

## CORRECTLY LOADED HEAVY COMMERCIAL VEHICLES

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#### Abstract

In October 2006, Sveriges Åkeriföretag, SÅ, appointed a working group with the task of suggesting measures to contribute to ensuring correct cargo weight and correct securing of cargo for different types of haulage while also contributing to legal and safe cargo traffic on the road. The work is presented in the report Correctly Loaded Heavy Commercial Vehicles. It would appear reasonable to demand that every professional player who has control over loading in the course of their business should learn to load correctly from the outset. There is a need for new rules governing liability and to some extent also for the development of new vehicles, new equipment and new regulations. Better vehicle scales need to be developed to assist with correct loading from the outset. A load premium model under which haulage companies are paid extra for legal loads and deductions are made for overloading has proven highly effective as an incentive to load vehicles correctly.

**Keywords:** Heavy vehicles, Loading, Liability, Cargo weight, Securing, Scales.

#### Résumé

En octobre 2006, Sveriges Åkeriföretag SA a demandé à un groupe de travail de lui suggérer des mesures susceptibles de contribuer à garantir un poids convenable et une fixation de la charge correcte pour les différents types de transport, afin de d'assurer un trafic routier sûr et avec des charges légales. Les résultats de ces travaux font l'objet d'un rapport intitulé « Des poids lourds correctement chargés ». Il semblerait raisonnable, dans ce secteur des transports doté de systèmes de gestion de la qualité, de demander à tous les acteurs professionnels responsables du chargement à un stade ou à un autre, de s'en acquitter correctement dès l'origine. De nouvelles règles sont nécessaires en matière de responsabilités et aussi, dans une certaine mesure, en ce qui concerne le développement de nouveaux véhicules, de nouveaux équipements et de nouvelles réglementations. Des dispositifs de pesage des véhicules plus efficaces doivent être mis au point afin de contribuer à un meilleur chargement dès la phase initiale. Un modèle de prime au chargement dans lequel les sociétés de transport reçoivent une prime pour la conformité aux conditions légales de chargement et où des pénalités sont imposées en cas de surcharge s'est avéré hautement efficace pour inciter au chargement correct des véhicules.

**Mots-Clés:** Poids lourds, chargement, responsabilités, poids de la cargaison, fixation de la cargaison, dispositif de pesage.

## **1. Contribute to the correct loading and securing of loads**

Vehicles must be loaded correctly and safely, with the right weight of cargo and with the cargo properly secured. This contributes to legal and safe cargo traffic on the road and to competition on equal terms. Roads and vehicles exist to be used optimally to solve society's need for cargo haulage, without unnecessary environmental impact. The report's suggestions and conclusions are aimed at several parties who are in a position to influence the correct loading and use of vehicles. To some degree, socio-economic consideration need to supplement the options for possible action, for instance to determine whether certain vehicles should be phased out and replaced with new variants with more axles, or whether there is scope in the road and bridge infrastructure to permit, to a certain extent, higher loads in terms of axle load and gross vehicle weight.

There are many good initiatives in the haulage sector, forms of agreement, handbooks, brochures and so on, all of which are intended to contribute to the correct loading of vehicles. However, there has been no overall understanding of cause and effect, nor of how the problem of overloading and inadequate securing of loads should be overcome. The lack of overall understanding may lead to under-optimisation and unilateral demands being placed on the wrong party, which may not have caused the problems.

### **1.1 Put the responsibility in the right place**

Where cargo haulage is concerned, the EU should introduce legislation to redistribute the responsibility for the correct securing of loads and for correct load weight to all those who professionally exercise control in a cargo chain, in the same way as Belgium, Finland and Australia, who have led the way. Simple and better information for practical use is needed for the person responsible for securing a load. With redistributed responsibility, there will be a major need for training and greater focus on the complexity of the present rules.

The complexity and the difficulty for truck drivers to know and apply all the rules is underestimated. When problems arise, usually the driver alone is regarded, to an excessive degree, as being liable for the mistakes and shortcomings of others. Measures to ensure that vehicles are correctly loaded cannot be fully effective unless more parties in the haulage sector cooperate and responsibility under the criminal law is shared more fairly between the various players that have control over loading. It would appear reasonable to demand that every professional player who has control over loading in the course of their business should learn to load correctly from the outset.

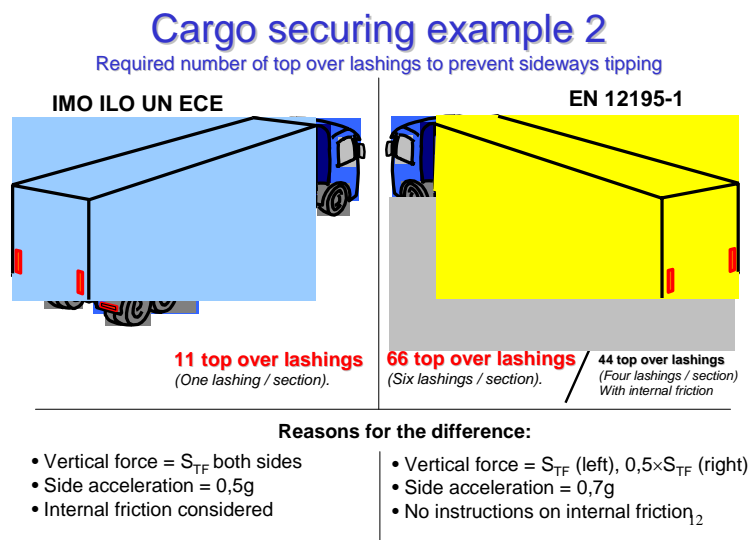
Regarding overloading and the securing of loads, modern logistics increasingly require industry (the transport purchaser) or the forwarding agent (transport broker) to load goods onto a trailer using their own personnel. The transport company seldom participates in the loading and therefore does not handle the goods. The transport company's task is only to take a load carrier to its destination. These practices mean that the shipper, besides loading the goods, also secures them.

The transport company's task is reduced to collecting a ready-loaded trailer or container with a tractor unit and conveying it to its destination. A driver usually has no opportunity to check load weight or load securing in a ready-loaded vehicle. However, legislation and penalties regarding overloading and load securing are directed solely to the driver and the transport company.

## 1.2 Need for new regulations

Ceasing to pay for excess load has been tried before but is not always an adequate solution for dealing with the problem. There is a need for new rules governing liability and to some extent also for the development of new vehicles, new equipment and new regulations.

Regulations regarding weight and load securing have not been harmonized between different countries, not even within the EU. Cross-border traffic must take into consideration the varying axle weight and gross vehicle weight regulations of different countries. This illustrates the need to determine during a trip whether weights are correct in order to be able to continue to another country.



**Figure 1** – Cargo securing IMO ILO UN ECE versus EN 12195-1

There are established methods for the securing of goods on vehicles for transportation by road. If a semi-trailer (figure 1) is loaded with 25 tonnes of palletted goods in three rows three pallets high and in 11 sections, then it is sufficient to secure the goods with 11 pcs. over-top lashings according to IMO ILO UN ECE - a level which Sweden and every other coastal nation in the world has accepted as safe. But this is not sufficient in Germany. Germany applies the European standard EN 12195-1 which in this example would require 66 pcs. over-top lashings, i.e. 600% more than the level already deemed safe. The EN12195-1 standard was drafted with the support of European strap manufacturers. One seatbelt is sufficient when you drive your car and it doesn't get any safer with six seatbelts. Sweden has taken the initiative for a revision of EN12195-1, and a revised standard will be distributed for voting during 2008.

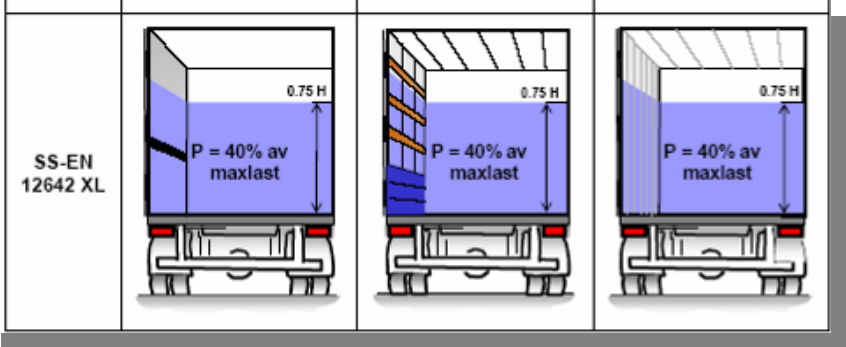
In time, this should lead to a revision that will bring about simpler rules without jeopardising safety. It should be made mandatory to issue a load securing certificate in cases where a load carrier or vehicle is passed on in a haulage chain. Employers must be made responsible for ensuring that personnel who load vehicles get the relevant training in how to position cargo in vehicles and how to secure cargo.

**2. New vehicles and new equipment**

When purchasing a new vehicle for cargo haulage on the road, the purchaser should demand from the supplier that the vehicle be dimensioned and marked in accordance with relevant standards in order to facilitate the correct loading and securing of cargo in the vehicle. Vehicle owners should ensure that vehicle drivers are given relevant training. Vehicle owners should also give their personnel clear instructions to comply with rules governing weight and load securing. For example, the new standard SS-EN 12642XL permits cargo to be restrained against the sides of curtain-sided vehicles whose strength is equivalent to that of box vehicles.

When cargo is carried in box vehicles, tarpaulin-covered vehicles and curtain-sided vehicles, it is stacked up to three metres high and lashed with ratchet straps tightened to up to 400 kg. To avoid damage to the cargo, the stacking and securing requirements should be taken into account when packing the cargo and preparing it for haulage.

Better vehicle scales need to be developed to assist with correct loading from the outset. Weighing equipment should be standard in new cargo haulage vehicles. Interfaces need to be developed so that weighing information can be passed between vehicle units and the various categories of personnel and players who are responsible for loading vehicles correctly.



**Figure 2** – 12642XL permits cargo to be restrained against the sides of curtain-sided vehicles

Fixed public self-service scales should be provided round the clock so that drivers can weigh heavy vehicles one axle at a time and obtain totalled gross vehicle weights. It should be possible to print out weighing reports so that the drivers can take the documentation with them on their journey.

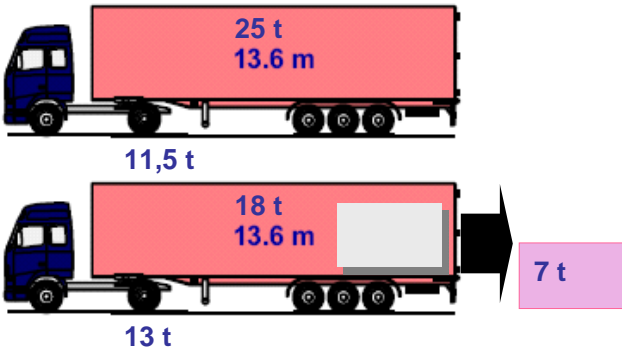
Electronic information systems and navigation aids should be developed further and adapted to support the correct loading of vehicles and to assist in choosing the correct route.

As far as the technical design of vehicles is concerned, the risk of exceeding the technical and legal gross vehicle weight is especially great with partial unloading of cargo from vehicles with only one front axle. This means that a legally loaded vehicle may become illegal when cargo is unloaded. Vehicles should be constructed and used so that the technical gross vehicle weight is never exceeded.

A two-axle tractor unit (figure 3) with an international traffic semi-trailer will carry approx. 25 tonnes within its 40 tonne gross vehicle weight.

A semi-trailer with a wheelbase (kingpin-centre axle) of up to 8.115 m is considered to meet the turning-circle requirement of less than 12.5 m outside radius and 5.3 m inside radius in accordance with Directive 97/27/EG. With such a long wheelbase and evenly-distributed cargo the drive axle load will be 11.5 tonnes at the fully-loaded start, but additional capacity resulting from partial offloading of cargo will not be available. The drive axle load will increase to 13 tonnes when 7 tonnes of goods are offloaded from the rear of the semi-trailer. The vehicle will be illegal when it is first offloaded but will become legal again as more goods are removed during a distribution route with multiple drop-off points.

The requirements of rational handling and load securing do not usually allow the rearrangement of goods during a distribution route to avoid the above problem. If a three-axle tractor is used as a substitute, then there will instead be over capacity for the same load. The use of two-axle tractors is an international phenomenon and although many drivers are fined this has still not led to an international switch to vehicles with the additional axle that would better solve the problem.



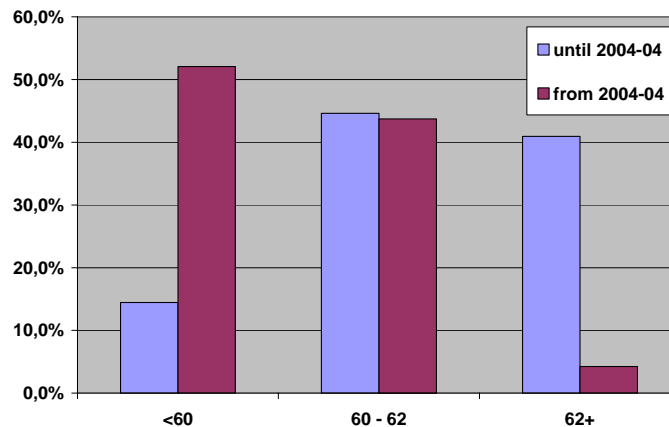
**Figure 3** – Driving axle load increases when cargo is partially unloaded from the rear

As far as the technical design and use of vehicles is concerned, there are several examples of the development of practices that are known to all professional interested parties, but where the legislation has not been developed sufficiently to legalise them. Roads are there to be used. This means that there may be a socio-economic justification for developing new rules instead of creating new vehicle concepts. Alternatively, vehicles can be phased out and replaced by vehicles with more axles. This means that transitional rules would need to be produced.

**3. The premium model**

A load premium model under which haulage companies are paid extra for legal loads and deductions are made for overloading has proven highly effective as an incentive to load vehicles correctly. The premium model should be tried out in several heavy haulage contracts for cargo such as round timber, cellulose chips, plant and agricultural haulage, etc. The success of this model depends on the availability of a weighbridge, preferably where the vehicle is loaded, but this does not work for every type of cargo and in such cases the alternative is to weigh the vehicle when it arrives at its destination. For heavy cargo with varying bulk density, the aim should be payment based on weight.

An example of a load premium model (figure 4) shows a freight price surcharge of 5 per cent for gross weights of 59.5 to 60.5 tonnes and a discount of 9 per cent of the freight charges for gross weights above 62 tonnes.



**Figure 4** – The load premium model's effect on gross vehicle weights in tonnes when delivering 1,800 fully-loaded vehicles with round timber, before and after introduction in March 2004

#### 4. Vehicle performance

International goods traffic by road within the EU takes place with gross vehicle weights of up to 40 tonnes and vehicle lengths of 16.5 m for tractors and semi-trailers, or 18.75 m for trucks with centre-axle trailers. Sweden has traditionally used longer and heavier trucks, 24 m and 60 tonnes, as has Finland with 22 m and 60 tonnes. In connection with Sweden's and Finland's entry into the EU, the European Modular System EMS was introduced (figure 5) with load lengths of 7.82 m plus 13.6 m combined in different ways within a total vehicle length of 25.25 m. EMS allows connection of three EU standard vehicles in two longer combinations for traffic through Sweden and Finland, thus achieving competitively neutral load capacity.

A large part of the flow of goods on EU roads has a low weight/volume ratio. There is therefore an advantage to society in permitting EU traffic with longer truck combinations - EMS. If trucks are allowed to be heavier as well, then this advantage increases also in the case of heavy loads. If both longer and heavier vehicle combinations cannot be achieved, a first step would be to at least permit longer vehicles.

A comparison of road wear using the fourth power rule for fully-loaded vehicles in international traffic shows that road wear within the EU per tonne of transported goods can easily be reduced. If a two-axle semi-trailer tractor is replaced by a three-axle unit and the permissible gross weight is at the same time raised from 40 to 44 tonnes, road wear will nonetheless be reduced by up to 22 per cent. The same low road wear per tonne of freight is achieved by EMS with gross vehicle weights of 60 tonnes.

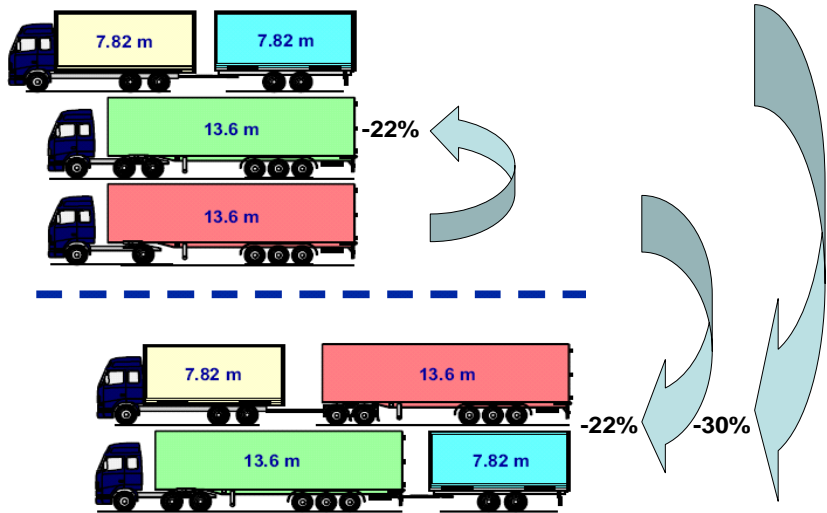
A 40-tonne truck with centre axle trailer as used in international traffic in the EU has a road wear figure of 0.1 per tonne of cargo carried. Taking this vehicle as a reference, the road wear is reduced to 0.07 ten-tonne equivalents per tonne of cargo for the 60-tonne EMS vehicles (figure 5) used in Sweden and Finland, all of 30 per cent less.

The benefit of the lower road wear with the EMS vehicles should be greater than the cost of the slightly increased space that is required for long vehicles at certain road junctions.

Society should create incentives to encourage the use of efficient vehicles that are easy to load correctly, with low axle loads, among other things by not imposing such high taxes and charges for these in relation to the less efficient international road haulage vehicles. Large modular vehicles have a low environmental impact per quantity of cargo transported, and road congestion is reduced.

**5. Use of the infrastructure**

What appears superficially best for the infrastructure owner – minimising maintenance costs – need not necessarily be the best or the only way to put a price on the utilisation of the infrastructure. To achieve the desired control effects, an ideal and fair-price system must have a tariff which, among other things, differentiates in terms of time, geographical location, vehicle dimensions, vehicle utilisation factor, emission levels, noise levels, accident-proneness, traffic congestion and possibly carbon dioxide emission as well. A further factor: Who is to pay for the breakdown of the infrastructure by the weather? It is not likely to be an easy legal text to formulate.



**Figure 5** – EMS decrease the road wear per tonne of cargo with up to 30 percent.

**6. Summary**

Where cargo haulage is concerned, the EU should introduce legislation to redistribute the responsibility for the correct securing of loads and for correct load weight to all those who professionally exercise control in a cargo chain.

Safe methods for the securing of goods on vehicles for transportation by road are established by IMO ILO UN ECE and for harmonisation reasons the EN12195-1 standard should be revised. It should be made mandatory to issue a load securing certificate in cases where a load carrier or vehicle is passed on in a haulage chain.

Better vehicle scales need to be developed to assist with correct loading from the outset. Weighing equipment should be standard in new cargo haulage vehicles.

A load premium model under which haulage companies are paid extra for legal loads and deductions are made for overloading has proven highly effective as an incentive to load vehicles correctly, and should be tried out in several heavy haulage contracts for cargo.

To decrease road wear within the EU and the risk for overloading of axles, two-axle semi-trailer tractors should be replaced by three-axle units and the permissible gross weight should at the same time be raised from 40 to 44 tonnes.

The use of EMS vehicles should increase within the EU which can decrease the road wear per tonne of cargo with up to 30 percent.

## **7. References**

- Johansson, M. (2007), Rätt Lastade Fordon, SÅ Rapport 2007:2 (Correct Loaded Heavy Commercial Vehicles).