Ground Condition and Preparation for Mobile Cranes

Host: **Mike Parnell**
President/CEO, ITI
ASME B30 Vice Chair (Cranes & Rigging)
ASME P30 Chair (Lift Planning)

Guest Speaker: **Klaus Meissner**
Director of Product Integrity
Terex Cranes
-Convenor of CEN TC147 WG11 (EN13000)
-President FEM Mobile cranes

The views expressed in this presentation are that of ITI and are not necessarily the views of the ASME or any of its committees

WHO WE ARE

A world leader in crane and rigging training and consulting.

We Rig It Right!

WHO WE ARE

We Serve a Variety of Industries

- Aerospace
- Chemicals
- Construction
- DOD
- DOE
- Electric Utility
- Hydro
- Manufacturing
- Maritime
- Mining
- Nuclear
- Oil & Gas
- Pulp & Paper
- Railroad
- Shipbuilding
- Wind Energy

OUR CUSTOMERS

The World's Greatest Organizations Trust ITI's Expertise with their Crane & Rigging Operations

SHOWCASE
WEBINAR SERIES

Past Presentations:

- 10 Audit Points for Your Crane and Rigging Operations: An HSE Perspective
- Tackling the Challenges of Training Site Supervisors, Lift Directors, and other Leaders
- 4 Major Lifting Considerations in Power Gen Environments
- Rigging and Sling Failures: Case Studies and Solutions
- How to Manage a Crane Accident
- Automation - Equipment Inspection and Asset Management
- 10 Points of Lift Plan Development
- 9 Questions You Must Ask When Selecting a Crane and Rigging Training Provider

Today's Presentation:

Terex Presents: Ground Condition and Preparation for Mobile Cranes

WEBINAR TRAINING COURSES

Coming in 2014

- Lift Director and Site Supervisor
- Critical Lift Planning
- Rigging Gear Inspection for Supervisors
- Advanced Rigging: Load Distribution and Center of Gravity
- Advanced Rigging: Multi-Crane Lifts and Load Turns

MIKE PARNELL – ABOUT YOUR HOST

Mr. Parnell has a wealth of knowledge regarding cranes, rigging, and lifting activities throughout a variety of industries.

- 30+ years learning about wire rope, rigging, load handling, and lifting activities.
- Vice Chair of the ASME B30 Main Committee which sets the standards in the US for cranes and rigging
- Chair of the ASME P30 Main Committee which sets the standards for lift planning.

ASME standards are also adopted by many countries around the world.

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Klaus Meissner – About your Guest Speaker

- Director of Product Integrity, Terex Cranes
- 25+ year experience in the crane industry
- Expert for mobile crane approval appointed by the German Health and Safety Authority
- Convenor of the working group developing EN13000 – the European Safety Standard for mobile cranes
- President of the product group for mobile cranes within FEM – the European Manufacturers Association of Material Handling, Lifting and Storage Equipment

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TEREX®

Cranes

Ground Condition and Preparation for Mobile Cranes

November 2013

Ground Condition and Preparation for Mobile Cranes

Content

Typical Incidents

- *Loading too high, ground gives way*
- *Crane tips over during travel on site*

Background

- *Load distribution*
- *Ground gives way, shear failure*
- *Centre of gravity at height*

Prevention

- *Load distribution, cribbing, mats*

Ground Condition and Preparation for Mobile Cranes

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Ground Condition and Preparation for Mobile Cranes

Typical Incidents

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Typical Incidents

Outside Influences

(acting on the "system crane")

Pure Physics

(the same for all sites and equipment)

Ground Condition and Preparation for Mobile Cranes

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Ground Condition and Preparation for Mobile Cranes

Background load distribution

Video 1

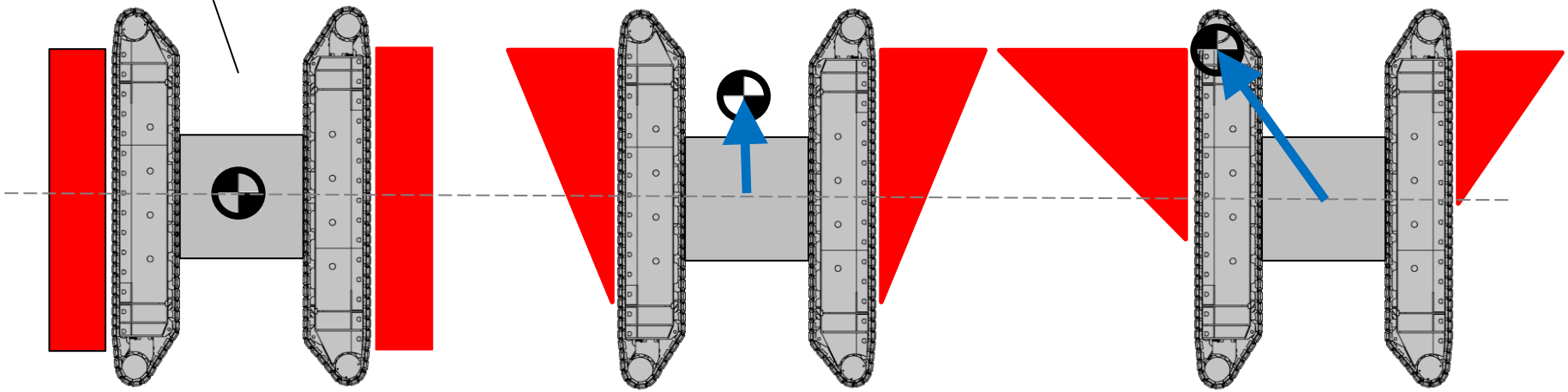
Ground Condition and Preparation for Mobile Cranes

Background load distribution

Top View on Crawler car Body,
Crawlers turned to better indicate Shape

Symbol indicates Centre of Gravity

Symbols indicate Ground Pressure under Crawler



Symmetrical Loading

Symmetrical Loading to the Front

Non-Symmetrical Loading

Ground Condition and Preparation for Mobile Cranes

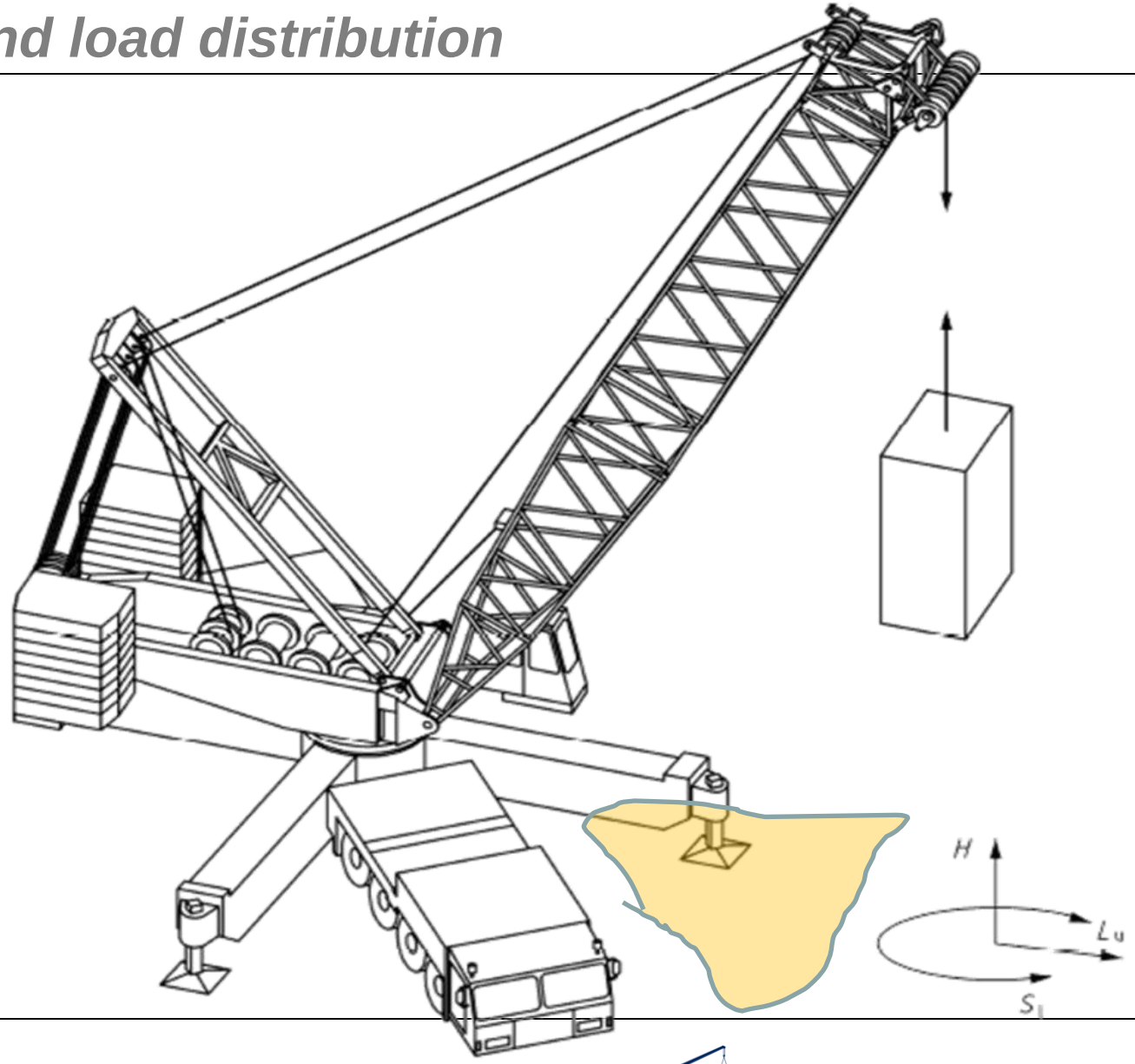
Background load distribution

Type of Soil/Description	**Max. Allowable Bearing values (presumptive)** in tons/sq.ft.	**Max. Allowable Bearing values (presumptive)** in psi
Hard Rock	100	1390
Soft Rock	12	167
Very compact sandy gravel	10	139
Loose fine sand or firm inorganic silt	1,5	21

Crane Cap.	**Weight**	**Crawler Length**	**Crawler Width**	**Contact Surface**	**Theor. min. Ground Loading** (crane w/o load and balaced)	**Typical Ground Loading w. Load**
600t	400t	10m	1,3m	26m^2	15,4t/m^2	30…>100 t/m^2
660tons	440tons	32ft	4.3ft	275sq.ft.	1,6tons/sq.ft.	3.1…>10.4 tons/sq.ft.

Ground Condition and Preparation for Mobile Cranes

Background load distribution



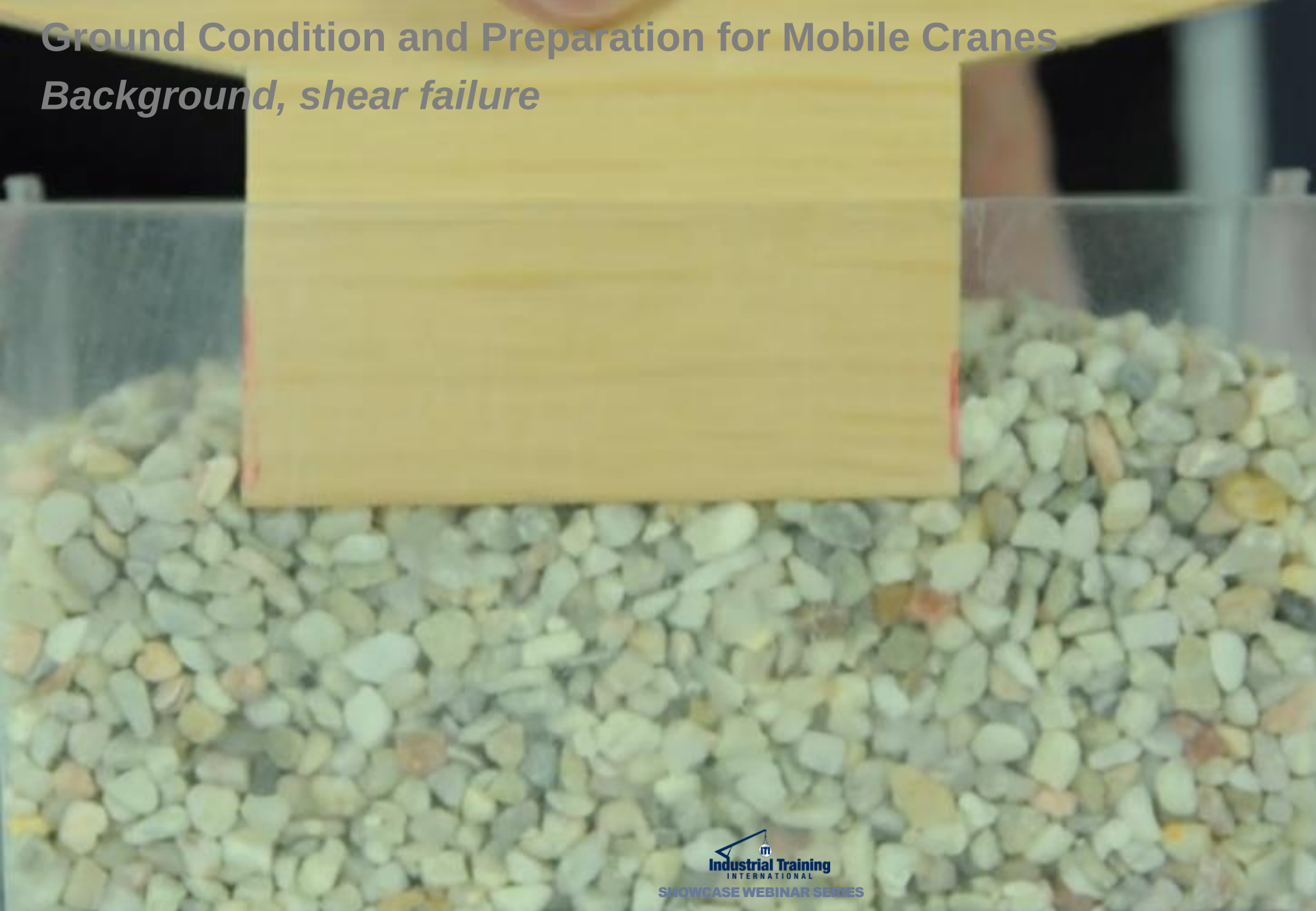
Ground Condition and Preparation for Mobile Cranes

Background, shear failure

Video 2

Ground Condition and Preparation for Mobile Cranes

Background, shear failure



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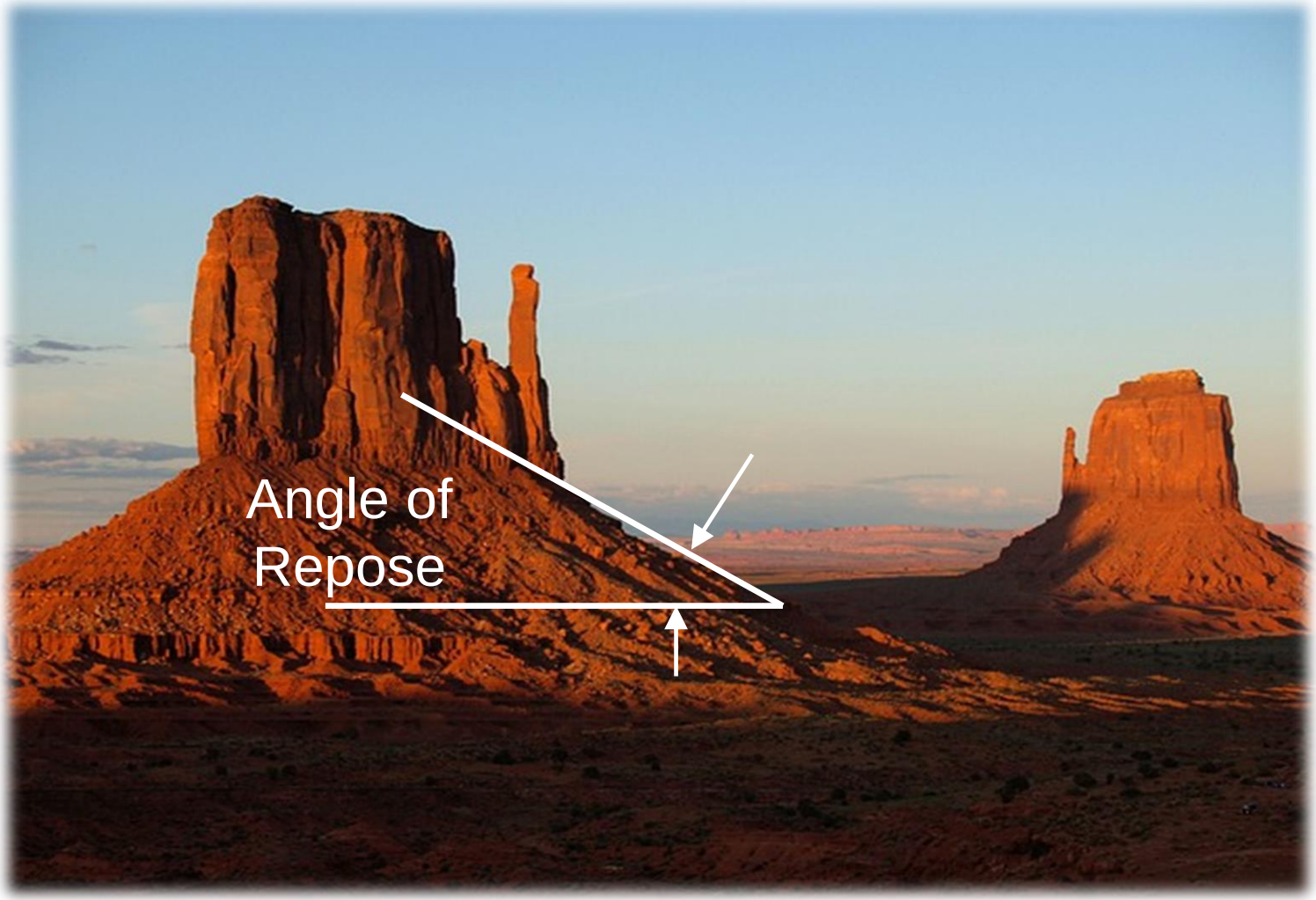
Ground Condition and Preparation for Mobile Cranes

Background, shear failure



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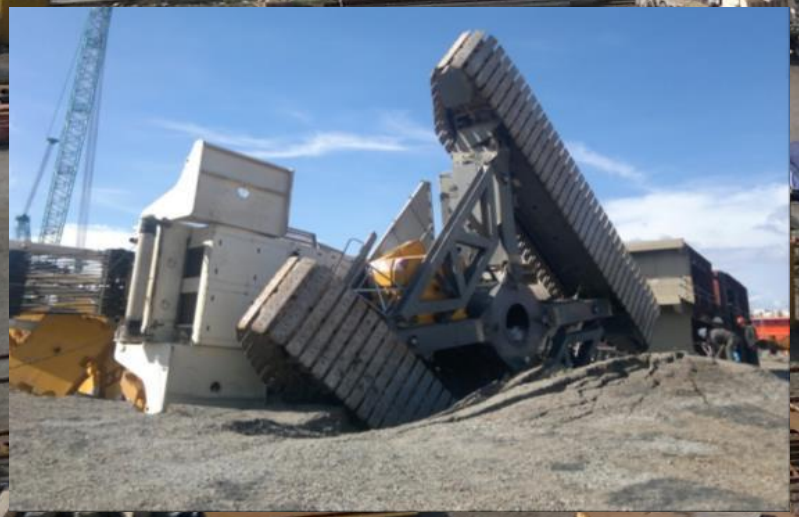
Travel with load, exceeding load bearing capacity of ground



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Rescuing a truck, exceeding load bearing capacity of ground

Ground Condition and Preparation for Mobile Cranes

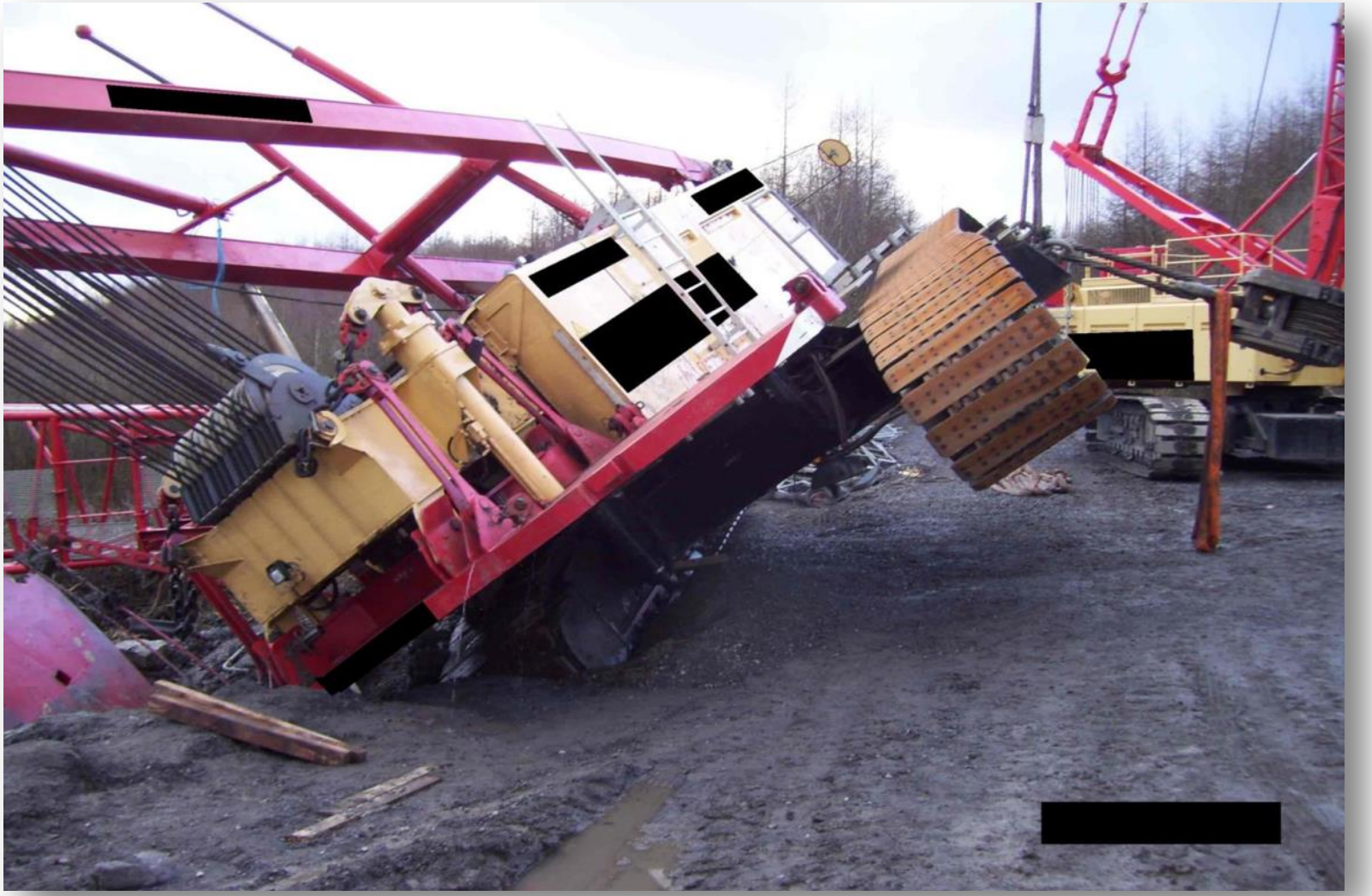
Travel on site with load

Ground Condition and Preparation for Mobile Cranes

Travel with load, exceeding load bearing capacity of ground

Ground Condition and Preparation for Mobile Cranes

Travel with load, exceeding load bearing capacity of ground



Ground Condition and Preparation for Mobile Cranes

Travel with load, partially erected crane

Ground Condition and Preparation for Mobile Cranes

Travel with load, partially erected crane

Ground Condition and Preparation for Mobile Cranes

Travel with load, partially erected crane

Ground Condition and Preparation for Mobile Cranes

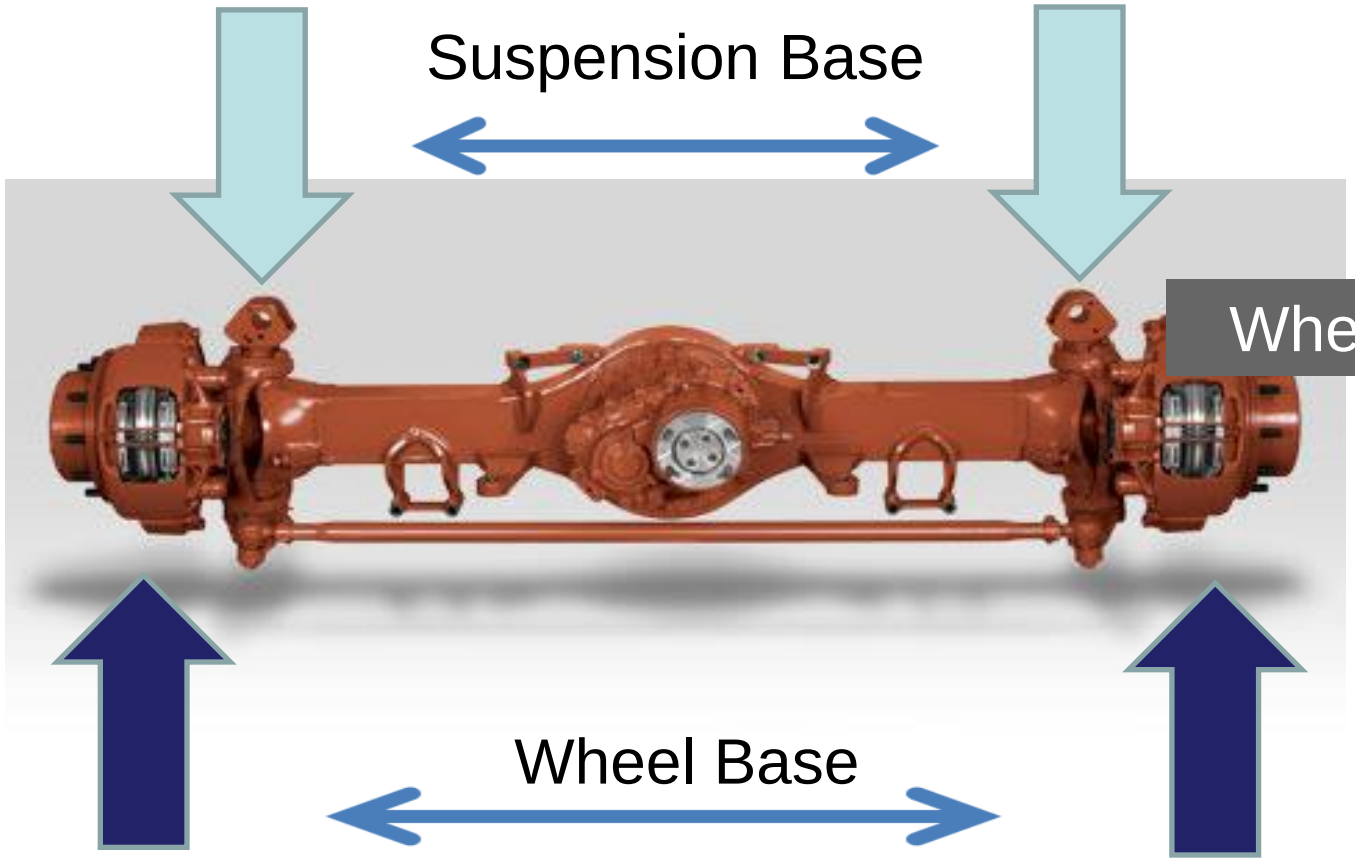
Travel with load, partially erected crane, consequence

Ground Condition and Preparation for Mobile Cranes

Travel with load, partially erected crane, consequence

Ground Condition and Preparation for Mobile Cranes

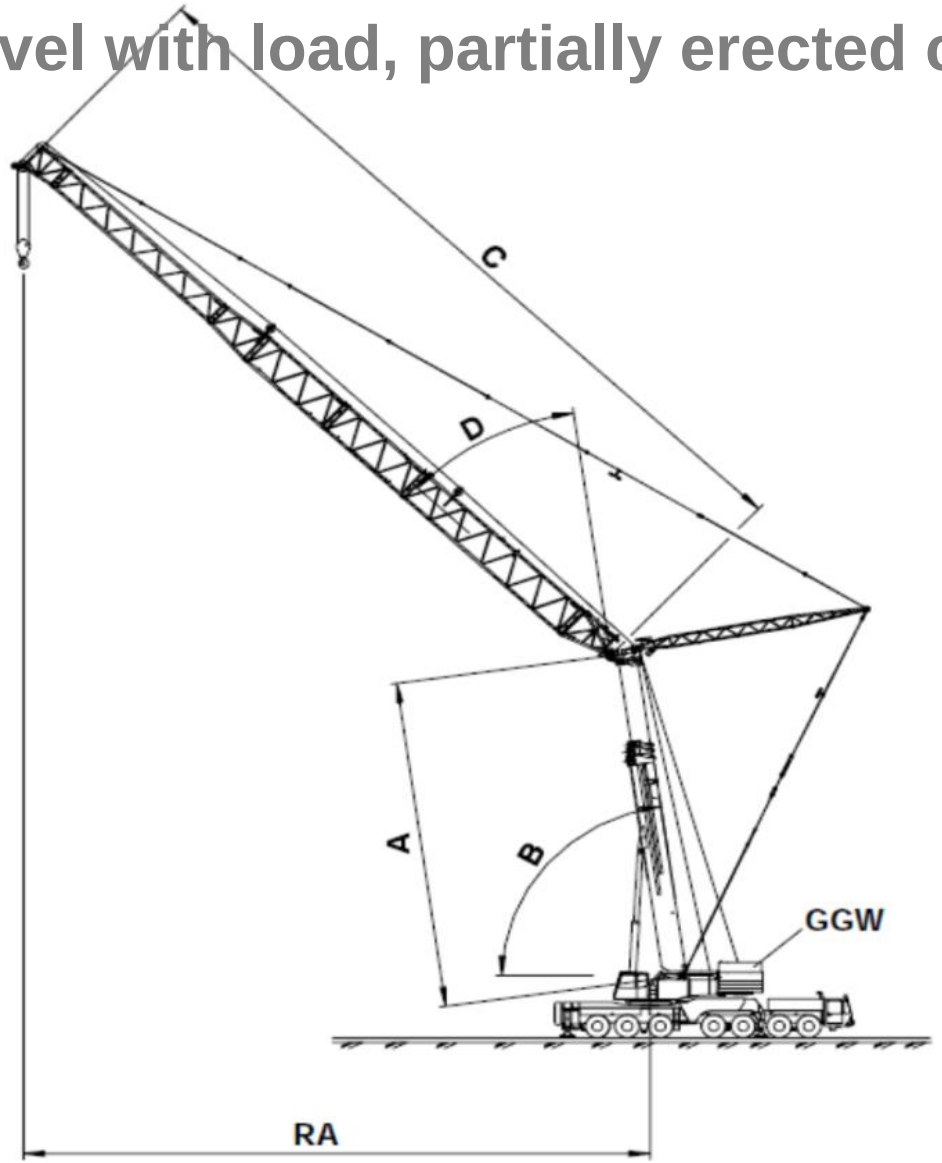
Travel with load, partially erected crane, consequence

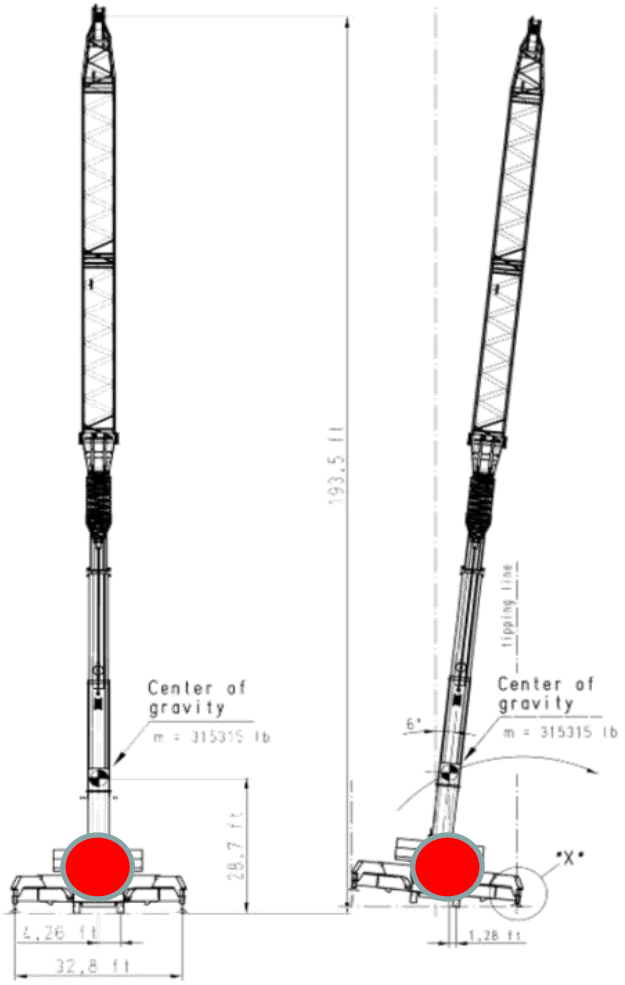


Where is the Tipping Line?

Ground Condition and Preparation for Mobile Cranes

Travel with load, partially erected crane, consequence





Ground Condition and Preparation for Mobile Cranes

Travel with load, partially erected crane, consequence

Ground Condition and Preparation for Mobile Cranes

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General

PLAN: Develop a Plan

DO: Act according to Plan

CHECK: Are Conditions as per Plan

ACT: Take Action if needed

Ground Condition and Preparation for Mobile Cranes

Preparation of the hard stand

- Establish the loads action on the ground
  - Consult manufacturer's documentation
  - Use calculation tools
- Investigate the ground
  - Load bearing capacity?
  - Hidden cavities?
- Prepare the ground and level it
- Use appropriate cribbing/mats
  - Cribbing may fail if the load is not spread over the full area of the mat
  - Cribbing/mats may fail if the ground crushes or extensive settling appears
  - Cribbing/mats may fail when the mat bends
  - Cribbing/mats may fail by horizontal splitting

Ground Condition and Preparation for Mobile Cranes

Travel with load, preparation of builder‘s roads

Axle load ≤ 12 t Width = 5.0 m
Axle load > 12 t [5] Width = 7.0 m

How are the Roads you are using?

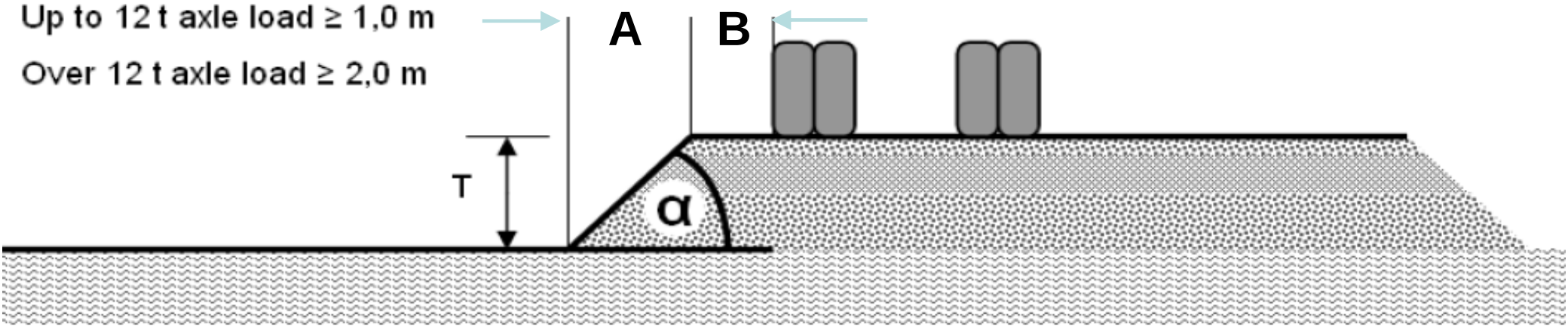
α ≤ 30° width soft soil; A = 2 x T

α ≤ 45° width firm soil; A = T

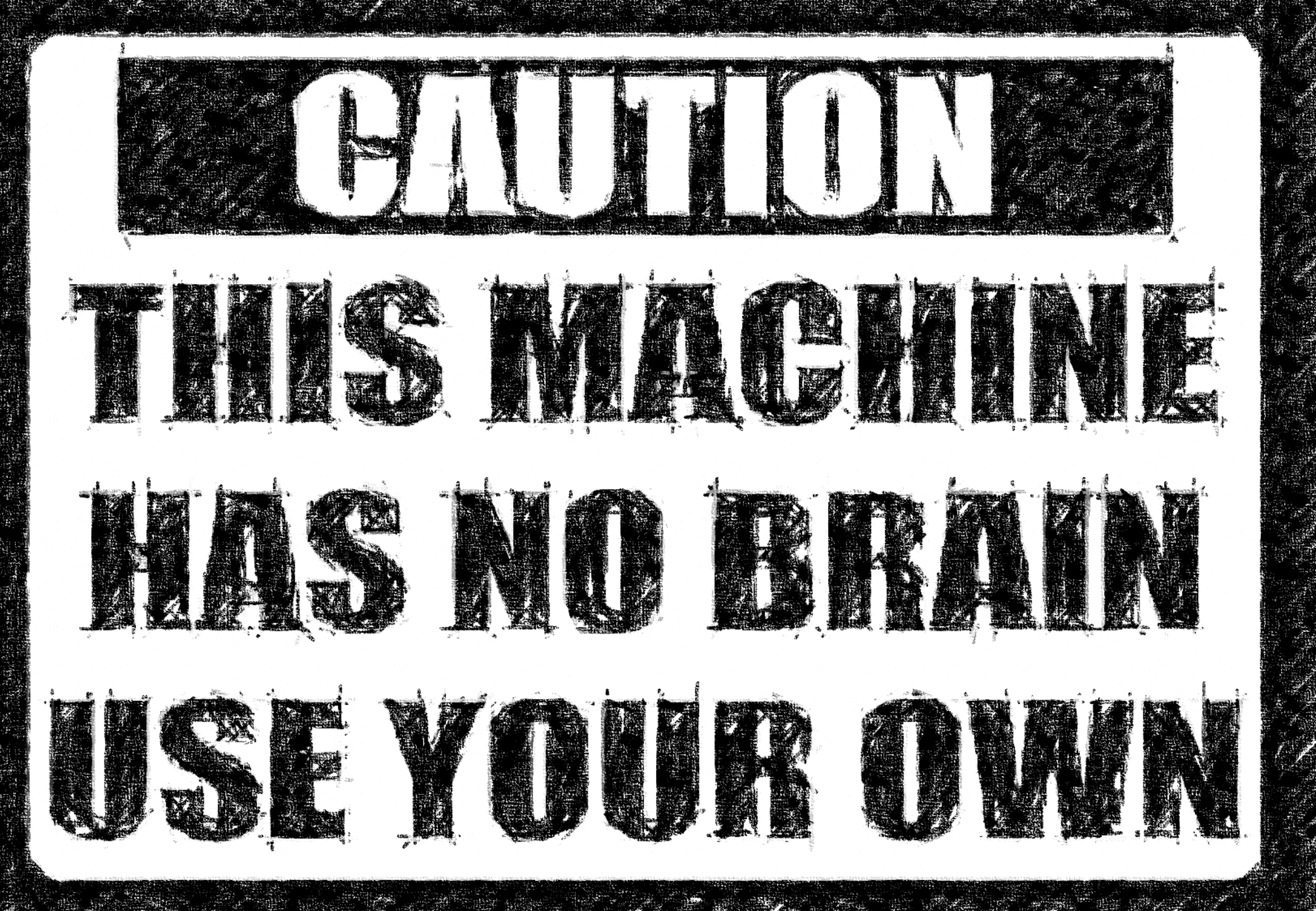
B

Up to 12 t axle load ≥ 1,0 m

Over 12 t axle load ≥ 2,0 m



Slope angle and dimensioning a builders’ road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Thank you for
your attention
work safely