

General Guidance on Load Restraint

This information is of a general nature only covering the main principles of load restraint.

Terminology

Load restraint is a general term covering all three methods of securing loads to vehicles. Without restraint a load is very likely to slide or topple in transit. The three methods are:

Blocking

Blocking is a securing method where the load lies against fixed structures or fixtures on the vehicle such as headboards, sideboards, stanchions or bracing which prevents the load from sliding or toppling.

Lashing

Lashing is a securing method which uses flexible lashing equipment to tie the load to the vehicle. There are two main types of lashing, frictional lashing (also known as top-over lashing) and direct lashing.

Frictional lashing forces the load onto the bed of the vehicle so as to increase the friction between the load and the vehicle bed. See figure 1.

Direct lashing connects a load bearing attachment point on the load to a lashing point on the vehicle. See figure 2.

Many lashing systems are a combination of direct and frictional lashing. Lashing can be used in conjunction with blocking.

Locking

Locking is a securing method where the load is secured to the vehicle by mechanical devices such as the twist locks which secure freight containers.

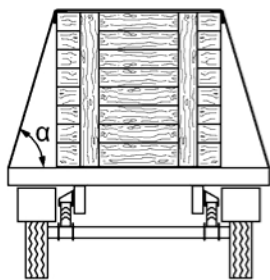


Figure 1
Example of frictional lashing

Figure 1 illustrates a wooden crate secured by a friction lashing. It is the vertical component of the tension in the lashing which forces the crate onto the bed of the vehicle. The maximum friction is obtained when $\alpha = 90^\circ$. When α reduces, the friction reduces. For example, when α is 30° , the effect is halved. The amount of friction also depends upon the friction factors of the materials the load and the bed are made from. (See Annex B of BS EN 12195-1 for a table of friction factors.) It can be enhanced by using a friction mat between the load and the bed.

Figure 2 illustrates a dumper truck secured by direct lashing. With direct lashing it is the horizontal component of the tension in the lashing which provides the majority of the longitudinal and transverse restraint. This horizontal component of the tension increases as α decreases.

Whilst the vertical component does increase the friction, the contribution of the friction to the overall restraint is relatively small. In plan view, the longitudinal lashing angle β_x controls the balance between the longitudinal and transverse restraint. For a given lashing capacity and vertical lashing angle α , as β_x increases, the longitudinal restraint decreases and the transverse restraint increases.

Direct lashing can only be used when both the load and the bed have lashing points compatible with the required strength of the lashing.

Other methods of lashing are loop lashing, spring lashing and round turn lashing. These are often used in conjunction with blocking. The European Best Practice Guidelines illustrates all these methods and explains them in more detail.

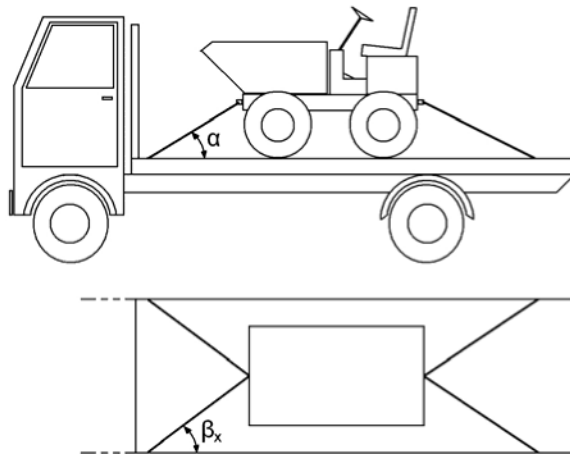


Figure 2
Example of direct lashing

Forces acting on the load

Loads on road vehicles are subjected to the forces generated due to the vehicle accelerating, braking and cornering.

EN 12195-1 specifies how the lashing forces should be calculated based on the possible acceleration of the load. The acceleration is expressed as a coefficient which, in effect, is the proportion of the weight of the load which the lashing must restrain in a particular direction.

Figure 3 illustrates the forces which can arise from the acceleration, braking and cornering of an HGV under normal driving conditions. For example, under braking the load can push forward with a force equivalent to 0.8 of the weight of the load.

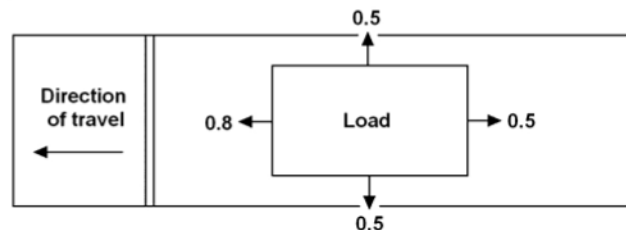


Figure 3
Forces acting on the load

As well as trying to make the load slide, these forces may try to topple the load. Additional restraint may therefore be required to prevent the load from toppling.

Lighter vehicles generally can accelerate, brake and corner more sharply than those classed as an HGV. Therefore higher forces may act on the load if the gross vehicle weight is less than 3,500kg. Higher forces may also act on the load if the vehicle is transported by rail or sea.

Other considerations

The standards and guidance assume that the bed of the vehicle is equipped with suitable lashing points. Unfortunately this is not always true. It may be possible to achieve adequate restraint by using a greater number of lashings thus sharing the load across more lashing points. However it must be shared equally taking account of possible movement in transit.

Lashing equipment used without protection over the edges of a load can result in the load damaging the lashing equipment. The degree of risk varies with the type of lashing equipment. See the specific guidance overleaf.

Periodically checking the lashing equipment for security and tension during a journey is recommended.

Fixing and releasing load lashings often involves working at height or alongside the vehicle at the roadside, both of which can be hazardous. Users should consider the risks involved and address them when planning the method of load restraint.