February 2017

LOAD SAFETY SERIES

Information Sheet

Safe Load Securing on Curtain-sided Vehicles

Unsecured loads on curtain-sided vehicles injure many people every year. It's easy to assume that a heavy load or a very light load either won't move or won't cause a problem if it does, and it can seem like a waste of time and money to strap a load down for a short journey. The reality is that loads can and do move, however carefully you drive. Load shifts can damage the goods you're carrying, along with your vehicle, and put your life and other people's lives at risk.

What the Law requires

Load securing is covered specifically by Road Traffic legislation, which requires that loads carried by vehicles must be properly secured at all times. It is an offence for a vehicle to be overloaded or to discharge material onto the public road[1].

Occupational Health and Safety legislation[2] also applies to load securing. Employers have a legal duty to:

- make sure systems of work are planned, performed and maintained for securing and transporting loads;
- provide drivers and loading / unloading staff with instruction, information and training about securing loads;
- make sure that adequate equipment is provided and maintained for securing loads; and
- have appropriate plans and procedures in place in the event of an emergency such as a load shifting.

The law also requires that employers co-operate, so where several parties are involved in ensuring the safe transport of a load, there should be adequate co-ordination and co-operation between the parties and clear responsibilities laid down.

Figure 1. Mega-Liner Variofloor curtain-sider[3]

Restraint Equipment

Loads can be restrained by two basic methods, 'tie-down' or 'direct restraint'.

Tie-down is when the load is prevented from moving by friction only, also called a 'frictional lashing'. It is an indirect method of restraint.

Direct restraint is when the load is prevented from moving by containing, blocking or attaching it to the vehicle.

[1] *S.I. No. 190/1963: ROAD TRAFFIC (CONSTRUCTION, EQUIPMENT AND USE OF VEHICLES) REGULATIONS, 1963, Reg 96*
[2] *Safety, Health and Welfare at Work Act 2005 (No.10 of 2005)*
[3] *Courtesy of KRONE-UK*

HEALTH AND SAFETY AUTHORITY
www.hsa.ie

www.garda.ie

RSA
Údarás Um Shábháilteacht Ar Bhóithre
Road Safety Authority
www.rsa.ie

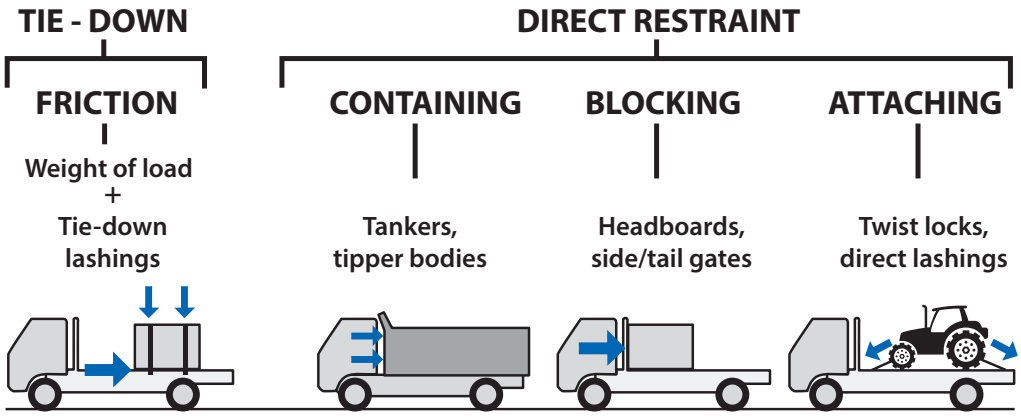

Figure 2. Load restraint methods (To control forward + rearward motion)

The load restraint system should be able to withstand:

- 80 percent of the payload weight in the forward direction,
- 50 percent of the payload weight in the sideways direction, and
- 50 percent of the payload weight in the rearward direction.

For sea travel additional requirements apply. Refer to EN12195.

In certain circumstances, vertical movement of the load may occur. This movement should be resisted by the restraint system in use. The system should be able to withstand:

- 20 percent of the payload weight vertically upwards.

Figure 3. Unacceptable, unsecured pallets within a curtain-sided vehicle.
***Note**: evidence of load shift during transit*

Webbing straps and ratchets

When designing a direct restraint system and deciding the required number of restraints, it is the lashing capacity (LC) and not the breaking force which must be taken into account. When designing an indirect (tie-down) restraint system, it is the standard tension force (STF), not the lashing capacity of the strap, which is relevant for the calculation of the number of straps needed.

Lashing capacity = *Maximum allowable tension in the strap.*

Breaking force = *Maximum force the web lashing withstands when tested complete with ratchet and end fittings.* The breaking force of the lashing assembly will be twice the lashing capacity.

- Lashing capacity is NOT to be mistaken for the allowable weight of product the lashing can safely restrain.
- A 2-tonne lashing capacity webbing strap will be denoted by LC 2000daN.
- A 2-tonne lashing capacity webbing strap will typically allow an STF of 300 – 600kg[4].

[4] *The lashing points should comply with EN 12640*

Lashing capacity	**LC.... daN**
Standard hand force* Standard tension force	**S_{HF} 50 daN** **S_{TF} .... daN**
Webbing material	**POLYESTER**
Length	**...m**
	"NOT FOR LIFTING"
Name of manufacturer or supplier	
Manufacturer's traceability code	**CODE NR #### ####**
Year of manufacture	**DD MM YYYY**
Standard	**BS EN 12195-2**

Figure 4. Standard data on web strap label

Requirements for webbing straps

- Straps should comply with the EN12195-2 standard, identified by a label on the web strap and a classification on the ratchet.
- The strap should have a hand-operated ratchet tensioner.
- Straps should be long enough for the securing method.
- Straps should be visually inspected before every journey.
- Straps with holes, tears or fraying should be thrown away.
- The end fitting of the strap (web lashing) should be suitable for the type of lashing point used.
- For best securing performance they should be attached to suitably rated lashing points on the vehicle.
- Where no lashing points are fitted, they can be attached directly to the vehicle chassis or rave (this is not ideal as it can allow for movement & loss of tension).
- Never attach straps to rope hooks.

WARNING: Do not use mechanical aids such as levers or bars, unless the tensioning device is specially designed to be used with them.

Number of lashings needed

The number of lashings required can be calculated using the procedures outlined in the EN 12195-1 standard[5]. This will depend on the nature of the load (weight, dimensions, centre of gravity), the static friction between the load and the load bed, the securing method used (direct, indirect or a combination of both) and the rated capacity of the lashings used.

Best practice for safe transport of palletised loads

Curtain-sided trailers are essentially flatbed trailers with a weather-protection structure mounted on the bed of the trailer. They allow goods to be transported and protected from the weather, as well as providing the advantage of easy access to the sides of the trailer for loading and unloading.

As a general rule, goods carried within curtain-sided vehicles should be secured as if they were being carried on a flat, open-bed vehicle. If the loading configuration or its securing would cause concern when used on an open vehicle, then it should be considered equally unacceptable with a curtain-sided vehicle.

Unless the entire trailer has been purposely designed according to EN12642-XL, the curtains of curtain-sided vehicles **MUST NOT** be considered as part of any load restraint system. If the curtains have been designed as a restraint system under this standard, the load capability of XL vehicles should be clearly marked on the vehicle structure.

Some operators believe that they can simply retro-fit EN12642-XL rated load-bearing curtains to existing non rated trailers. However EN12642-XL rated curtains *do not exist* in isolation as the rating refers to the bodywork as a whole (vehicle structure + curtain).

[5] *For detailed calculations refer to EN 12195 and associated guidance*

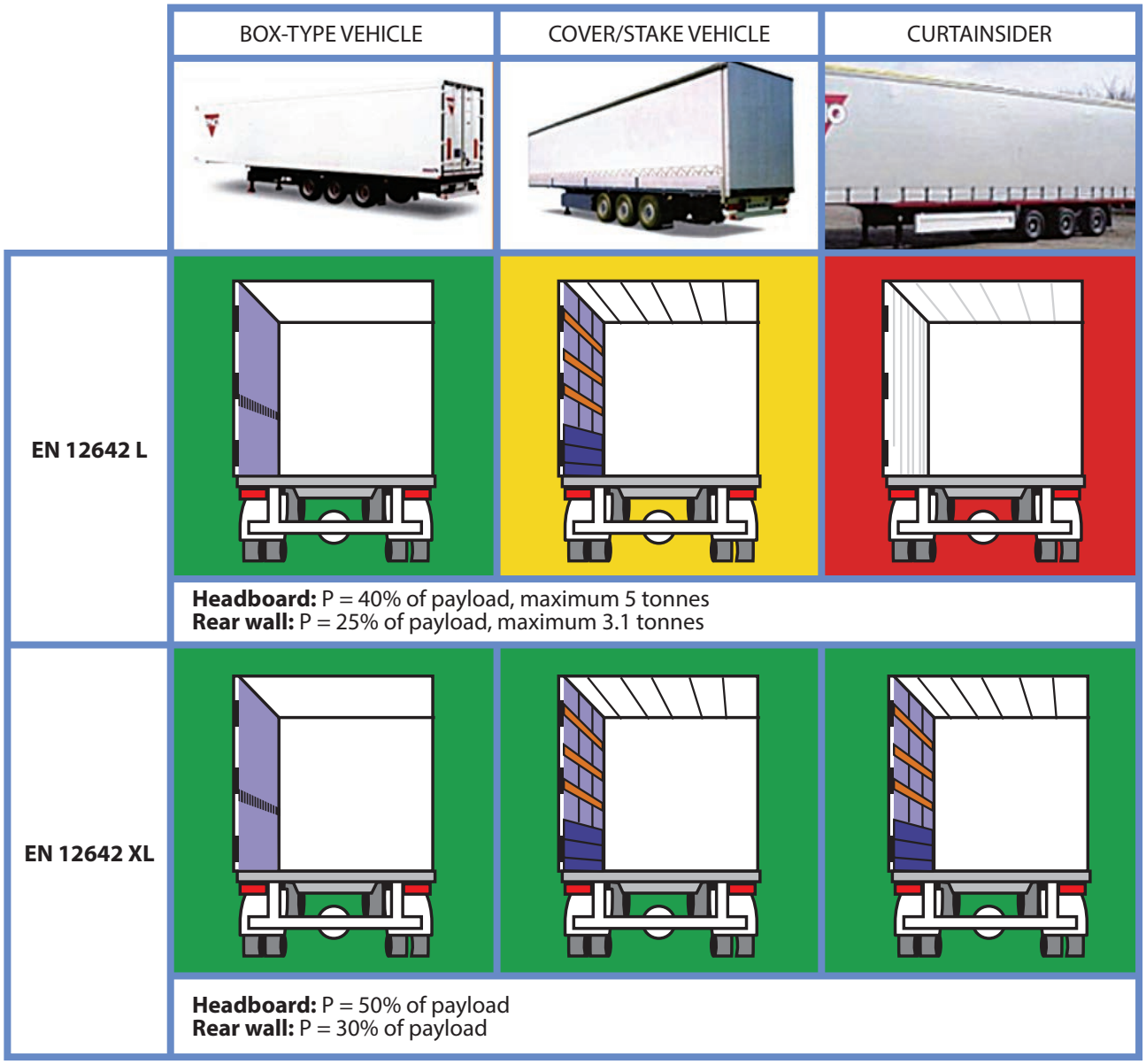

Figure 5. Strength properties of different cargo transport units (CTUs)

The vehicle types marked in green have strong side walls, the yellow marked vehicles have sides for bottom blocking only and the sides of the red marked vehicles are to be **regarded as weather protection only**.

Figure 6. Example of XL marking on vehicle body

Even though palletised loads can be heavy, the weight of the load alone cannot not be relied on to hold it in place. If the load lifts off the bed, even momentarily, static friction is lost. Therefore friction alone cannot be relied on to hold a palletised load in place. For this type of load the use of the 'tie-down' method on its own is not recommended, as it relies on the combined friction generated by the weight of the load and the 'tie-down' force of the lashings alone.

The appropriate method to secure loads on a curtain-sided vehicle is using a combination of the 'tie-down' and 'direct restraint' methods using suitable lashings (to increase friction), suitable headboard, restraint bars and or side rails (to provide blocking). Securing can be further assisted by the use of 'anti-slip' load matting between the load and the load bed to ensure maximum coefficient of friction values are achieved for the calculation of the number of lashings, and to reduce the number of lashings required.

Blocking the load, sometimes called positive fit, only works if the gaps between the load and the vehicle structure are small (less than 15cm[6])

Figure 8. Example of an edge protector spreading the tie-down force on a unitised pallet load.

Note: *the rear temporary partition fitted to block the load*

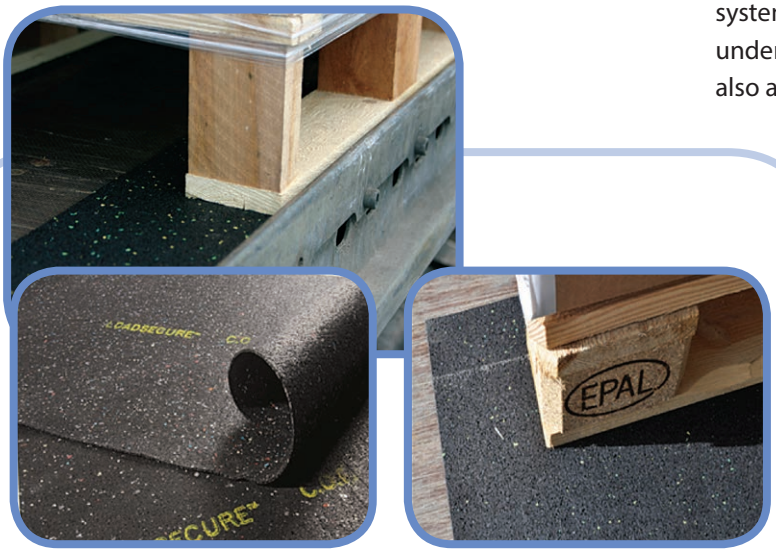

Figure 7. Examples of 'Anti-slip' friction matting and its application

Edge protectors should be used to protect straps from sharp edges of unit loads and also to evenly spread the tie down forces on a unitised pallet (see Figure 8), preventing damage to the load. A protection sleeve may be useful to protect the strap from loads which can cause abrasion or contamination. Failure to protect the strap introduces the risk of strap failure and losing some or all of the restraint on the product.

Use of headboards

The front of the load unit should be placed so that it is against the headboard of the vehicle. This allows the headboard to become part of the load securing system by blocking the load from moving forward under braking or emergency conditions. This will also allow for fewer lashings being needed, than for a load loaded away from the headboard. The headboard should be strong enough to prevent the load from moving forward[7]. The headboard offers critical protection to the driver, and therefore the load should not be loaded above the height of the headboard unless precautions have been taken to stop it moving forward.

Figure 9. Not loaded to headboard = no blocking capacity

[6] See EU Directive 2014/47/EU on technical roadside inspections

[7] Best practice suggests that the strength of the superstructure should meet the requirements laid down in EN 12642 (L-XL). In addition, the end wall should be able to withstand 40% of the payload, up to a maximum of 50 KN

If it is not possible to load to the headboard or:

- there is no headboard fitted, or
- the headboard is of inadequate strength, or
- the load is designed for loading away from headboard, or
- for load weight distribution purposes

then there is a need to make sure that the load is well secured to stop it sliding forward uncontrollably.

Ideally suitable blocking or dunnage should be used to fill the gap. The type of blocking used will be dictated by the load carried and the size of the gap. The larger the gap the more robust the blocking would need to be. If the gap cannot be filled by blocking or dunnage then additional lashings will be needed to secure the load.

For further information and guidance visit www.loadsafe.ie

Some examples load securing methods on curtain-sided vehicles

Figure 10. Example of a load blocked back from front with timber dunnage

Figure 11. Kite type web strap-tarpaulin combination

Figure 12. Suspended strapping system in stowed position

Figure 13. Kite type web strap-tarpaulin combination

Figure 14. Suspended strapping system in stowed position