

# Transport of Abnormal Loads to Wind Farms



## **DRAFT CONSULTATION** **On Safety Excellence Standards**

*An IWEA Safety Series Toolkit*

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**Fig. 1. Engaging with stakeholders during turbine transport.**

*Capturing your experiences has guided us to produce this standard. With feedback and further input over the next few months, this standard will become the first IWEA safety standard to be fully published.*

*With special thanks and much work from our members, we have been able to review renewable energy related abnormal loads transport and associated issues.*

*Paul Whelan*

### **Contributors to Date**



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## 1.0 Introduction

This document is the first of the *IWEA Safety Toolkit Series* in safety management, and aims to focus on key areas when considering safety, and transporting abnormal loads associated with wind farm projects in Ireland. From managing convoys with ninety tonne nacelles, to towing 45 metre long trailers through rural environments, there are significant issues which require consideration.

Whilst regulation and the permitting processes set minimum legal standards, in reaching safety excellence; it is incumbent upon all of our members to think about the challenges and apply some of the principles set out in this guide to your work environment.



**Fig. 2. Abnormal loads convoy to a wind farm project.**

Public safety, driver health & welfare, and delivering on good risk management practices are the cornerstones of transport safety.

IWEA has set out this guide to enable stakeholders formulate their own turbine transport policy, and aid the industry to reach higher levels of safety performance. This guide may be used as a reference aid, and as a pointer for discussion for those who are directly or indirectly concerned with the movement of abnormal loads at onshore projects

## 2.0 Risk Management

In EU, an abnormal load is defined as a vehicle or vehicle combination having either no load or an indivisible load, which can only be transported by exceeding at least one of the dimensions and/or axle, bogie or total weights authorised by Directive EC 96/53 and national legislation, for us in the renewables sector, it refers to wind turbine components and transformers which meet these criteria.

Please also see chapter 7.0 on EU standards for *Load Securement* & European Best Practice Guidelines for Abnormal Road Transports See also UK Department of Transport Approved Code of Practice '*Safety of Loads on Vehicles*' *Third Edition*

Transport risk management has long been a key focal point for ensuring that turbine components and large transformers (i.e. abnormal loads) are delivered to wind farms in a safe manner. Over recent years, our members have built up a wealth of experience in logistics safety, and there is now a growing demand from our members seeking guidance on transport issues. Those involved include:

- Turbine and transformer suppliers who manage and subcontract shipping services, and the logistics support provided by specialist haulage companies.
- Designers & consultants who provide technical studies, and create the designs which allow civil engineering contractors to build the infrastructure.
- Civil engineering contractors who build site infrastructure and ensures sites are suitably prepared to receive components.

- Project teams in renewable energy companies who are at the hub of co-ordination and project planning.



**Fig. 3 Multidisciplinary project team evaluating site roads during a trial run.**

## ***2.1 Considerations and Planning***

Many of those involved in building wind projects already have well developed systems in managing logistics, and there is much focus on route planning, road upgrades and land negotiations. A lot of the methodologies tell us we can get the turbine components to site, but doesn't necessarily tell us **how to do it safely**.

Developers have historically left logistics management elements to the wind turbine supplier and subcontractors. This is perfectly acceptable, as they are best placed to manage this specialist field.

However, recent trends in the sector are showing a move towards a more integrated approach, energy generation companies are now demanding greater focus on all aspects of their business influence. With a better understanding of the issues, we are now beginning to see a shift towards a benchmark in logistics safety. For example, when working up a site design package, we are beginning to consider key points such as provision of escorts, contingency planning, gradient, trailer and tractor combinations, road traction, turning points and hammerheads.



**Fig. 4. Blade delivery on steep gradients of 18%.**

## 2.2 Turbine Supply Agreements: Think Logistics

As project teams begin setting out their site design and logistics management philosophy, there are many issues to consider in the early stages of planning, and negotiation of component supply agreements.

When it comes to negotiation for the supply of a wind turbine package, it is incumbent upon all parties to consider logistics elements and safety, not just route upgrades but what are the safety concerns?, and, how best to capture risk management in contract form. Some wind projects have higher levels of logistical challenges than others, restricted access routes, damaged road edges, unconsolidated off road tracks, steep gradients and confined road corridors, therefore greater consideration is required. Afterthoughts on changing routes, road upgrades and even failure of a logistics provider to meet safety standards can greatly impact upon a project



**Fig. 5. A tractor unit and tower section arriving on a wind farm site.**

Incorporating safe standards and ensuring that specific requirements are detailed and discussed at any turbine negotiation is an imperative. This document or parts therein may be useful as talking points, or even consider appending certain elements of this guidance note into any procurement deal.

*It is most important that the client/ turbine manufacturer provides the transport service provider with the original route survey document at the tender stage to allow the correct route to be defined. The chosen service provider should then undertake trial run prior to starting delivery of items to construction site.*

## 2.3 Project Planning

One should take reasonable endeavours to ensure that the following factors are taken into account in risk management of abnormal loads.

**Table 1. Points to consider**

Area	Points to consider
<b>Competency</b>	Logistics providers such as the specific transport company are assessed for competence, including incident history and driver skills. This should also include the escort vehicle provider.

	<b>Permitting</b>	A special loads application is completed well in advance and is accurate and retained on site for inspection.
	<b>Site Roads</b>	The transport logistics provider & subcontractors are appointed well in advance of planned delivery phase. Are they fit for purpose, adequate dimensions and well-constructed?
	<b>Public Interface</b>	<p>The effect/impact of the move on the safety and convenience of other road users and stakeholders is considered.</p> <p>What the traffic conditions are likely to be.</p> <p>Special events that may affect traffic?</p> <p>How long will it take to complete the move?</p> <p>The distance to be travelled.</p> <p>Where is the move to take place?</p> <p>Take into account reasonable alternative means of transportation.</p> <p>Proximity to schools, public events etc.</p>
	<b>Incidents &amp; Contingency planning</b>	Plan prepared and communicated.
	<b>Preparation and Traffic Management Plan</b>	<p>All vehicles inspected daily before work starts? Are drivers and escort briefed and tool box talks held?</p> <p>Is a Traffic Management Plan in place and reviewed</p> <p>Police escorting arrangements (if any)?</p> <p>Escort Arrangement Understood and clear, adequate number of pilot drivers.</p> <p>The traffic management plan for the site has been developed and everyone is aware of it.</p> <p>All drivers have had a familiarisation exercise on the site.</p> <p>Everyone knows about giving way to abnormal loads vehicles at all times.</p> <p>Driver measures and knows his overall height (trailer + load)</p>
	<b>Environment</b>	<p>The potential weather conditions.</p> <p>Low hanging trees or physical changes to environment after initial surveys or trial runs.</p> <p>Tree surgeons on standby.</p>
	<b>Physical</b>	<p>Suitable and appropriate equipment is being used</p> <p>Bridge restrictions; height, length and allowable loads</p> <p>Upgrades, what if bats are roosting in bridges thus preventing any improvement works?</p> <p>Overhead cables (electrical, telephone)</p> <p>Defective roads and road edges</p>



There are many formats and iterations of transport plans and method statements, and they vary considerably in quality and consideration of risk. Poor hazards assessments and inattention to detail can potentially lead to significant issues which can cause delay, or worse, a serious accident or loss of a high value load. An outline of what is expected in a good quality method statement is referred to in the Table below.

**Table 2. Transport Plans/Contents for Method Statements**

	<b>Area</b>	<b>Points to consider</b>
	Executive Summary	High level summary of equipment deployed; number of transport runs, route outline, provision of escorts, delivery times, length of run, equipment deployed.
	Schedule	Transport schedule with dates, components information e.g. dimensions, weight, quantity, length, etc.
	Project Organisation	Chart roles and responsibilities, interfaces, personnel involved
	Permits Register	Register of permits and local authorities consulted Hours of delivery, road closure details, police escorting requirements
	Risk Assessment	Route hazards; underground and over-ground services; black-spots; s-bends; festivals; weather conditions, overhead obstacles, telecoms and cable clearances. Site road conditions
	Point of Acceptance	What happens on arrival at the site gates; induction in advance; holding and parking areas & passing places
	Site Familiarisation	Driver knowledge of site; advance sited induction; awareness of site rules; awareness of floated and excavated roads, the need to drive in the centre of the road (off the public highway); pre-start toolbox talks
	Planning	Offsite co-ordination of convoy movements; police involvement; notifications of delivery to site; clear corridors on site and local roads; weather windows
	Lifting	Transfer of components from trailers to hard-standing areas; lift plans; appointed persons; safe working loads; max. safe wind speeds; exclusion zones; load bearing capacity of hardstand checked; hardstand meets design criteria;

Site Roads (tracks)	Are site pads designed, engineered, compacted, and suitable and maintained to a good standard that will support cranes and road vehicles?
Site Rules	Everyone aware and understands; break times; tachograph; compliance with working hours limits; work at heights, PPE; seatbelts
Incident Reporting	Contact phone numbers; breakdown & recovery; road based repairs; managing incidents. Investigation processes defined?
Maintenance Records	Truck logs; records for maintenance
Task Specific Method Statements	Have safe systems of work been defined for loading and unloading each component. Is there anything unusual about a hardstand or is it at variance with design specification? Does it require a further risk assessment or extra banksmen?

## 2.5 Role of Public Agencies

Public agencies, such as An Garda Siochana, the PSNI, local government, and the regulators set the legal basis for the movement of abnormal loads. The safety of other road users is paramount, and much thought and effort goes into logistics planning and permitting for the movement of these large loads.

Public authorities also assist with practical measures when route upgrades are required, or when temporary road side alterations such as signage removal is required.

Specialist companies can help in processing permit applications, and many logistics companies manage their own permitting arrangements with their clients.



Fig. 7 Garda escorts.

## 3.0 Escorting Arrangements

It should be borne in mind that authorities may stipulate specific escort requirements for the transport of abnormal loads. Road transport exceeding legal weights or minimum dimensions may require an accompaniment of escort vehicles; this can include police escort and/or a private escort vehicle solution.

In the transport of turbine components, there are three main functions of the escort vehicle:

- To provide and apply an element of control on roads users along particular sections of the route, e.g. when a load must impinge upon the centre line of a road or move along the wrong-side of a roundabout.
- To provide an element of warning & information for other road users about the imminent proximity of the convoy.
- Assess and warn of potential hazards, e.g. clearance, low hanging branches, junctions, etc.
- Please also see chapter 7.0 on EU standards for Load Securement & European Best Practice Guidelines for Abnormal Road Transports (*See also UK Department of Transport Approved Code of Practice 'Safety of Loads on Vehicles' Third Edition*)

At all other times, the road authorities need to be consulted to determine appropriate route and necessity to supply a police escort or private escort vehicle.

The advantages of using escorts include:

- To provide essential data to the driver of the abnormal load regarding road usage in the immediate area environment, e.g. traffic density, road edge visibility.
- Provides 'rear vision' when required due to load width, and advises on deployment of rear wheel steering mechanisms.
- In some cases, this can extend to assisting with traffic control and management.
- Provide assistance in the event of a breakdown, or emergency situation.
- Self-escorting offers greater flexibility for scheduling moves and therefore should enable loads to travel at off-peak times when there is less traffic. This both reduces traffic disruption to other road users and improves journey times for the haulier.

Brief objectives and expectations regarding private vehicle escort services

1. Escort Vehicle drivers experienced and familiar with route
2. Escort Vehicles conspicuously marked and illuminated marking: example below



The role of the escort vehicle is an essential tool in wind turbine transport safety. From experience of our members, consideration of provision of an adequate number of escort vehicles should be made at the very early stage of procurement of either the turbine with the logistics package, or at a stage when reviewing who the nominated logistics contractor is going to be.

Each project contract may be set out differently, but as a standard, a recommended number of three escort vehicles should be provided when moving abnormal loads from port to the site. This may be in addition to escorts provided by the police.

*This standard (about escort numbers) is above UK and Mainland EU practice and is deemed by several clients to be especially important for Ireland with many narrow and winding roads*

Further consideration should be made on the basis of the route and associated risks, such as accident black spots and rural roads with little illumination.

### **3.1 Travelling Position of Vehicles**

There are a combination of positions adopted in a convoy, the positions may change when the abnormal loads is under police escort, otherwise, the recommended combination is one vehicle at the front of the convoy and one at the rear. This third vehicle can take on a 'scouting' position ahead of the convoy to provide advance warning and information about oncoming traffic.

*International guidance exists on this subject, for example, See UK Dept. of Transport ACOP Operating guides for positioning of escort vehicle on road, Section 6\**



**Fig. 8. Providing 'Rear vision' escort of tower section transport.**

### **3.2 Radio Communication**

Each abnormal load vehicle and all accompanying escort vehicle drivers should have a facility to allow effective communication with each other. More often than not, the police may also be involved during some of the convoy, it is therefore important to keep spare radios for police command vehicles who can then effectively communicate with motorbike outriders. Spare batteries and a few extra radio handsets may also come in use. You will need to consider the frequencies you will use for communication so as to be compatible with the police/gards if working with them *See UK ACOP Section 5,6 &7\* as an example*



**Fig. 9. Radio communication is a vital tool in co-ordination.**

## **4.0 Incident Management**

Everyone benefits from a strong culture of incident and near miss reporting. Failure to report close calls and minor incidents can lead to a greater possibility and higher risk of more serious accidents occurring. As a matter of course, all project partners should develop a strong and open culture of safety reporting so we may effectively manage and learn from incidents. Typically, all road related transport incidents should be notified to the wind turbine supplier, who in turn will notify the wind farm project team.



**Fig. 10. Blade delivery on the main highway.**

In the case of serious incidents and significant near misses, there is great benefit in defining a reporting protocol with a specified time frame, for example, a sixty minute reporting rule would ensure appropriate swift communication through the logistics chain, and will ensure that an appropriate response plan is put into place.

### ***4.1 Responding effectively to Incidents***

When serious incidents occur, it is vital an appropriate response is put into effect and there is a plan available to dynamically respond to the specific nature of the incident. Incidents may involve other vehicles, jack-knifing trailers, the shifting of loads or even the shedding of a turbine component in a public space, such as a main road or transport corridor, such as a railway track. Local authorities and police services have little, and in some cases, no experience when it comes to heavy or awkward loads recovery, yet these are the frontline responders who are called to the scene. It should be clearly understood by all stakeholders that specialist advice is required when loads recovery is required.

#### ***4.2 Steps in Incident Management***

The convoy pilots and drivers may call the emergency services who will respond to the incident.

An incident co-ordinator should be mobilised and present at the scene of a serious road related incident to assist and co-ordinate with the emergency and recovery efforts.



**Fig. 11. Archive Picture: A tower section being recovered from a public road [from an event some years in the past]**



**Fig. 12. Archive Picture: Overturned Tower and Transport Unit on a public road [from an event some years in the past]. Past example of what could go wrong**

## **5.0 Driver Safety & Welfare**

Drivers have a great responsibility to perform their jobs with diligence, and maintaining alertness and control of both their vehicles and the environment in which they work. There are no specific statutory training requirements specific for abnormal loads transport. However, logistics companies should be queried on the training programmes and systems of work they have in place for their teams.

Drivers must hold a class of licence and/or endorsement appropriate to the weight and configuration of the vehicle being driven and equipment being loaded or unloaded.

Where a permit is issued on the condition that the permit holder provides an Escort, the escort vehicle(s) should be operated by a fully licensed driver with appropriate experience and a valid driver's licence.

### **5.1 Driver Work Hours**

A Log of hours worked by all convoy drivers should be kept and maintained up to date by an appointed logistics co-ordinator. For heavy goods vehicles that require a tachograph, this data can be read from the recording device. Such records should be available for inspection.

### **5.2 Seatbelts**

From experience, drivers will often come up with excuses and reasons not to wear seatbelts. Recent experiences in the wind industry have shown that wearing seatbelts saves lives; we fully encourage and support our members to ensure a policy on seat belt wearing is fully applied. *[Both on and off site]*

### **5.3 Alcohol prohibition**

All of our members apply strict rules when it comes alcohol and drugs, we fully support our members and consider that drivers of vehicles must never be under the influence of alcohol, drugs or other substances at any time when expected to fulfil driving duties, this includes when they are on official stand-by duties. Furthermore, alcohol, illegal drugs or other illegal substances are not permitted in the vehicles or storage containers in the vehicles at any time during transport to and from site, and whilst on site.

### **5.4 Accommodation for Drivers**

Recent industry reports have raised welfare issues in relation to the provision of suitable accommodation for convoy support personnel; this includes escort vehicle pilots and traffic directors. The issues include failure of transportation companies to provide appropriate accommodation for their drivers; escort vans may sometimes be parked up by the side of a busy road or at port with the driver in poor sleeping accommodation in the vehicle. We advise all our members to check there is suitable sleeping quarters with welfare facilities. We can never accept 'wild camping' arrangements or a loose mattress in a van, as an acceptable accommodation arrangement.

## 6.0 Lessons Learned

### 6.1 Challenging Gradients

It is important to note there is a wide range of logistics providers with varying degrees of capabilities, and this needs to be assessed when planning transportation. Promises will be made that logistics providers can do the job, and these commitments may not be fulfilled or meet expectation, thus leading to project delays, potential design changes to roads, and extra upgrades at the late stages of project development.

It is incumbent upon wind turbine suppliers and energy generation companies to ensure an appropriate and measured strategy is in place to managing these challenging sites. Wind turbines and transformers can be delivered with the right equipment and skilled crews; it's up to us to ensure we know what we're getting into! *Turbine Manufacturers / Generation Companies to influence and work with developers/customers to ensure that site roads are constructed within the capabilities of the chosen transport contractors vehicles steering geometry.*

The Site Road layout to incorporate sufficient turning heads / laybys to allow push-pull vehicles / convoy to turn around / remove push-pull unit in setting out of site roads, at both top and bottom of inclines.

Provision of a layby/holding area prior to the gradient on site large enough to contain a convoy of vehicles. i.e. more than one vehicle.

Some manufacturers publish site road dimensions and construction specifications and these should be followed.

### 6.2 Equipment Selection

Do we have the right tools for the job? Heavy loads being transported along cambered site track roads need to be balanced to ensure stability of the loads and flexibility in negotiating undulations. Maintaining a low centre of gravity is paramount, gusts of wind and unforeseen soft spots on roads can cause a shift in the centre of gravity, and drivers need to have the confidence their machines can do the job safely, accounting for risk factors such as these.



**Fig. 13. Hydraulically adjustable trailer can elevate the rear clamp set of tower section**

Dependent upon the site, it may be necessary to provide trailer units with hydraulic dynamically balanced suspension systems which can counter the camber, and also respond to varying road undulations by adjusting the elevations of the loads.



**Fig. 14. Managing the effect of 2% camber on a wind farm, balancing the load.**

### **6.3 Accidents**

Believe it or not; over 50% of transportation incidents on wind farm sites are caused by two human related behavioural factors; drivers moving off the **centre line of the road** and, should a **vehicle become stuck**, the driver may take a chance and attempt to manoeuvre out of the situation without the appropriate assistance, leading to a more serious incident.

#### **Vehicles leaving the centre of the road**

Many wind farm sites are built to a design specification, with roads varying in width, but normally hovering around 5 metres, just enough to move across the site safely, with due care and diligence. Driver distraction and view of the road edge needs to be fully maintained at all times, failure to maintain driving along the centre line of the road has caused some very significant accidents. Vehicles have lost control and become stuck or banked over the edge causing the vehicle to turn over.



**Fig. 15. Tower section delivery in Northern Ireland.**



**Fig. 16. A crane driving along the centre line of a track road.**



**Fig. 17. Track roads drying up can lead to dust clouds, creating challenges for visibility and safety on site.**



**Fig. 18. Eight wheel drive towing assist with nacelle and tractor unit.**



**Fig. 19. Driving in the centre of the road, signage always helps. Chevrons are a useful tool in creating focal points on roads.**



**Fig. 20. Police outrider exercising road control**

## 7.0 EU Abnormal Loads References

[http://ec.europa.eu/transport/road\\_safety/vehicles/guidelines\\_cargo\\_securing\\_en.htm](http://ec.europa.eu/transport/road_safety/vehicles/guidelines_cargo_securing_en.htm)



### European Best Practice Guidelines for Abnormal Road Transports

[http://ec.europa.eu/transport/road\\_safety/vehicles/doc/abnormal\\_transport\\_guidelines\\_en.pdf](http://ec.europa.eu/transport/road_safety/vehicles/doc/abnormal_transport_guidelines_en.pdf)

European  
Best Practice Guidelines  
for  
Abnormal Road Transports

EUROPEAN COMMISSION  
DIRECTORATE-GENERAL FOR ENERGY AND TRANSPORT

#### Extract on Escorts

##### 7.2 Escort Categories

##### 7.2.1 Categorisation by function

The primary functions of an escort are:

- warning other road users to the possible dangers of the abnormal road transport,
- assisting with the progress of the abnormal road transport and/or
- directing road traffic on junctions, bridges, roundabouts, etc. (This would be carried out by

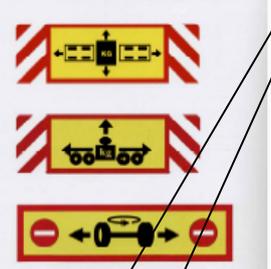
The police and/or a traffic director who would need a specific qualification.)

National authorisation of the Member State being crossed is required before acting as traffic director.

Some Member States do not allow traffic directors in the absence of the police or even do not allow private people to direct traffic

6.2 Recommended marking and signalling for abnormal road transports

Table 4: Abnormal road transports marking and signalling

Item	Description	Remarks/details
General warning	Pictogram	
Wide loads	<p>Warning sign</p> <ul style="list-style-type: none"> <li>- Red/white or red/yellow diagonal striping at 45° to 60° angle;</li> <li>- Retro-reflective UNECE Regulation 104 Class C;</li> <li>- Minimum dimensions (rectangular) 420x420, 280x560 or 140x800 mm;</li> <li>- Width of stripes 70 to 100 mm.</li> </ul> <p>During darkness, lights have to be added on the load (warning sign):</p> <ul style="list-style-type: none"> <li>- White at front, red at rear;</li> <li>- Bulb or LED type;</li> <li>- 15-21 Watts bulbs or LEDs with an equivalent luminance output.</li> </ul>	<ul style="list-style-type: none"> <li>- Required for load projecting more than 100 mm sideways.</li> </ul> <p>Installation:</p> <ul style="list-style-type: none"> <li>- Signs and lights must indicate the greatest width of the load and facing forward and backward;</li> <li>- Signs and lights may be mounted either to load or vehicle and must be clearly visible at a reasonable distance by other road users. The signs and lights must be placed at a height of maximum 2 m and not in front of the windshield.</li> </ul>

This is a very important issue. Long loads need to be **visible** along their length at night. Also beware during daytime operations: shiny or white painted towers can reflect back the landscape on sunny days and can confuse drivers approaching from distance when a tower trailer for example, is making a turn, especially to the right.

Item	Description	Remarks/details
(Un)laden length	<p>Side marking during darkness:</p> <ul style="list-style-type: none"> <li>- White or yellow line marking;</li> <li>- Retro reflective UNECE Regulation 104 Class C;</li> <li>- Compulsory for lengths over 20 m.</li> </ul>	<p>Installation:</p> <p>On vehicle and/or load according to UNECE recommendations.</p>
Projecting load at rear and front	<p>Warning sign:</p> <p>Same as for wide loads but only square shape allowed.</p> <p>During darkness one white light forward and one red light backward have to be added.</p>	<ul style="list-style-type: none"> <li>- Required for load projecting more than 1000 mm beyond front and rear vehicle limits;</li> </ul> <p>Installation:</p> <ul style="list-style-type: none"> <li>- Signs and lights must be placed at the extremities of the projecting load.</li> </ul>
Other marking	Use of special warning lamps (UNECE R 65) and headlights according to national regulations	

Other useful references (UK Dept. of Transport and Vehicle and Operator Services Agency, VOSA) Guides etc.):

- VOSA: Rules on Drivers' Hours and Tachographs: Goods vehicles in GB and Europe- Revised 2011 GV262 – 03
- Highways Agency- Code of Practice Lighting and Marking for Abnormal Load Self escorting vehicles incorporating Operating guidance
- Code of Practice Lighting and Marking for Special Order VR1, STGO and C&U loads

## Cargo Securing:

[http://ec.europa.eu/transport/road\\_safety/vehicles/doc/cargo\\_securing\\_guidelines\\_en.pdf](http://ec.europa.eu/transport/road_safety/vehicles/doc/cargo_securing_guidelines_en.pdf)



### **Training on Cargo Securing European Legislation**

According to Commission Directive 2000/56 EC "*safety factors relating to the vehicle, the load and persons carried*" have to be contents of the driver license test for all categories of vehicles. Specifically, truck drivers' knowledge on "*Safety factors relating to vehicle loading: controlling the load (stowing and fastening), difficulties with different kinds of load (e.g. liquids, hanging loads, ...), loading and unloading goods and the use of loading equipment (categories C, C+E, C1, C1+E only)*" has to be tested.

According to Directive 2003/59 EC of 15 July 2003 the training for "professional drivers" has to contain (among many other issues):

- *Ability to load the vehicle with due regard for safety rules and proper vehicle use:*
- *forces affecting vehicles in motion, use of gearbox ratios according to vehicle load and road profile, calculation of payload of vehicle or assembly, calculation of total volume, load distribution, consequences of overloading the axle, vehicle stability and centre of gravity, types of packaging and pallets;*
- *main categories of goods needing securing, clamping and securing techniques, use of securing straps, checking of securing devices, use of handling equipment, placing and removal of tarpaulins.*

This general description of contents should be complemented by more detailed information in national syllabuses, or at least in the syllabuses of the institutions carrying out this training.

### **Example Standards**

Detailed information on the contents of cargo securing training is described in the German VDI standard "VDI 2700, Blatt 1" or the "IMO/ILO/UN ECE Guidelines for Packing of Cargo Transport Units". The following recommendations are partly based on these standards.

### **Personnel to be trained**

- Truck drivers,
- Personnel concerned with loading/unloading of vehicles,
- Fleet managers,
- Personnel concerned with planning of itinerary, loading and unloading locations

Training

### ***ESTA-The European Association of abnormal road transport and mobile cranes (ESTA)***

Website: <http://www.esta-eu.org/>

Note that some IWEA Logistics Transporters and Crane Companies also belong to ESTA, including the current chair.

This organisation also publishes guidelines and has as its stated goals:

- representative of abnormal road transport companies and mobile crane rental companies
- strives, together with the manufacturers, towards a continuous improvement of equipment to create a safer working environment

- wants to harmonise equipment travel rules, general conditions of work and reduce permit delays throughout Europe
  - maintains an inter-European network for national Associations, companies and manufacturers
  - strives towards a continuous improvement of the image of the sector
- 

**Notes:**