Battermann + Tillery Group

„Heavy Units in Containers“

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Heavy Units in Containers

Agenda

1. Introduction
2. Advantages/ Disadvantages of Project Cargo on Container Vessels
3. Planning Requirements
4. Planning & Preparation
5. Loading - requirements
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7. Summary

Heavy Units in Containers

Introduction

What is a heavy unit?

Heavy Units in Containers

Introduction

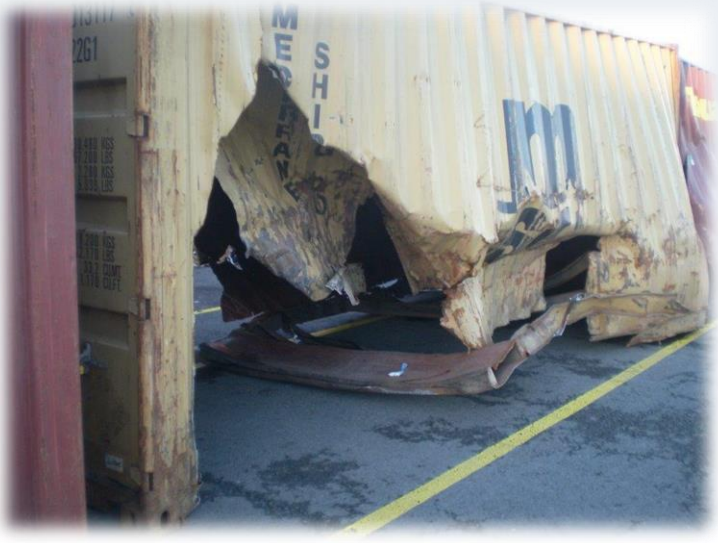
What is a heavy unit?

1. A heavy unit is a single cargo item with a weight of more than 30% of the payload of a container.
2. A heavy unit is a single cargo item, whose footprint exceeds the maximum permissible line load of a container.

Heavy Units in Containers

Introduction

Ignoring regulations and exceeding the load bearing capacities of container units can result in considerable collateral damage and high costs:



Heavy Units in Containers

Advantages / Disadvantages – Manufacturer/ Shippers/ Cargo owners

Advantages	Disadvantages
+ Fast vessels/routes	– No possibility of checking the stowage and securing arrangements during transport at sea
+ Terminals with inland connection/infrastructure	- Limited number of units per container
+ Reputable shipping lines	- High risk
+ Standardised transport methods	
+ Costs are affordable/calculable	
+ Cargo is protected from the elements	

Heavy Units in Containers

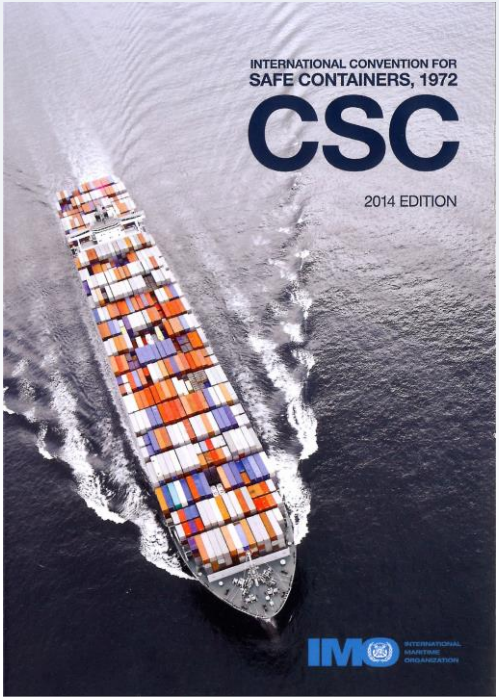
Advantages / Disadvantages for the Underwriters

Advantages	Disadvantages
+ Large companies/shipping lines (terminals) → Claims handling department (worst case) / availability	– Packers need considerable knowledge of load distribution principles
+ Always the same structure→ easily plannable	– High risk of collateral damage to other cargo
+ Lower risk of collateral damage from other cargo	– Increased risk due to possible transshipping
+ Cargo is protected from the elements	– No continuous checking of cargo possible during ocean transit (27-mt breakbulk units are checked every day)

Heavy Units in Containers

Planning requirements - Relevant Regulations

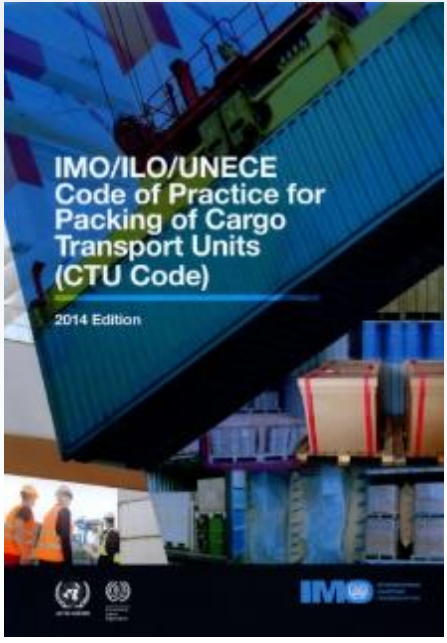
1. CSC-Code (International **C**onvention For **S**afe **C**ontainers)
   - Regulations for testing, inspection, approval, and maintenance of containers
   - Applies to new and existing containers



Heavy Units in Containers

Planning requirements - Relevant Regulations

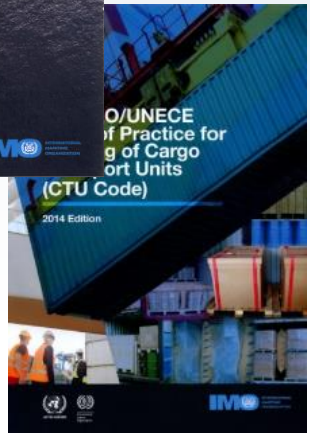
2. CTU-Code (Code of Practice for Packing of **C**argo **T**ransport **U**nits)
   - Non-mandatory, global code of practice for handling and stuffing of shipping containers



Heavy Units in Containers

Planning requirements - Relevant Regulations

The applicable regulations provide only basic information and advice in connection with stowage and securing requirements for loading of heavy units.



Room for mistakes and faulty procedures

Heavy Units in Containers

Planning and Preparation – Required information

Timely compilation of information and inspection of necessary equipment is critical!

- Cargo details
  - Dimensions and weight of cargo
  - Pre-existing packaging
  - Manufacturer’s requirements
- Suitability of handling equipment
- Fitness of container units

Heavy Units in Containers

Planning and Preparation – Inspection of containers

Prior to stuffing cargo into a container, the latter must be visually inspected in order to:

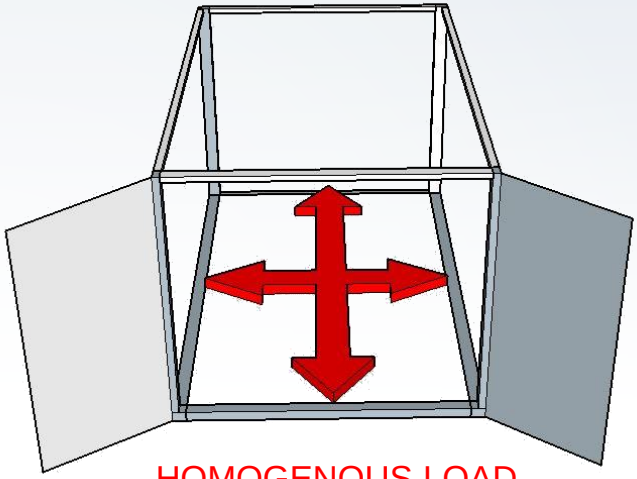
- ensure the container is fit for purpose
- ensure the validity of examination status
- ensure the structural integrity

See: CTU CODE Chapter 8, Part 2 - Checks

Heavy Units in Containers

Planning and Preparation – Evaluation of Load Distribution Requirements

Containers are designed in such a way that the permissible payload can safely be transferred to the four corner posts under all conditions of carriage, if the weight is homogenously distributed over the entire loading area.

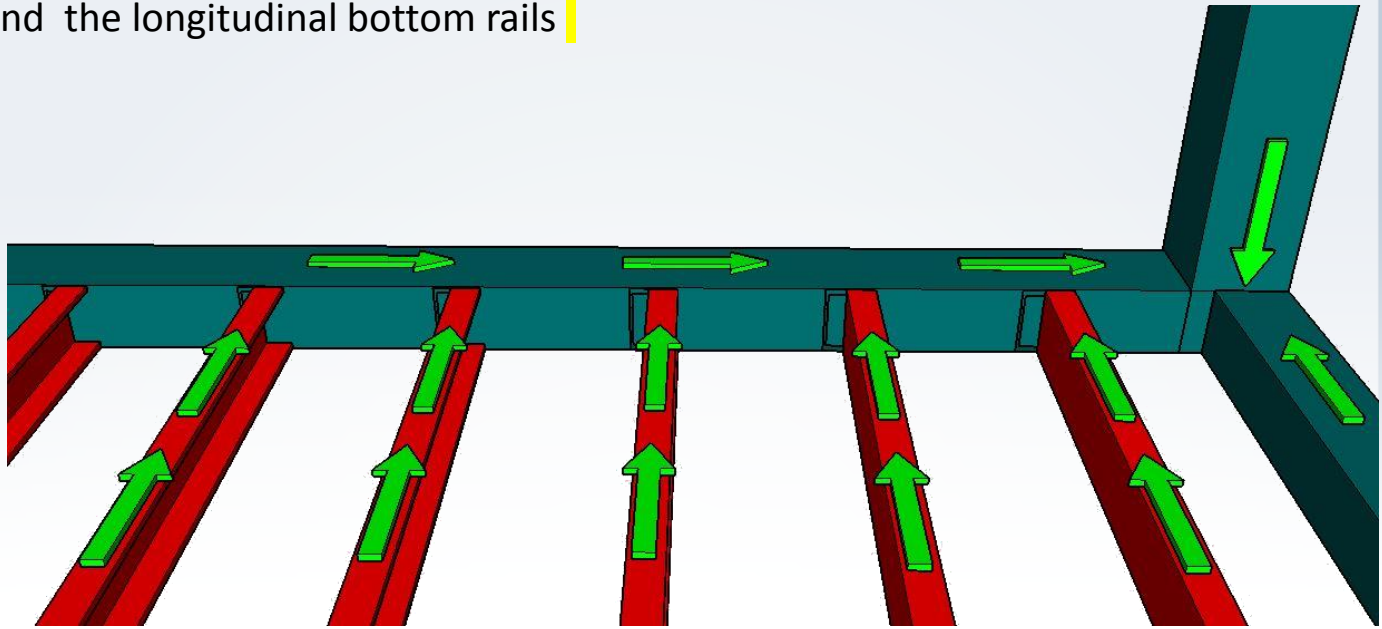


HOMOGENOUS LOAD

Heavy Units in Containers

Planning and Preparation – Evaluation of Load Distribution Requirements

The payload is transferred to the corner posts by the transverse crossmembers and the longitudinal bottom rails



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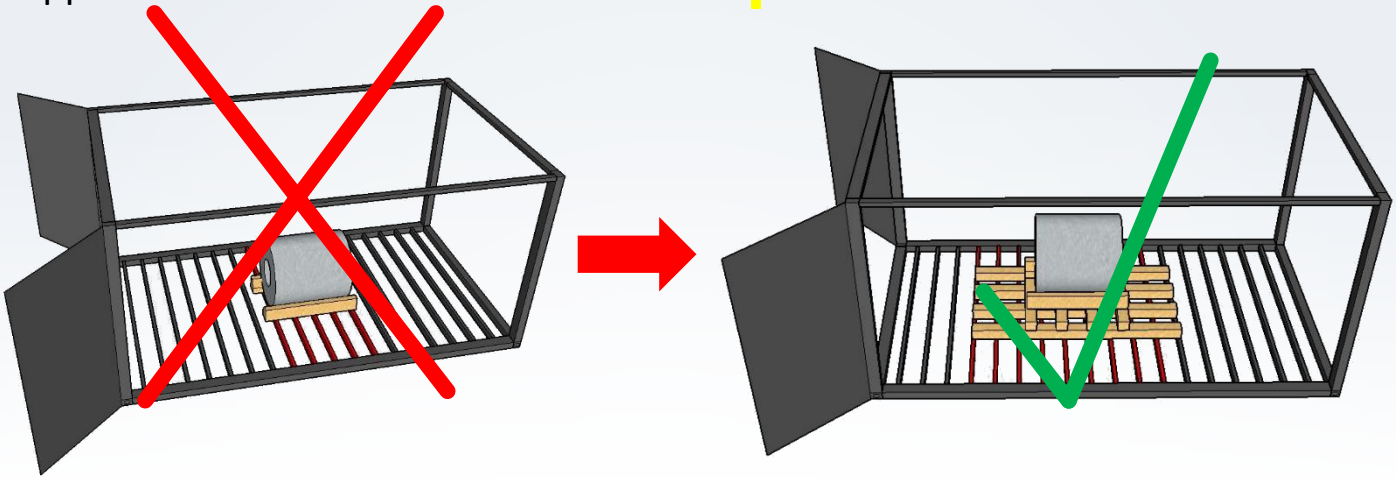
Planning and Preparation – Evaluation of Load Distribution Requirements

Where the homogenous distribution of the payload is not possible it may be necessary to transfer the weight to a sufficient number of crossmembers by support of suitable timber or steel beams.



The support by beams or skids
is called „bedding“.

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Planning and Preparation – Evaluation of Load Distribution Requirements

A simple approach to determine whether a supportive bedding is needed or not is to calculate the permissible and actual line loads.

Line load is defined as the maximum permissible load per meter of length [kg/m].

$$permissible\ lineload = \frac{P}{L} \geq actual\ lineload = \frac{m}{l}$$

$P = Payload$

$L = internal\ length$

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Planning and Preparation – Evaluation of Load Distribution Requirements

The required length of the supportive beams can than be calculated as follows:

$$\textbf{\textit{required bedding length}} = \frac{\textbf{\textit{actual lineload}}}{\textbf{\textit{permissible lineload}}}$$

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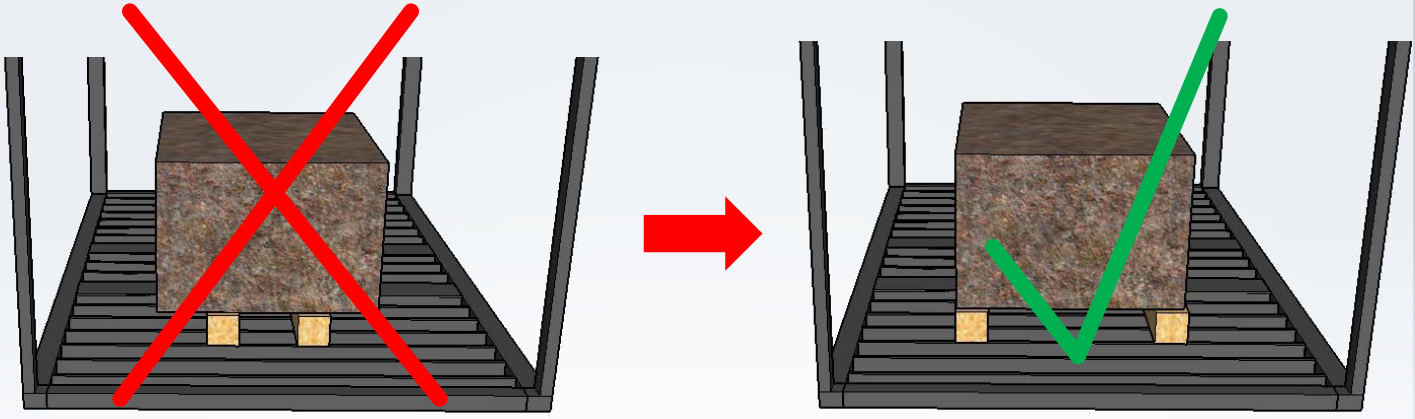
Planning and Preparation – Evaluation of Load Distribution Requirements



If a sufficient lateral distance cannot be ensured, the bedding should be futher extended!

Heavy Units in Containers

Planning and Preparation – Evaluation of Load Distribution Requirements

In connection with the below table the required section modulus can be estimated as follows:

$$W = 60\ x\ mass\ of\ cargo\ x\ (length\ of\ beam - length\ of\ contact\ area)$$

Dimension	10x10	15x15	20x20	25x25
Section modulus [cm^3]	152	508	1236	2450

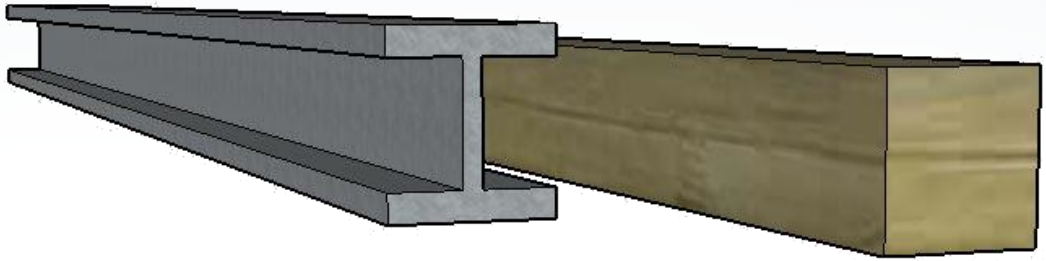
The maximum permissible free length has to be duly observed!

Heavy Units in Containers

Planning & Preparation – Loadspread materials

Types of loadspread materials:

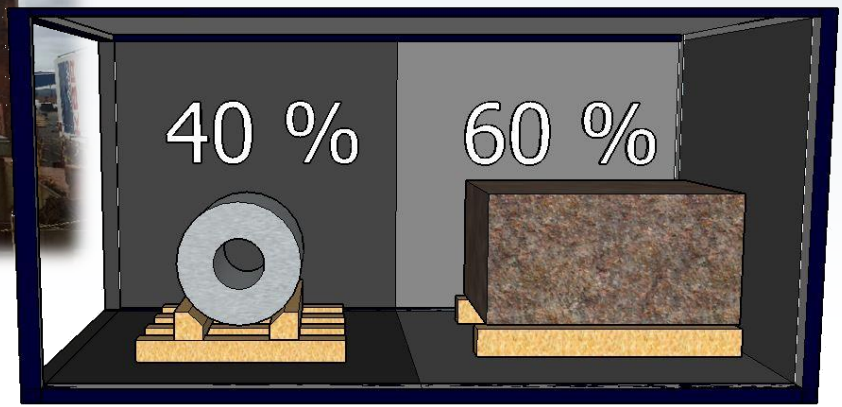
- ***steel H beams***
  + High strength
  - Heavy, difficult to handle
- ***Squared timber***
  + relatively low weight
  + good strength
  - Subject to compression and shrinking



Heavy Units in Containers

Loading – Load Distribution

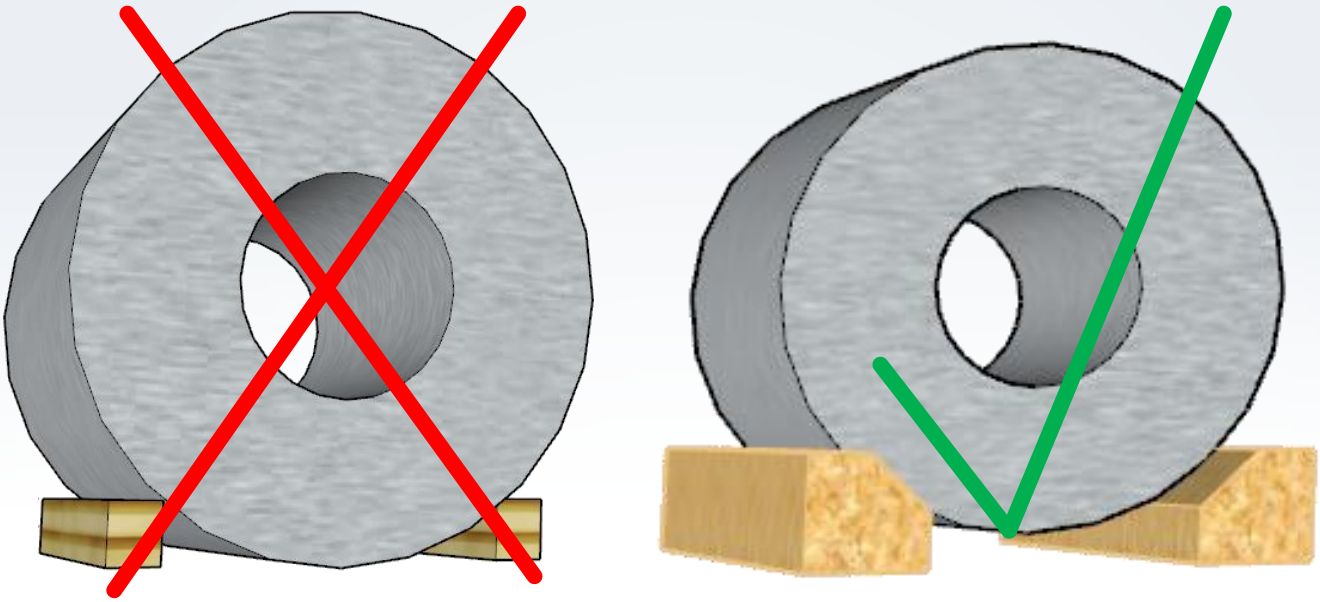
Rule of thumb: 60 % of cargo weight is distributed over half the length



Heavy Units in Containers

Stuffing – Positioning of Cargo

Heavy units should be loaded in such way that direct contact between the goods and the container floor is avoided!



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Loading – Concentrated Load/Point Load

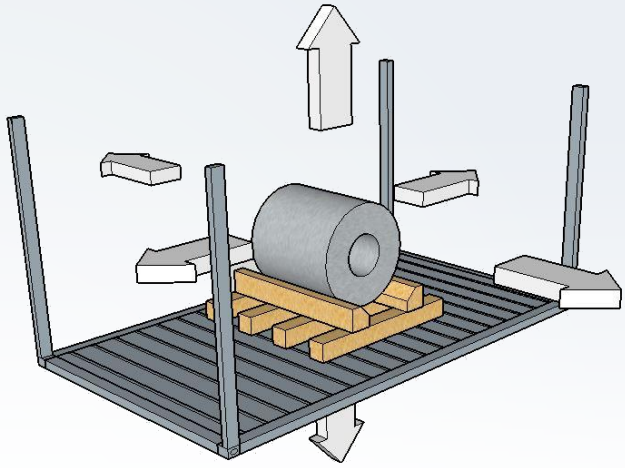
If wheeled loading equipment is utilized, e.g. forklift trucks, care must be taken not to exceed the maximum permissible concentrated/point load:

The floor has to withstand a concentrated load of 5,460.00 kg, devided over two surfaces with a total contact area of 2 x 142 cm² = 284 cm² (surface width = 18 cm) and located at a distance from each other 76 cm (CSC Code Annex II, Chapter 3 b)

Heavy Units in Containers

Securing – General Principles

1. Containers may be subjected to vertical, longitudinal and transverse accelerations that also act on the cargo unit.
2. Forces are proportional to the mass of a cargo item. Therefore, cargo units will move regardless of their weight!
3. The exerted forces may exceed the cargo‘s capability to withstand them by way of static friction or tilting stability. In this case, items will shift



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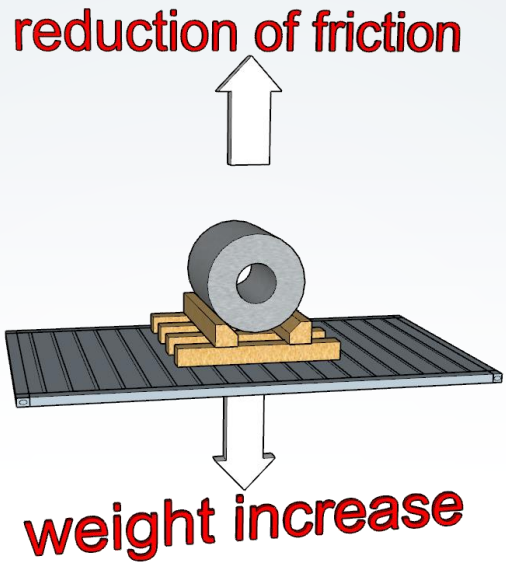
Securing – General Principles

4. Simultaneously acting vertical accelerations cause either an increase of weight or reduction of friction forces, depending on the working direction.



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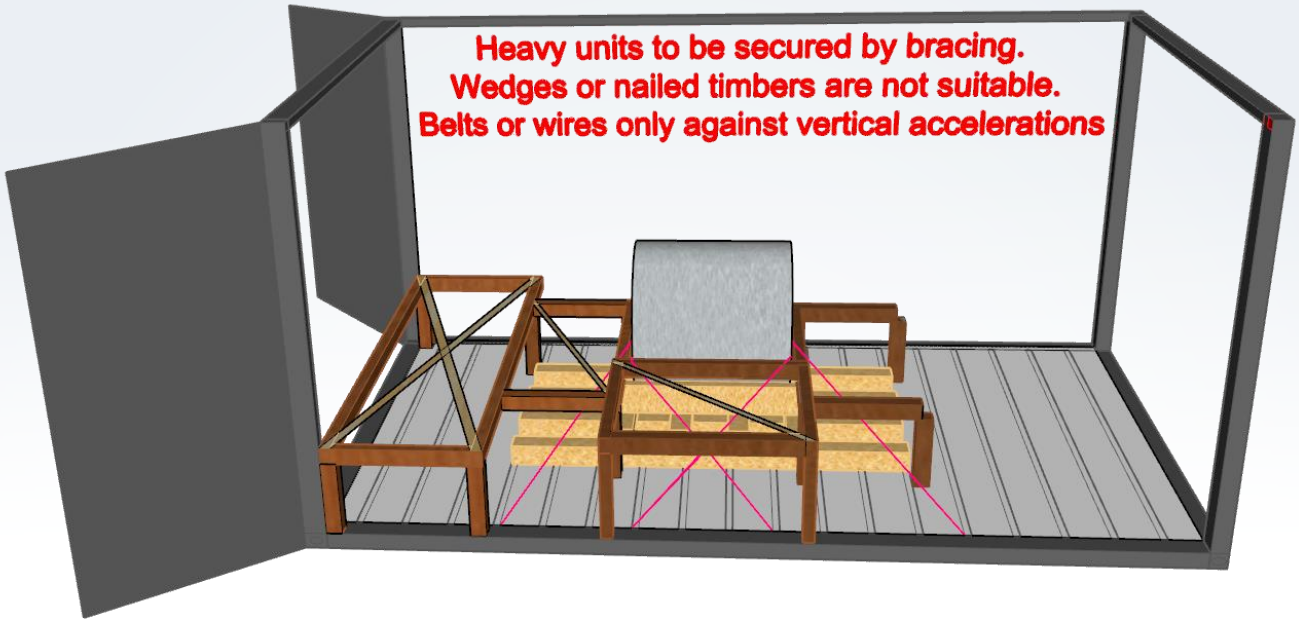
Securing – General Principles

Only securing by bracing should be considered:



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Securing – General Principles

The strength of the load area boundaries of a container must be duly observed (values given in percent of the total permissible payload):

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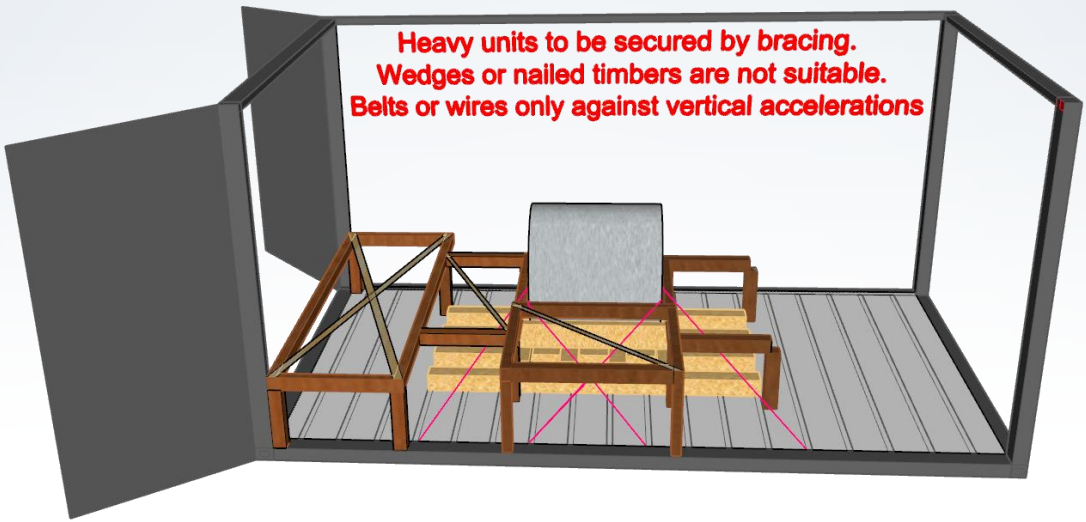
Securing – General Principles

Any blocking should deflect the acceleration forces over a sufficient length, corresponding with the strength limitations of the respective wall.



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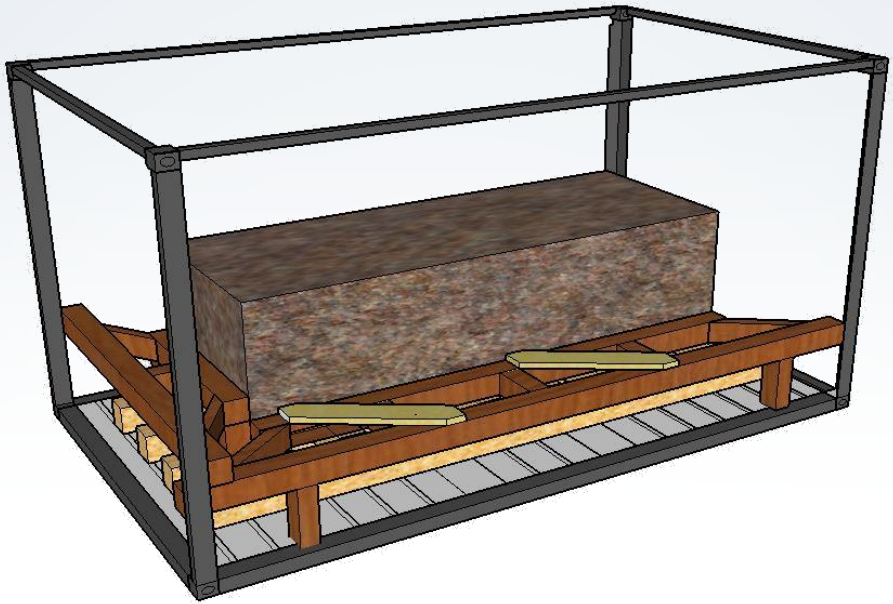
Securing – General Principles

The mass of heavy units should be directly deflected into the corner posts by means of suitable timber beams.



Heavy Units in Containers

Summary

Failure of container units due to improper securing and derivation of loads may cause excessive collateral damage!

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Thank you very much
for your kind attention!

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