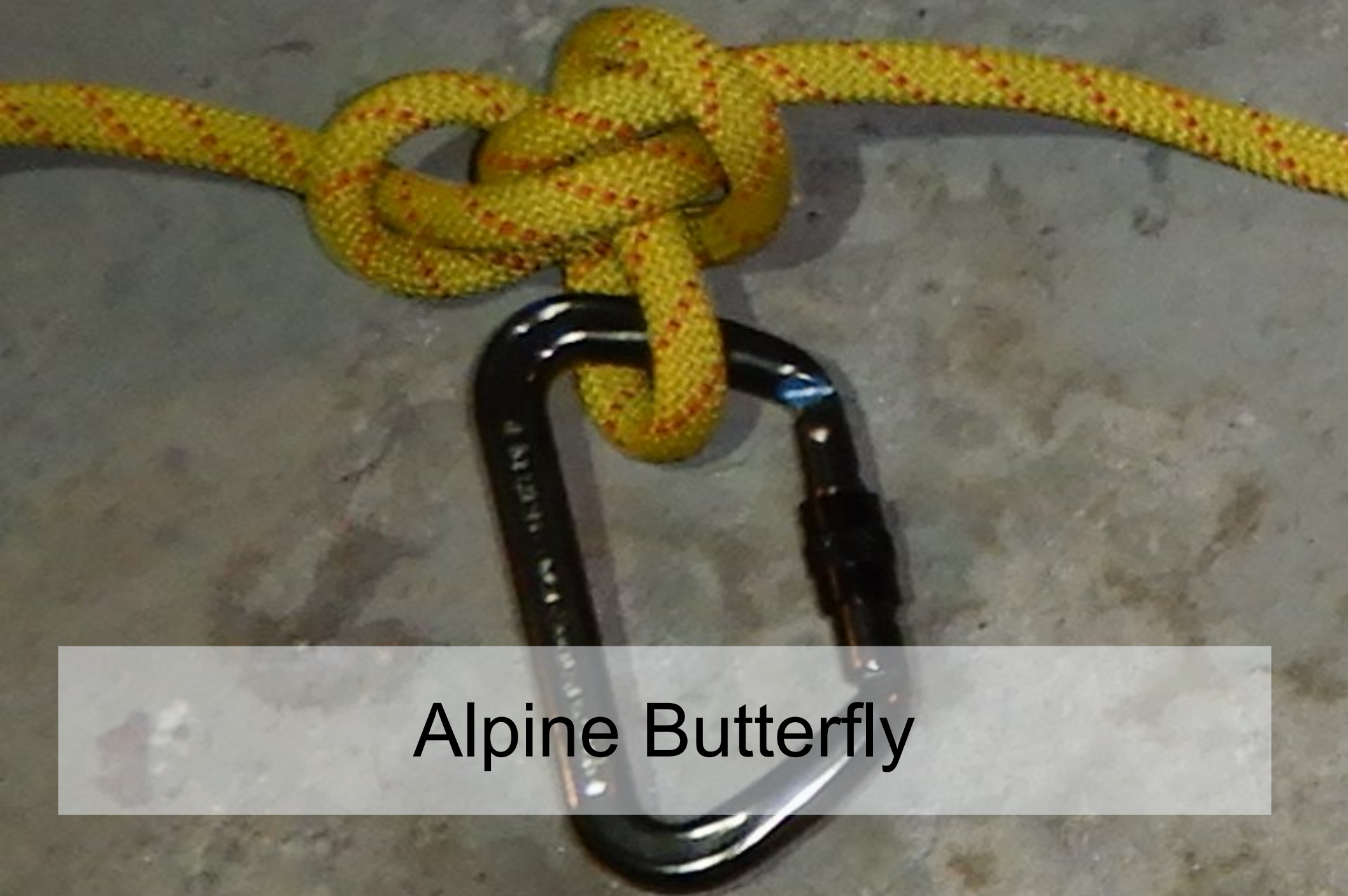




# Double Overhand Bend (Grapevine)







Alpine Butterfly



# Prusik Hitch





# Water Knot (Ring Bend)







Square Knot





# Swiss Seat





# Anchors

- Secure
- Redundant
- Equalizing
- Non-Extensible



# Single Point Anchor





# Multi-Point Anchor











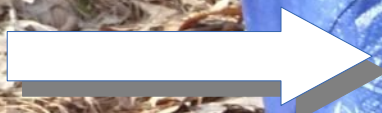


# High Strength Tie-Off (tensionless hitch)

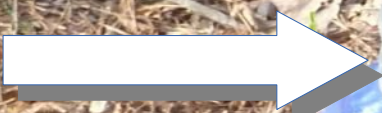




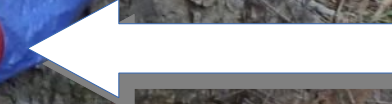
Edge Protection



3 wraps



No angle here.



Not under tension



In-line with load





# Anchor Strap (and tri-link)

Tri-link,  
Do Not put  
3 way load on  
a Carabiner

Keep Angle  
Small



# Team Functions

- Rescue Group Supervisor
- Edge Manager
- Safety
- Belay operator
- Lowering/Haul system operator(s)
- Rescuer/Litter Attendant(s)



# Haul Systems



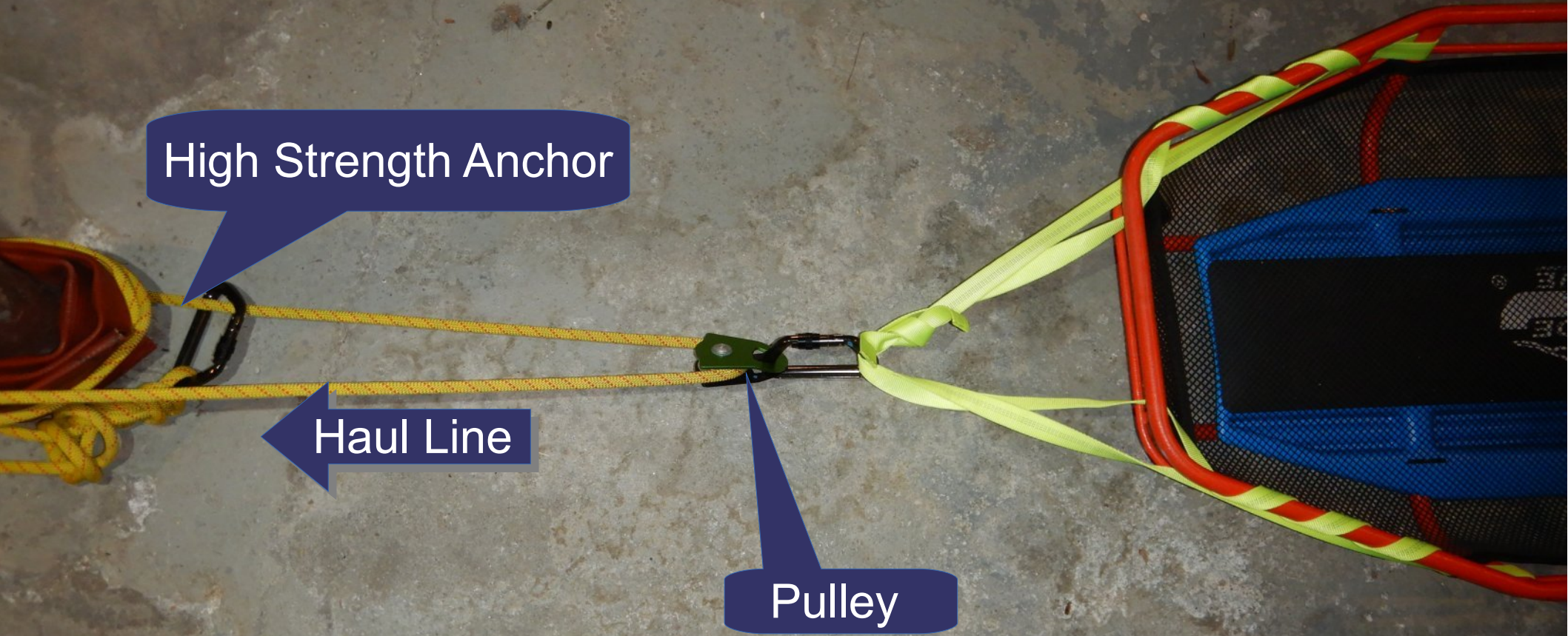


# Mechanical Advantage





# Simple 2:1 for low angle assist



High Strength Anchor

Haul Line

Pulley



# Simple 2:1 with change of direction for low angle assist





# Simple 2:1 with change of direction for low angle assist

High Strength Anchor

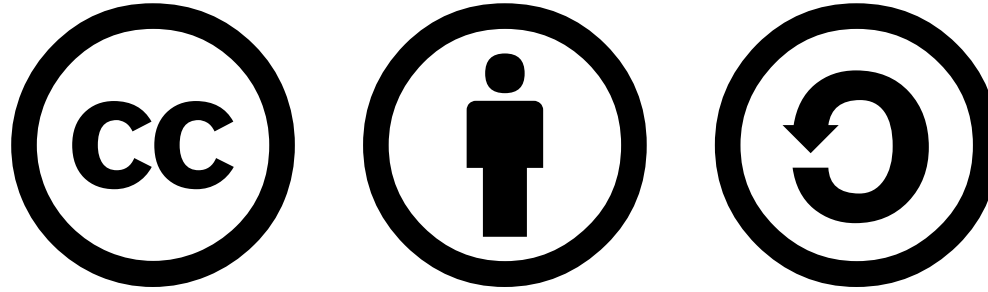
Progress Capture

Change of Direction Pulley

Pulley  
2:1 Mechanical Advantage

Haul Line





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