Código de buenas prácticas para la estiba segura de la carga en el transporte por carretera

International Guidelines on Safe Load Securing for Road Transport

13TH INTERNATIONAL SYMPOSIUM ON HEAVY VEHICLE TRANSPORT TECHNOLOGY

Session 8b HV braking and safety

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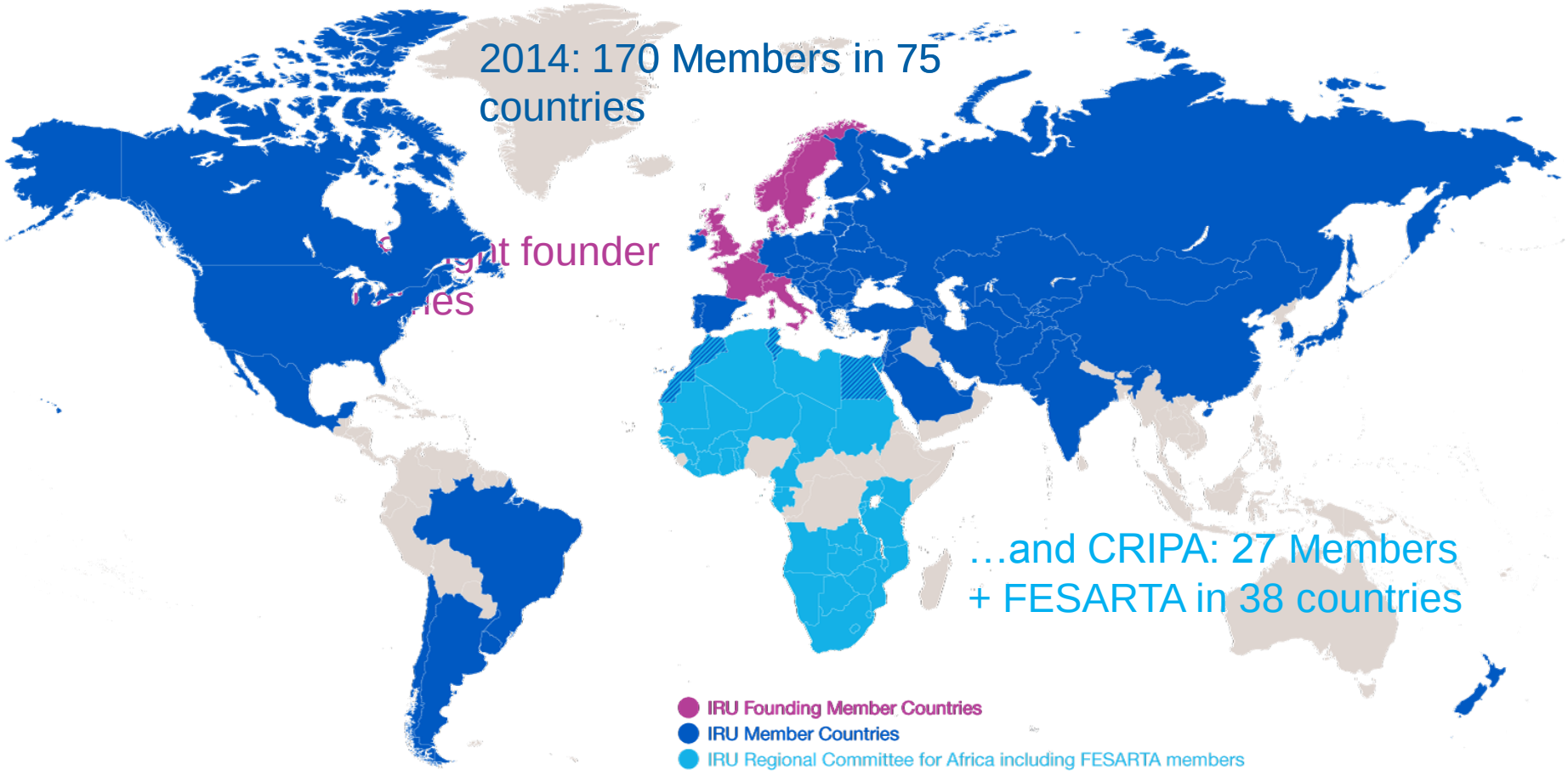
Mårten Johansson

IRU International Road Transport Union

This is the IRU

Evolution of IRU Membership



IRU Secretariat General

1948 – IRU founded in Geneva

1973 – IRU Permanent Delegation to the European Union in Brussels

1998 – IRU Permanent Delegation to Eurasia in Moscow

2005 – IRU Permanent Delegation to the Middle East and Region in Istanbul

2012 – IRU Secretariat for Africa in Geneva

2013 – IRU Permanent Delegation to the United Nations in New-York

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Commissions

- Social Affairs 
- Economic Affairs 
- Customs Affairs 
- Legal Affairs 
- Technical Affairs 
- Road Safety 
- Services to Transport Operators 

Working Parties

- Dangerous Goods 
- Intermodal Transport & Logistics 
- Taxis and hire cars with driver 

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Securing and facilitating trade and international road transport

What is Globalisation?

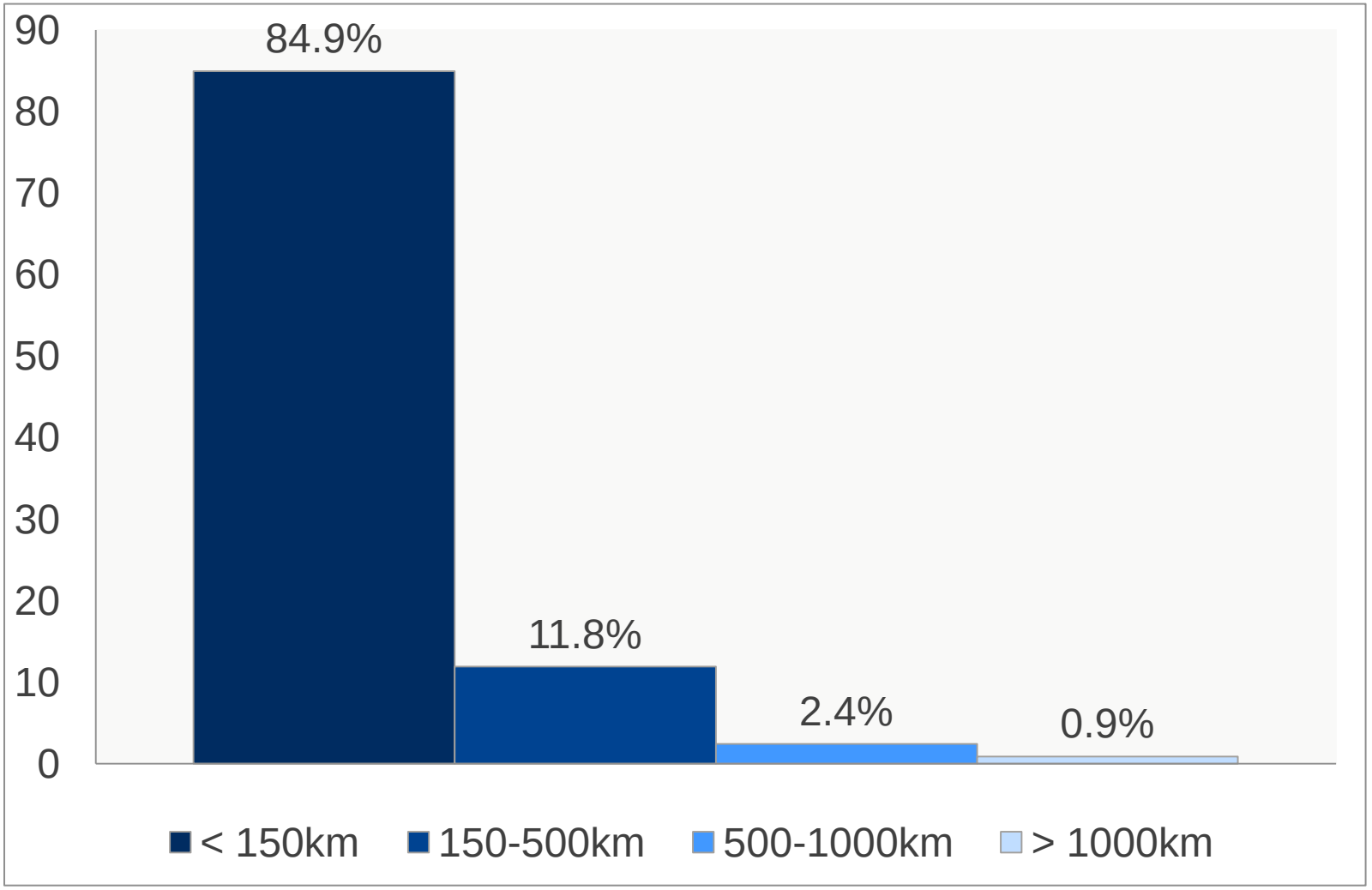
What does it take to have a cup of coffee in a café?

The combined efforts of 29 companies in 18 countries

Road Transport has become a vital production tool!

Source: IRU

Road transport tonnage distances in modern economies



Scope and Objectives

The aim of these Guidelines is to provide basic practical information and instruction to all key stakeholders involved in the international road transport industry to correctly load and secure goods on vehicles, from the outset, improving global road traffic safety.

The Guidelines should serve as a common basis for practical application and enforcement of load securing!

Applicable Standards

Load securing arrangements, strength and performance are based on the following standards:

EN12195-1	Calculation Lashing forces
EN 12640	Lashing points
EN12641-1 / EN 12641-2	Swap bodies Tarpaulin / curtainsiders
EN 12642 L / EN 12642 XL	Strength of vehicle body structure (0.3P) or (0.4P)
EN 12195-2	Web lashing
EN 12195-3	Lashing chains

EN 12195-4	Lashing steel wire ropes
EN 283	Swap bodies – testing
EN 284	Swap bodies – Non-stackable
ISO 1161 / ISO 1496-1	ISO Container
ISO 27955	Load securing in passenger cars and multi-purpose vehicles
ISO 27956	Load securing in delivery vans

Responsibilities

The IRU Guidelines address liability issues which should be included in contracts.

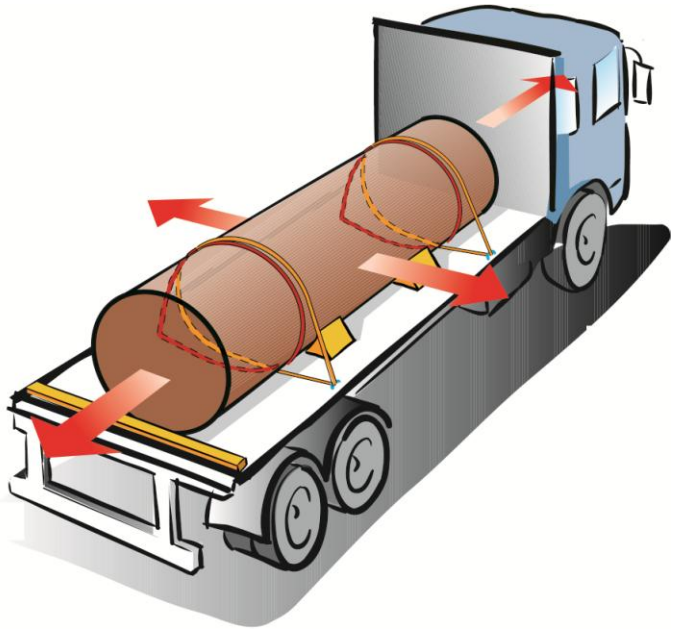
The road transport industry wants legislation and liability which covers:

- ✓correct loading and correct load securing
- ✓correct laden weight
- ✓shared liability between the parties responsible within the freight chain

Physical constraints

The load securing arrangements must be based on:

- ✓ Accelerations
- ✓ Friction factors
- ✓ Safety factors
- ✓ Test methods

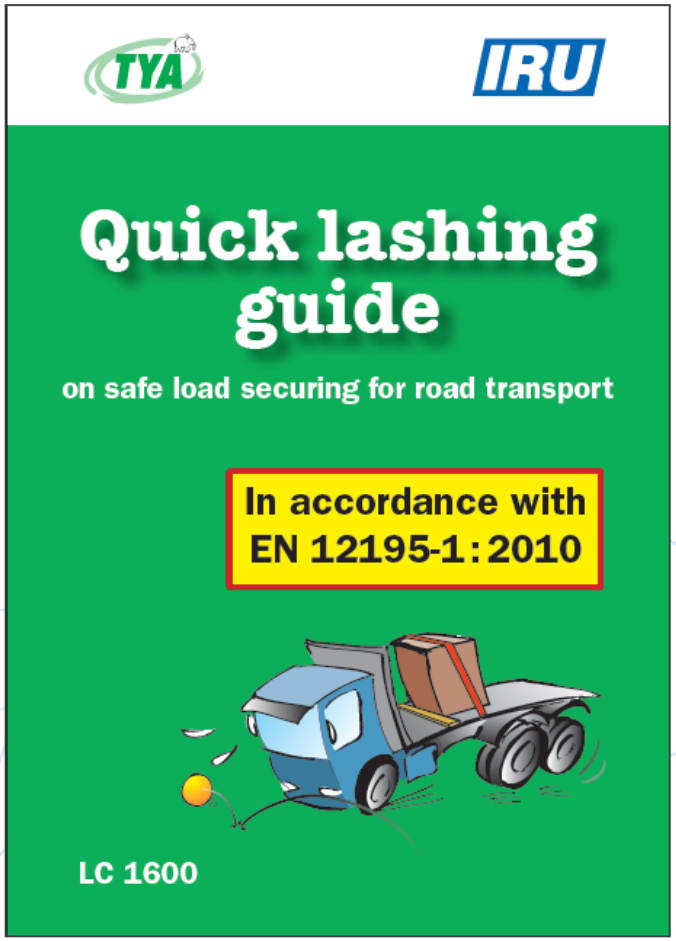


….these parameters are described in the standard EN 12195-1:2010

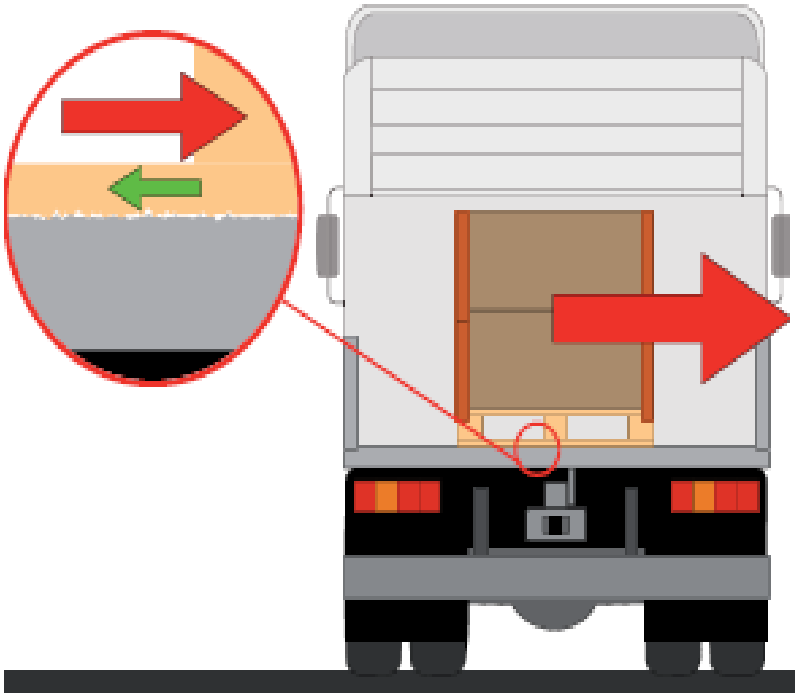
Overall principles

To avoid loads sliding, tilting and rolling the following principles must be considered:

- Securing direction
- Securing method and equipments
- Friction
- Dimensions / center of gravity
- Mass of the load



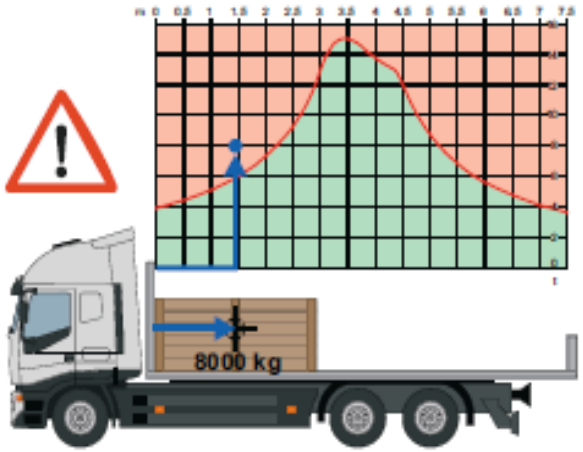
Friction factors

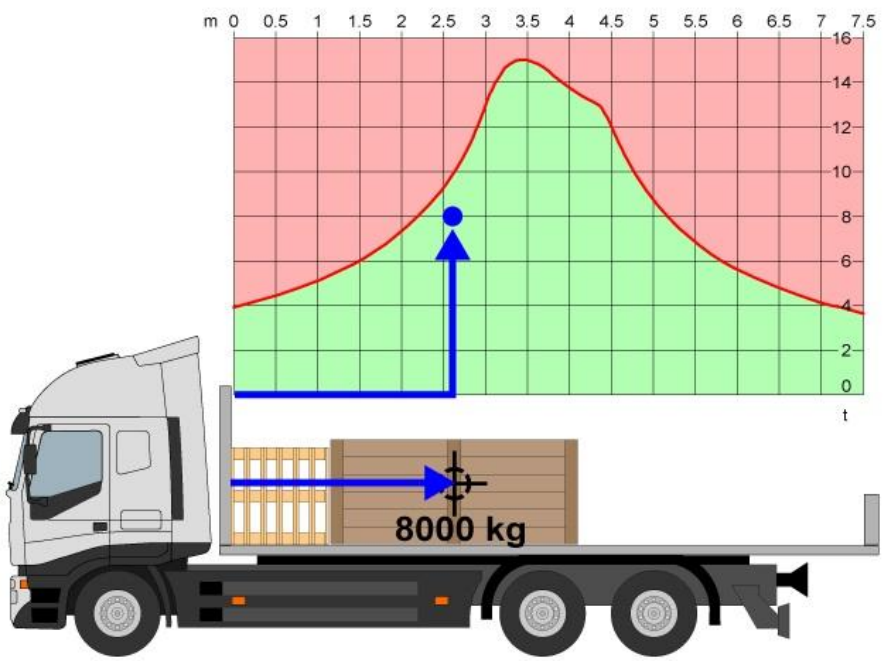


$$F = \frac{m \cdot v^2}{r}$$

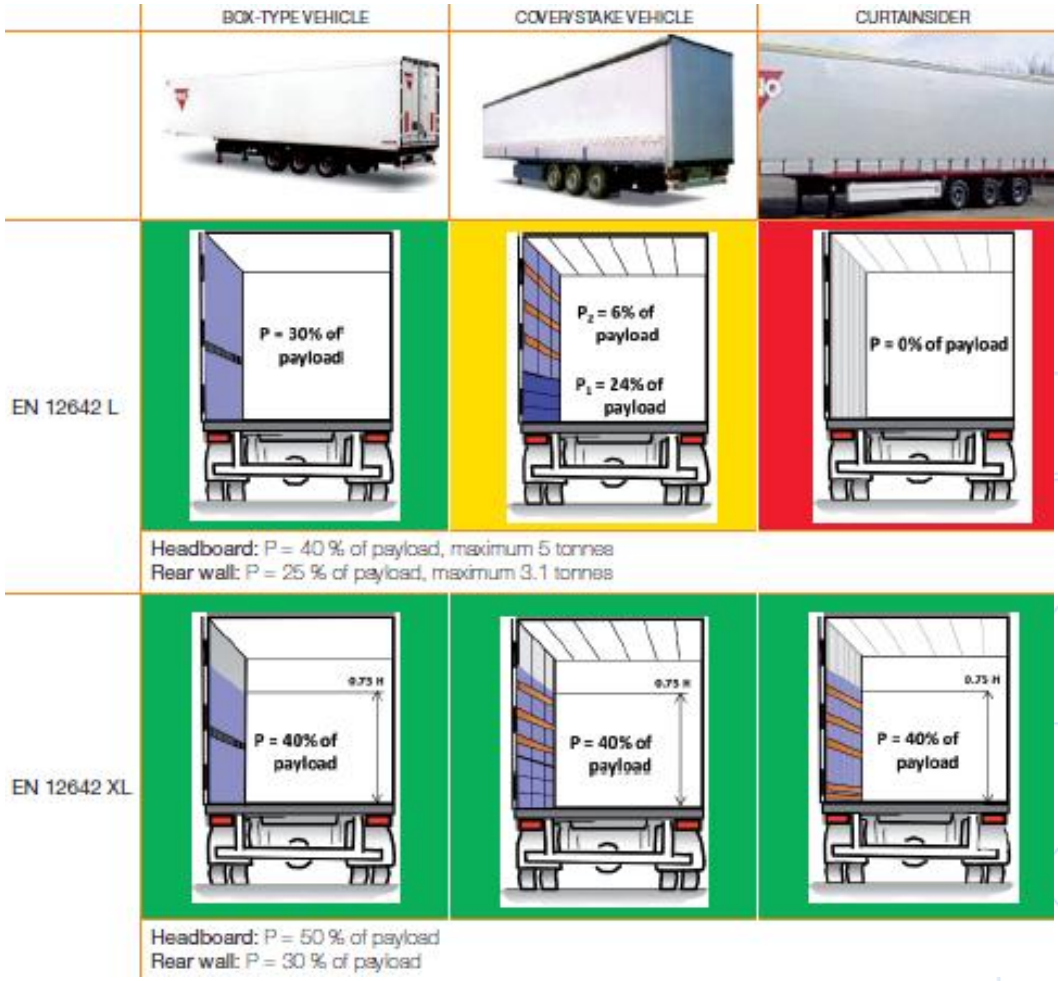
Load distribution

Road transport vehicles are particularly sensitive regarding the position of the centre of gravity of the loads, due to specified axle loads.

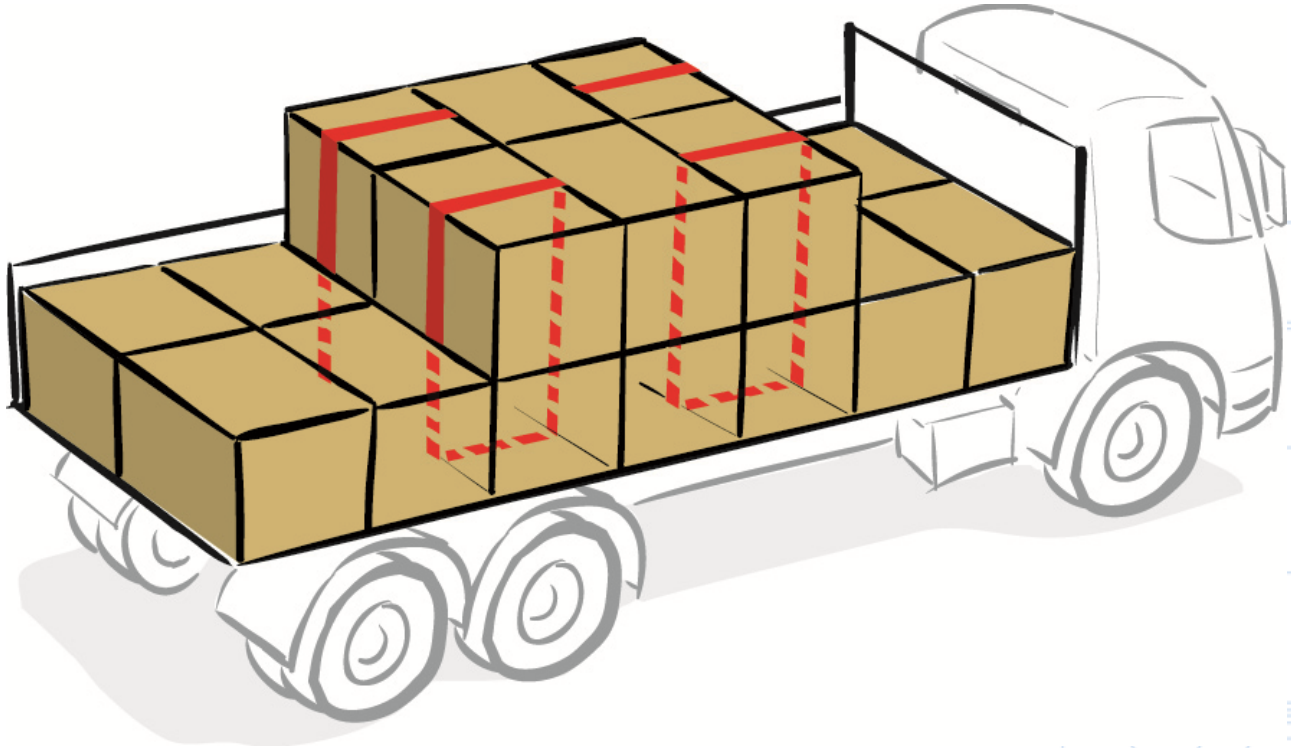




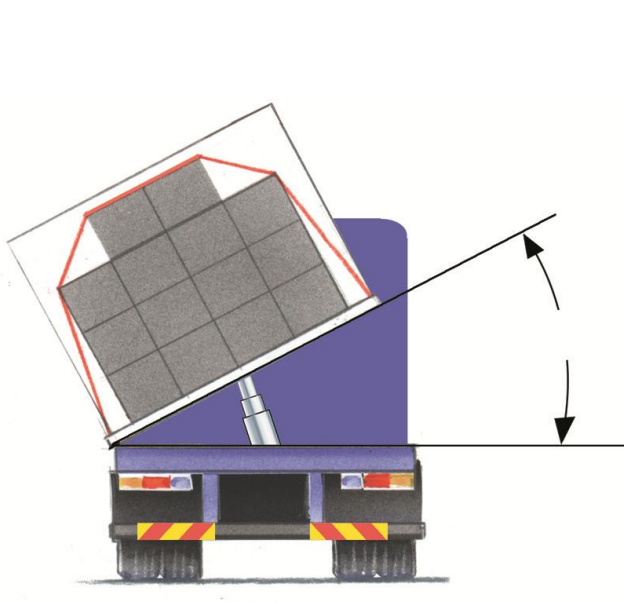
Vehicle structures / Estructura del vehiculo

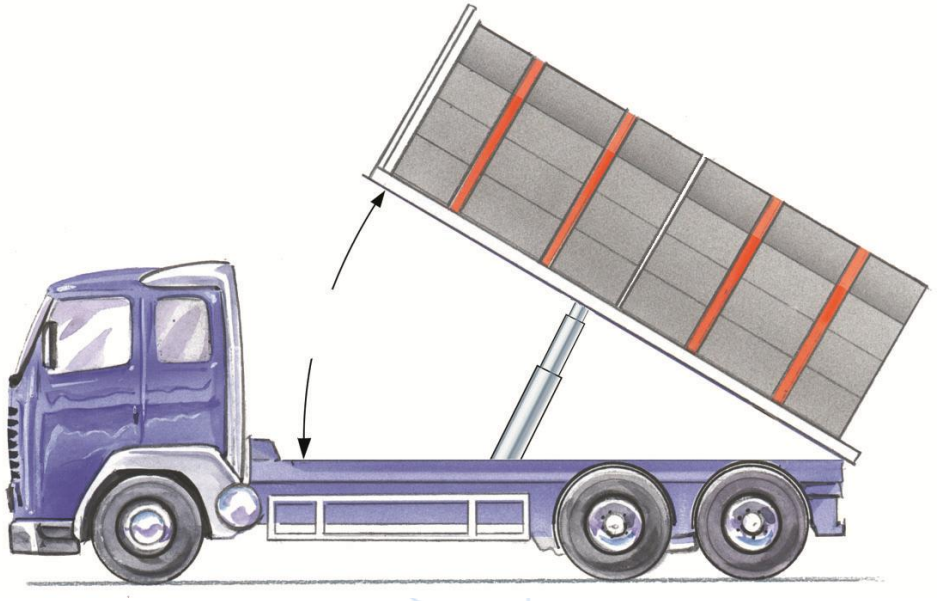


Headboard



Packaging





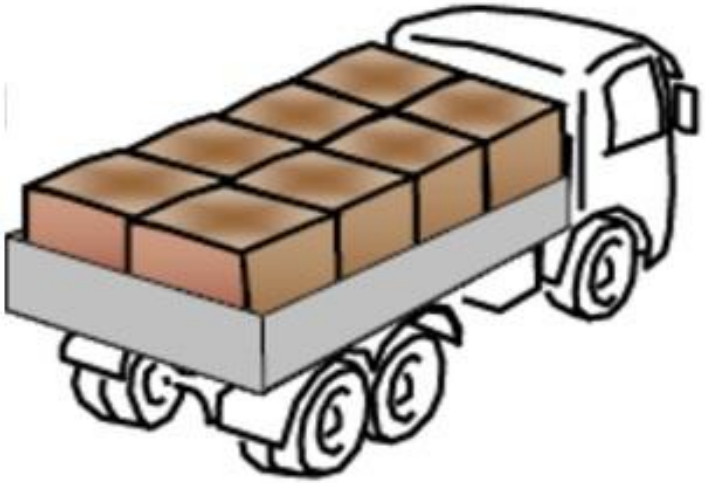
Restraining methods

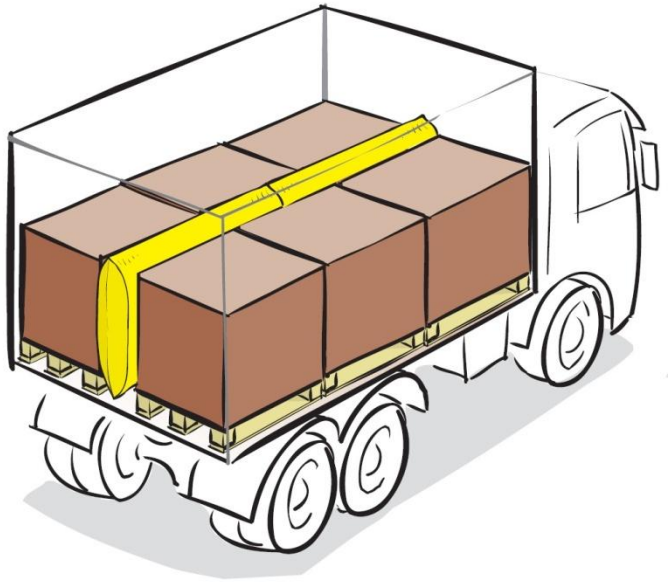
Restraining methods are principally

- locking
- blocking
- direct lashing
- top-over lashing
- combinations of methods in conjunction with friction

Blocking

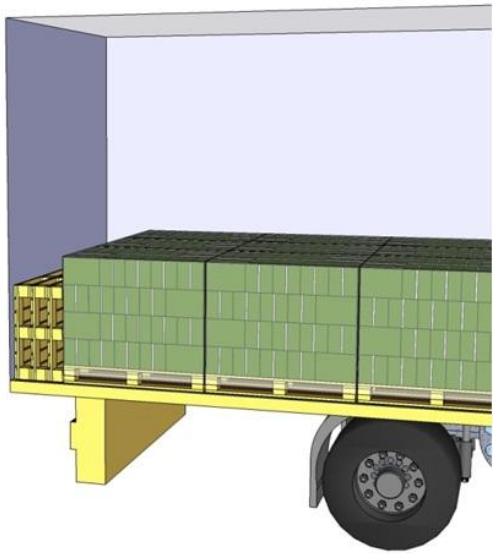
Blocking by headboard and sides



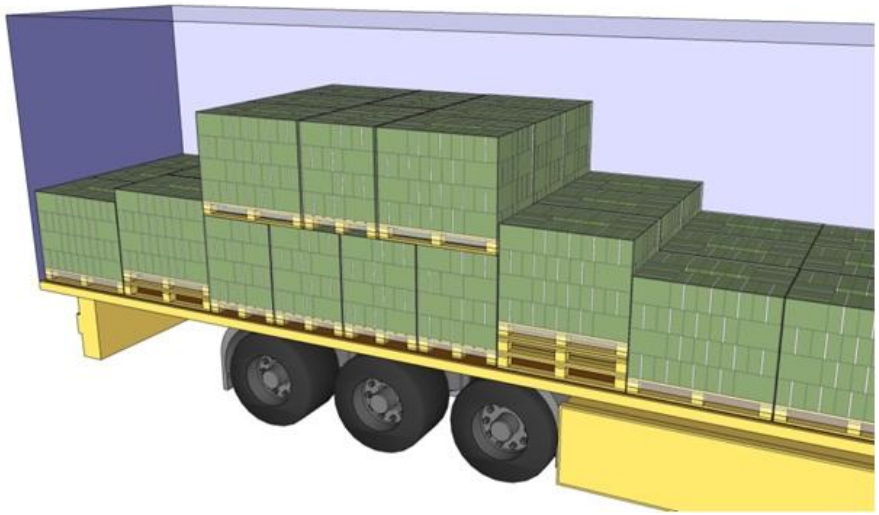


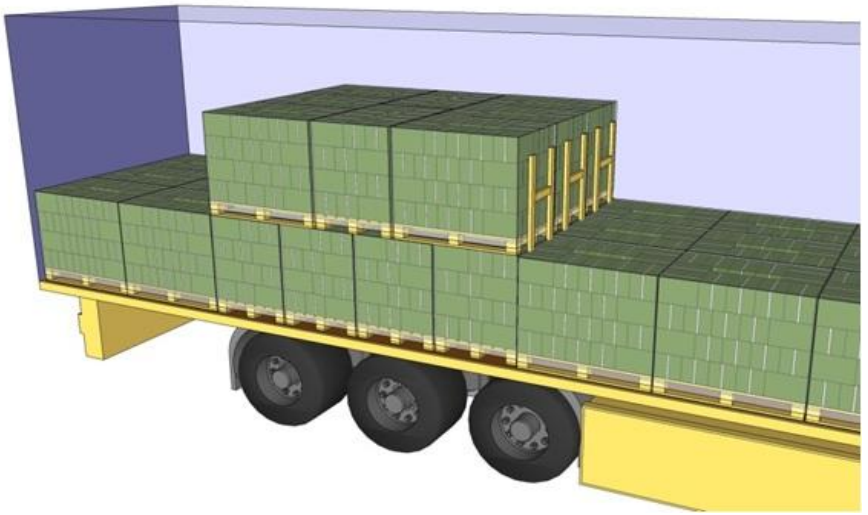
Blocking with filler between the rows of load

Blocking



Blocking with pallets in rear direction





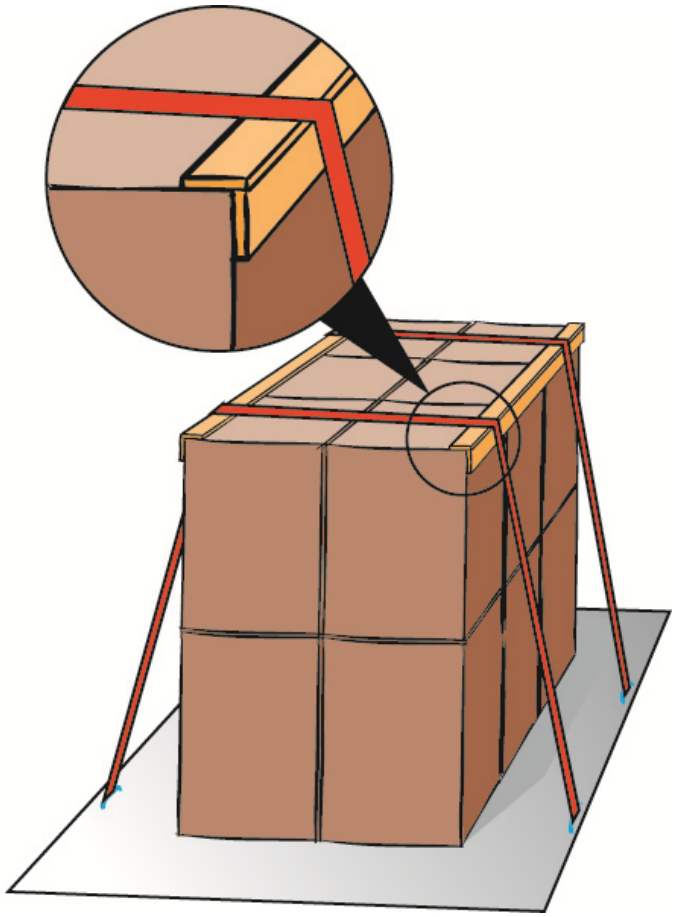
Threshold blocking or panel blocking

Lashing equipment

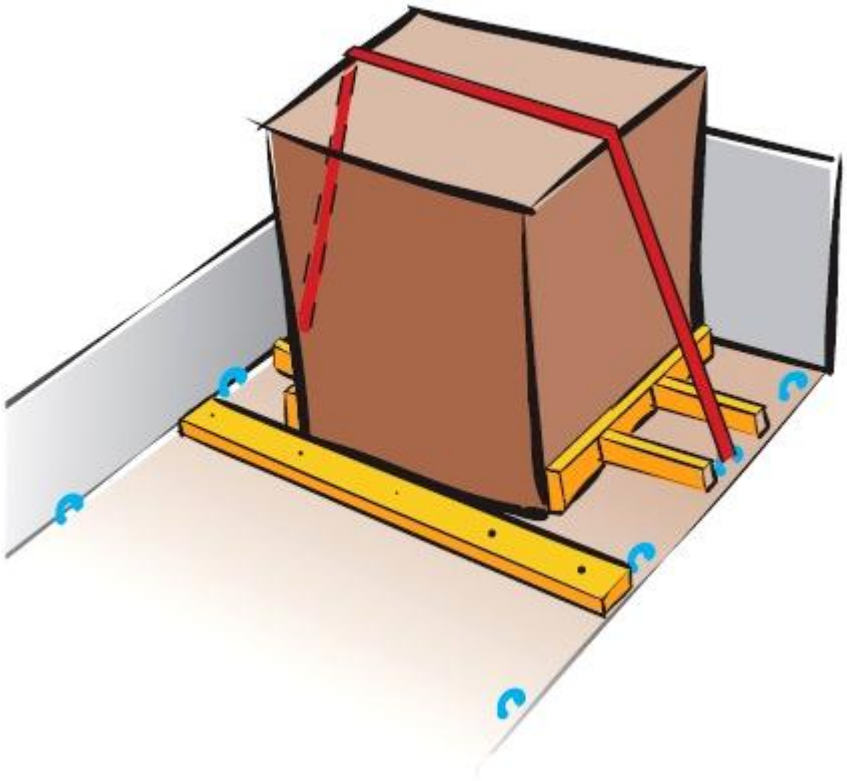
- ✓Webbing assemblies
- ✓Chain
- ✓Wire rope
- ✓Nets or covers with lashings
- ✓Ropes
- ✓Blocking boards

Supporting equipment

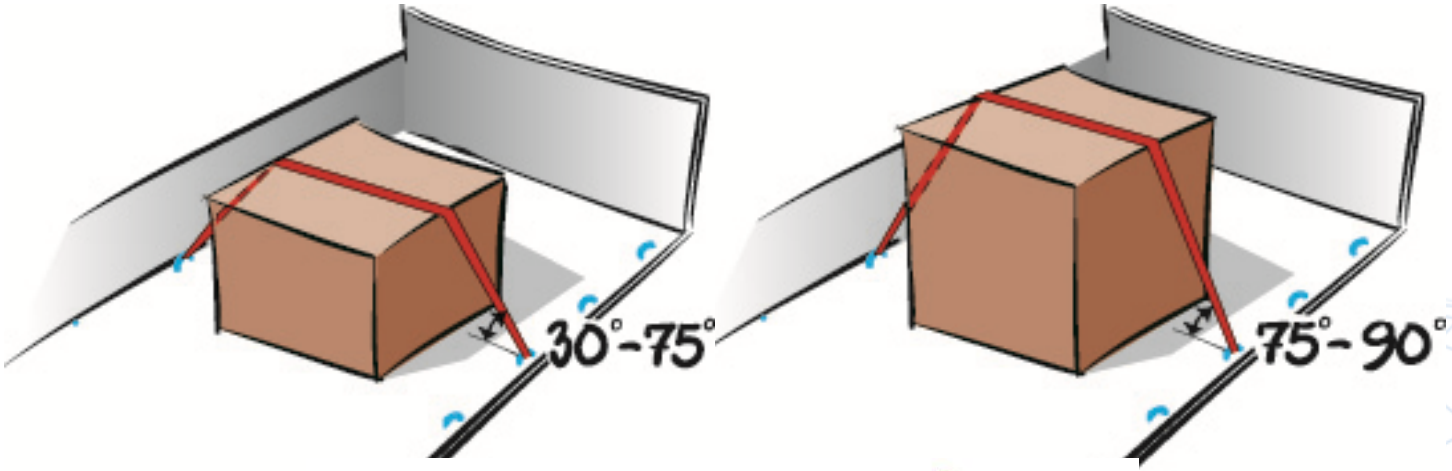
- ✓Friction mats
- ✓Wood runner
- ✓Shrink film and stretch film
- ✓Steel or plastic band straps
- ✓Edge beams protector (aluminium, plastic, wood)
- ✓Protective spacers
- ✓Tag washers

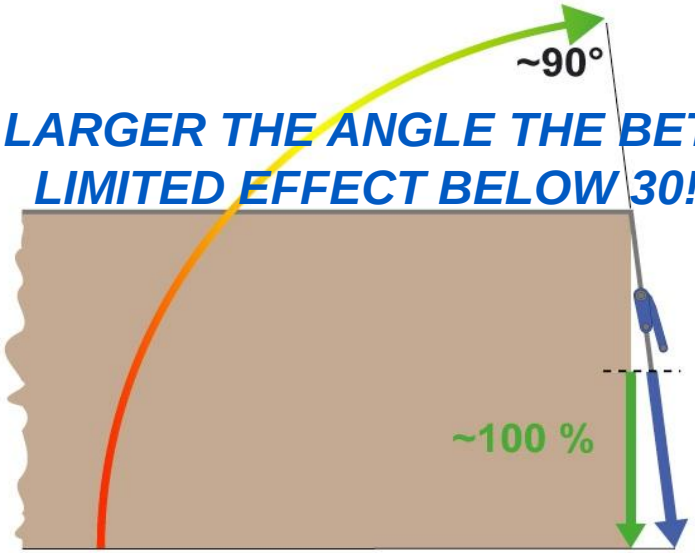


Lashing method



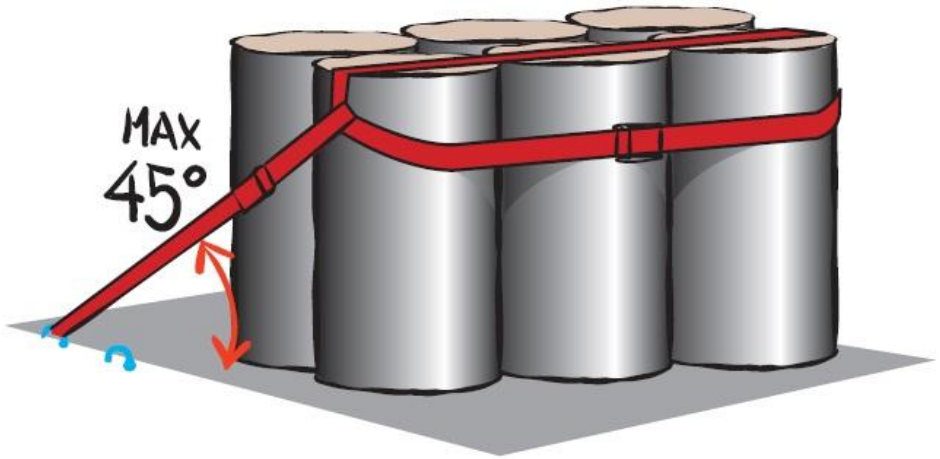
Top-over lashing

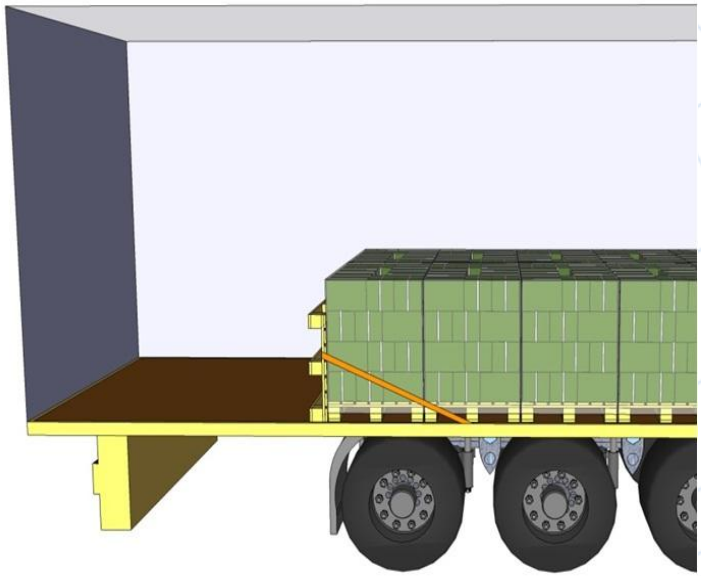




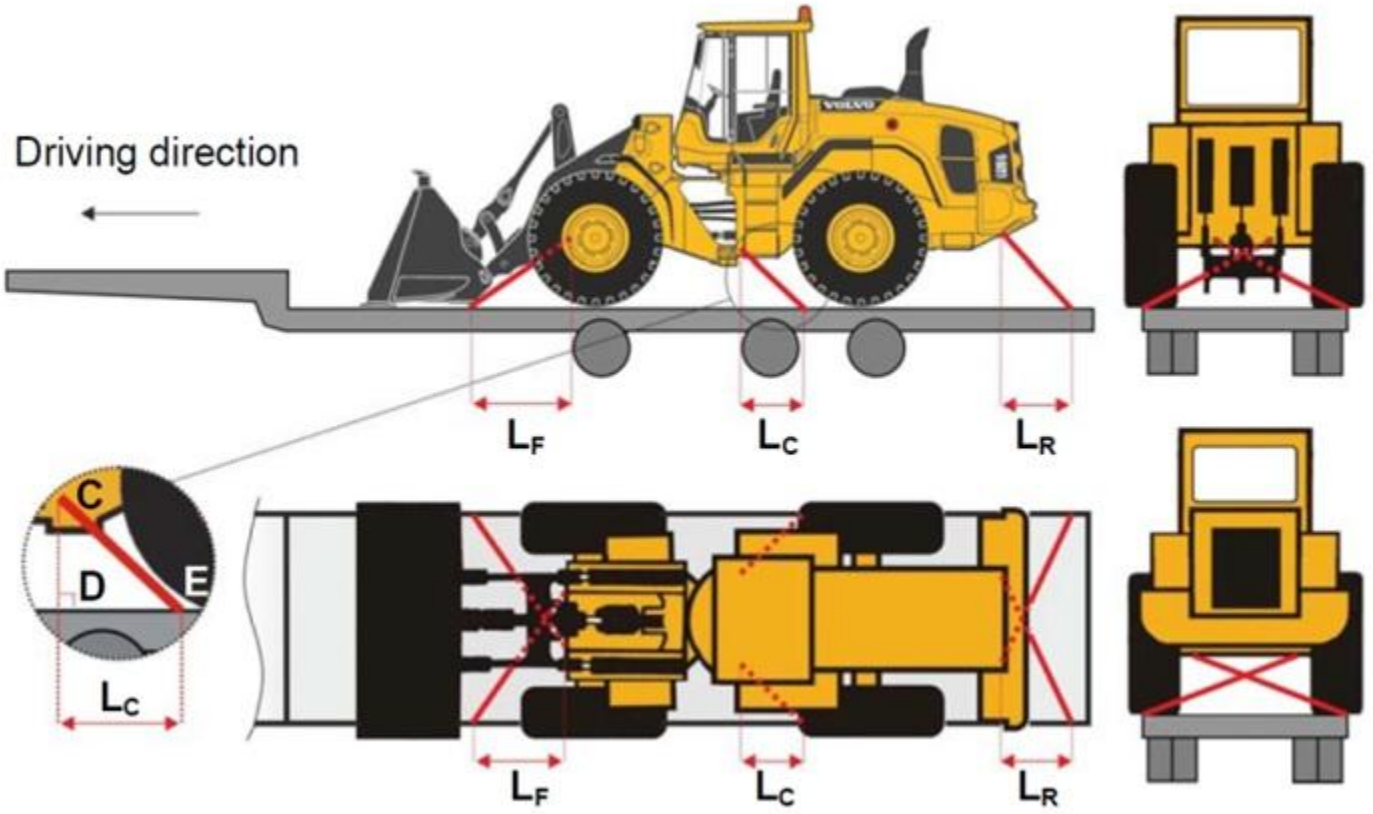
THE LARGER THE ANGLE THE BETTER!
LIMITED EFFECT BELOW 30!

Spring lashing

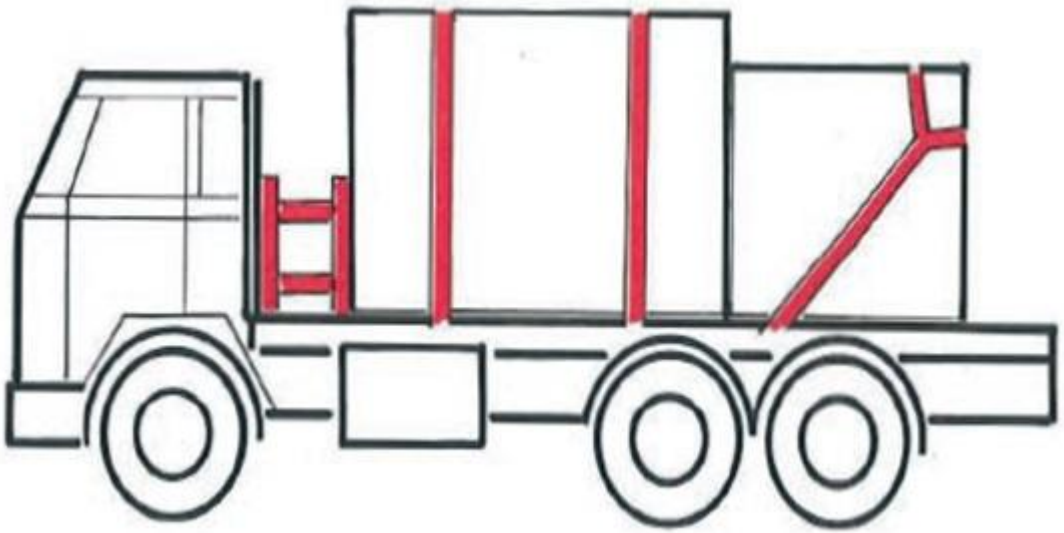




Direct lashing



Combination of load securing methods



Calculation examples

Load prevented from sliding by top-over lashings

EQ10

$$m = \frac{n \cdot 2 \cdot \mu \cdot \sin\alpha \cdot F_T}{g(c_{x,y} - \mu \cdot c_Z) f_s}$$

Load weight prevented from sliding forward by spring lashings

EQ35

$$m = \frac{2 \cdot n \cdot F_R \cdot (\mu \cdot f_\mu \cdot \sin\alpha + \cos\alpha \cdot \cos\beta)}{g \cdot (c_x - \mu \cdot f_\mu \cdot c_z)}$$

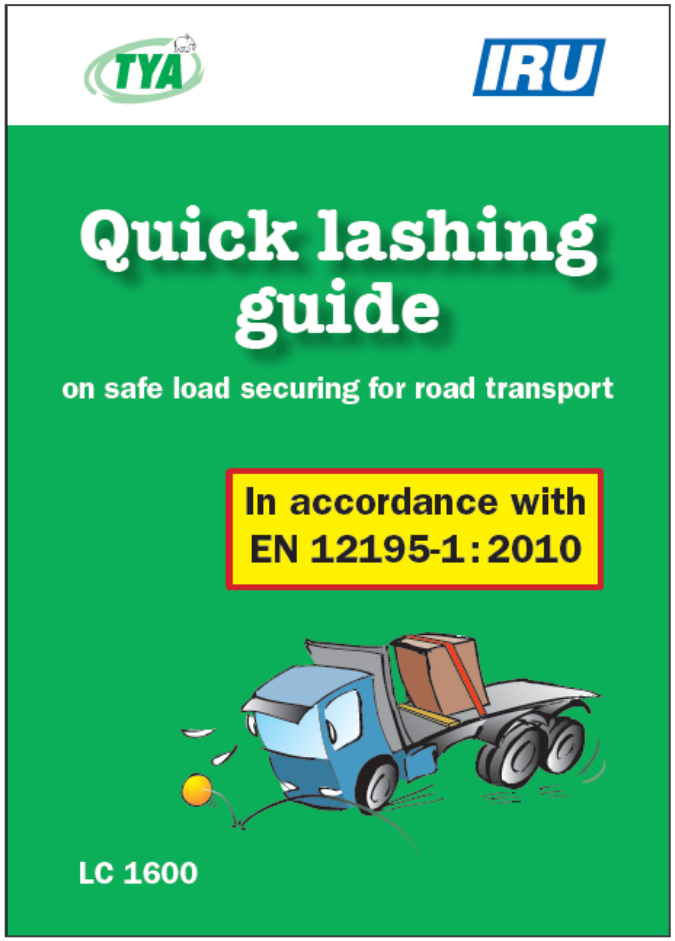
Check of load securing

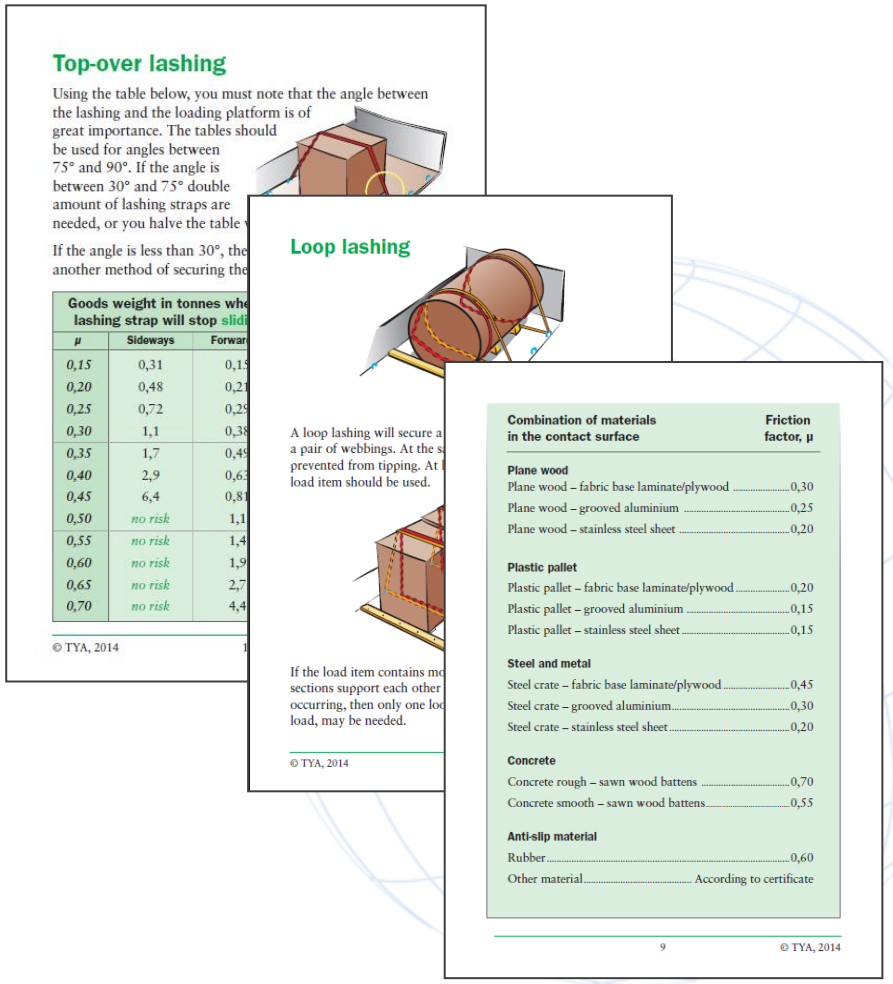
DEFICIENCIES	
Related to the load:	a. Transport packaging does not allow proper load securing b. One or more load units are not properly positioned
Related to the vehicle and the equipment:	a. The vehicle is not suitable for the load b. Obvious defects in the vehicle superstructure c. Certificates of vehicle parts that are effectively used, are not available, are false or show insufficient strength d. Securing equipment that is effectively used, does not comply with relevant standards
Related to the securing method:	a. Securing is insufficient, but can be corrected b. Securing is insufficient and cannot be corrected with available equipment c. Expert advice is required to assess the effectiveness of the load securing system

Training in loading and load securing

All persons should receive instruction, information and training on safe loading and securing practices

Quick Lashing Guide





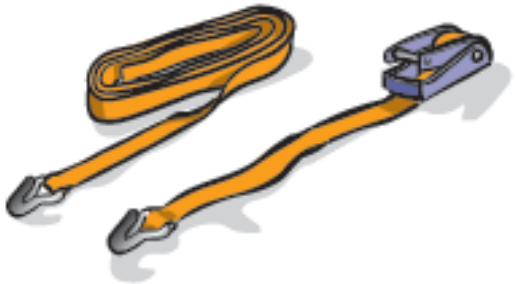
Lashing equipment

Values in this guide have been calculated on the assumption that the;

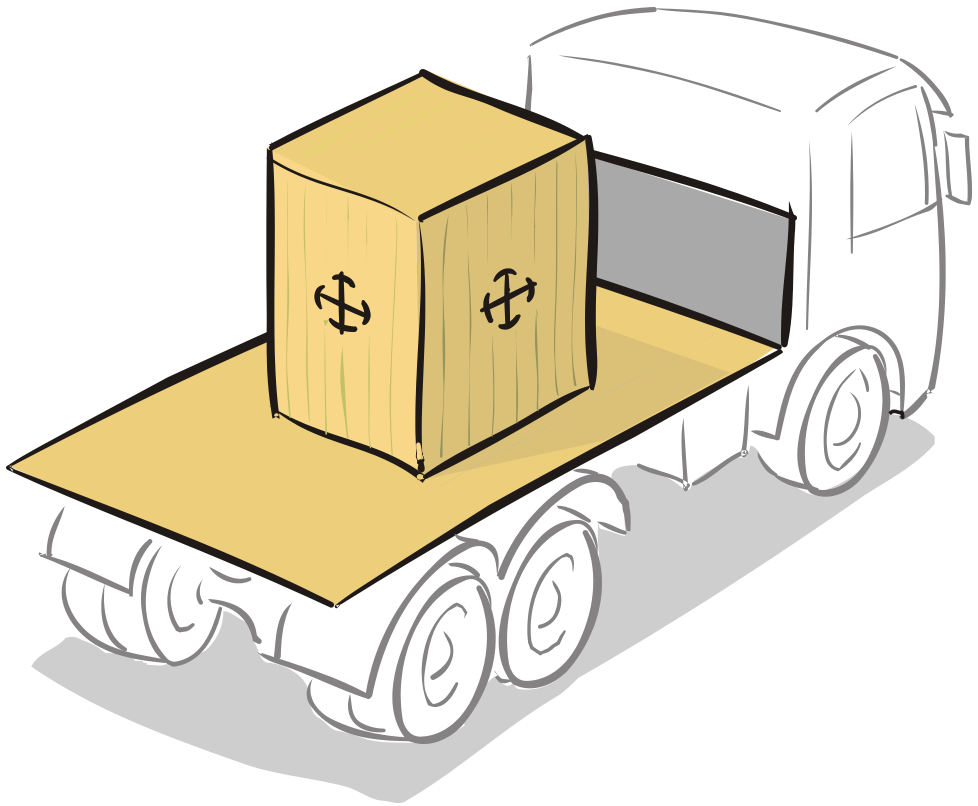
... *lashing points* resist 2000 daN (2 tonnes under stress)

... *webbings* have a Lashing Capacity (LC) of 1600 daN (1.6 tons under stress)

... *webbings* with S_{TF} = 400 daN (tightened to 400 kg).



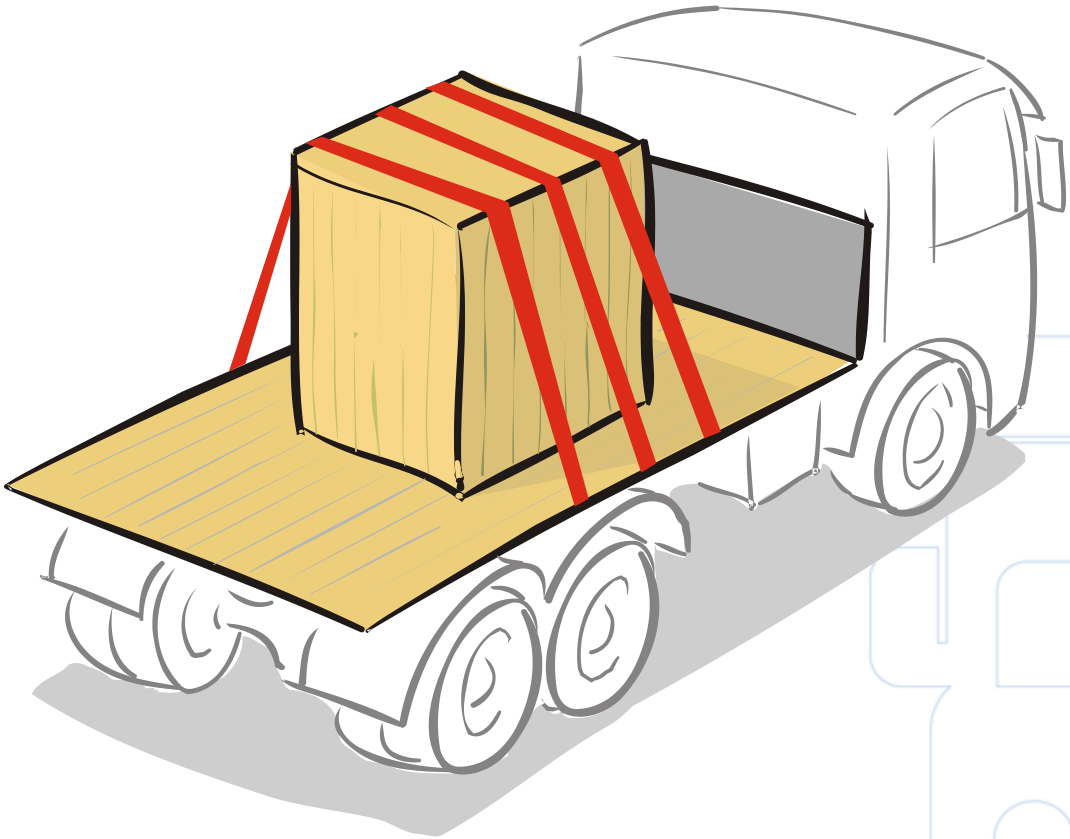
Wooden box / plywood platform



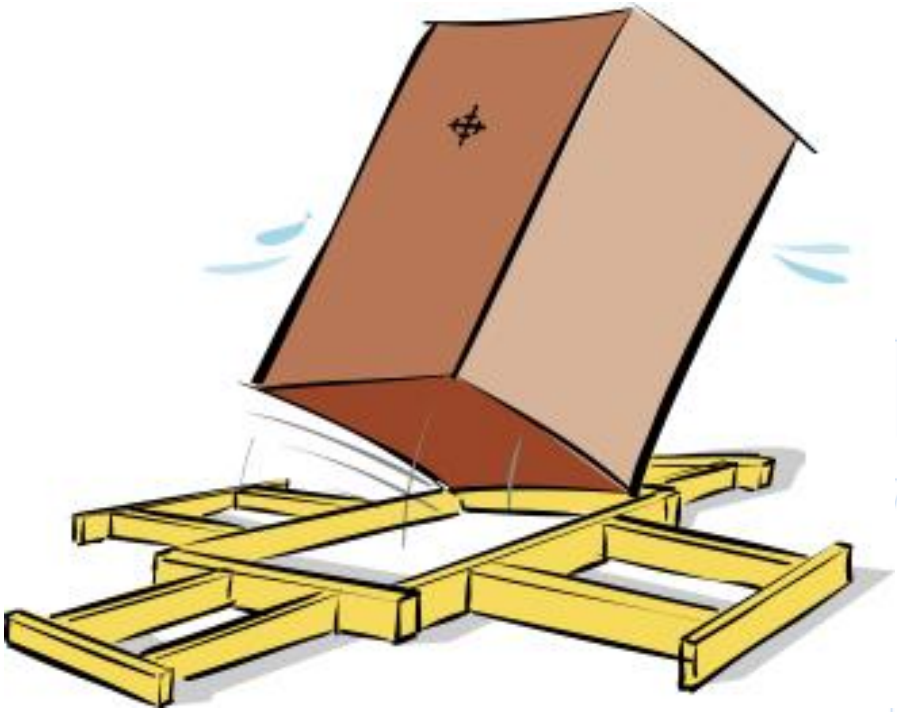
- Weight 2,2 ton
- Length 2,0 m
- Breadth 2,0 m
- Height 2,4 m

Combination of materials in the contact surface	Friction factor, μ
Sawn wood	
Sawn wood – fabric base laminate/plywood	0,45
Sawn wood – grooved aluminium	0,40
Sawn wood – shrink film	0,30
Sawn wood – stainless steel sheet	0,30

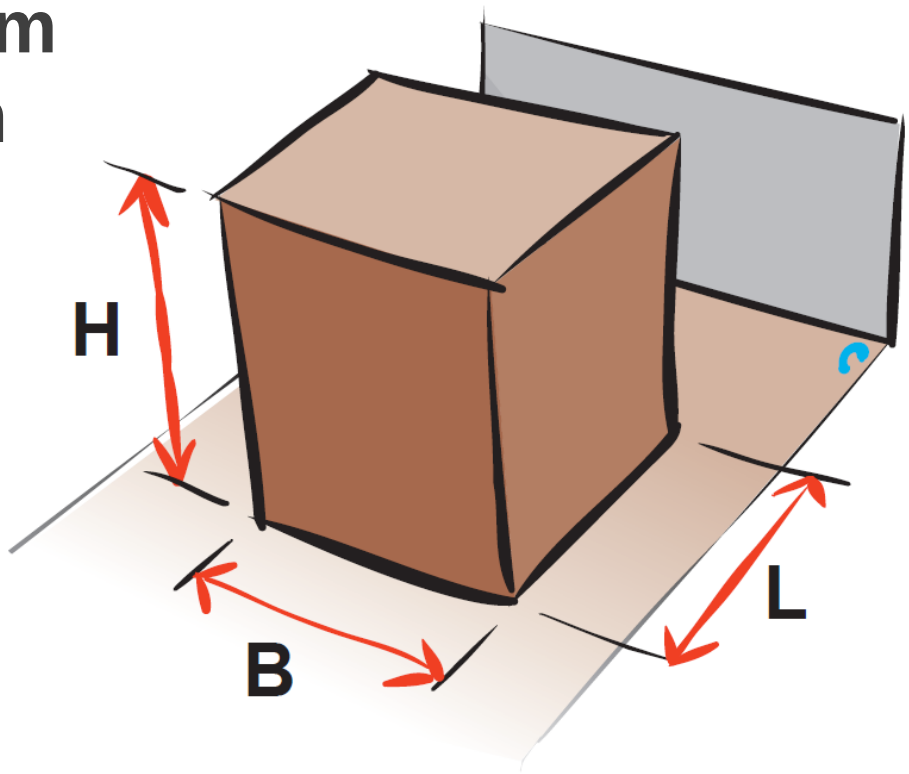
Goods weight in tonnes where one top-over lashing strap will stop sliding movements			
μ	Sideways	Forwards	Towards the rear
0,15	0,31	0,15	0,31
0,20	0,48	0,21	0,48
0,25	0,72	0,29	0,72
0,30	1,1	0,38	1,1
0,35	1,7	0,49	1,7
0,40	2,9	0,63	2,9
0,45	6,4	0,81	6,4
0,50	no risk	1,1	no risk
0,55	no risk	1,4	no risk
0,60	no risk	1,9	no risk
0,65	no risk	2,7	no risk
0,70	no risk	4,4	no risk



Tipping



- Weight 2,2 ton
- Length 2,0 m
- Breadth 2,0 m
- Height 2,4 m

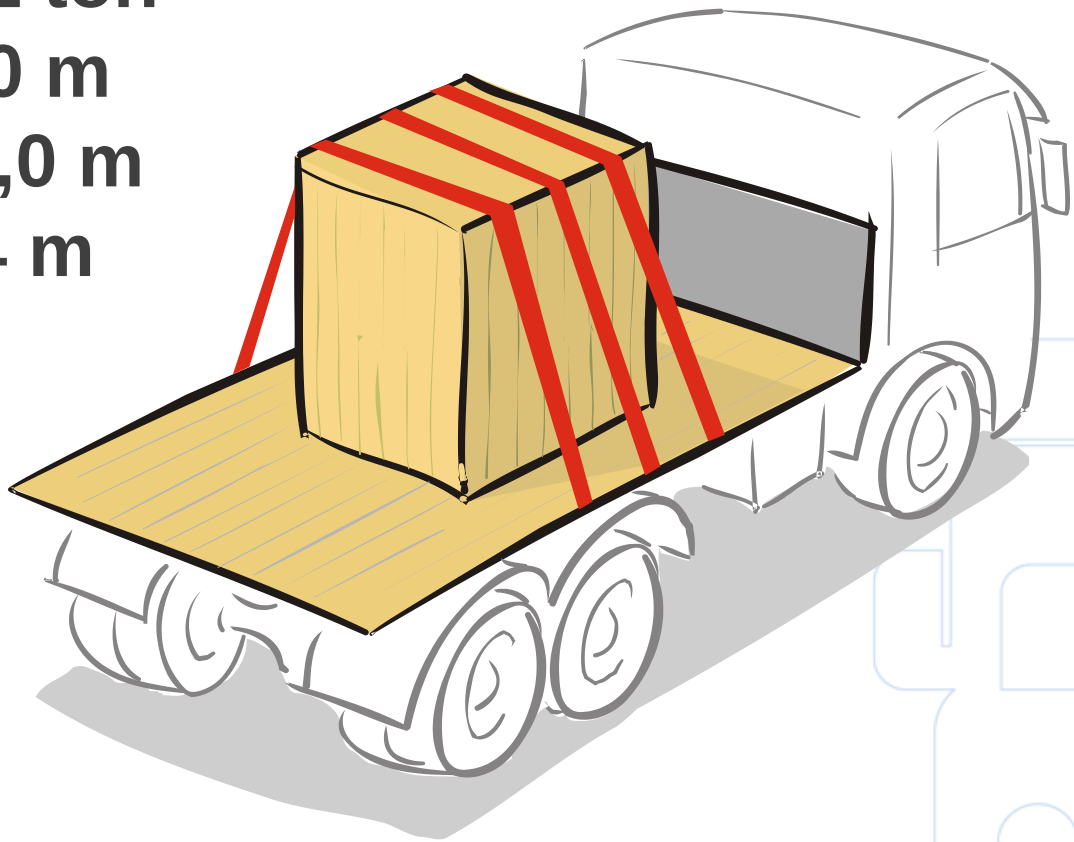


Load weight in tons where one top-over lashing strap will stop tipping motion

H/B	Sideways 1 row	2 rows	3 rows	4 rows	5 rows
0,6	no risk	no risk	no risk	5,8	2,9
0,8	no risk	no risk	4,9	2,1	1,5
1,0	no risk	no risk	2,2	1,3	0,97
1,2	no risk	4,1	1,4	0,91	0,73
1,4	no risk	2,3	0,99	0,71	0,58
1,6	no risk	1,5	0,78	0,58	0,49
1,8	no risk	1,1	0,64	0,49	0,42
2,0	no risk	0,90	0,54	0,42	0,36
2,2	4,5	0,75	0,47	0,37	0,32
2,4	3,3	0,64	0,42	0,33	0,29
2,6	2,4	0,56	0,37	0,30	0,26
2,8	1,8	0,50	0,34	0,28	0,24
3,0	1,4	0,45	0,31	0,25	0,22
3,2	1,2	0,41	0,29	0,24	0,21

H/L	For-wards	Towards the rear
0,6	no risk	no risk
0,8	no risk	no risk
1,0	no risk	no risk
1,2	no risk	no risk
1,4	5,3	no risk
1,6	2,3	no risk
1,8	1,4	no risk
2,0	1,1	no risk
2,2	0,83	7,2
2,4	0,68	3,6
2,6	0,58	2,4
2,8	0,51	1,8
3,0	0,45	1,4
3,2	0,40	1,2

- **Weight 2,2 ton**
- **Length 2,0 m**
- **Breadth 2,0 m**
- **Height 2,4 m**



Other lashing equipment

Values for LC and S_{TF} are marked on the lashing equipment.

If the LC for a chain is not known, the LC can be set to 50% of the breaking load.

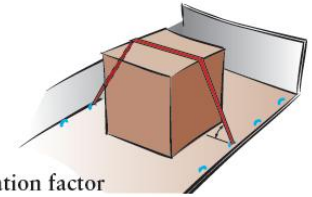
Recalculating

If equipment with a different capacity to LC 1600 or S_{TF}400 are used, the figures in the sliding and tipping tables have to be multiplied with the following factors.

When recalculating, never use larger LC or S_{TF} than the lashing points can hold.

Methods

Top-over lashing



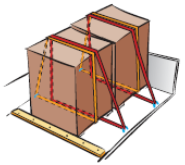
For sliding:

$$\frac{\text{Actual } S_{TF}}{400} = \text{Multiplication factor}$$

For tipping the smallest of the following factors shall be used:

$$\frac{\text{Actual } S_{TF}}{400} \text{ or } \frac{\text{Actual LC}}{1600} = \text{Multiplication factor}$$

Loop lashing

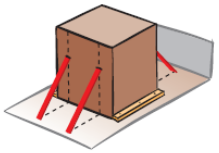


$$\frac{\text{Actual LC}}{1600} = \text{Multiplication factor}$$

Spring lashing

$$\frac{\text{Actual LC}}{1600} = \text{Multiplication factor}$$

Direct lashing



$$\frac{\text{Actual LC}}{1600} = \text{Multiplication factor}$$

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