Bull Rigging: Who, What, Where, Why & How?

Presented by

Joseph Kuzar
Assistant Technical Director
ITI

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THE *WHY* OF ITI

We exist to serve and learn every day.

ITI was founded by people whose desire is to help other people.
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Our founder, Mike Parnell became an Eagle Scout at the age of 14 –
a rigorous feat that even 18-year-old candidates struggle to attain.

For over 30 years, this tenacity to achieve and our desire to help others
has produced a company that continuously exhausts all efforts to lead
the world in training skills and technical curriculum.

At ITI our top priority is to save lives and improve the industrial activities
of the employers we serve.

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Joe Kuzar

Assistant Technical Director
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Joe joined Industrial Training International (ITI) in 2012, with over 22 years in the construction industry with experience in gas/oil field operations, and civil, commercial, and transportation construction with a large emphasis on crane and rigging operations.

His passion for the crane and rigging industry is clear, and highlighted by 8 years of volunteer services as a member of the ASME P30.1 Planning for Load Handling Activities committee.

Professional Associations & Certifications

- Association of Crane & Rigging Professionals (ACRP), Board of Directors
- American Society of Mechanical Engineers (ASME), Member
- NCCCO Lift Director Committee Member
- Certified Lift Director (NCCCO)
- Certified Mobile and Overhead Crane Operator (NCCCO)
- Certified and Accredited Rigger I & II and Signal Person (NCCCO)
- Mobile and Overhead Crane Practical Examiner (NCCCO)

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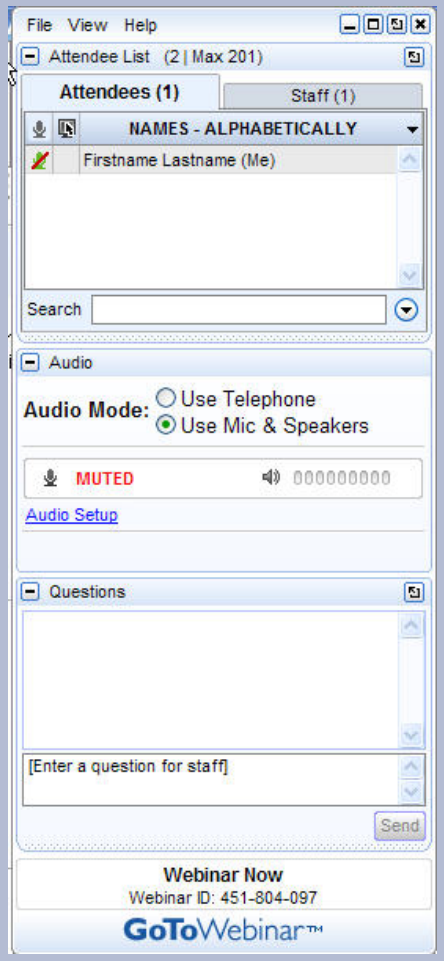
Questions?

Enter them in the question pane.

We will answer as many as time allows over the air at the end of the webinar!



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What is bull rigging?

Bull rigging is method or system of rigging commonly used where more conventional means of load handling, such as a mobile cranes or overhead cranes cannot gain access.

Bull rigging often involves manual load handling techniques and designing the load handling system to meet the environment.

- No overhead access
- No Crane access
- Travel path(s) are limited & restrictive
- Floor load minimal
- Just some examples

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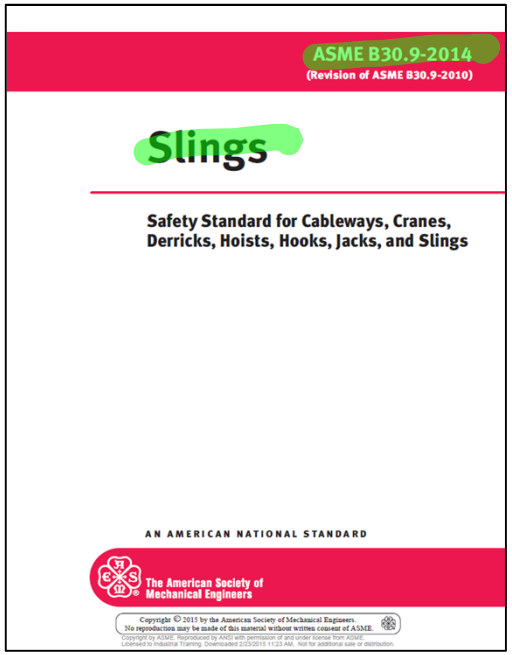
Common Bull Rigging Equipment

Slings

1) Wire rope
2) Alloy Chain
3) Synthetic Web
4) Synthetic Roundslings

1)

2)



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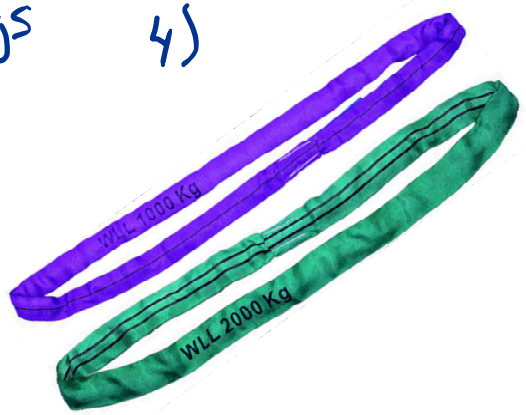

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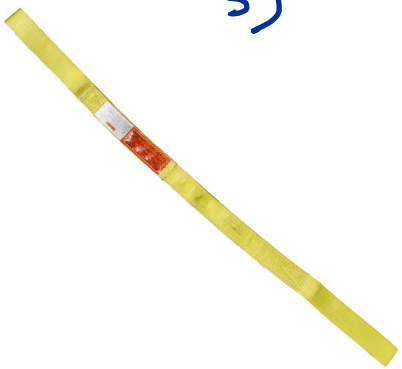

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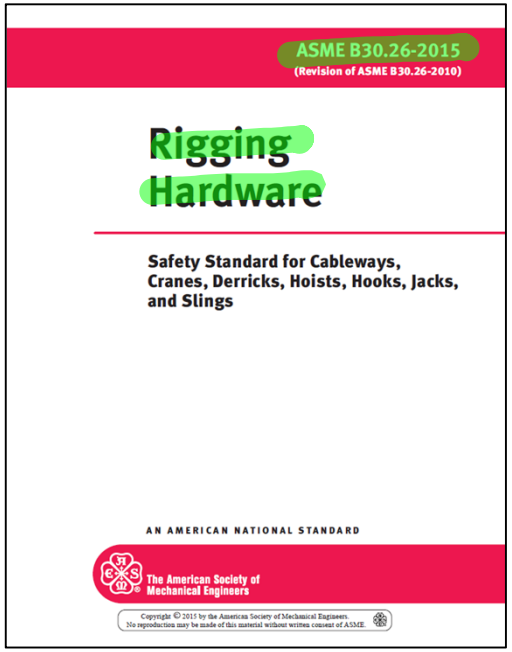
Hardware

1) Master Link
2) Shackle
3) Rigging Block
4) Shoulder Eyebolt
5) Swivel Hoist Ring

1)

2)



4)

5)

5)

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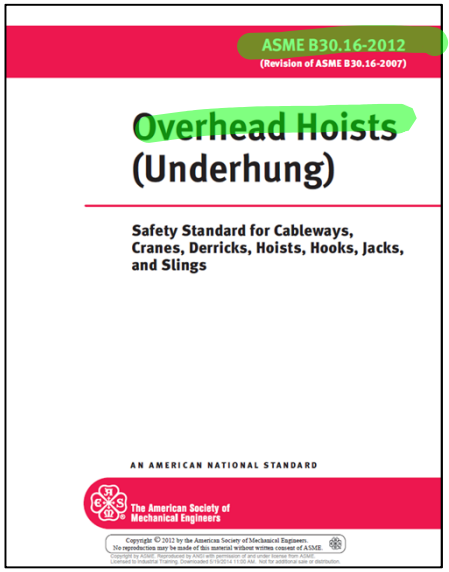
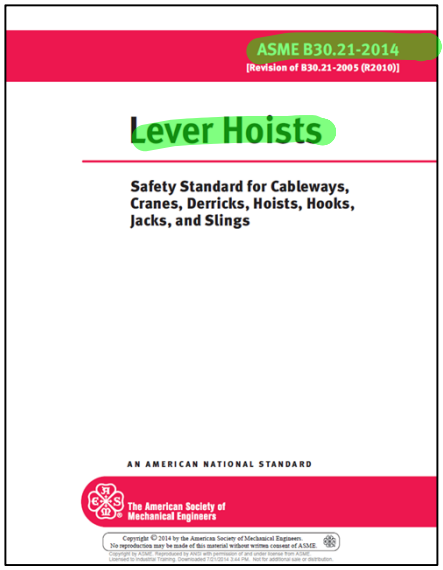
Chain Hoists and Come-a-longs





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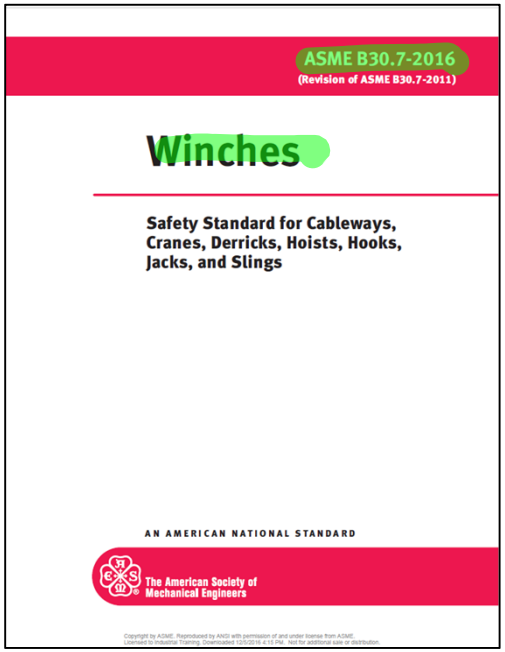
Winches



1) Winch

2) Grip Hoist

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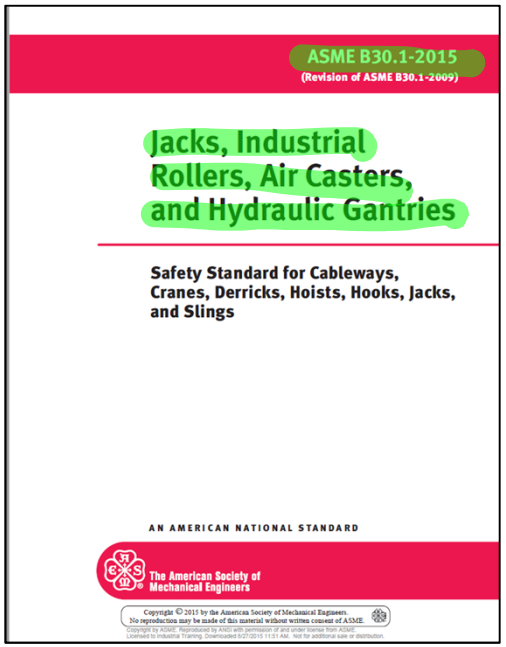
Jacks and Industrial Skates



Hydraulic jacks

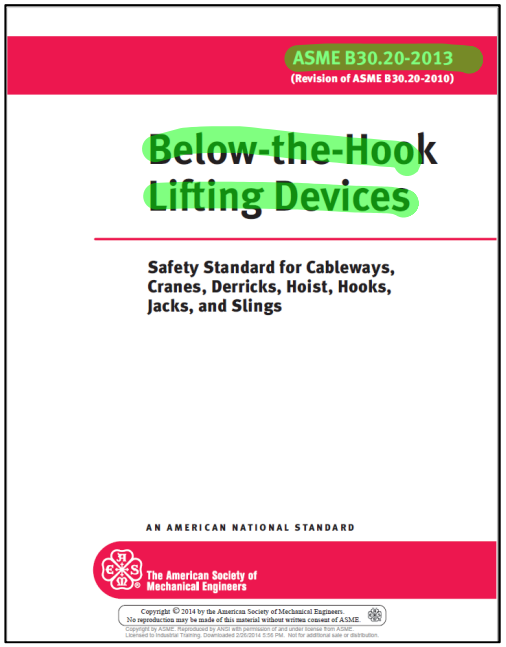
Mechanical Jacks

Steerman's

Hillman's

Beam Clamps

> Pay attention to each manufacturer's limitations



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Bull Rigging Applications

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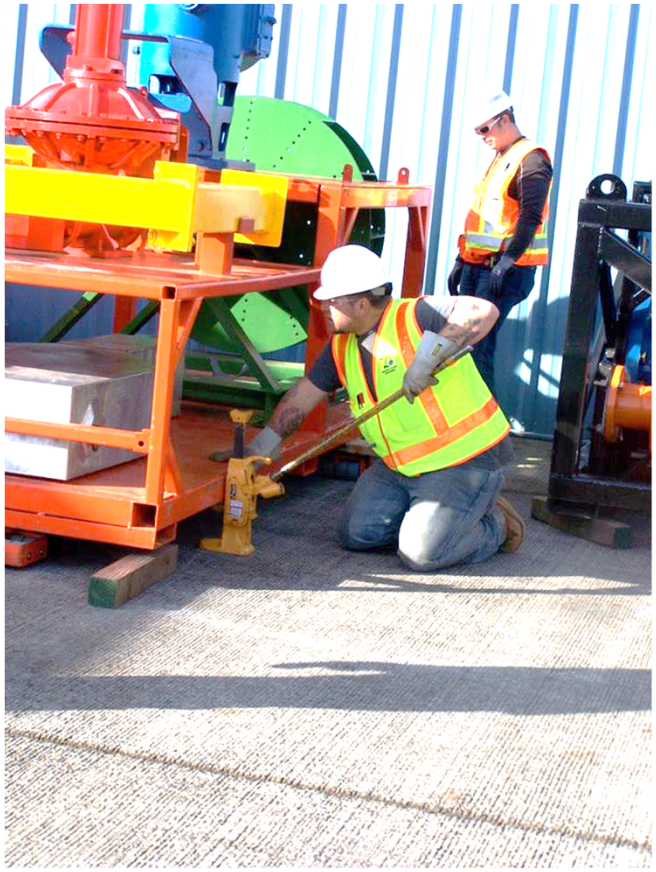
Jacking and Rolling

- Resources
  - ASME B30.1
  - ASME B30.7
  - ASME B30.9
  - ASME B30.26



- Equipment
  - Blocking / Cribbing
  - Jacks
  - Industrial Rollers
  - Winches

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Jacking and Rolling

- Considerations
  - Share of load
  - Floor loading
  - Load distribution
  - Area Prep
  - Inclines / Declines
  - Coefficient of Friction

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Jacking and Rolling

Considerations:

- Equipment Capacity
- Communication
- Personnel Placement
- Planning

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Jacking and Rolling

Jacking Practices

2

Share of Load

Before beginning a jacking and rolling operation, ensure that a plan has been developed and discussed with all affected personnel.

Prior to placing jacks/blocking, determine the load's weight and center of gravity.

Use all jacks in accordance with the manufacturer's instructions.

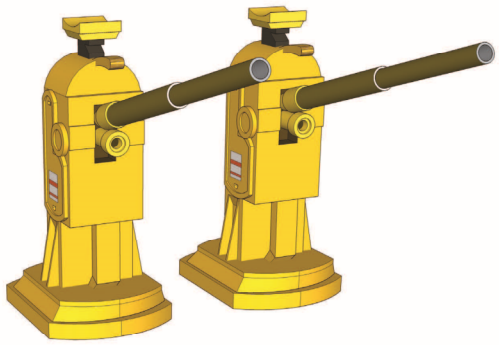
Before and during jacking operations, ensure that the opposite end/side of the load is stabilized.

When possible, insert friction material between the jack load point and the load surface during jacking operations to help prevent slippage.

Do not leave a load unattended while supported solely by jacks.

Remove and stow jack handles when idle to avoid accidental jack engagement or tripping.

For mechanical jacks, ensure linkage engagement is achieved by the handle's full range of motion.



Jacking and Rolling

Jacking From The Crib Pile

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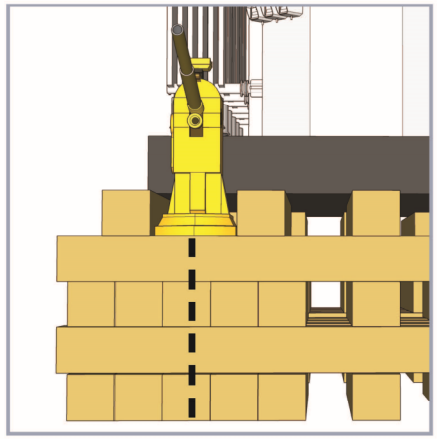
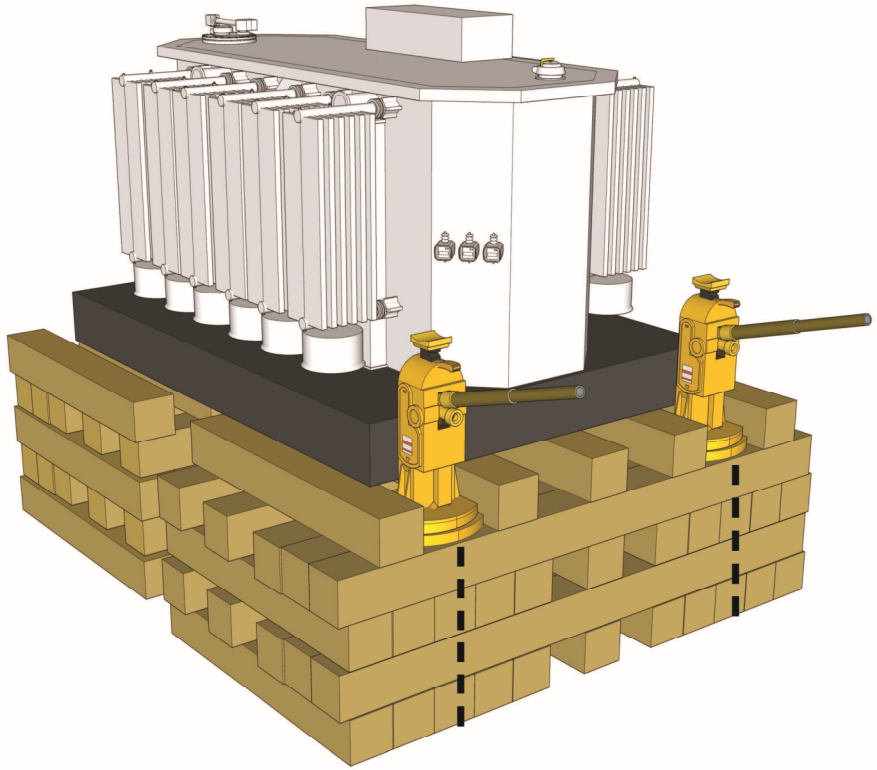
Ensure:

- That a column of crib material is aligned below the jack.
- The jack's primary or auxiliary load point fully engages the load.
- The jack base is fully supported.





⚠ **WARNING:** Refer to rigging equipment manufacturers' specifications for proper applications and limitations.

Jacking and Rolling

Area Prep

Roller Practices

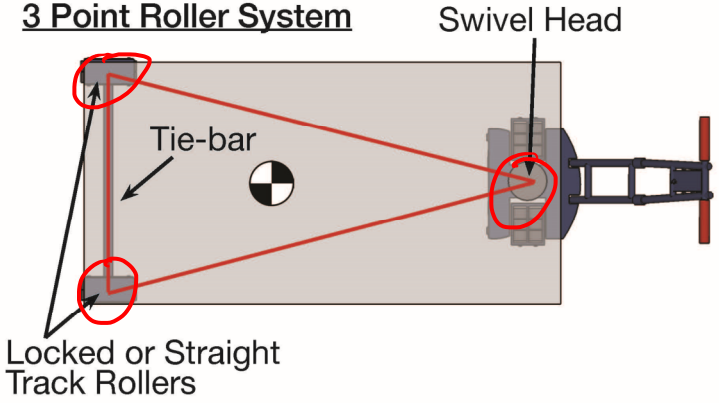
11

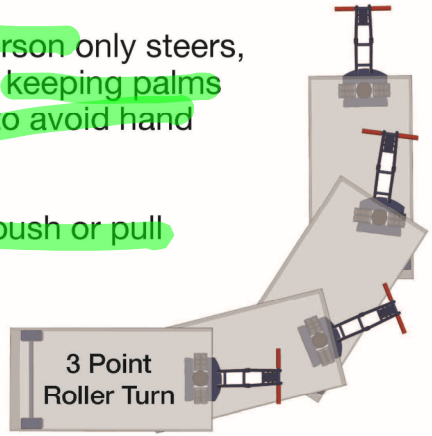
Remove grit and debris from roller travel path.

Steering-person only steers, never pulls, keeping palms face down to avoid hand crushing.

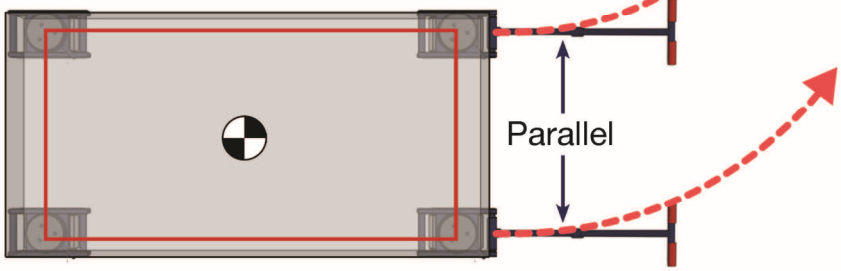
Assistants push or pull the load.

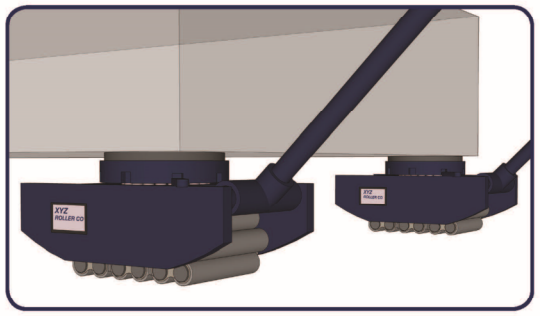
3 Point Roller System





4 Point Roller System*





*Anticipate cross-corner loading. Increased roller rated capacity is advised (+25% minimum).

Share of Load

Which is better?

3 or 4 point load support?

Consider uneven floor - drains

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Winching

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Winching

Resources:

- ASME B30.7
- ASME B30.9
- ASME B30.26
- ASME B30.1

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Considerations:

- Line Pull
- Inclines / Declines
- Anchoring the winch
- Block Fairlead Loading
- Structural Capacity of Columns & Floor
- Load Weight
- Coefficient of Friction

Winching

Level & Incline Planes [For Estimation Only]

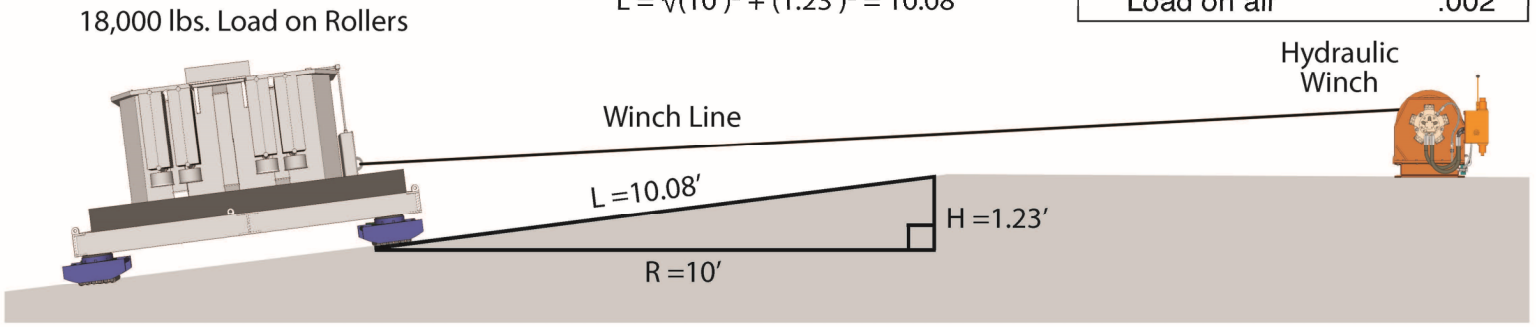
12

Formulas	Legend
	W = **W**eight of load
Level: CF x W = F	**CF** = **C**oefficient of **F**riction
Uphill: [CF x W x (R ÷ L)] + [(H ÷ L) x W] = F	**F** = **F**orce required to move load
Downhill: [CF x W x (R ÷ L)] – [(H ÷ L) x W] = F	**H** = **H**eight in feet
	R = **R**un, horizontal distance in feet
	L = **L**ength of ramp in ft.

Avg. Coefficients of Friction	
Concrete on concrete	.65
Metal on concrete	.60
Wood on wood	.50
Wood on concrete	.45
Wood on metal	.30
Cast iron on steel	.25
Steel on steel	.10
Load on rollers	.05
Load on ice	.01
Load on air	.002

$R^2 + H^2 = L^2$

$L = \sqrt{(10')^2 + (1.23')^2} = 10.08'$



Pulling Uphill - **Example:** [.05 x 18,000 x (10 ÷ 10.08)] + [(1.23 ÷ 10.08) x 18,000] = F

893 + 2,196 = F

3,089 lbs. = F

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Resources : - ASME B30.9 - ASME B30.16
- ASME B30.26 - ASME B30.21
- ASME B30.7

Drifting

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Considerations : - Tension
- Structural Capacity
- Share of Load
- Load Weight

Drifting

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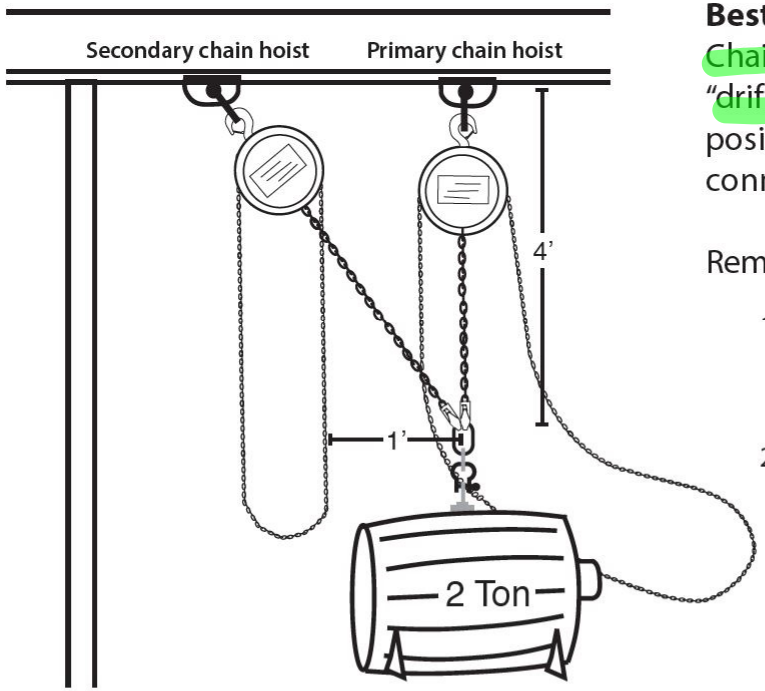
Drifting

Cautions About Drifting



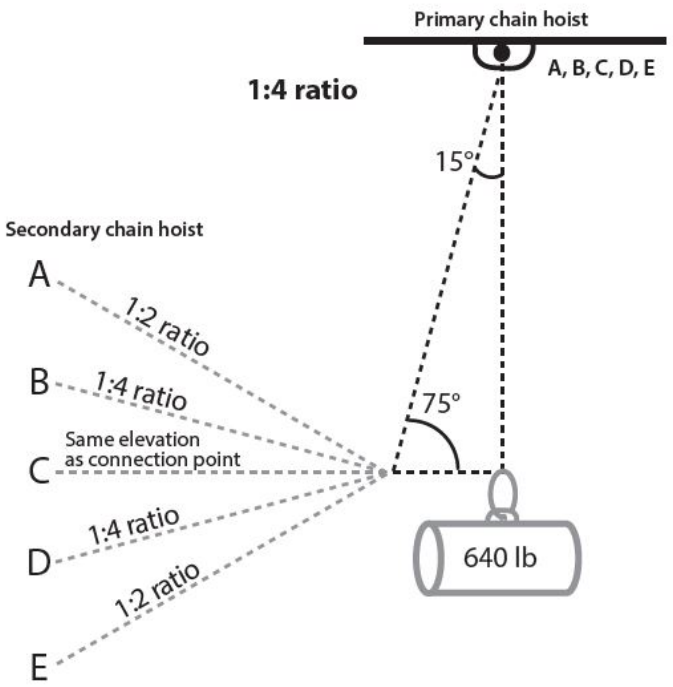
Best Practice: The tension in the Primary Chain Hoist is reduced when the load is "drifted" with a Secondary Chain Hoist positioned well above the rigging connection point.

Remember these key points:

1. NOTE: Each chain hoist must be capable of supporting the entire suspended load since it will start/stop under each individual hoist.
2. Never drift a load using two chain hoists on the same beam, to the point that the horizontal angle is less than 30 deg, without substantial engineering review. (A trolley used along the beam may be a better option)

Drifting

Caution: Be careful where your secondary hoist is located.



Example of tension resulting from placement of 2nd chain hoist.

	Tension on Primary Chain Hoist (lbs)	Tension on Secondary Chain Hoist (lbs)
A	572	185
B	610	195
C	668	190
D	730	230
E	808	285

Caution: Always lift at or above the connection point elevation when using two chain hoists.

	Percentage of increase/decrease compared to original load of 640 lb on Primary chain hoist
A	-11%
B	-5%
C	+4%
D	+14%
E	+26%

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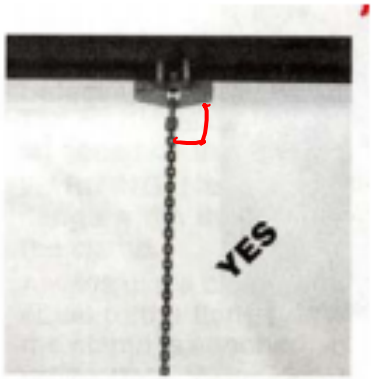
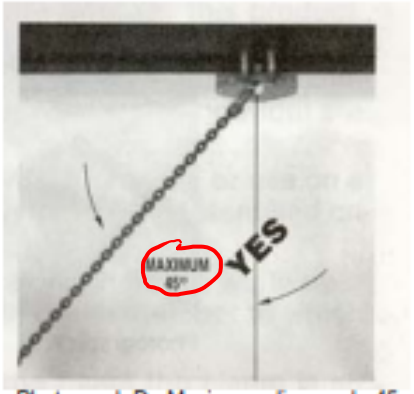
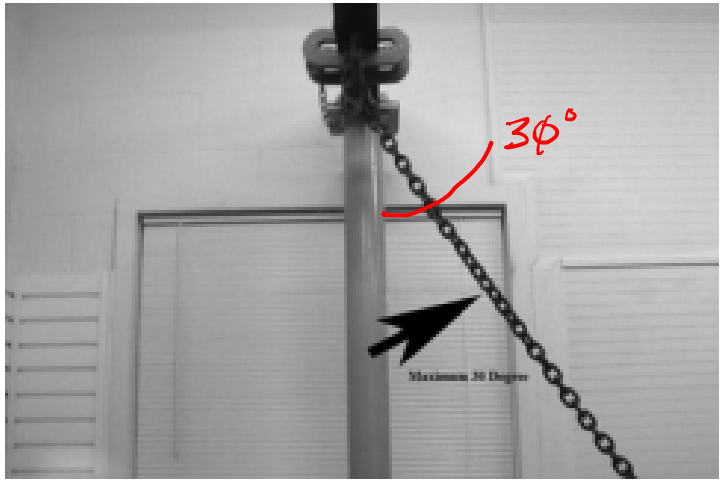
Drifting – Beam Clamp Selection & Limitations



Photograph C Sling Directly in line with lifting eye.



Photograph D. Maximum sling angle 45 degrees. Load in-line or parallel to



Photograph H. 30 degrees perpendicular to the beam.

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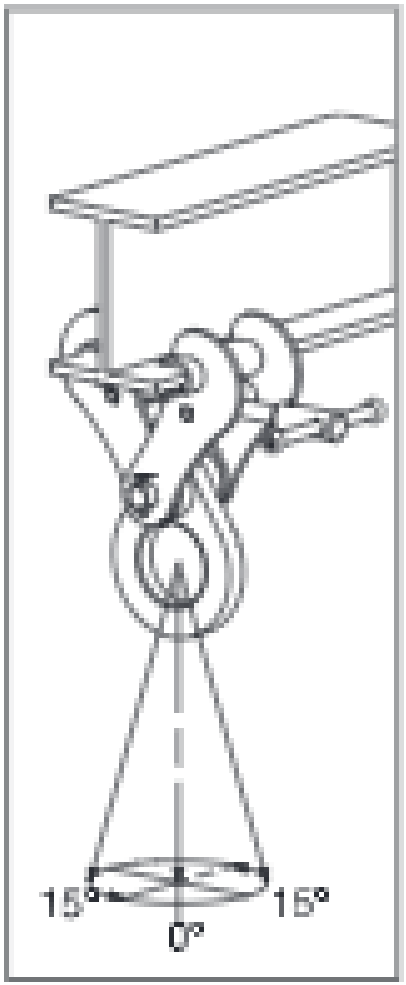
Drifting – Beam Clamp Selection & Limitations

IPTK
This IPTK series beam clamp is suitable for use as a temporary tackle eye for a beam.



IPTK

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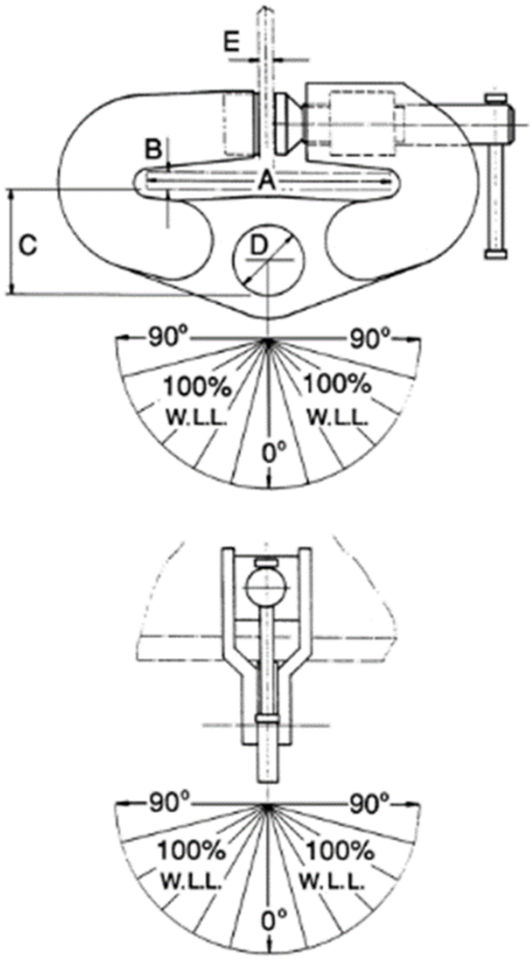
Drifting – Beam Clamp Selection & Limitations



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Blocking

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Blocking

Blocking Practices

4

Ensure that the ground or floor is stable enough to support the cribbing and the load weight.

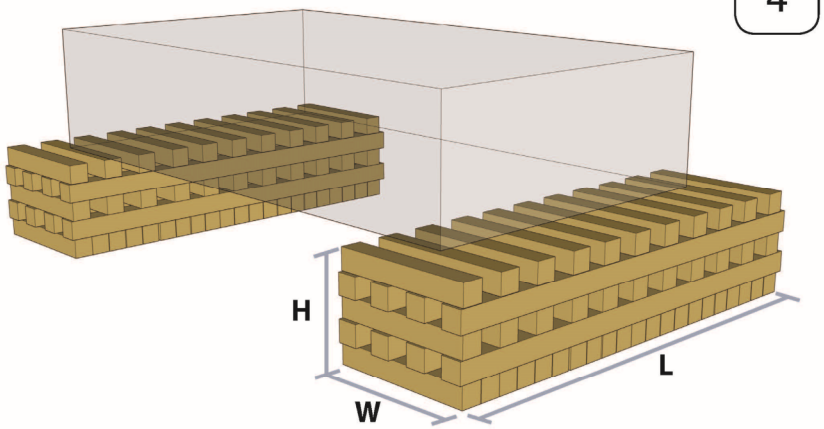
Ensure that the blocking is of sufficient strength to prevent crushing, bending or shearing failure.

Ensure that the span between blocking is able to carry the load.

Position dimensional cribbing with the widest face on the top/bottom.

Insert/remove blocking and/or shims to minimize fall distance in case of jack failure.

Shims or wedges should be used at the base and within the crib pile to maintain perpendicularity and meet predetermined height requirements.



Fully blocking the base layer reduces the loading pounds per square foot (psf) imposed on the ground surface.

Consult a geotechnical engineer to ensure that there is adequate ground support for the distributed load.

The crib pile height should not exceed 2 times the width, $H \leq 2W$.

or

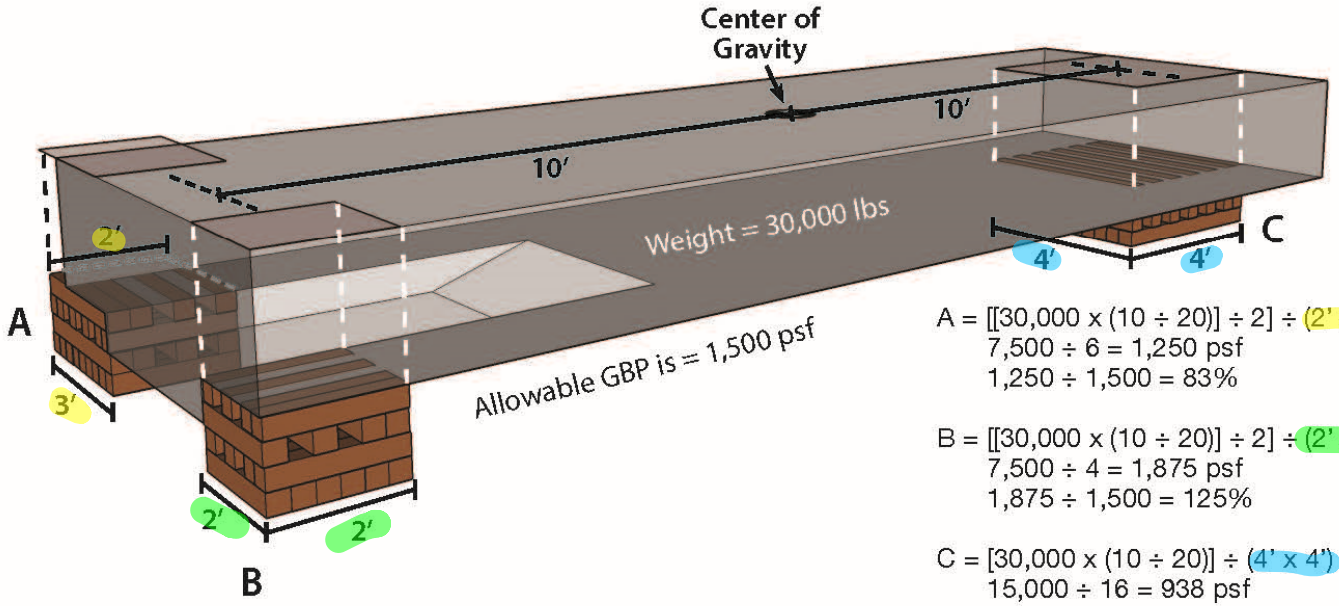
Blocking

Crib Pile Loading [For Estimation Only]

9

Determine: Share of load (lbs) ÷ cribbing foot print (sf) = Pressure imposed on ground (psf).

Confirm: [Pressure imposed (psf) ÷ allowable ground bearing pressure (psf)] x 100% = ____% ≤ 100%



A = [[30,000 x (10 ÷ 20)] ÷ 2] ÷ (2' x 3') =
7,500 ÷ 6 = 1,250 psf
1,250 ÷ 1,500 = 83%

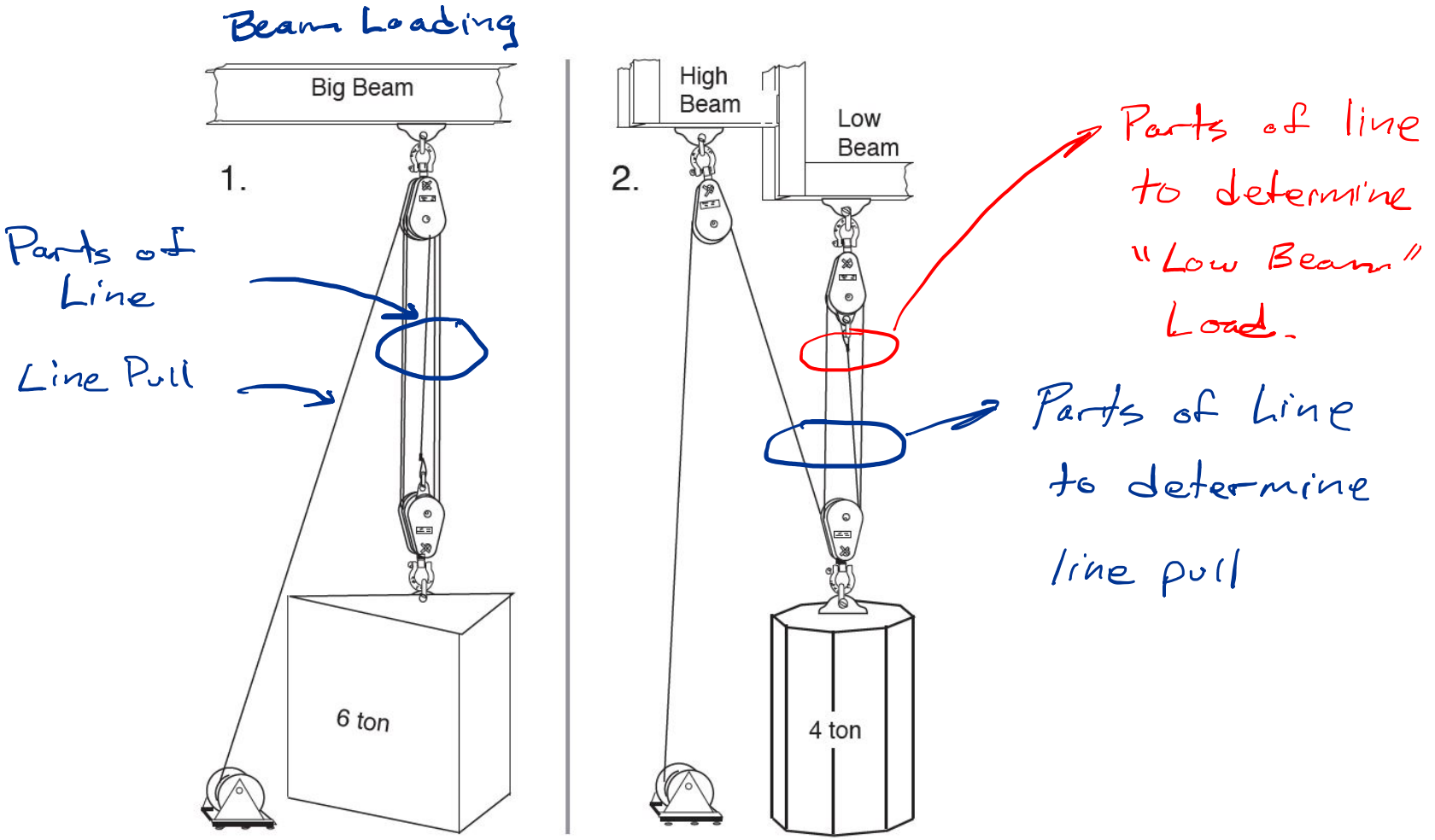
B = [[30,000 x (10 ÷ 20)] ÷ 2] ÷ (2' x 2') =
7,500 ÷ 4 = 1,875 psf
1,875 ÷ 1,500 = 125%

C = [30,000 x (10 ÷ 20)] ÷ (4' x 4') =
15,000 ÷ 16 = 938 psf
938 ÷ 1,500 = 63%

Solution: Increase crib pile B to 2' x 3'

Drifting Concepts

Line Pull



Share of Load and Tension

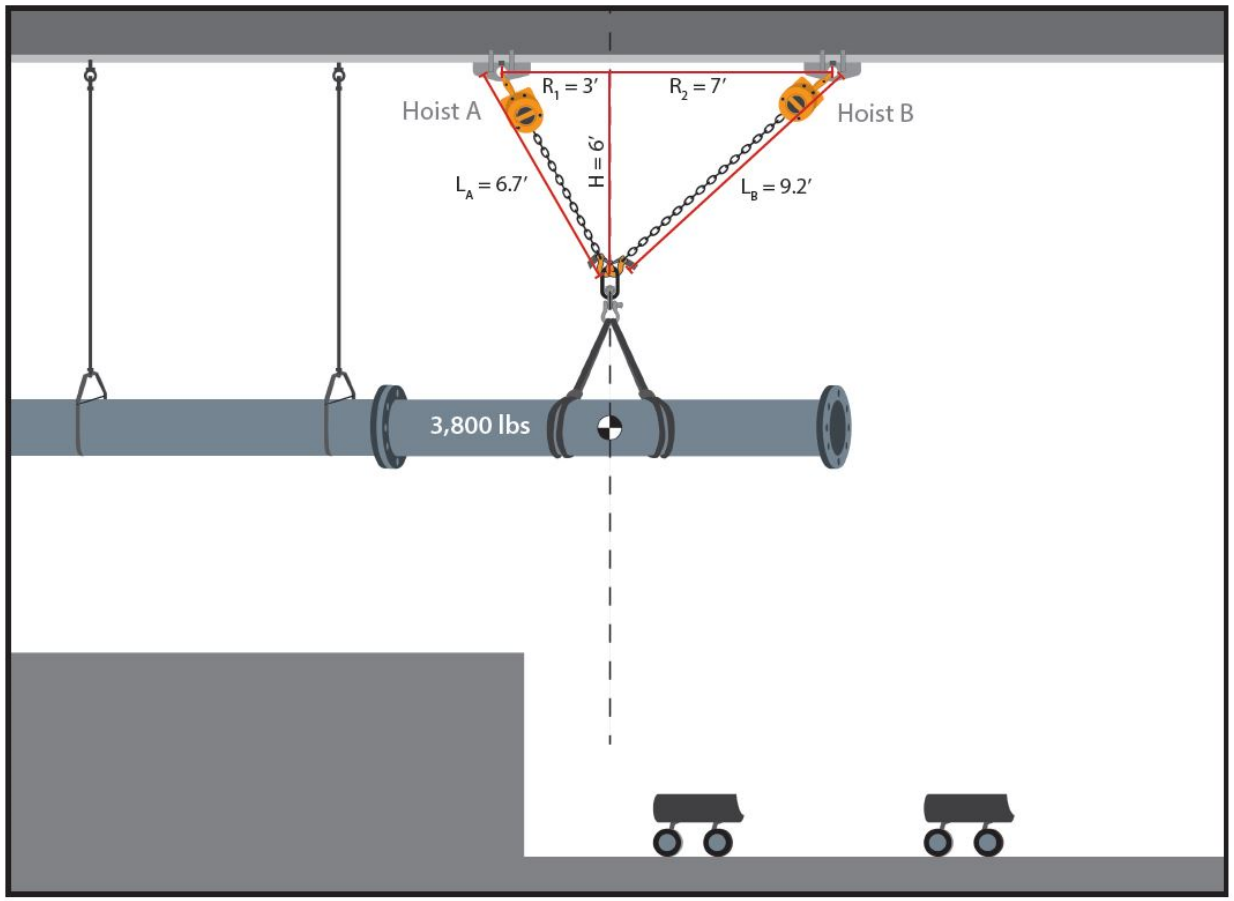
Considerations:

1) Share of Load

2) Tension

3) Beam Loading

4) Equipment Capacities



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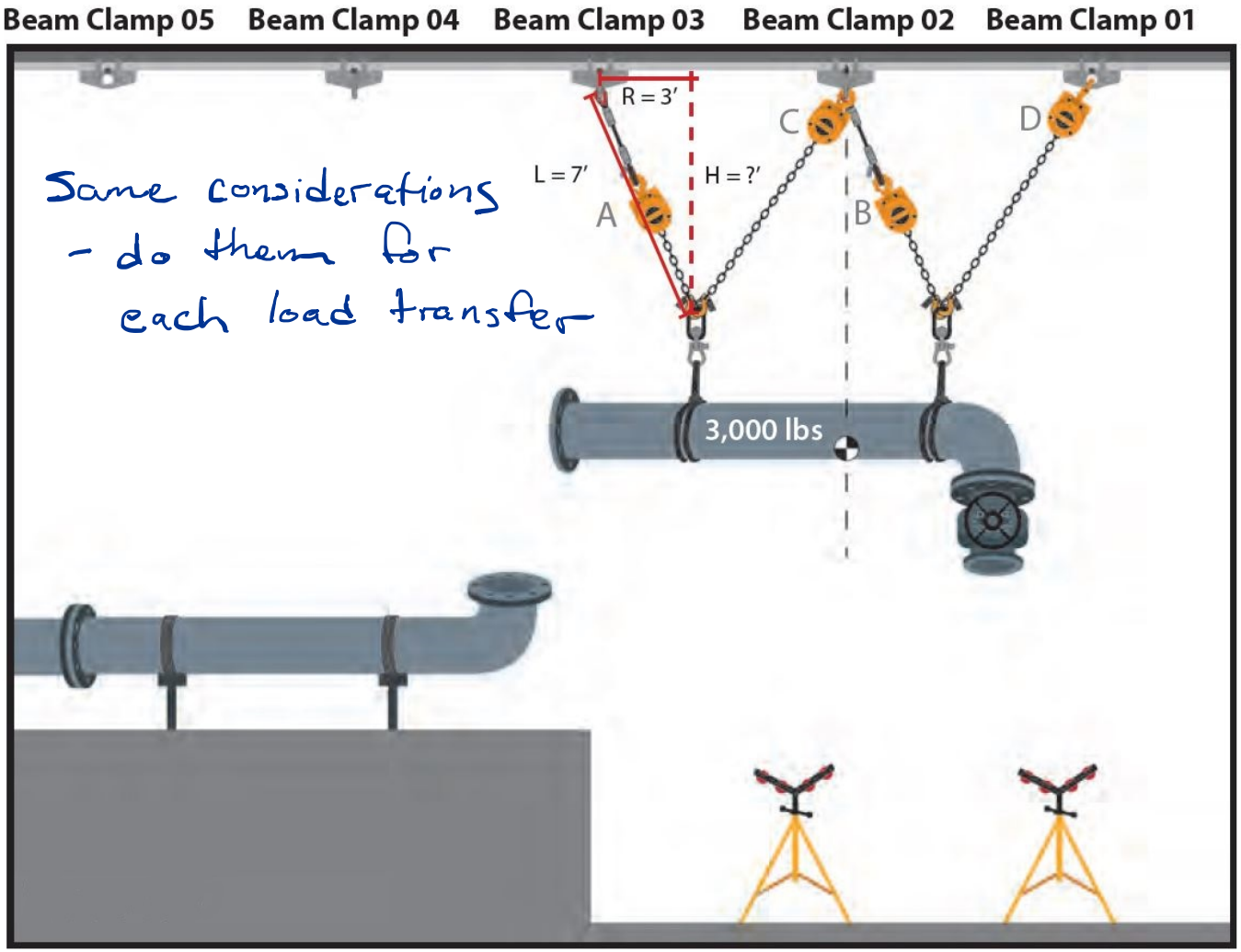
Load Transfer



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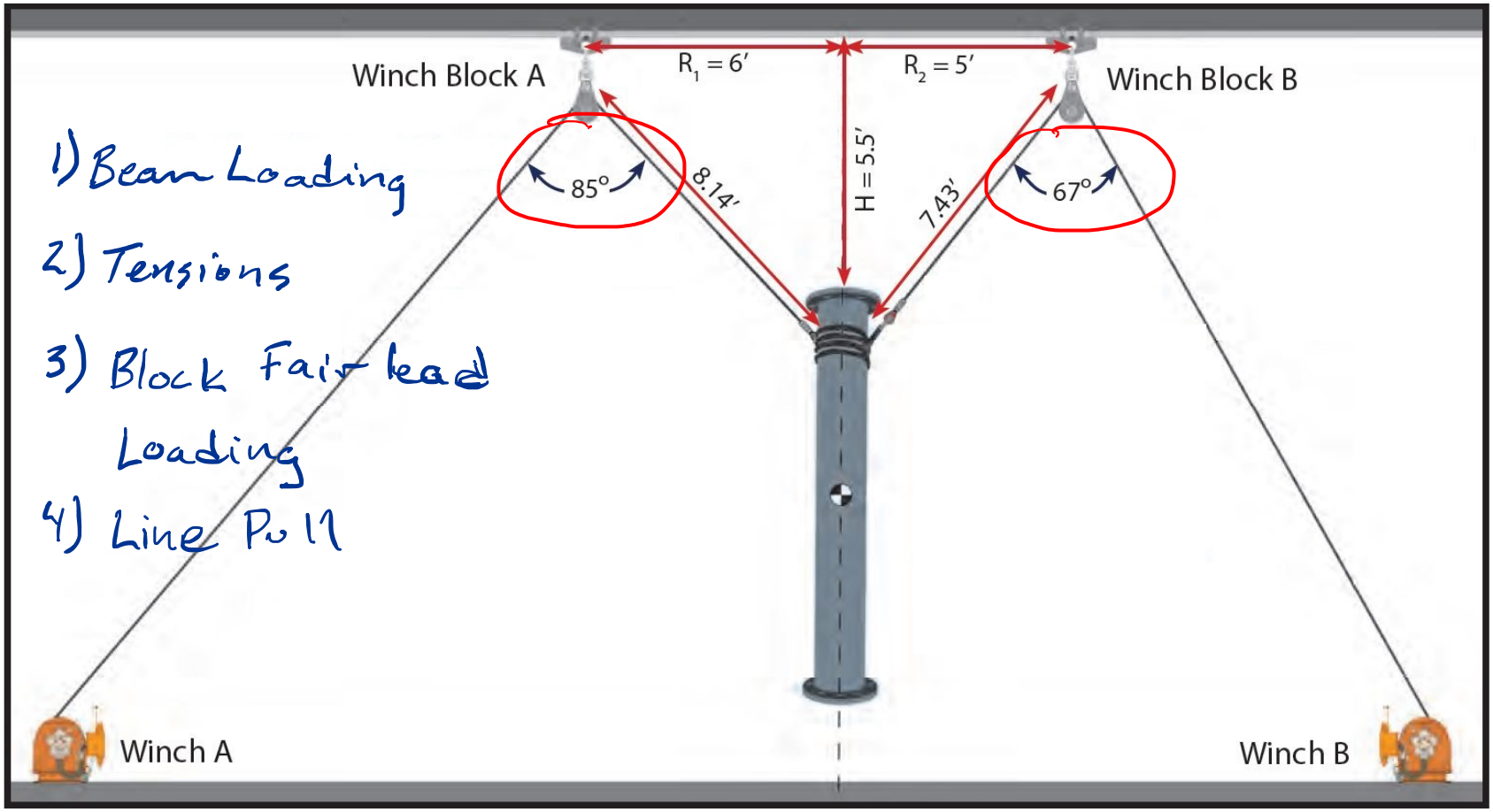
Block and Fairlead Loading



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When you mess with the bull, sometimes you get the horns.

Bull Rigging Gone Bad

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Hazard Recognition

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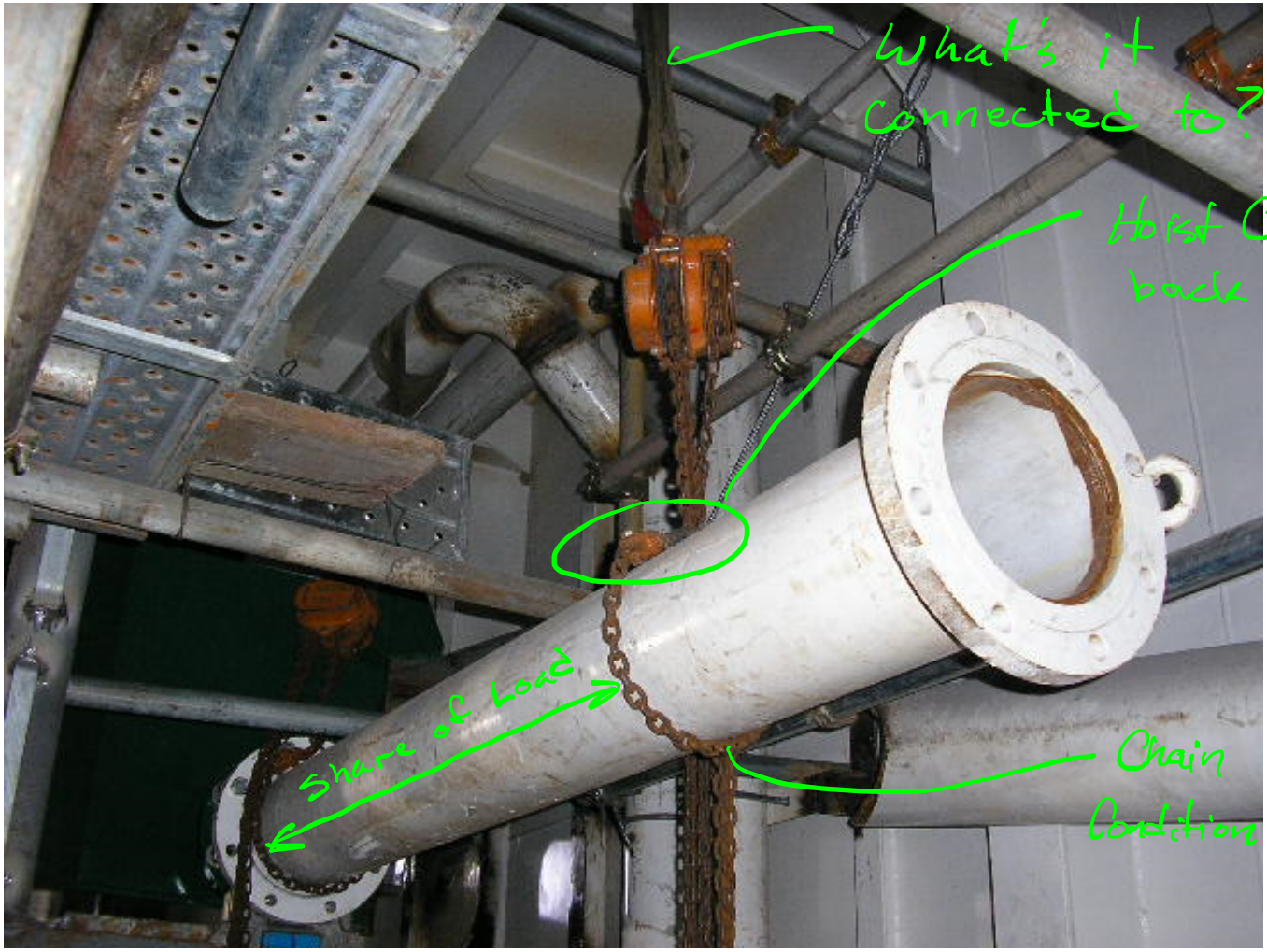
Hazard Recognition



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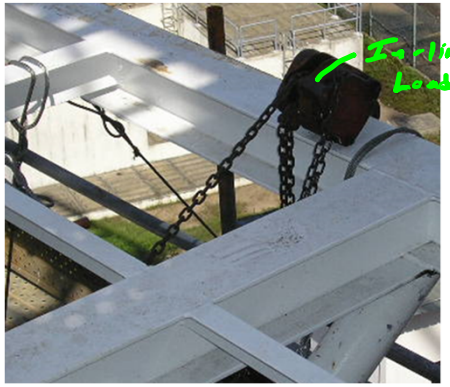
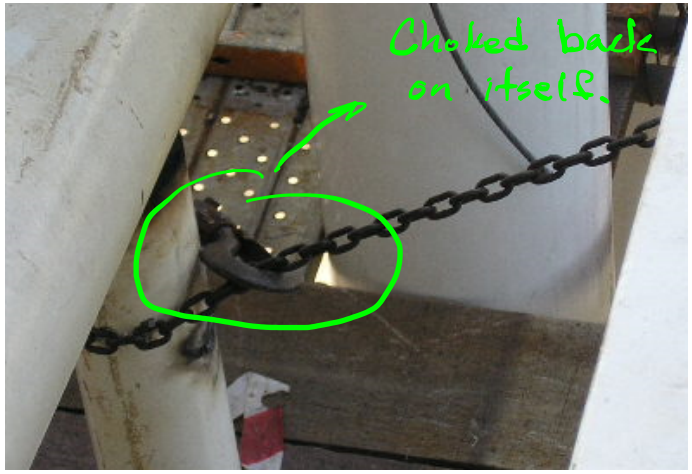
Hazard Recognition





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Good Training and Good Practices Lead to Successful Outcomes

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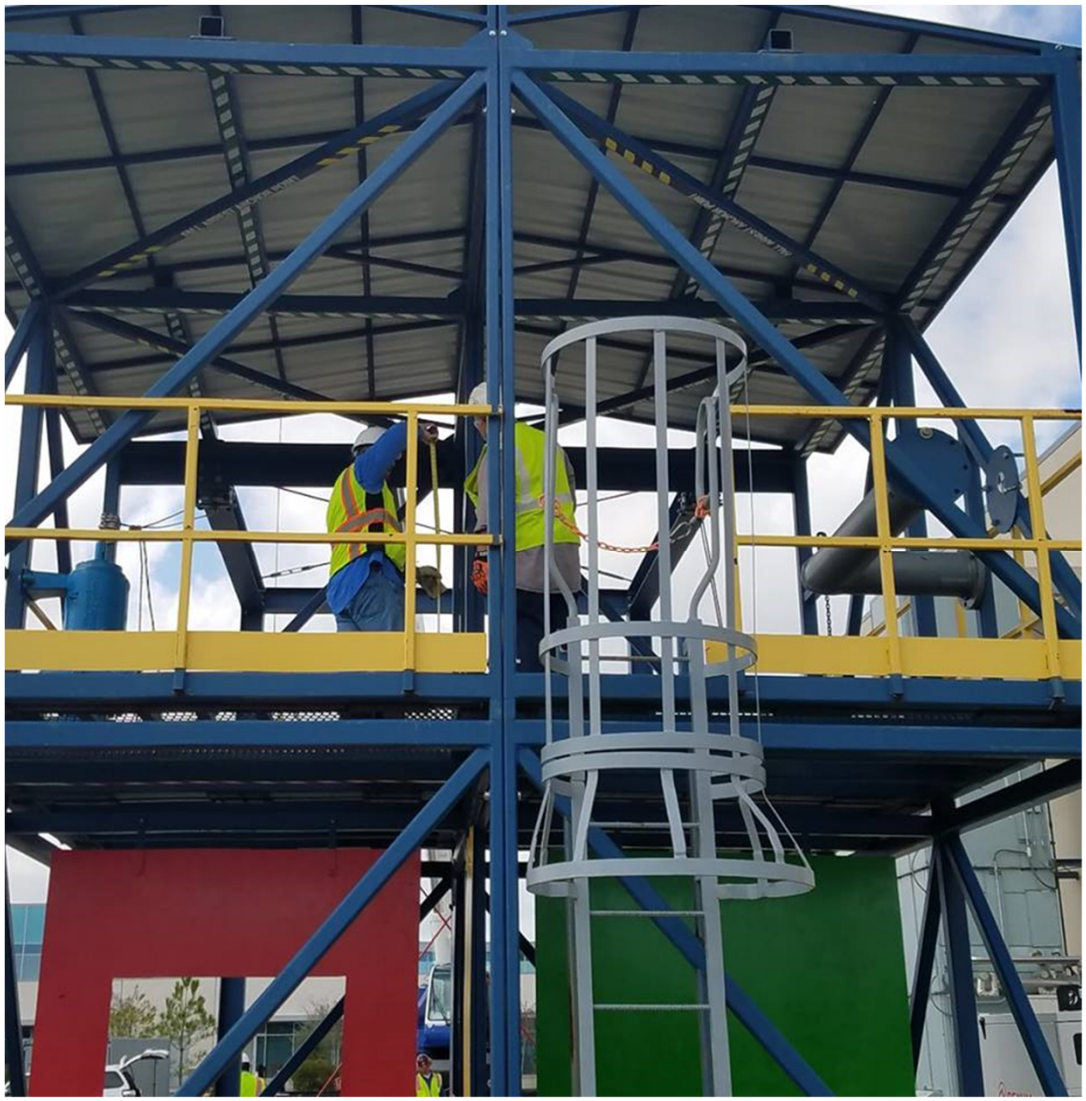

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1) Understand the theories & principals

2) Apply those theories & principals in hands-on, skill-building activities

3) Re-inforce safe & efficient practices

4) Create a positive safety culture

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Thank you for your time.

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