



Cargo securing to prevent cargo damages on road, sea, rail and air

WELCOME TO STUDY CARGO SECURING

This material has been created in EU-project "CARING" by the following participants:

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Lufthans Cargo AG, Finland
Finnish Shipowner's Association, Finland
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GENERAL SECTION

CARING is partially financed by the Leonardo da Vinci programme of the European Union. In Finland the Centre for International Mobility CIMO administers and is responsible for implementing the Leonardo da Vinci Programme. This publication has been funded by the European Commission. The Commission accepts no responsibility for the contents of the publication.



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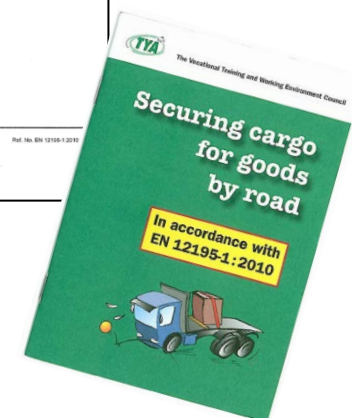
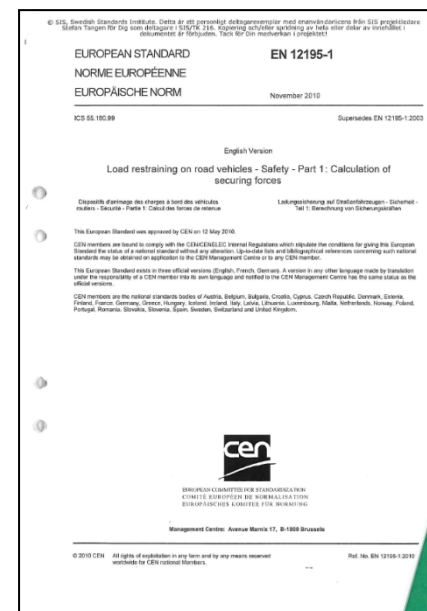
Cargo Securing - General Training Introduction

The presentation is based on standard EN 12195-1:2010.

Included transport modes are: road, sea, rail and air

Up-to-date view of the reasons why cargo should be secured and how it should be done in different cases.

This presentation is accompanied with a Student book and Quick lashing Guides.



Cargo Securing - General

Content of the Cargo Securing Training

Cargo securing in general

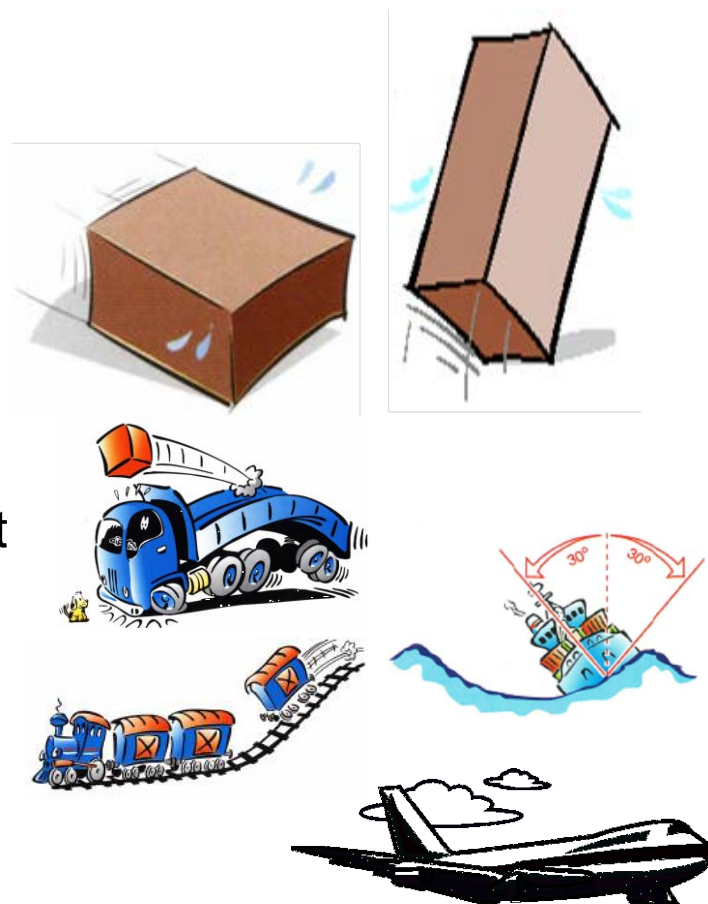
- Objectives of cargo securing
- Cargo securing factors
- Cargo transport units
- Liabilities in the transport chain
- Basic principles of cargo securing
- Cargo securing methods and equipment

Cargo Securing at Road Transport

Cargo Securing at Sea Transport

Cargo Securing at Rail Transport

Cargo Securing at Air Transport



Cargo Securing - General Objectives

The objectives of the cargo securing training are to learn

- Why cargo securing is important
- Cargo securing principles
- Cargo securing methods
- Cargo securing equipment
- How to use the Quick Lashing Guide

The objectives of cargo securing are

- To avoid accidents
- Minimize cargo breakage



Cargo Securing - General

Consequences of Insufficient Cargo Securing

Consequences of improper or inadequate cargo securing can be divided into the following issues:

- Loss of lives
- Damage to cargo and Cargo Transport Unit (CTU)
- Loss of CTUs
- Damage to the environment
- Economic consequences
- Badwill

Sometimes small mistakes in cargo securing can cause big problems.



Cargo Securing - General

Cargo Securing Factors

Factors that influence the cargo securing

- Transport modes
- Cargo Transport Unit
- Cargo
 - Shape
 - Durability
 - Dimensions
 - Weight
 - Sharp edges
 - Wrong load distribution
- Availability of securing equipment
- Human factors
 - Hurry
 - Carelessness
 - Lack of education



Cargo Securing - General

Cargo Securing Factors

Cargo tends to move during transport. Basic movements are:

- Sliding
- Tilting
- Wandering

Additional behaviors are:

- Compression
- Collapsing

These factors may cause the change of lashing tension. Usually it's impossible to make corrections to lashing during transport. The European standard recommends to retighten the lashings after a short travel.



Cargo Securing - General

Different Type of Cargo

The most transported goods on road in EU (million tonne-kilometres)

- | | |
|--|---------|
| • Food and beverage products | 293 000 |
| • Products of agriculture, hunting, fishing and forestry | 180 000 |
| • Non metallic mineral products | 153 000 |
| • Metal ores and other mining and quarrying products | 143 000 |
| • Chemical, rubber and plastic products | 132 000 |

EUROSTAT: 2010



Cargo Securing - General Transport Modes

International trade brings along a long transport chain, where possibly all basic modes of transport are used:

Road, Rail, Sea and Air

Cargo securing will take into account the whole transport chain. The different transport modes have different acting forces that influence the cargo.



Cargo Securing - General

Different Cargo Transport Units and Cargoes

- Vehicles and trailers

- General cargo
- Pulp and paper
- Steel products



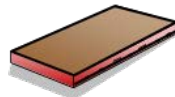
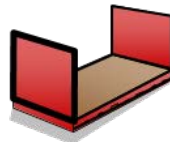
- Freight containers

- General cargo
- Pulp and paper
- Steel products
- Machinery



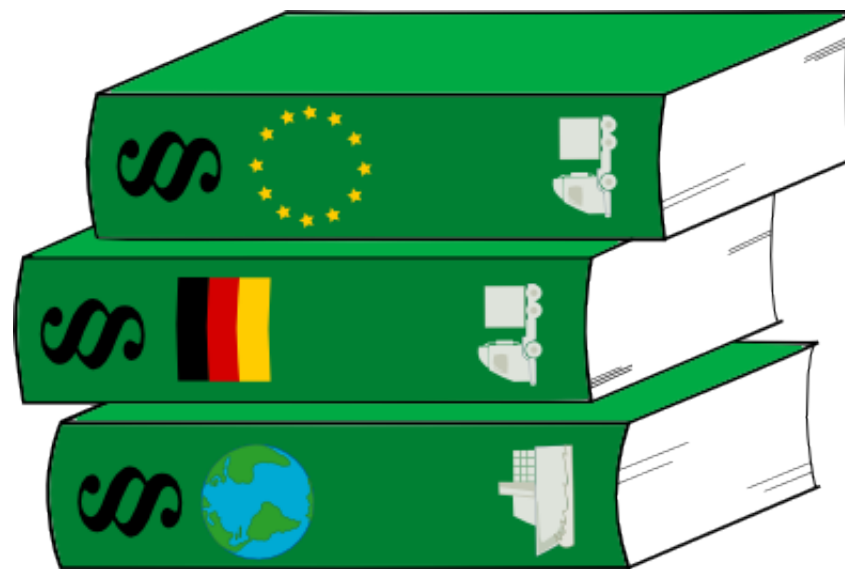
- Flat racks

- Machinery
- Vehicles
- Project cargoes



Cargo Securing - General Liabilities in the Transport Chain

Cargo securing in every transport mode is effectively regulated by legislation, standards and norms.



Cargo Securing - General Liabilities - Regulations

Legislation vary by country but the intention is the same – the cargo has to be secured to prevent accidents.

Legal responsibility for different parties comes from legislation.

By operating according to CEN or IMO regulations cargo securing fulfills the requirements in most national regulations.

Cargo Securing - General Liabilities - Regulations

Proper cargo securing is an important element in safe loading of packed goods on transport vehicles.

The European standard **EN-12195-1:2010** is the European reference document on cargo securing on road transport.

Sea transport has the IMO/ILO/UN ECE regulation.

Rail transport has created its own norms, but for intermodal transports the cargo securing that follows the principles of the EN-12195-1:2010 standard are accepted by the most intermodal rail transporters.

Air transport has also its own norms created by IATA.

Cargo Securing - General Liabilities - Regulations



Regulations in Finland

Road

- The Finnish Road Transport Act: 3.4.1981/267
- The Finnish Decree on the Use of Vehicles on the Road: 4.12.1992/1257

Rail

- The Finnish Railway Act: 8.4.2011/304
- Government Decree on the Transport of Dangerous Goods by Rail: 195/2002

Sea

- The Finnish Maritime Act: 15.7.1994/674
- Government Decree on the Transport of Dangerous Goods as General Cargo on Vessel: 666/1998

Cargo Securing - General Liabilities - Regulations



Regulations in Sweden

Road

- The Swedish decree of traffic: SFS 1998:1276 3 kap. 80§
- The Swedish Transport Authority regulation TSVFS 1978:10 and VVFS 1998:95

Rail

- The Swedish Rail company regulation: SJF 601 (year 1985)

Sea

- The Swedish Transport Authority regulation: TSFS 2010:174

Cargo Securing - General Liabilities - Regulations



Regulations in Germany

Road

- StVO
 - §§ 22 and 23 StVO govern the responsibilities of the loader and the driver
 - VDI directive 2700a

Rail

- German Railway Act: AEG (Year 1951 / revised 1994)
- Trans-European Railway Interoperability Order: TEIV (Year 2007:revised 2012)

Sea

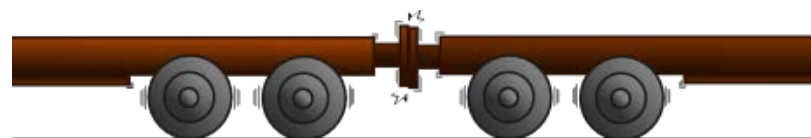
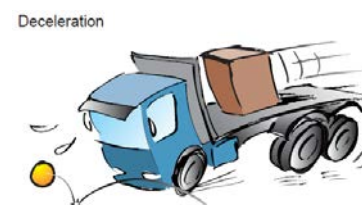
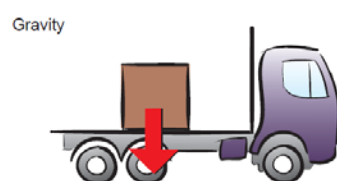
- Inland Waterway Vessel Act BinSchG (Year 1895; revised 2009)
- United Nations Convention on Contracts for the International Carriage of Goods wholly or partly by Sea (A/63/438) (Year 2008)

Cargo Securing - General Basic Principles – Acting Forces

Forces acting on the cargo during transport are caused by different movements due to the mode of transport. The acting forces are:

- Deceleration
- Acceleration
- Centrifugal force
- Gravity
- Vibration

These forces may cause **sliding**, **tipping** and **wandering**.



Cargo Securing - General Basic Principles - Sliding

Sliding occurs when cargo securing and friction can't hold the cargo in place.

For example hard and sudden braking or steep turning can create forces that make the cargo slide on the load carrier's platform or even fall out.

Observe - the weight of the cargo has no influence on whether the package starts to slide or not!

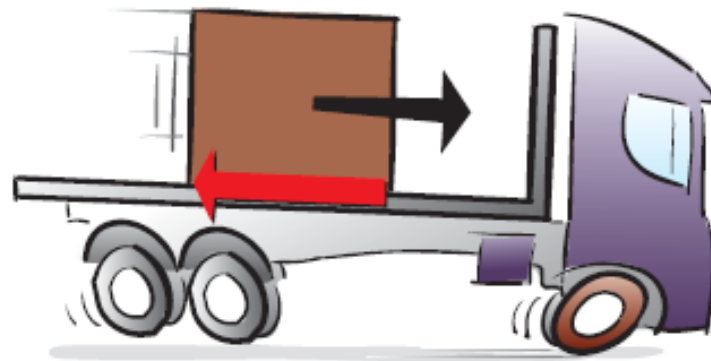


30 kg 5 kg



Cargo Securing - General Basic Principles - Friction

Friction exists in the contact between two surfaces. Friction force resists the movement of the cargo on its surface. The higher the friction is the harder it is for the cargo to start sliding.



Video

<http://www.cargosecuring.info>

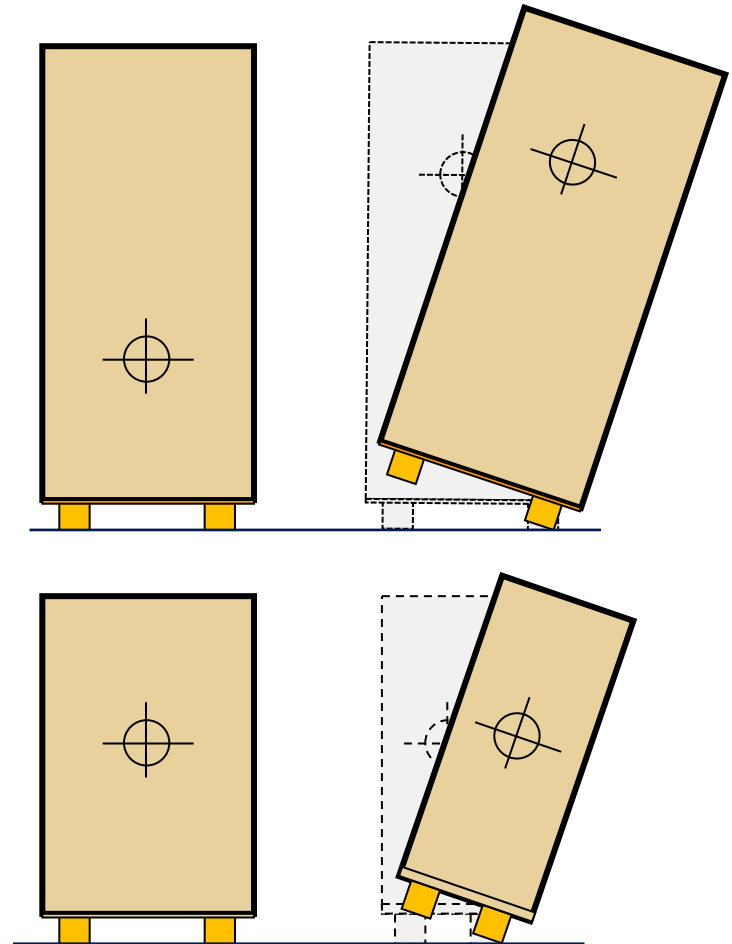
Cargo Securing - General

Basic Principles - Tipping

The stability of a cargo depends on the position of the centre of gravity, load carrying area and the dimension of the package.

Horizontal forces as a result of the change of CTU's speed may cause the cargo to tilt or tip over.

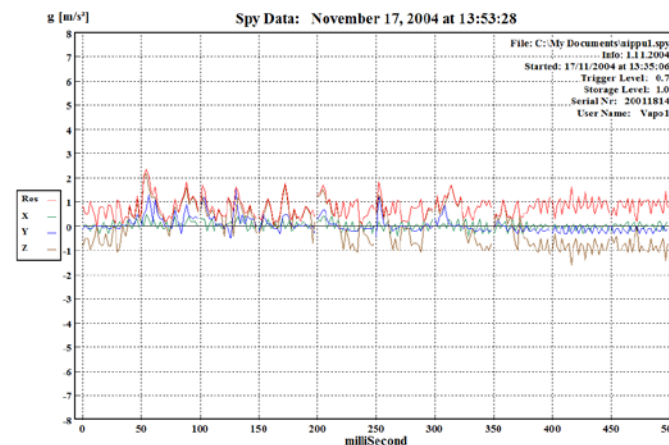
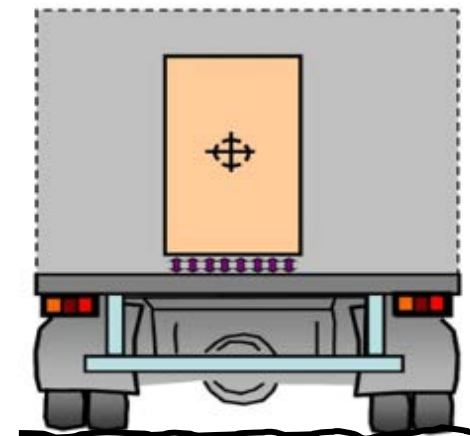
The longer and wider the package is the harder it is to tip over. On the other hand the higher the centre of gravity is the easier the package tips over.



Cargo Securing - General Basic Principles - Wandering

Every time cargo is transported it is exposed to vibration. Vibration can be caused by the load carrier's engine, road surface/track, tires/wheels, suspension, superstructure etc.

If the vibration is strong, cargo can start to wander on the load carrier platform and it may cause problems.

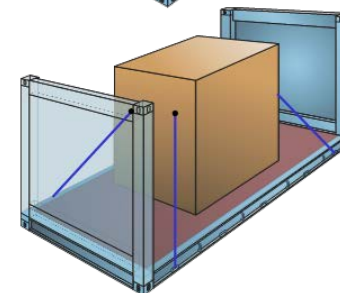
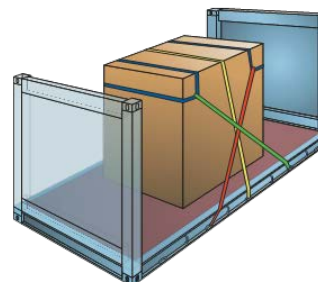
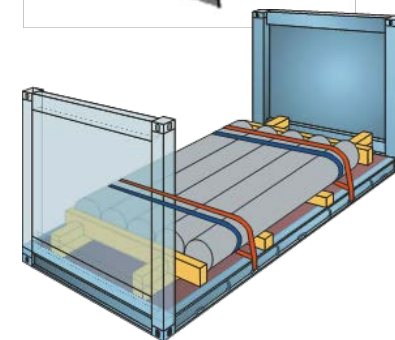
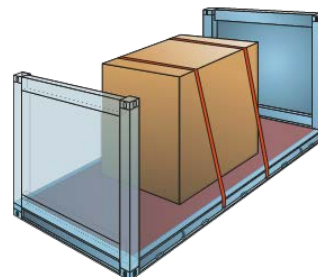
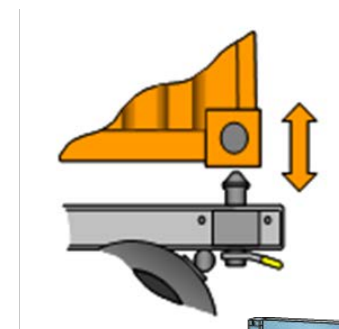
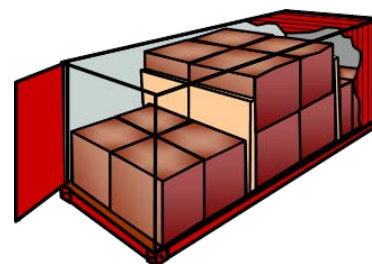


Magnitude of vibration can be large which can create wandering phenomena

Cargo Securing - General Securing Methods

Different securing methods:

- Blocking
- Locking
- Lashing
 - Top-over lashing
 - Loop lashing
 - Spring lashing
 - Straight/Cross lashing

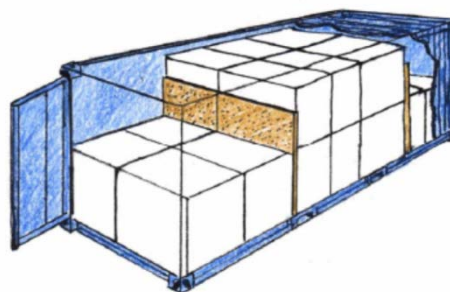
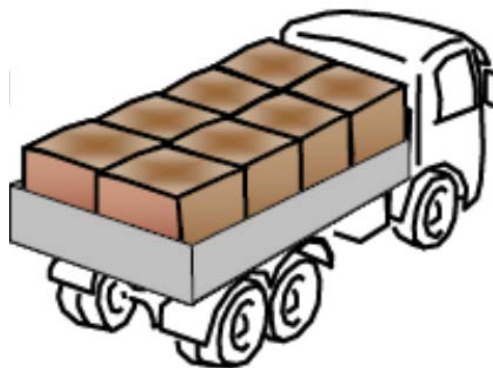


Cargo Securing - General

Securing Methods - Blocking

Blocking

- Is the basic method of cargo securing.
- Uses the CTU's structures in cooperation with a wide variety of devices.
- Eliminates the movement of the cargo so that sliding or tipping can't occur.

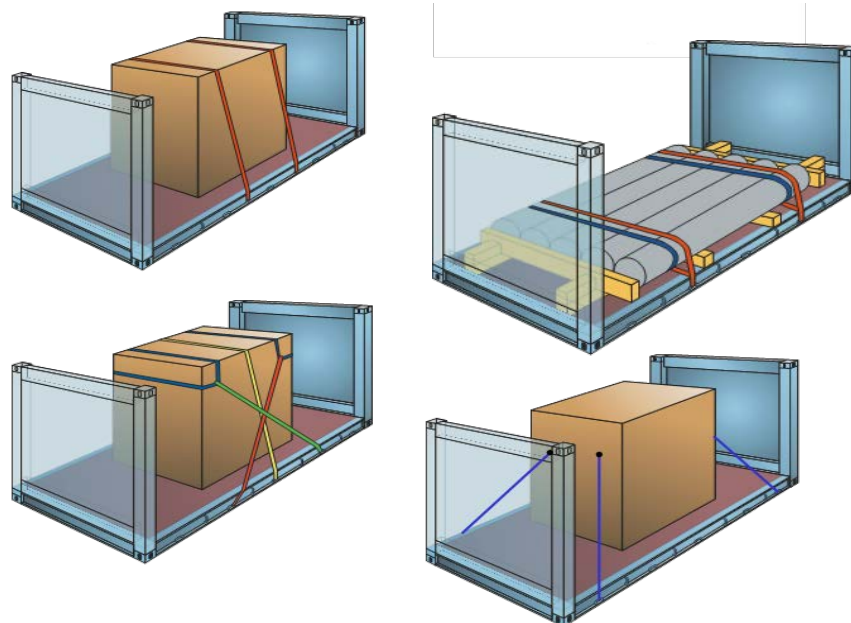


Cargo Securing - General

Securing Methods – Lashing Methods

Lashing methods

- Top-over lashing (Frictional lashing in standard)
- Direct lashing
 - Straight/Cross lashing (Slope lashing in standard)
 - Loop lashing
 - Spring lashing
- Round turn lashing



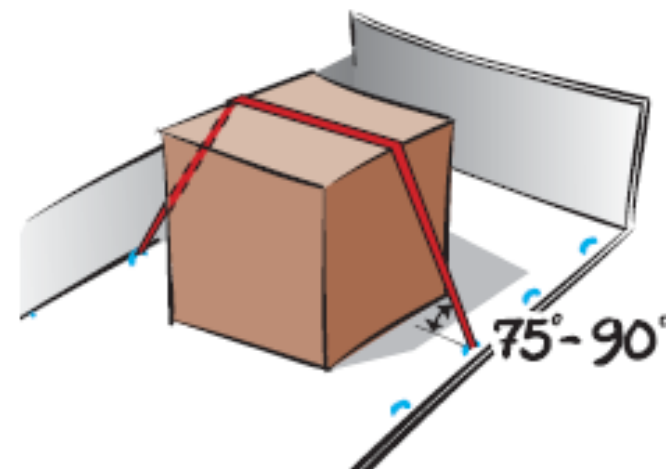
Cargo Securing - General

Securing Methods – Top-Over Lashing

Top-over Lashing

Top-over lashing is used to prevent the cargo from sliding and tipping. The purpose of this securing method is to press the cargo against the load carrier with lashing equipment so that the friction force can keep the cargo in place.

The top-over lashing runs from side to side over the load. Lashing is most effective when the angle is between 75 and 90 degrees.



Cargo Securing - General Securing Methods – Top-Over Lashing

If the cargo requires more than one webbing, they should be evenly distributed over the length of the cargo.

Re-tightening is necessary during the transport because of acting forces that make the load move and loosen the lashing equipment.



Source: Betoniteollisuus ry



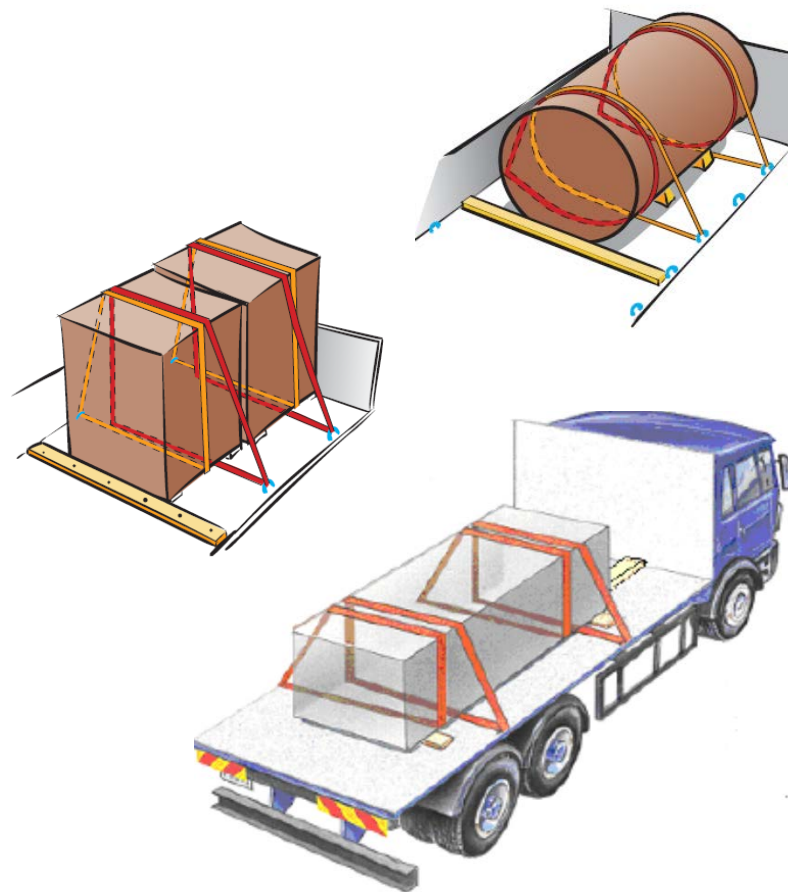
Cargo Securing - General Securing Methods – Loop Lashing

Loop Lashing

Loop lashing is a kind of slope lashing. It prevents effectively sliding and tipping in transverse direction.

At least two pairs of loop lashings must be used per cargo unit if the cargo unit is not prevented from twisting.

Remember to take care of cargo securing forward and backward directions for instance by blocking.



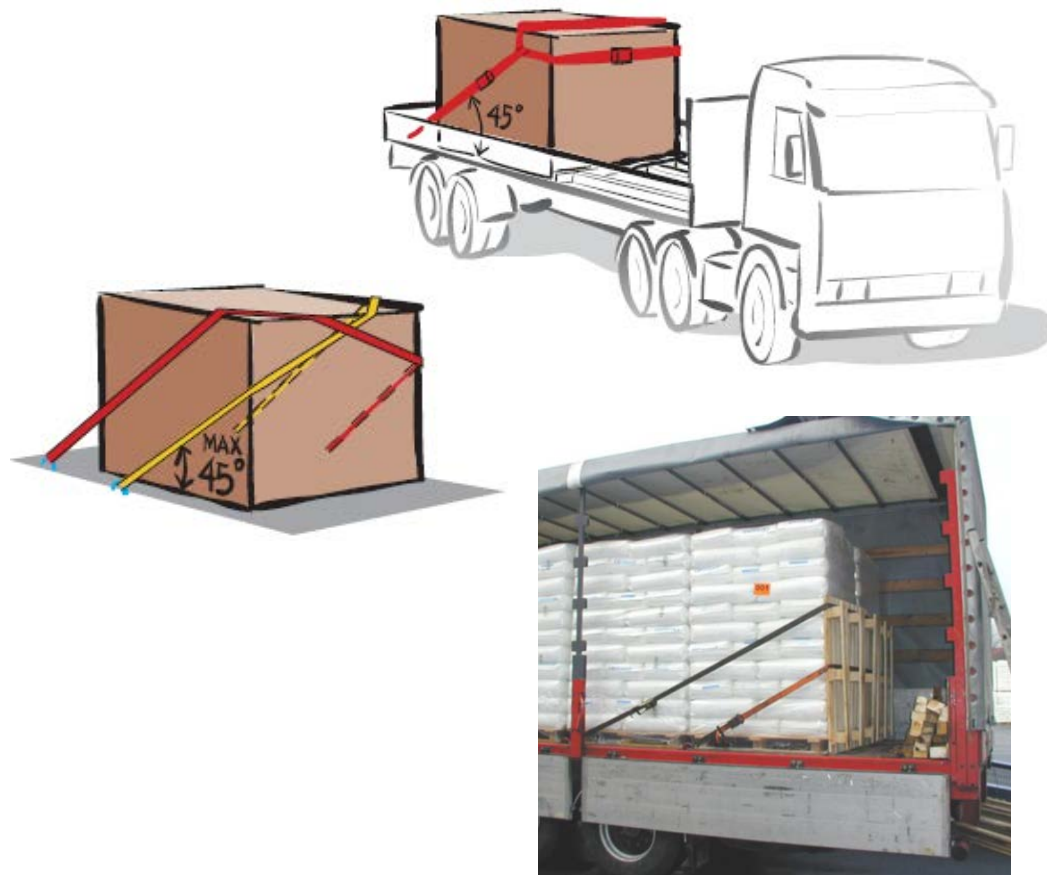
Cargo Securing - General

Securing Methods – Spring Lashing

Spring Lashing

A spring lashing is used mainly to prevent cargo movement and tipping in forward or backward directions.

Angle between the platform and webbing should be as low as possible and it must not exceed 45 degrees.



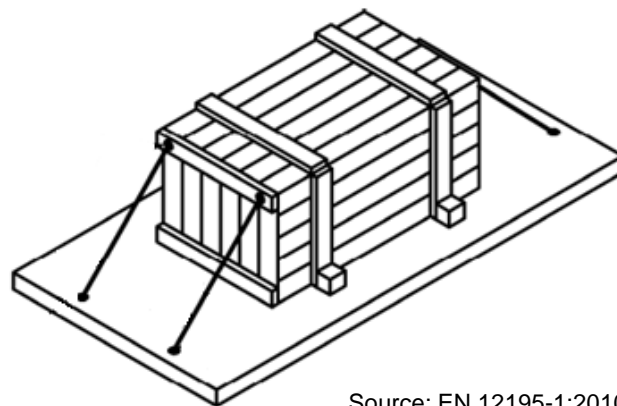
Cargo Securing - General

Securing Methods – Straight/Cross Lashing

Straight/Cross Lashing

Used typically with larger machinery and cargo to which you can attach the lashing directly.

Be aware when the lashings are attached crossways – if the cross occurs under the centre of gravity the lashing does not prevent the cargo from tipping.



Source: EN 12195-1:2010



Cargo Securing - General

Securing Methods – Round Turn Lashing

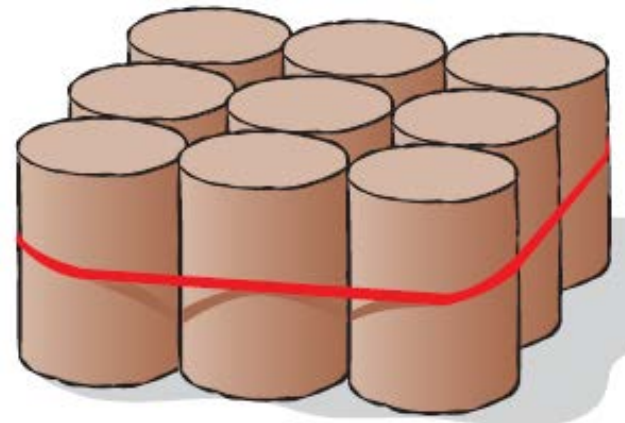
Round Turn Lashing

Round-turn lashing is mainly used to prevent tipping. The principle is to make several units to become one.

If the round-turn lashing is considerably long the effect of preventing tipping is small.

Observe!

When using horizontal round turn lashing make sure the lashing can't drop because of vibration!



Cargo Securing - General Securing/Lashing Equipment - Webbing

Webbing is the most commonly used cargo securing equipment. It is easy to use and versatile so it can be used to secure many kinds of cargoes.

Because webbings are made from fibers they should be protected against sharp edges.

Webbings prolong under strain so they need to be retightened during the transport.



Cargo Securing - General

Securing/Lashing Equipment - Webbing

Example of marking of a webbing according to standard EN 12195-2

- Unit: 1 daN \approx 1 kg
- Breaking load = 4000 kg
- LC = Lashing capacity = 1600 daN
- S_{HF} = Standard hand force = 50 daN
- S_{TF} = Standard tension force = 400 daN

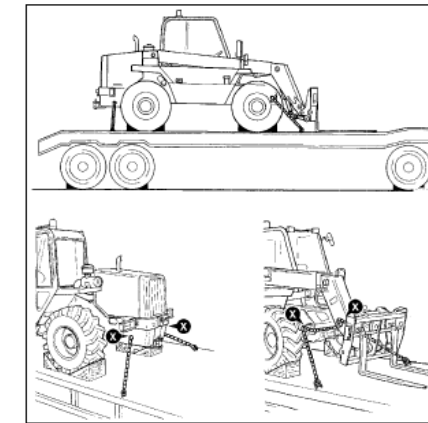
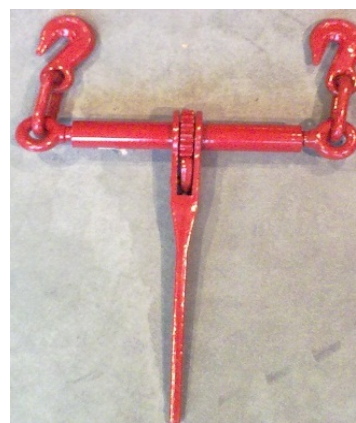


Cargo Securing - General

Securing/Lashing Equipment – Chain

Chains are typically used when transporting heavy cargo like electric transformers or earth movers.

The main differences between a web and a chain lashing are that under a normal load a chain lashing doesn't stretch and it's not so sensitive for sharp edges.



Source: Best practice guidelines

Cargo Securing - General

Securing/Lashing Equipment - Blocking

Blocking devices

- Beams
- Bars
- Braces
- Dunnage bags
- Wooden battens
- Wedges



Source: W. Strauch/containerhandbook.de

Cargo Securing - General Securing/Lashing Equipment - Others

Increasing Friction

- Friction mat
- Tag washers



Protective

- Supporting edge profile
- Corner protection



Other

- Lashing cover
- Net



Cargo Securing - General

Inspection of Web and Chain Lashings

Web and chain lashings should be inspected before use!

Don't use a web lashing if you notice:

- Edge damage
- Cuts
- Tear damage or knots
- Wear damage
- Dirt level and old age



Don't use a chain lashing if you notice:

- Cracks in the surface
- Visual deformation i.e. prolongation
- Wear more than 10 % of the diameter



ROAD TRANSPORT

Cargo Securing at Road Transport

Typical Factors Affecting Cargo Securing in Road Transport

Typical factors affecting cargo securing in road transport are

- Loading and unloading
- Large forces in forward direction due to brakes
- Variability of cargo units
- Weather conditions
- Vibrations



Cargo Securing at Road Transport

Typical Cargoes

- General cargo
 - Pallets
 - Cages
 - Sacks
 - Parcels/boxes
 - Barrels
 - Pallets
- Bulk
- Timber
- Paper
- Metal

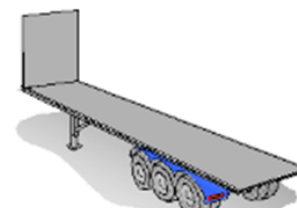


Cargo Securing at Road Transport

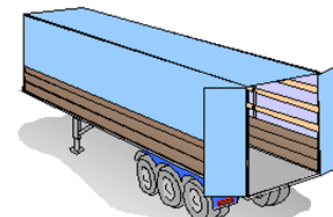
Cargo Transport Units - Superstructures

Different types of superstructures:

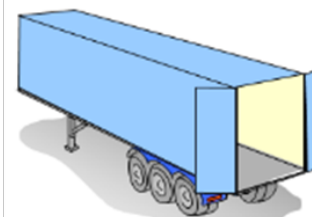
- Open flat
- Cover/stake
- Box with or without side doors
- Curtainsider



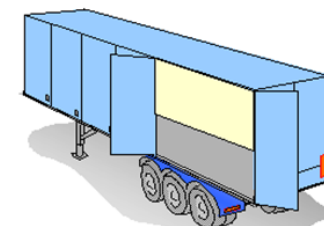
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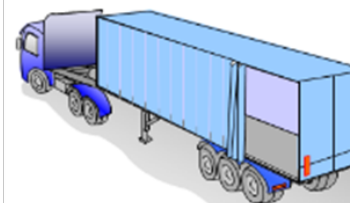
Cover/stake



Box



Box - with side doors



Curtainsider

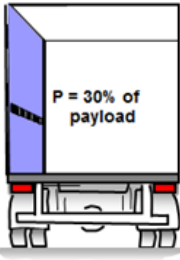
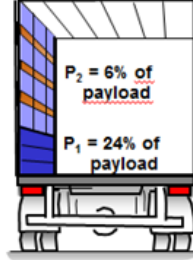
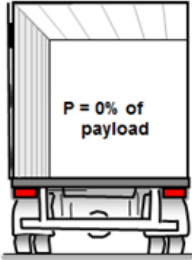
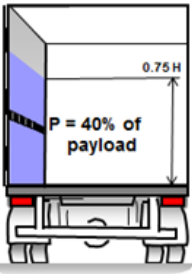
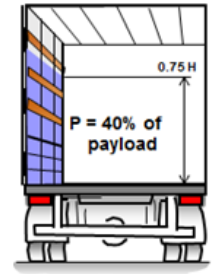
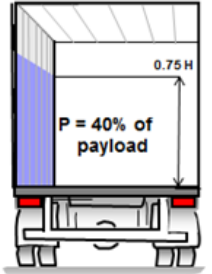
Cargo Securing at Road Transport

Cargo Transport Units - Superstructures

Strength Demand on Superstructure

Sideways Strength according to the European Standards

- EN 12642 L and
- EN 12642 XL

| Box | Cover/Stake | Curtinsider |
|--|---|--|
| EN 12642 L | | |
|  <p>P = 30% of payload</p> |  <p>$P_2 = 6\%$ of payload $P_1 = 24\%$ of payload</p> |  <p>P = 0% of payload</p> |
| EN 12642 XL | | |
|  <p>P = 40% of payload 0.75H</p> |  <p>P = 40% of payload 0.75H</p> |  <p>P = 40% of payload 0.75H</p> |

Cargo Securing at Road Transport

Lashing Points

When attaching the lashing devices remember to make sure the lashing points are strong enough.

According to standard EN-12640 floor lashing points in vehicles that weigh over 12 tons should withstand 2000 kg of tensile force. Lashing points in the front wall withstand 1000 kg.



Source: Krone



Source: Ekeri



Cargo Securing at Road Transport Liabilities - General

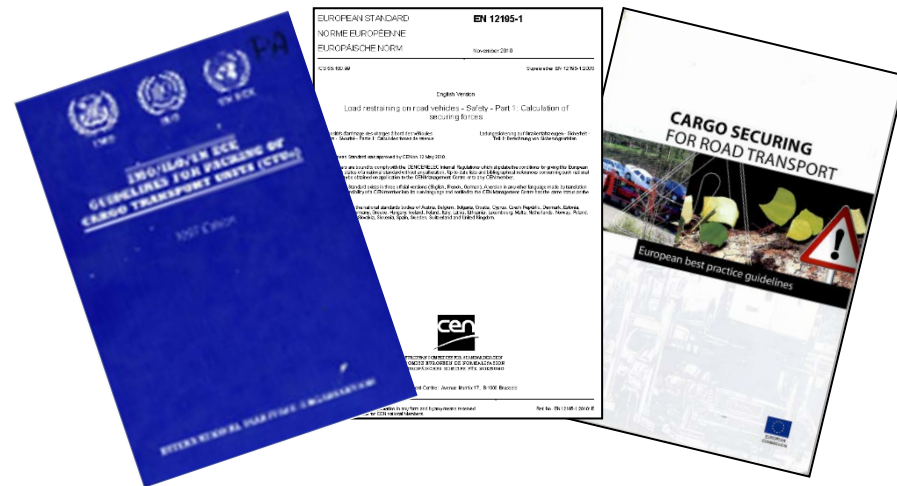
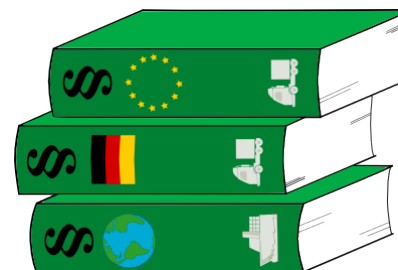
Today and in the near future liabilities emphasize the sharing of responsibilities for different parties.

Shipper has to make sure goods withstand loading, cargo securing and normal stress from transport during the whole journey. Shipper is also responsible for giving instructions.

Driver has to make sure cargo is transported in time and intact to the customer. At the same time he is responsible for the road safety of the vehicle and its cargo. Driver is also responsible for loading if it is his task.

Cargo Securing at Road Transport Liabilities – Regulations And Standards

- National regulations
- European Standard:
 - EN 12195-1:2010
- Guidelines:
 - IMO/ILO/UNECE,
 - European Best Practice Guidelines on Cargo Securing for Road Transport



Cargo Securing at Road Transport Liabilities – Regulations Dangerous Goods

- In the regulations for transport of Dangerous Goods – ADR the cargo securing is regulated in section 7.5.7:

“The requirements of this paragraph are deemed to be complied with if the cargo is secured in accordance with standard EN 12195-1:2010”



Cargo Securing at Road Transport Acts and Decrees - Finland



- Road Traffic Act
 - The Finnish Road Transport Act: 3.4.1981/267
- The Decree on the Use of Vehicles on the Road
 - The Finnish Decree on the Use of Vehicles on the Road: 4.12.1992/1257

| Regulation vs. standard | Regulation | Standard 12195-1:2010 |
|------------------------------------|------------|---|
| Acceleration value forward | - 1g | - 0.8g |
| Acceleration value sideways | - 0.5g | - 0.5g or - 0.6g when risk of tipping |
| Safety factor for top-over lashing | - None | - 1.25 forward - 1.1 sideways and backward |

Decree regulates that if a single lashing comes loose, it must not impair other lashings of the load

Cargo Securing at Road Transport Acts and Decrees - Sweden



- The Swedish decree of traffic:
 - Trafikförordningen SFS 1998:1276 3 kap. 80§
- The Swedish Transport Authority regulations:
 - Trafiksäkerhetsverkets föreskrifter TSVFS 1978:10 om säkring av last på fordon under färd
 - Vägverkets föreskrifter VVFS 1998:95 om ändring i Trafiksäkerhetsverkets föreskrifter (TSVFS 1978:10)

| Regulation vs. standard | Regulation | Standard 12195-1:2010 |
|------------------------------------|------------|---|
| Acceleration value forward | - 1g | - 0.8g |
| Acceleration value sideways | - 0.5g | - 0.5g or - 0.6g when risk of tipping |
| Safety factor for top-over lashing | - None | - 1.25 forward - 1.1 sideways and backward |

Cargo Securing at Road Transport Acts and Decrees - Germany



- German road traffic regulations (StVO)
 - §§ 22 and 23 StVO govern the responsibilities of the loader and of the driver
 - § 22 clause 2 StVO Load
 - “The load as well as tension chains, equipment and other loading devices must be stowed in a roadworthy manner and must be particularly secured against falling off and against making avoidable noise.”
 - § 23 StVO Miscellaneous duties of the driver

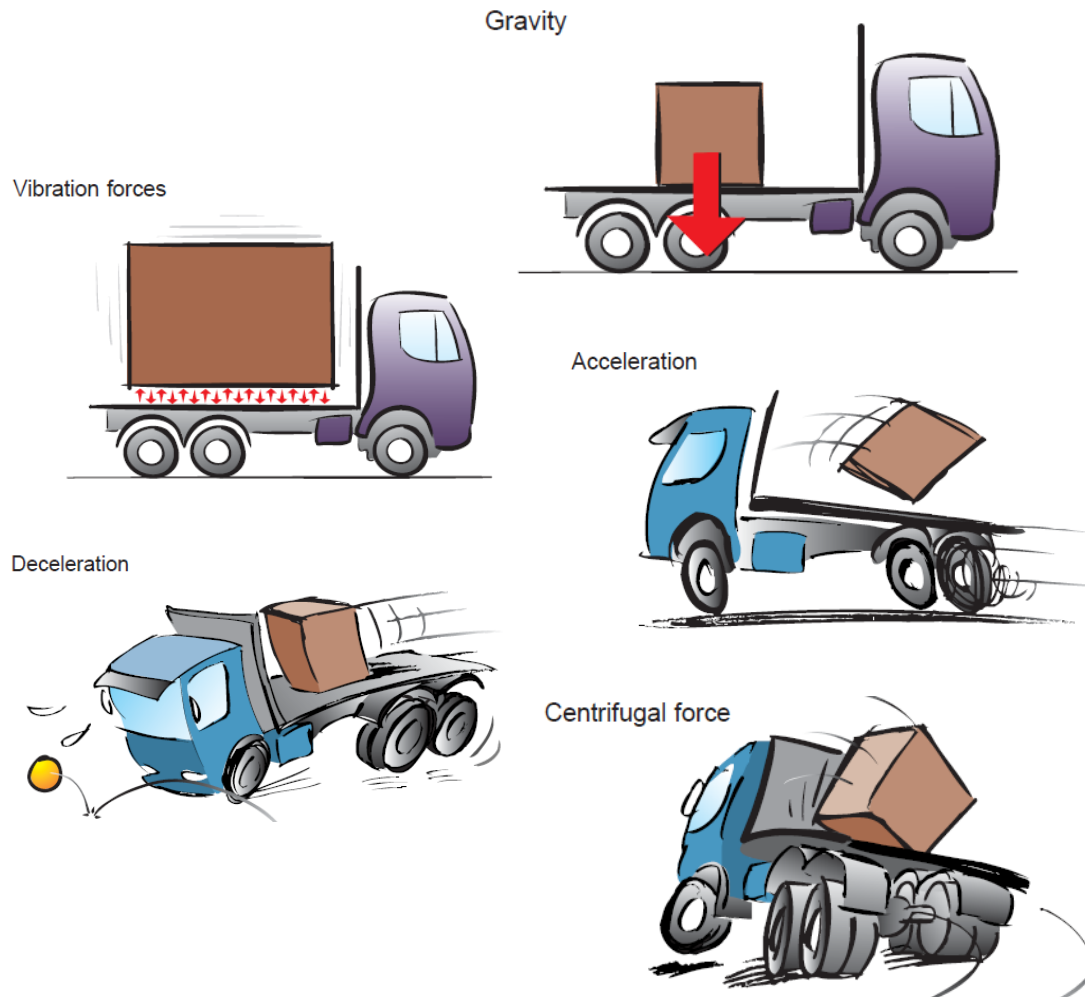
Cargo Securing at Road Transport

Acting Forces

During road transport gravity together with friction tries to hold the cargo on its place.

Other forces try to make the cargo move. These forces are

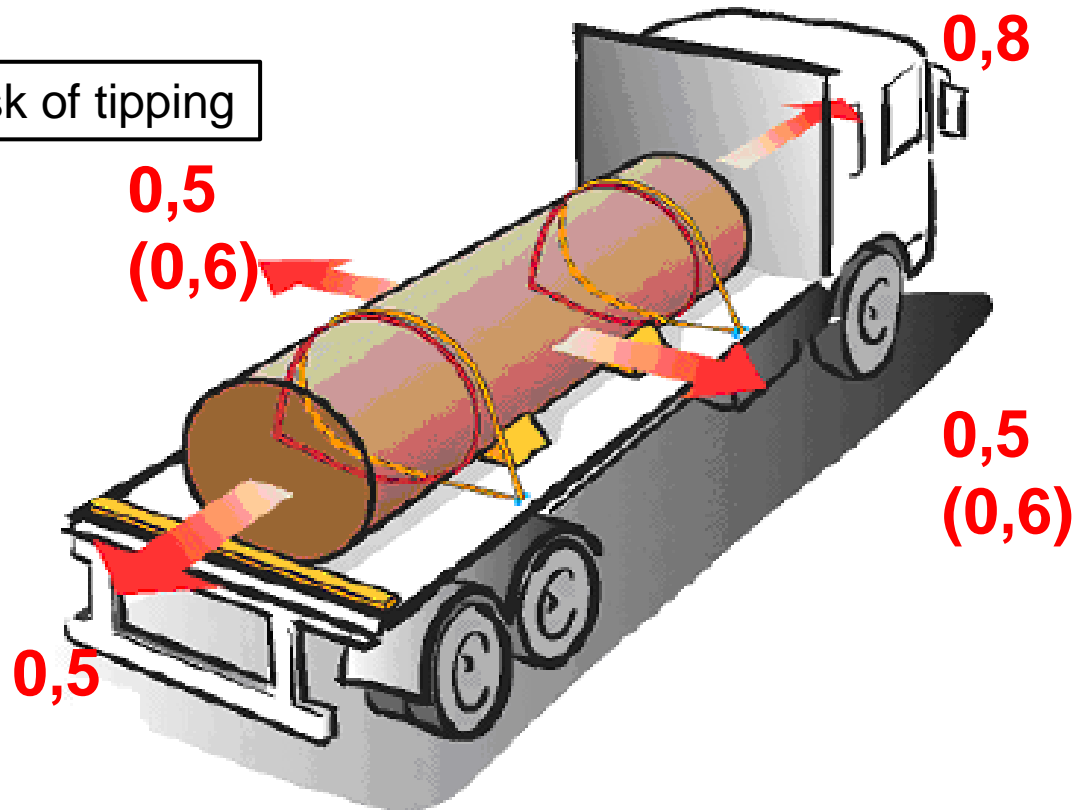
- Acceleration
- Deceleration
- Centrifugal force
- Vibration



Cargo Securing at Road Transport

Acting Forces

0,6 when risk of tipping



All the forces are expressed as part of weight of the cargo.

Cargo Securing at Road Transport Acting Forces - Examples

Sudden and hard braking is a typical situation that might cause an accident.



Source: Transport information service



Cargo Securing at Road Transport

Acting Forces - Examples

In steep turning the centrifugal force can move the cargo without proper cargo securing.

Even at low speeds e.g. traffic circles, transverse force can be so high that the cargo moves and in worst case falls off or the whole truck or trailer tips over.



Source: Transport information service

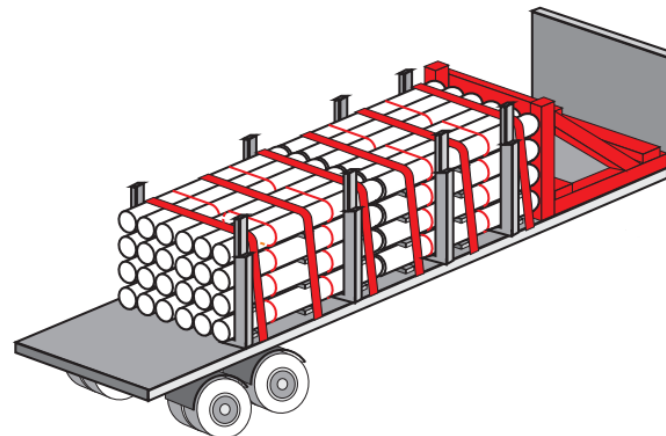
Cargo Securing at Road Transport

Cargo Securing in Different Directions - Forward

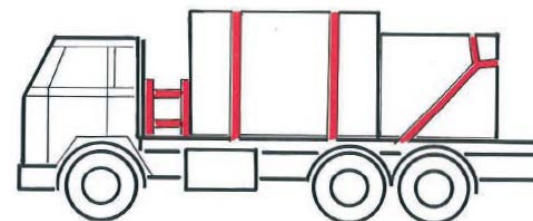
If possible block the cargo in lengthways directions against

- Firm structures of the CTU
- Boards
- Empty pallets
- Other cargo
- Threshold made of other packages
- H-bracing
- Wooden battens

If necessary use different lashing methods in combination with blocking.



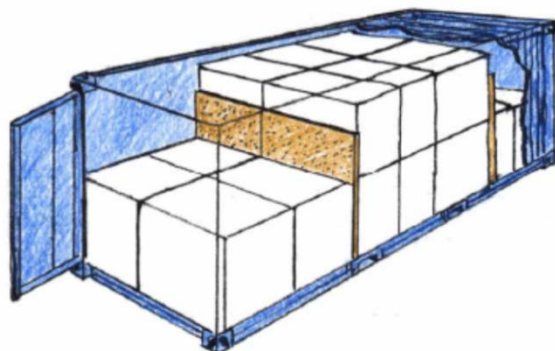
Source: LOGY



Source: Haklift

Cargo Securing at Road Transport

Cargo Securing in Different Directions - Forward



Source: Cargo securing guidelines



Cargo Securing at Road Transport

Cargo Securing in Different Directions - Forward



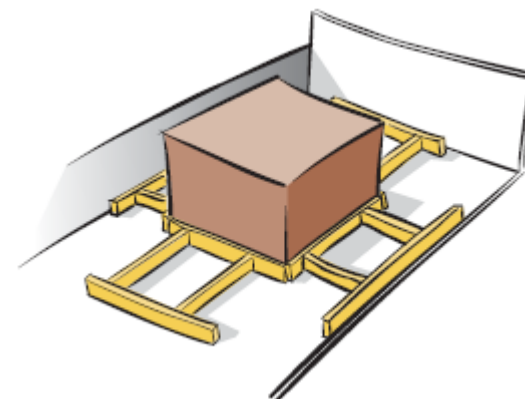
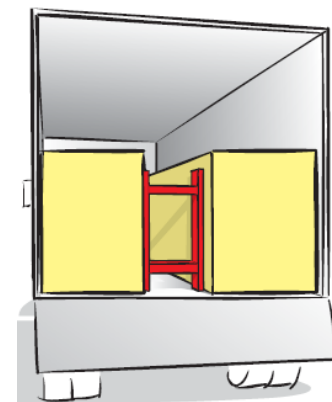
Cargo Securing at Road Transport

Cargo Securing in Different Directions - Sideways

If possible block the cargo in sideways directions against

- Firm structures of the CTU
- Other cargo
- Empty pallets
- Dunnage bags
- Wooden battens
- Stanchions

If necessary use different lashing methods in combination with blocking.



Cargo Securing at Road Transport

Cargo Securing in Different Directions - Sideways



Source:
Krone

Cargo Securing at Road Transport

Cargo Securing in Different Directions - Backward

Cargo can be secured to backward direction with the same methods as with other directions. Blocking is preferred but it is more commonly used in containers. Also lashing can be used.

The rear wall of the CTU can be used in blocking if it is constructed according to EN-12642 standard. Rear wall can withstand 25 % of the cargo weight.



Source: Cargo securing guidelines



Source: Krone

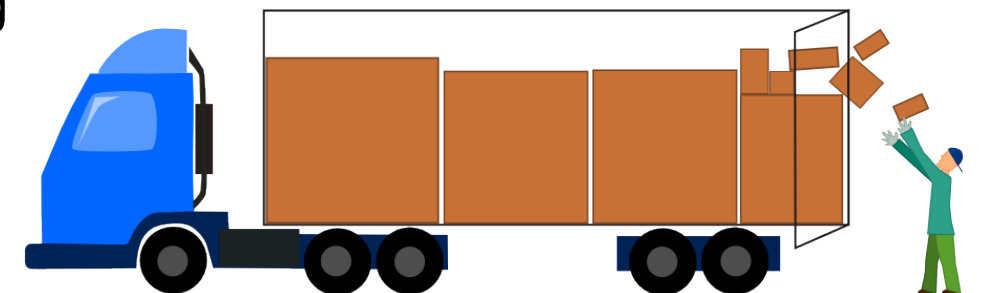
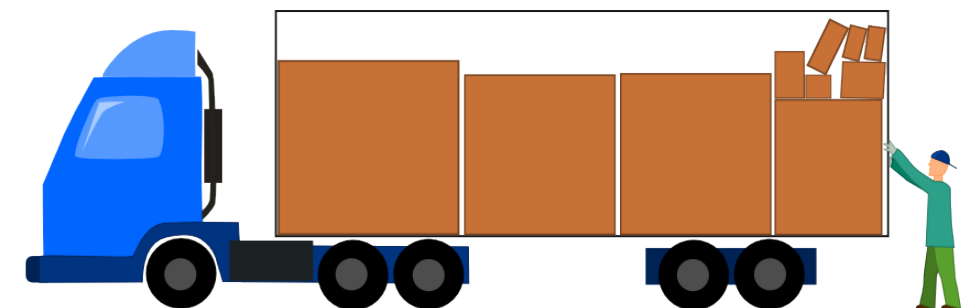
Cargo Securing at Road Transport

Cargo Securing in Different Directions

Observe!

Be careful when unloading cargo!

Cargo might have moved during transport and lean against the doors!

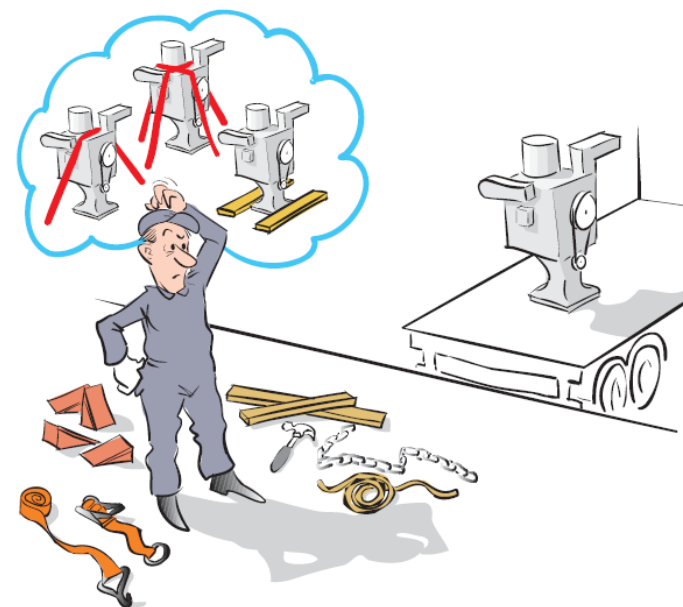


Cargo Securing at Road Transport

Cargo Securing in Different Directions - Summary

Where possible choose blocking as method to secure the cargo. Cargo can also be secured using friction and lashings methods in combination with blocking.

- Top-over Lashing
- Loop Lashing
- Spring Lashing
- Straight/Cross Lashing
- Round Turn Lashing



Cargo Securing at Road Transport

Cargo Securing in Different Directions - Summary

Eight most important guidelines for cargo securing

- Check load platform, bodywork and load securing equipment
 - Make sure that the CTU is appropriate for the cargo
 - Secure the cargo with appropriate method
 - Ensure that the cargo securing equipment withstands the constraints it will encounter during the journey
- Check the cargo securing after a short travel, if possible
 - Check the cargo and its load distribution after every (un)loading
 - If possible use equipment that support the cargo securing method
 - Ensure that the securing arrangements do not damage the transported goods

Cargo Securing at Road Transport

Quick Lashing Guide – User Instructions

Use this guide book to calculate the number of lashings needed to prevent sliding and tipping in longitudinal and transverse directions tipping in three simple steps:

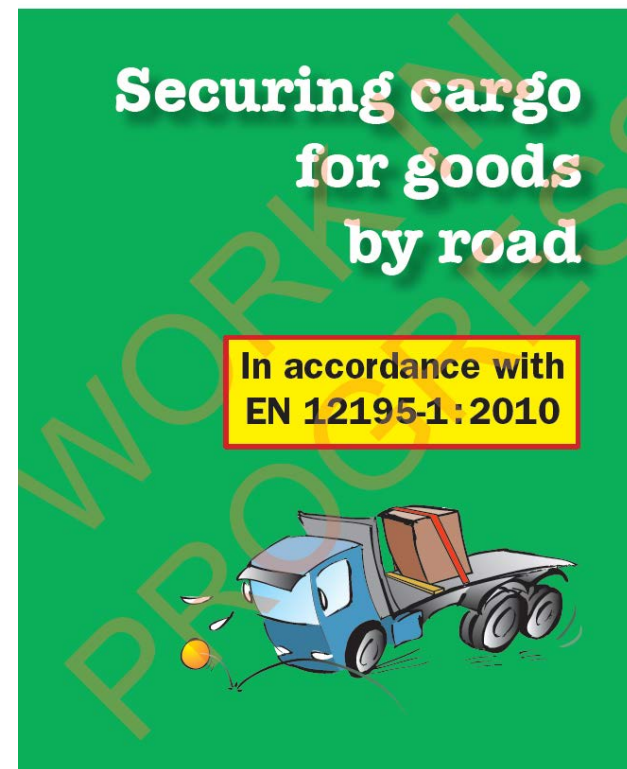
Step 1. How many lashings prevent cargo from sliding

Step 2. How many lashings prevent cargo from tipping

Step 3. The highest number shows the minimum number of lashings you have to use



The Vocational Training and Working Environment Council



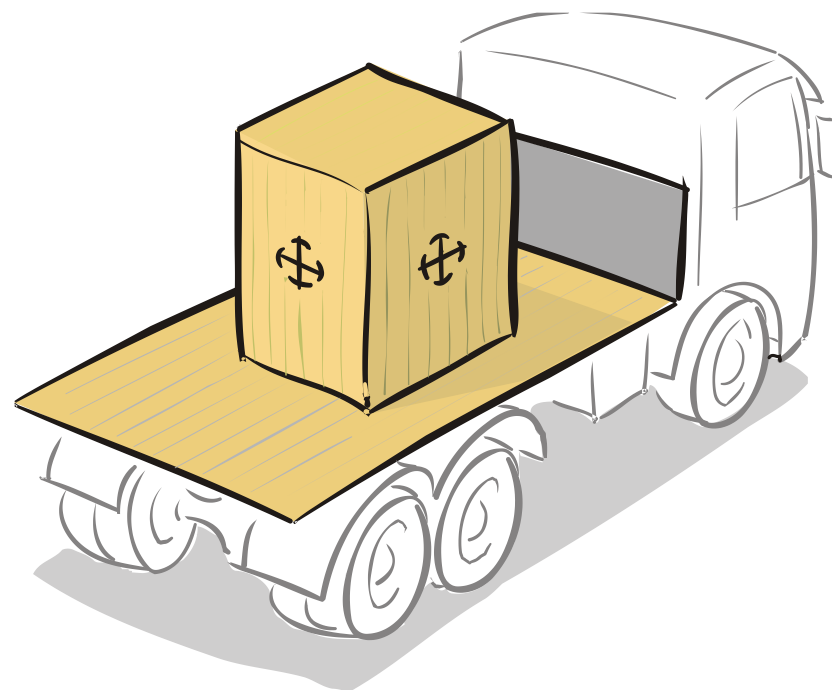
Cargo Securing at Road Transport

Quick Lashing Guide – Example

A wooden crate against a wooden cargo deck.

Dimensions of the crate:

- Weight 2,2 ton
- 2,1 m high
- 2,0 m wide
- 1,5 m long



Cargo Securing at Road Transport

Quick Lashing Guide – Example

STEP 1: Sliding

1. Check the friction coefficient
2. Check how many tons one lashing prevents from sliding
3. Calculate how many lashings are needed by dividing the weight with the result

STEP 2: Tipping

1. Calculate the ratio H/W and H/L
2. Check how many tons one lashing prevents from tipping
3. Calculate how many lashings are needed by dividing the weight with the result

| Amount of tons of cargo one top over lashing prevents from tipping over | | | | | | | | | |
|---|----------|----------|--------|----------|----------|---|-----|----------|-----------|
| H/W | Sideways | | | | | a | H/L | Forwards | Backwards |
| | 1 row | 2 rows | 3 rows | 4 rows | 5 rows | | | | |
| 0,6 | no tip | no tip | no tip | 6,4 | 2,9 | | 0,6 | no tip | no tip |
| 0,8 | no tip | no tip | 5,4 | 2,1 | 1,5 | | 0,8 | no tip | no tip |
| 1,0 | no tip | no tip | 2,2 | 1,3 | 0,97 | | 1,0 | no tip | no tip |
| 1,2 | no tip | 4,5 | 1,4 | 0,91 | 0,73 | | 1,2 | no tip | no tip |
| 1,4 | no tip | 2,3 | 0,99 | 0,71 | 0,58 | | 1,4 | 5,3 | no tip |
| 1,6 | no tip | 1,5 | 0,78 | 0,58 | 0,49 | | 1,6 | 2,3 | no tip |
| 1,8 | no tip | 1,1 | 0,64 | 0,49 | 0,42 | | 1,8 | 1,4 | no tip |
| 2,0 | no tip | 0,9 | 0,54 | 0,42 | 0,36 | | 2,0 | 1,1 | no tip |
| 2,2 | 5,6 | 0,75 | 0,47 | 0,37 | 0,32 | | 2,2 | 0,83 | 7,2 |
| 2,4 | 3,6 | 0,64 | 0,42 | 0,33 | 0,29 | | 2,4 | 0,68 | 3,6 |
| | 0,55 | no slide | | 1,7 | no slide | | | | |
| | 0,60 | no slide | | 1,9 | no slide | | | | |
| | 0,65 | no slide | | 2,7 | no slide | | | | |
| | 0,70 | no slide | | 4,4 | no slide | | | | |
| | 0,75 | no slide | | 9,5 | no slide | | | | |
| | 0,80 | no slide | | no slide | no slide | | | | |

Cargo Securing at Road Transport

Securing Bulk Cargo

With bulk cargo it is very important to use appropriate CTU

- Liquids
- Gravel, sand etc.
- Light bulk e.g. woodchips

If the transported material can dust or wind can lift pieces of it, a tarpaulin or net should be used.



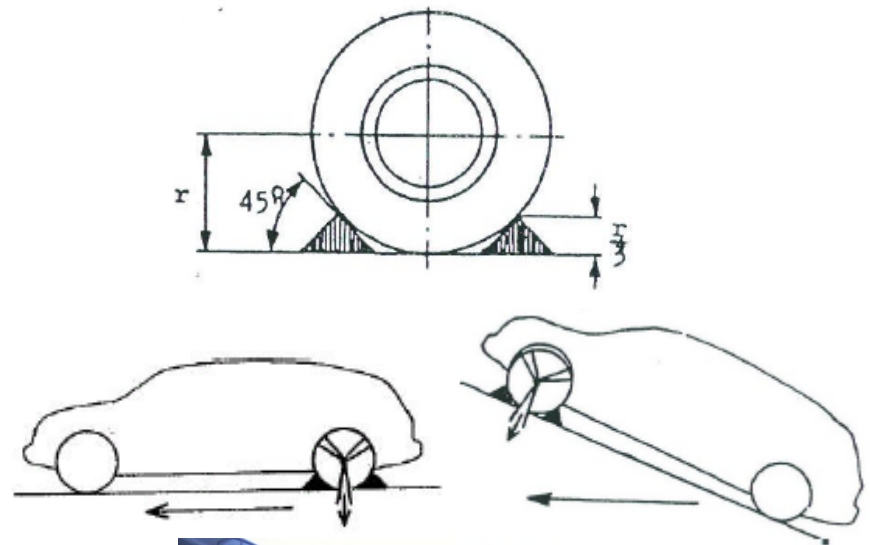
Cargo Securing at Road Transport

Securing Vehicles

Parking brake itself isn't sufficient for preventing movement of vehicles. Vehicles or trailer should be lashed with appropriate equipment.

Lashing should be positioned in such a way that the vehicle is pulled directly against the platform floor.

In addition to lashing wedges can be used. The appropriate number of lashings and wedges depends on the weight of the vehicle and the incline of the platform floor.

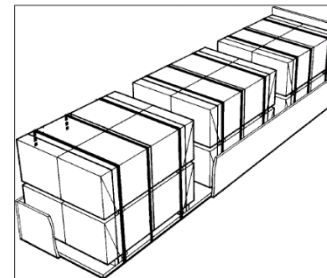


Cargo Securing at Road Transport

Securing Sawn Timber

Sawn timber is very often transported in standardized packages that are covered with plastic. Remember that plastic will lower the friction coefficient! Packages can although vary in size and weight.

Packages should be loaded tightly and blocked against front and side walls and stanchions. If lashing is needed, remember to prepare for it in advance!



Cargo Securing at Road Transport

Securing Concrete Elements

Chains are most commonly used in securing concrete elements. If blocking is not possible spring lashing is very often used to prevent movement in forward direction. Also direct lashing can be used if lifting anchors are available.

Corner protectors have to be used if the concrete elements are secured with web lashings!



Source: Betoniteollisuus ry

