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LOAD SAFETY SERIES

Information Sheet

Safe Load Securing of Site Cabins and Prefabricated Accommodation Units

Due to their size, weight and configuration, consignments of site cabins and prefabricated accommodation units are high-risk loads. The consequences of load shift or load shed can be extremely serious. It is essential that units are not loaded in such a way that the vehicle or load could become unstable or the load could fall off the vehicle.

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 shift or load shed during transport.

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. Prefabricated building transport

Restraint Equipment

Requirements for site cabins and prefabricated accommodation units

Even though these load units 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 the 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.

[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)*

When site cabins or prefabricated accommodation units are based on a standard ISO Container footprint (20ft or 40ft), **best practice requires that these units should only be carried on vehicles fitted with Twist Locks.** Provided the twist locks are fully engaged and locked in position, the container will be adequately secured and no further restraint will be necessary.

For Non-ISO Container type cabins and prefabricated accommodation units, the appropriate method to secure these loads is using a combination of the:

- 'tie-down' method using suitable lashings (to increase friction), and
- 'direct restraint' methods
  - suitable headboard (to provide blocking), and
  - straps or lashing chains used in a direct lashing capacity.

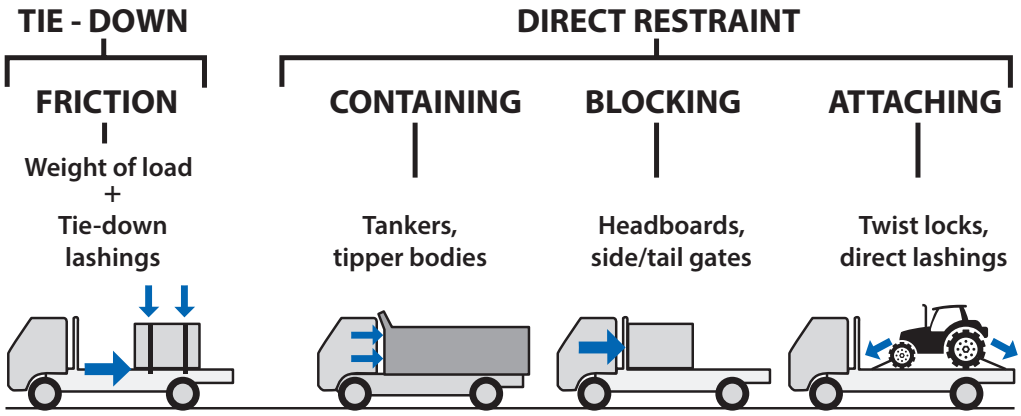


Figure 2. Load restraint methods (To control forward + rearward motion

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 must be resisted by the restraint system in use. The system should be able to withstand:

- 20 percent of the payload weight vertically upwards.

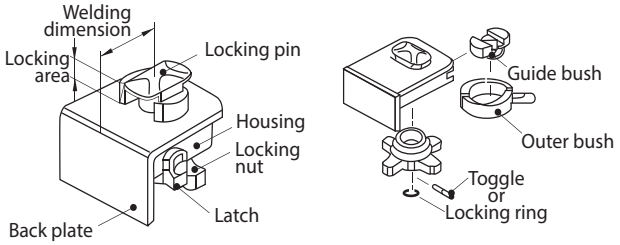
Twist locks (ISO Container based units only)

Site cabins and prefabricated accommodation units, with a mass of more than 5.5 tonnes should only be carried on vehicles fitted with twist locks[3]. Provided the twist locks are fully engaged and locked in position, the container will be adequately secured and no further restraint will be necessary. The twist locks should be maintained in a serviceable condition and a minimum of four should be used for each container carried. In most cases twist locks are fitted to the vehicle during manufacture but if fitted at a later stage, modifications to the chassis/structure should be carried out in accordance with the recommendations of the vehicle manufacturer. Twist locks should be regularly inspected for wear, damage and operation defects. Locking devices intended to prevent operating levers from moving during the journey should be given special attention.

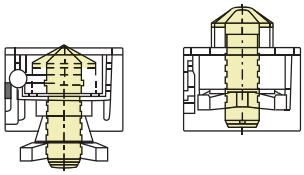
[3] *European Best Practice Guidelines on Load Securing for Road Transport*

Twist Locks

Twist Locks either can be lowered or cannot be lowered.



Structure of a twist lock ***Individual parts of a twist lock***



Retractable and non-retractable twist lock

Figure 3. Twist locks

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].

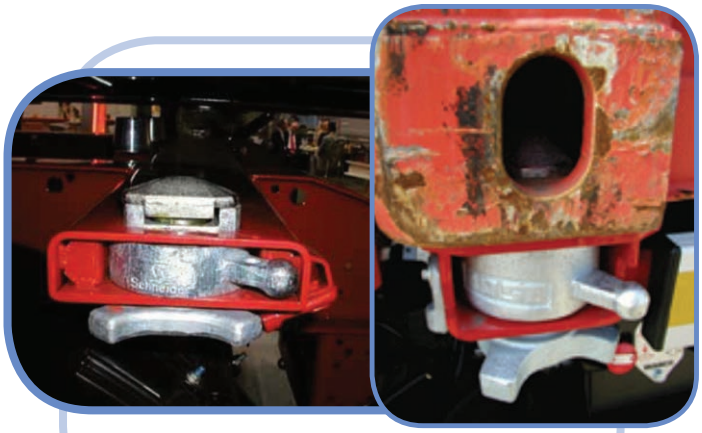


Figure 4. Twist locks fitted and in operation

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 5. Webbing strap with label description

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.

[4] The lashing points should comply with EN 12640

- 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) shoud be suitable for the type of lashing point used.
- They should be attached to suitably rated lashing points[4] not 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.

Edge protectors should be used to protect straps from sharp edges of unit loads. A protection sleeve is also recommended to protect the strap from 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.

Figure 6. Example of an edge protector

Transport chains and tensioners

When designing a restraint system using chains and determining the required number of restraints, it is the lashing capacity and not the breaking force which must be taken into account.

- Lashing capacity = *the maximum allowable tension in the chain.*
- Lashing capacity is NOT to be mistaken for the allowable weight of product the lashing can safely restrain.
- A 4-tonne lashing capacity chain will be denoted by LC 40kN.

Breaking force = *Maximum force the complete chain lashing, including load binder and connection components, can withstand.* The breaking force of the lashing assembly will be twice the lashing capacity.

Requirements

- Lashing chains should comply with the EN12195-3 standard, identified by means of a metal tag attached to the chain.
- Lashing chains should be visually inspected before every journey. Damaged or worn restraints, fittings or load binders must not be used.
- The use of spring links (over centre load binders) is not advised due to kick back hazard.
- The end fitting of the chain should be suitable for the type of securing point used.

Figure 7. Over centre load binder (not recommended

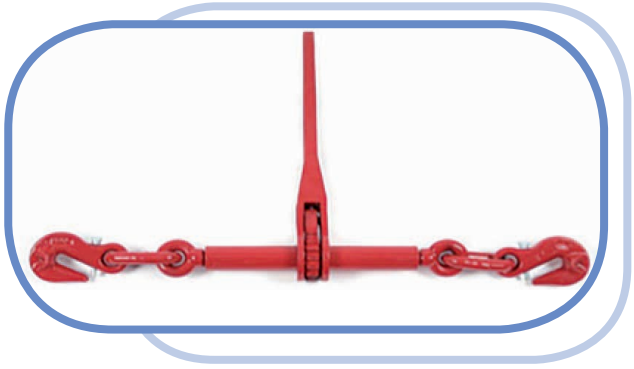


Figure 8. Bottle tensioner (recommended)

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.

WARNING: Because of different behaviour and elongation under load conditions, chain lashings and web lashings must not be used in combination to secure the same load.

Figure 9. Typical site cabin based on ISO Container footprint

The number of lashings required can be calculated using the procedures outlined in the EN 12195-1 standard . 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.

Vehicle Mounted Cranes

Vehicle mounted cranes are **not** designed to be a part of the load restraint system and cannot be used in calculating the number of lashings required. Lashings **should not** pass over the crane jib to assist in securing a load package. This procedure can lead to weakening of the crane structure creating a possible route to failure. The crane should be secured for transport in accordance with the manufacturer's operating instructions.

Note: In accordance with the requirements of legislation[6], vehicle mounted cranes are subject to an annual scheme of Thorough Examination by a competent person.

Best practice for safe transport of site cabins and prefabricated accommodation units

Direct restraint by use of twist locks is by far the best method for securing these loads. The strength of this design has to be checked in advance. Such a locking system should be used according to the specifications of the manufacturer.

However, large containers for road transport, with or without load, can alternatively be secured with lashing and blocking in accordance with the principles of the standard EN 12195-1. When securing these loads you should follow the general principles of load distribution, and it is important to make sure that the load is blocked against the headboard, whenever possible.

The use of chain or web lashings with tensioner is recommended and all lashings should be checked and kept tight during the whole transport operation.

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

6 *Safety Health & Welfare at Work (General Applications) Regulation 2007 (SI no. 299 of 2007)*

Use of headboards (non ISO Container type loads)

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 10. Site cabin loading operation

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

then there is a need to make sure that the load is well secured to stop it sliding forward uncontrollably. In this case, you will need to use additional direct restraint lashings between the load unit and trailer structure.

In all cases, friction matting between the cabin and the load bed can help prevent movement.

Caution: When carrying non ISO standard units, notably when the floor area footprint exceeds the dimensions of the trailer bed, the widely seen practice of using tie–down lashings, up and over the load, becomes ineffective. In these cases suitably rated direct lashings need to be used. These must be attached directly between a suitable lashing point on the load unit and a suitable lashing point on the trailer. **There must be suitable lashing points[8] available on the load unit to enable it to be secured.**

For further information and guidance visit
www.loadsafe.ie

[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*

[8] The lashing points should comply with EN 12640