

*Cooperative dynamic formation of platoons for safe and
energy-optimized goods transportation*



D2.2. Current state of EU legislation

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1. Executive summary

The object of this task is to analyse the current state of the rules in European Union in general and its countries in particular, in order to follow an adjustment proposal to allow the vehicle to be part of a platoon and to be aware of any legal impediments and legal gaps to make the Companion project possible.

Taking into account the mentioned scope, the vehicle platoons have been analysed in three main aspects in order to consider all possible no safety situations or legal issues:

1. The technical requirements to allow trucks as part of a platoon to keep this activity safe, either for them, either for other road users;
2. The use of the platoon, its behaviour in the road and its potential interaction with other road users;
3. The use of road infrastructures.

At the same time all these three aspects are regulated by different levels of legal rules divided in European Union Regulations, UNECE Regulations, local regulations and Standard guidelines.

Inside the development of this analysis, the legal frames have been defined firstly. Then, the vehicle itself and the platoon analysis have been carried out, describing different regulatory acts. Finally there is an analysis of the lack of standards in order to clarify what should be / what should not be legal.

The bodies, organisms and working groups, which are currently discussing the autonomous driving, are described at the end of this report. However, a suitable direction for future works in order to fill legislation gaps with regard the Companion project will be exposed in the next task “D2.6 Future legislation developments”.

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3. Introduction

In order to make the Companion system possible, it is not only necessary to analyse the legal issues regarding each vehicle under the platoon as a single element, but also to analyse their behaviour as a whole convoy in public roads where the interaction with other vehicles will take place. This is the aim we followed when analysing the vehicles and the platoons which have been previously defined.

According to “D2.1 Envisioned scenarios” deliverable, the platoon vehicles should be made by N3 trucks (maximum mass exceeding 12 tonnes), including tilt and rigid trailers. For these trucks it is mandatory to fulfil all N3 regulatory acts announced in the Directive 2007/46 and listed in Annex IV of the mentioned Directive [9.1 Annex A]. These vehicles shall be driven in a semiautonomous way, as the driver is responsible for any lateral control (E.g. steering) but the longitudinal one is automated (E.g. brake). In order to guarantee the European type approval fulfilment, the Directive 2007/46 and all the related regulatory acts are analysed.

Furthermore, according to the D2.1 all trucks shall be equipped with a safe HMI (Human Machine Interaction) and long / short range communication's interfaces for in-vehicle information, control and communication systems. The HMI and communication requirements are described in deliverables “D2.3 User requirements” and “D2.4 Technical requirements”. All these systems have been addressed by the development of safety guidelines, standards, and regulations that have evolved as the complexity of the driver cockpit has increased. With increasing penetration of both, integrated and nomadic telematics devices, government and industry have responded appropriately with the generation of applicable guidelines covering the visual-manual driver vehicle interface.

In addition to that and according to D2.1, the Companion platoons shall include a number of vehicles ranging between 2 and 10 trucks driven on highway, one behind the other and keeping between them a narrow safety distance. European Union and local legislations establish the traffic rules and, in consequence, the way in those special vehicles should be driven in public roads. Besides, public roads and infrastructures have some use limitations established in local regulations that must be taken into account.

There are three different legislation levels:

- The EU regulations concerning vehicle homologation, the platoons and the autonomous driving legalization.
- The Standardization of communication systems regarding to non-national bodies
- The local legislation regarding road traffic rules and infrastructures.

In order to properly analyse the Companion, the use of the platoons and the vehicles that will be part of them, the analysis is divided in three different subjects:

- Vehicles as individual elements regarding the semiautonomous driving.
- The use of vehicles and platoons as a system, also regarding the semiautonomous driving.
- The use of the infrastructures such as highways or bridges, as the place where Companion will run.

4. Bodies stakeholders

The analysis of the current legislation has been divided in three different levels: the EU regulations, the Standardization and the local regulations. The principal bodies stakeholders are defined in the following lines.

4.1. Vehicles and components regulatory frame

4.1.1. Regulations from the United Nations Economical commission of Europe

The United Nations Economic Commission of Europe (UNECE or ECE) was established in 1947 to encourage economic cooperation among its member states. It is one of five regional commissions under the administrative direction of United Nations headquarters.

One of the main areas of work is among transports in order to facilitate the international movement of persons and goods by inland transport modes and improve competitiveness, safety, energy efficiency and security.

UN Regulations (UNECE)

In 1958 the United Nations Economic Commission from Europe, in Genève, established an integrated global system for the mutual recognition of vehicle-related product and subsystem approvals. These regulations are accepted by all signatories to the 1958 Agreement (all the countries from the European Union and some others not taking part in the EU) that have adopted each particular regulation within their respective regulatory systems.



Figure 1: Logo of the United Nations Economical Commission of Europe

Although voluntary, the UNECE regulatory process has been integrated directly into EU rulemaking such that the use of UNECE Regulations, where applicable, is often mandatory under EU law.

4.1.2. Regulations and Directives of European Commission of the European Union

The European Commission (EC) is the executive body of the European Union responsible for proposing legislation, implementing decisions, upholding the Union's treaties and day-to-day running of the EU. The European Commission represents the interests of the EU as a whole.



Figure 2: Logo of the European commission of the European Union

The term 'Commission' refers to both the 28 Commissioners and the wider institution itself.

Regulations (EU)

Regulations (EU) from the European Union, in Brussels, (previously known as Regulations (EC) from European Commission), are the most direct form of EU law - as soon as they are passed, they have binding legal force throughout every Member State, on a par with national laws. National governments do not have to take action themselves to implement EU regulations. Regulations are passed either jointly by the EU Council and European Parliament, or by the Commission alone.

Directives (EU)

Directives (EU) and Directives (EC) from the European Union and the European Commission in Brussels are addressed to national authorities, who must then take action to make them part of national law, and decisions, which apply in specific cases only, involving particular authorities or individuals.

The Directive 2007/46EC regulates the vehicle type-approval in the European Union. It is the procedure whereby a Member State certifies that a type of vehicle, system, component or separate technical unit, satisfies the relevant administrative provisions and technical requirements. All the motor vehicles are classified in different categories according to its function and weigh. The technical requirements of all them are laid down in different regulatory act announced in an exhaustive list set out in Annex IV of the mentioned Directive [9.1 Annex A]. The regulatory acts come from different regulation bodies such as (UNECE) Regulations, Regulations (EU) and Directives (EU), all of them equally mandatory.

4.2. Standardization frame

Areas that are considered important from a policy viewpoint will often need Directives to handle the legal aspects of pan-European introduction and operation. Directives should usually not contain any direct technical requirements, but should primarily point to European Standards (ENs) for the detailed specifications.

One of the primary tools for the European Commission is called Mandates and is used to get technical standards. The expectation from the EC will be described in a document together with requirements to develop technical standards, and offered to the three European standards developing organization (SDOs), which are **CEN** (European Committee for Standardization), **CENELEC** (European Committee for Electrotechnical Standardization) and **ETSI** (European Telecommunication Standards Institute). These will develop standards in the Mandate domain.

Mandate 453 is considered to be the main ITS mandate and is intended to support part of the *ITS Action Plan* and *ITS Directive*. M/453 is cooperation between DG INFSO (from a technical/research perspective), DG MOVE (responsible for the legal perspective), and DG ENTERPRISE (will finance the actual work). It describes 69 areas of work for a complete Cooperative System, and requests a “minimum set of standards” to deploy C-ITS. This task has been taken up by ETSI and CEN, and

there is a split of responsibility between the two bodies where ETSI TC ITS mainly deals with communications and active safety applications, while CEN TC278 takes responsibility for the rest.

The release 1 of the European level standard framework related to **M/453** for the deployment of ITS, was presented by **ETSI** and **CEN** in February 2014. They have just started to work in release 2 to be finished by 2017.

A legal framework (Directive 2010/40/EU) was adopted on 7 July 2010 to accelerate the deployment of these innovative transport technologies across Europe. This Directive is an important instrument for the coordinated implementation of ITS in Europe. It aims to establish interoperable and seamless ITS services while leaving Member States the freedom to decide which systems to invest in. Under this Directive the European Commission has to adopt within the next seven years specifications (i.e. functional, technical, organisational or services provisions) to address the compatibility, interoperability and continuity of ITS solutions across the EU. The first priorities will be:

- Traffic and travel information
- The eCall emergency system
- Intelligent truck parking.

The Action Plan adopted by the commission in order to develop and use ITS in road transport on 16 December 2008, suggested a number of targeted measures and included the proposal for this Directive. The goal is to create the momentum necessary to speed up market penetration of rather mature ITS applications and services in Europe.

The EU ITS Action Plan has 6 main action points:

- Action area 1: Optimal use of road, traffic and travel data
- Action area 2: Continuity of traffic and freight management ITS services on European transport corridors and in conurbations
- Action area 3: Road safety and security
- Action area 4: Integration of the vehicle into the transport infrastructure
- Action area 5: Data security and protection, and liability issues
- Action area 6: European ITS cooperation and coordination

The initiative is supported by five co-operating Directorates-General: DG Mobility and Transport (lead), DG Information Society and Media, DG Research, DG Enterprise and Industry and DG Climate Action.

The standardization bodies involved in C-ITS are:

4.2.1. ETSI ITS G5

ETSI is the European Telecom Standardisation Institute, and is a major contributor to global telecom standards such as GSM (Global System for Mobile Communications, originally *Groupe Spécial Mobile*) and DVB (Digital Video Broadcasting). ETSI does also have a formal and legal role

in Europe since it produces Harmonised European Norms, which is an operative part of the R&TTE directive that allows sale and operation of radio equipment without type approval.

ETSI is different from ISO (International Organisation for Standardization) and CEN since it is a private institution with paying members and where voting is done according to weighted votes according to membership size. Since the members pay for the secretariat, the resulting standards and finished documents can be downloaded for free. The main link to ETSI gives a good overview and has further links to search for freely downloadable standards.

Long range communications in COMPANION shall be based in consolidated cellular access technologies following the current standards for data transmission: GPRS; 3G and LTE. Cellular communications follow GSM Association (GSMA) standards and protocols that include not just the mobile devices but the whole trunk network that provides coverage and connectivity. Older technologies like 2G (GPRS) and 3G have different standards in different geographic areas (not in Europe where it was harmonized) while 4G (LTE) can be considered the first worldwide standard.

Short range communications is based in ETSI G5, the European protocol stack for 5.9GHz communications between vehicles (**V2V**) and between vehicles and the infrastructure (**V2I**). The responsible SDOs have published a first iteration, called release 1 of standards, creating a framework for researchers and vendors to develop compliant C-ITS systems.

In conclusion, the on-board system should comply with ETSI ITS G5 protocol stack. This protocol stack has recently been released by ETSI with some standards still under draft and waiting to be finalized and approved, especially in topics related to device testing and interoperability. Annex B of this document [9.2 Annex B] shows an overview of the published and draft standards from ETSI and ISO/CEN and its release, expected release dates. ETSI ITS G5 is used for short range communications between the vehicles on the platoon, allowing a low latency, robust and royalty free interaction.

4.2.2. CEN / CENELEC

CEN TC278 is the European ITS committee with the name of Road Transport and Traffic Telematics (RTTT). This was the first ITS standardization body, and TC278 has laid the ground works for global ITS standards. The initial ideas came from the European framework programme called DRIVE, where it became clear that standardization had to be started.

In general, CEN has a good representation and participation from industry, service providers, public bodies and road operators/authorities, but less from car makers.

CEN TC278 home page shows a thorough overview of ITS standardization and search facilities for TC278 items

4.2.3. ISO

ISO TC204 is the international ITS committee. Originally called Transport Information Control Systems (TICS), but changed its name to Intelligent Transport Systems some years ago. This was the second ITS standardisation body to start after CEN TC278.

Under study at ISO/TC 204 are standardization proposals for

- 1) system architecture
- 2) interface (message set, etc.),
- 3) framework (data dictionary and message template)
- 4) performance requirements of a system
- 5) test methods

TC204 was patterned on TC278, and the cooperation is regulated by the Vienna Agreement (VA) between ISO and CEN, which means that they occasionally have joint meetings to ensure alignment. The following Figure 3 show the working groups and the overlap between CEN TC278 and ISO TC204. [9.3 Annex C]

CEN/TC 278 WGs	ISO/TC 204 WGs
– WG13 (Architecture)	– WG1 (Architecture)
– WG12 (Automatic Vehicle & Equipment Identification)	– WG3 (Database Technology)
– WG1 (Electronic Fee Collection)	– WG4 (Automatic Vehicle & Equipment Identification)
	– WG5 (Fee and Toll Collection)
	– WG7 (General Fleet Management and Commercial/Freight Operations)
– WG3 (Public Transport)	– WG8 (Public Transport)
– WG8 (Road Traffic Data)	– WG9 (Integrated Transport Inform., Management and Control)
– WG4 (Traffic and Traveller Inform.)	– WG10 (Traveller Inform. Systems)
	– WG14 (Vehicle/Roadway Warning and Control Systems)
	– WG16 (CALM)
	– WG17 (Nomadic Devices)
– WG14 (After Theft Systems for the Recovery of Stolen Vehicles)	
– WG15 (SafetyCal)	
– WG16 (Cooperative Systems)	– WG18 (Cooperative Systems)

Figure 3: Equivalences between standardization rules from CEN/TC and ISO bodies.

ISO 26262 is a **functional safety standard** that is intended to be applied to all the electric/electronic (E/E) systems that will be installed in a series production passenger vehicle with a maximum gross weight of up to 3.5 tons. The standard provides guidelines and regulations throughout the vehicle development cycle from the conceptual phase to the decommissioning towards the functional safety analysis, development and validation of the different functionalities.

4.2.4. IEEE

The Institute of Electrical and Electronics Engineers (IEEE, read I-Triple-E) is a professional association headquartered in New York City that is dedicated to advancing technological innovation and excellence. It has about 425,000 members in about 160 countries, slightly less than half of whom reside in the United States.

IEEE is mainly a USA based organisation, but it has some work relevant for global ITS standardisation. Two groups in IEEE needs to be mentioned is particular:

IEEE 802.11p has defined the basic medium-range **V2V/V2I** (vehicle-to-vehicle and vehicle-to-roadside) communication link dedicated to ITS. This operates on 5.9 GHz and is currently accepted in all of Europe, Northern America, Australia and New Zealand, some central and South American countries, and some countries in Asia and Africa are considering the use at the moment. 802.11p will be “rolled up” in the main 802.11 wireless standard and become an operational mode of normal 802.11. The 802.11p Task Group has completed their work and the approved 802.11p amendment was published July 15, 2010. This standard is available for free download. It consists of several thousand pages that include the full 802.11 standard and the needed modifications to have 802.11p version.

IEEE P1609 adds the higher layers including some applications of the US C-ITS protocol stack under the generic name of WAVE. P1609 has approved five preliminary test standards (P1609.1 – 1609.4), and is in the process of updating and adding two more related to architecture and EFC application for 5.9GHz. P1609 is the preferred standardisation body for 5.9GHz operation in the US. Standards can also be accessed or bought from this site

4.2.5. IETF

The Internet Engineering Task Force (IETF) supplies all the basic Internet standards. “Normal” Internet access is of course already the basis for almost **all communications except short range** vehicle access. C-ITS is depending on a new level of mobility that current Internet Protocol (IPv4) cannot supply out of the box. Therefore IETF has had a task force working on a better solution for the new **IPv6** that we all are being moved into these days as the addressable range of IPv4 is getting depleted.

The task force relevant for ITS used to be called NEMO for Network Mobility, but is now merged with other (intermodal) use cases to the group MEXT, Mobility EXTensions. NEMO is a protocol developed to provide IPv6 addressing with the capability to provide easy mobility management for IP communications. This means that an Internet connected device making use of NEMO can move across different networks, domains and access technologies, without losing the logical connection of their active internet services.

4.3. Local legislations of vehicles use and infrastructures

The use of the vehicles such as traffic rules, driving licences or the general interaction between vehicles are regulated at for both the EU directives and the national regulations. We will focus the analysis of the use of vehicles on the platoons (defined in the Deliverable 2.1) and their interaction with the other road users.

The local bodies can be the Ministry directorate a public service, national company’s regional administrations, and others.

Taking into consideration the large number of local regulations, in this document we will not analyse in depth all of them, but we will inform about the different limits on the basis of the national legislations and the compatibility between them and the EU member's regulations.

5. Regulations frame & COMPANION

5.1. Analysis matrix

The analysis of the current legislation has been divided in three different aspects: the vehicle and their components, the use of vehicles and the platoons and finally the use of the infrastructures.

	Vehicle								Use				Infra.	
	Distance between the vehicles	Automatic steering direction	Indicator lights	Special vehicles	Devices for indirect vision	On-board system device	Tachograph	Masses and dimensions	Technical conditions of motor vehicles	Traffic regulations and driving licences	Driving hours and rest periods	International transport of goods	Road user charges	Road use: Dimension and Weights
UNECE regulations	R-10 Electromagnetic compatibility EMC					X								
	R-46 Indirect vision devices				X									
	R-48 Installation of lighting and light-signalling devices		X											
	R-79 Steering equipment	X												
	R-89 speed limitation device													
	R-105 Vehicle for the carriage of dangerous goods ADR			X								X		
	R-121 Hand controls tell-tales and indicators					X								
	R-130 Lane departure warning system LDWS, LKS		X											
	R-131 Advanced Emergency Braking System AEBS	X												
	Treaty: Carriage of Perishable Foodstuffs ATP			X								X		
EU directives & regulations	Regulation (EU) 1230/2012 masses & dimensions							X						
	Regulation (EU) 351/2012 LDWS		X											
	Regulation (EU) 347/2012 AEBS	X												
	Regulation (EC) 1266/2009 & R(EEC)3821/85 Tachograph						X							
	Regulation (EC) 1071/2009 Road operators								X					
	Regulation (EC) 561/2006 Driving time									X				
	Directive 2011/82/EU Information on road safety								X					
	Directive 2006/126 EC Driving licenses								X					
	Directive 2006/103/EC Road taxes												X	
	Directive 2002/15/EC Driving time									X				
	Directive 2002/7/EC dimensions & weights													X
	Directive 2000/30/EC Trailers roadworthiness test								X					
	HMI standards and guidelines					X								
Standard.	Short range communications: ETSI ITS G5 protocol stack					X								
	Long Range communications: ETSI ITS G5					X								
	ISO 26262					X								
	Local regulations	X							X	X	X	X	X	X

Table 1: Matrix about the legislations regulations and the companion transport system

This table summarizes the previous defined analysis in a matricidal system, regarding the Companion on one sense and the legislation on the other.

Firstly all the regulation have been analysed taking into account the Companion vehicles operation and their technical requirements. Secondly they have been classified according to weather these would comply or there is a reasonable doubt about its fulfilment. Thirdly, in the following points, the regulations acts that will doubtful fulfil have been explained.

Regarding the communication interface, their required activities have been divided in three main aspects which are related with three general standards. Then, each communication activity have been analysed.

5.2. Regulation and standard frames regarding vehicles:

5.2.1. UNECE Regulation N° 10: Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility

Scope of the regulation:

This Regulation applies to vehicles of categories L, M, N, and O, with regard to its electromagnetic compatibility

Description of the regulation:

It covers:

- Requirements regarding the immunity to radiated and conducted disturbances for functions related to direct control of the vehicle
- Requirements regarding the control of unwanted radiated and conducted emissions
- Additional requirements for vehicles providing coupling systems for charging the RESS

Definitions:

- *Electromagnetic compatibility*: means the ability of a vehicle or component(s) or separate technical unit(s) to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.
- *Electromagnetic disturbance*: means any electromagnetic phenomenon which may degrade the performance of a vehicle or component(s) or separate technical unit(s), or of any other device, unit of equipment or system operated in vicinity of a vehicle. An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself.
- *Electromagnetic immunity*: means the ability of a vehicle or component(s) or separate technical unit(s) to operate without degradation of performance in the presence of (specified) electromagnetic disturbances which includes wanted radio frequency signals from radio transmitters or radiated in-band emissions of industrial-scientific-medical (ISM) apparatus, internal or external to the vehicle.
- *RESS*: means the rechargeable energy storage system that provides electric energy for electric propulsion of the vehicle.

Description of the use in the Companion vehicles:

Regarding the vehicles that will take part in the platoons of the Companion-system we are focusing only in new electronic devices installed in them. There will be a continuous communication between vehicles on-board system and the off-board system and all these devices must be approved according to R10.04

Possible directions to work on:

- It should be desirable to get the homologation according to R10.04 for every new device installed in companion vehicles

Fulfilment analyses

It should not be any difficult issue to get the approval for every device involved in the COMPANION systems which are installed in the vehicles.

Current work in this regulation

There is no current work on this matter in this moment.

5.2.2. UNECE Regulation N° 46: Uniform provisions concerning the approval of devices for indirect vision and of motor vehicles with regard to the installation of these devices

Scope of the regulation:

This Regulation applies:

- To compulsory and optional devices for indirect vision for vehicles of category M and N and to compulsory and optional devices for indirect vision for vehicles of category L with bodywork at least partly enclosing the driver;
- To the installation of devices for indirect visions on vehicles of categories M and N and on vehicles of category L with bodywork at least partly enclosing the driver.

Description of the regulation:

This regulation describes the fields of view that the indirect vision devices have to provide to the driver.

Description of the use in the Companion vehicles:

When a platoon is driven, it would be necessary (in safety term) for all the drivers to have a good front and rear vision. If the vehicles in the platoon are driving really close it is considered that these fields of vision have to be provided by cameras as it is not possible to have direct vision with mirrors.

In Regulation No. 46, the only fields of view considered to be shown by cameras are the close lateral proximity view (see figures 8a, 8b, 8c, 8d) and a close front proximity view (see figure 9).

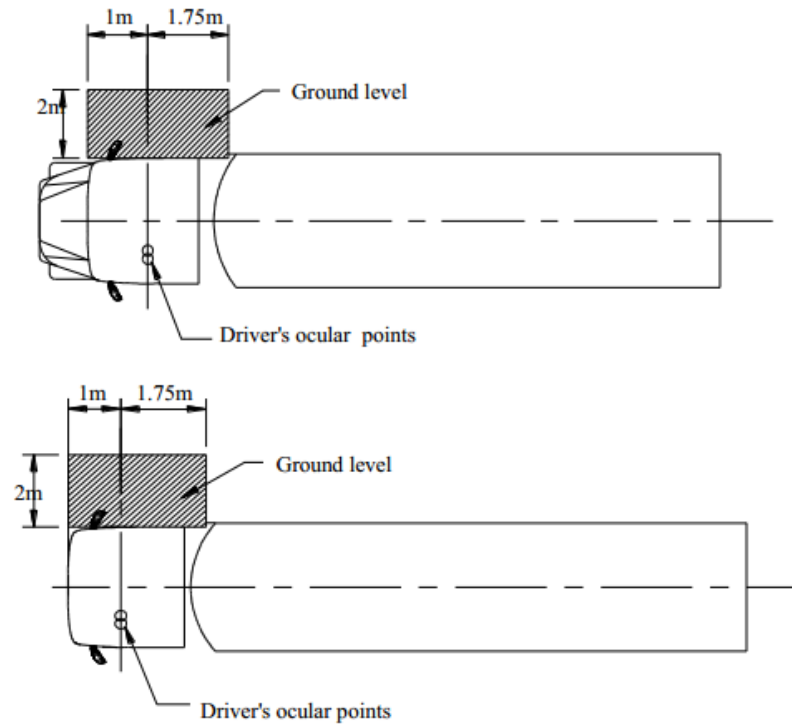


Figure 4: Figures 8a and 8b from the UNECE R46. Field of version of Class V close-proximity mirror

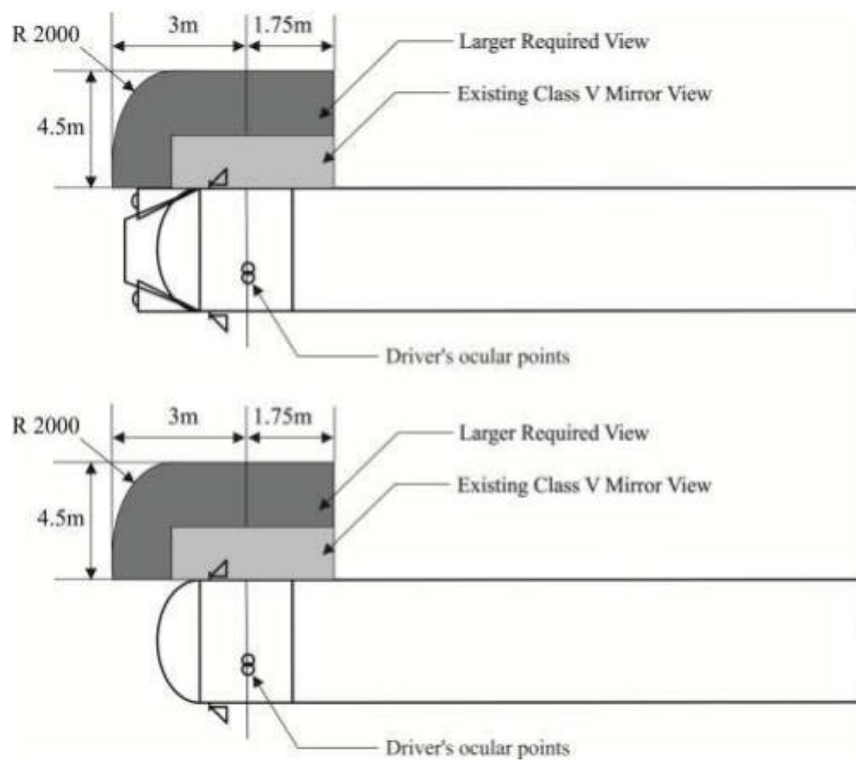


Figure 5: Figure 8c and 8d from the UNECE R46. Larger field of vision on the passenger side

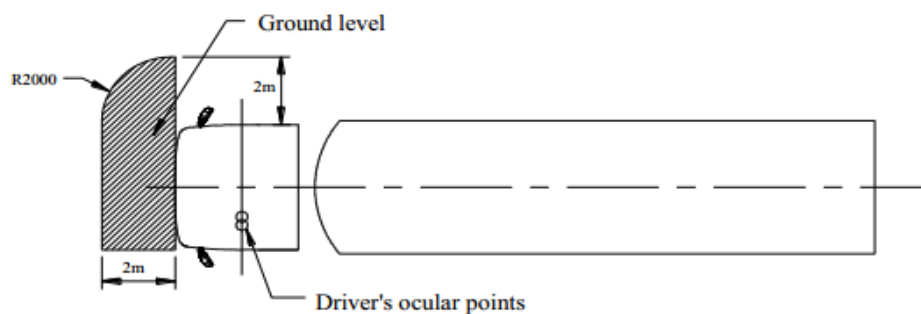


Figure 6: Figure 9 of the UNECE R46. Field of vision Class VI front mirror

Fulfilment analyses

This Regulation does not consider the use of cameras for an application such as those required for the implementation of Companion. That is why it is considered that it has to be modified or a new regulation has to be created.

Current work in this regulation

There is no current work on this matter in this moment.

5.2.3. UNECE Regulation N°48: Uniform provisions concerning the approval of vehicles with regard to the installation of lighting and light-signalling devices

Scope of the regulation:

This Regulation applies to vehicles of categories M, N, and to their trailers (category O) with regard to the installation of lighting and light-signalling devices.

Its main scope is to regulate, mainly, the number and position of lighting and light-signalling devices in the vehicles.

Description of the regulation

Definitions:

- *Lighting devices:* They have two functions, the main one to provide enough vision to vehicle users when needed and, secondary, to provide information to other road users, when needed.
- *Light-signaling devices:* In this case it provides information to other road users about our position, characteristics of our vehicle or intentions. Included in this category we find also conspicuity markings to the rear, front and side of the vehicle.

The approval certificate on lights or light-signalling devices installation can be provided **ONLY** if all the devices installed have been previously homologated as an Independent Technical Unit (ITU). UNECE Regulation No. 48.06 and the approval of the UTI will inform us about the final installation position of any device installed.

Description the use in the Companion vehicles

Obviously, for Companion we are focusing only in light-signalling devices in order to inform other users that they are interacting with a platoon in the road.

Possible directions to work on:

- Light-signalling at the end of the platoon informing about dimensions: long cue of vehicles moving at the same time. Visible also during light time.
- Possibility of annulation or simultaneous use of some devices in the platoon vehicles: direction indicators, anti-fog devices, etc. That mainly depends on the distance among vehicles.
- New colours, characteristics, position and homologation of any new devices.

Fulfilment analyses

In this moment there is no homologated lighting device in this sense but, apparently, it should not be difficult to agree about it and its working protocol in the working group for lighting devices (GRE).

Current work in this regulation

There is no current work on this matter in this moment.

5.2.4. UNECE Regulation N°:79 Uniform provisions concerning the approval of vehicles with regard to steering equipment

Scope of the regulation:

Regulation UNECE 79 applies to the steering equipment of categories M, N and O

The intention of this regulation is to uniform the prescriptions and performance of the steering systems of vehicles

Description of the regulation:

Advancing technology, coupled with the wish to improve occupant safety by elimination of the mechanical steering column, and the production advantages associated with easier transfer of the steering control between left and right hand drive vehicles, has led to a review of the traditional approach and the Regulation is now amended to take account of the new technologies. Accordingly it will now be possible to have steering systems in which there is not any positive mechanical connection between the steering control and the road wheels

Systems whereby the driver remains in primary control of the vehicle but may be helped by the steering system being influenced by signals initiated on-board the vehicle are defined as "Advanced Driver Assistance Steering Systems". Such Systems can incorporate an "Automatically Commanded Steering Function", for example, using passive infrastructure features to assist the driver in keeping the vehicle on an ideal path (Lane Guidance, Lane Keeping or Heading Control), to assist the driver in coming to rest at a pre-defined point (Bus Stop Guidance) or to assist the

driver in manoeuvring the vehicle at low speed in confined spaces. Advanced Driver Assistance Steering Systems can also incorporate a "Corrective Steering Function" that, for example, warns the driver of any deviation from the chosen lane (Lane Departure Warning), corrects the steering angle to prevent departure from the chosen lane (Lane Departure Avoidance) or corrects the steering angle of one or more wheels to improve the vehicle's dynamic behaviour or stability.

In the case of any Advanced Driver Assistance Steering System, the driver can, at all times, choose to override the assistance function by deliberate action, for example, to avoid an unforeseen object in the road

2.3.4. "Advanced Driver Assistance Steering System" means a system, additional to the main steering system, that provides assistance to the driver in steering the vehicle but in which **the driver remains at all times in primary control** of the vehicle

2.3.4.1. "Automatically commanded steering function" means the function within a complex electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate continuous control action in order to assist the driver in following a particular path, **in low speed manoeuvring or parking operations.**

2.3.4.2. "Corrective steering function" means the discontinuous control function within a complex electronic control system whereby, for a limited duration, changes to the steering angle of one or more wheels may result from the automatic evaluation of signals initiated on-board the vehicle, in order to maintain the basic desired path of the vehicle or to influence the vehicle's dynamic behaviour

Systems that do not themselves positively actuate the steering system but that, possibly in conjunction with passive infrastructure features, simply warns the driver of a deviation from the ideal path of the vehicle, or of an unseen hazard, by means of a tactile warning transmitted through the steering control, are also considered to be corrective steering.

5.1.6. Advanced driver assistance steering systems shall only be approved in accordance with this Regulation where the function does not cause any deterioration in the performance of the basic steering system. In addition they shall be designed such that **the driver may**, at any time and by deliberate action, **override the function.**

5.1.6.1. Whenever the Automatically Commanded Steering function becomes operational, this shall be indicated to the driver and the control action shall be automatically **disabled** if **the vehicle speed exceeds the set limit of 10 km/h** by more than 20 per cent **or the signals to be evaluated are no longer being received.** Any termination of control shall produce a short but distinctive driver warning by a visual signal and either an acoustic signal or by imposing a tactile warning signal on the steering control.

Description the use in the Companion vehicles

Even though the control of the longitudinal movement will be autonomous for the following vehicles in the platoon, the driver will be responsible for lateral control, steering the vehicle and all other functions in the truck.

The longitudinal autonomous control will allow keep a lower distance between the vehicles of the platoon due to the fact that the reaction time of the driver in the case of an emergency manoeuvre should be non-existent. Nevertheless this distance couldn't be so close because of the necessity for the drivers to see the road ground in order to keep the lateral control.

Fulfilment analyses:

Provided that the COMPANION vehicles will not have any kind of steering control will not be any trouble with this regulation. However in order to provide assistance in steering the vehicle and make easier to drive it in a close distance with the front vehicle, it would be recommendable to install any kind of Advanced Driver Assistance Steering System which are defined in this regulation.

Current work in this regulation:

The current work in this regulation is focused on new modifications of those paragraphs that don't allow systems for autonomous driving.

It is also being discussed a new Regulation in Lane Keeping Assist Systems which are defined by the current GRRF informal group as a comfortable system and not being necessary its homologation.

Related with this system (LKAS) there are some "guidelines" and ISO standards for its testing.

5.2.5. UNECE Regulation N°89 Uniform provisions concerning the approval of vehicles with regard to the installation of Speed Limitation Devices or Adjustable Speed Limitation Device of an approved type

Scope of the regulation:

This regulation applies to the vehicles of categories M₂, M₃, N₂ and N₃ which are equipped or where have been installed an SLD (speed limitation device), and to all vehicles of categories M and N equipped or where have been installed an adjustable speed limitation device (ASLD). This regulation also applies to the SLD s and the ASLD which are intended to be fitted to vehicles of Categories M₂, M₃, N₂ and N₃ or categories M and N respectively

Description of the regulation

The purpose of this Regulation is to limit the road speed of vehicles by means of a vehicle system which has the primary function of controlling the fuel feed to the engine or via the engine management. This control can be carried up by a speed limitation device (SLD) or an adjustable speed limitation device (ASLD), where:

- *Speed limitation device*: means a device able to perform a function to control the fuel feed of the vehicle or engine management in order to limit the vehicle speed to a fixed maximum value

- *Adjustable speed limitation device*: means a device able to perform a function which allows the driver to set a vehicle speed V_{adj} , and when activated limits the vehicle automatically to that speed

This regulation sets both the general requirements and the performance requirements.

- *General requirements*: requirements affecting the construction of the device, such as the electromagnetic compatibility, resistance to corrosion or vibration or information shown to the driver, among others.
- *Performance requirements*: Requirements on how accurate the device shall be. These requirements define the characteristics of the speed of the vehicle with the system activated both in the transition phase and in the stabilized phase.

Description the use in the Companion vehicles

As platoons in Companion will be formed by many different vehicles with an autonomous longitudinal control, it is necessary to standardize the speed of all of them.

Moreover, the speed of the platoons will be calculated taking into account several factors in order to achieve the optimal economical result, so it may not always be the maximum speed of the vehicles. In these conditions, an adjustable speed limitation device makes sense.

According to the vehicles that are taking part in a platoon of the companion system will be equipped with SLD and ASLD that set the maximum speed to which the vehicle will be limited, however, the speed of the vehicles on a platoon will be continuously calculated and modified thus, in a platoon it will not be enough. In order to make it possible to control the whole platoon, it is necessary to control not only the maximum permitted speed, but also the instant speed of each vehicle. A cruise control device is necessary.

Fulfilment analyses

The SLD system shall limit the maximum speed of N3 vehicles as it is described in this regulation. The installation of ASLD in N₃ vehicles is not applicable by the UNECE Regulation N°89, although it is covered for other vehicles categories. If the ASLD installation were necessary, the regulation should be extended to cover truck vehicles.

Regarding the ACC is considered to be a comfort element and is not necessary to fulfil a homologation.

Current work in this regulation:

There is no current work in this regulation specifically at the present moment. However, a function which is closely related to SLD but which is not included in Regulation 89 ECE because it is considered to be a comfort element, not a safety one (adaptive cruise control) has been recently under discussion in GRSG due to some safety problems occurred with vehicles equipped with this function in Qatar.

5.2.6. UNECE Regulation N° 121: Uniform provisions concerning the approval of vehicles with regard to the location and identification of hand controls, tell-tales and indicators

Scope of the regulation

This Regulation applies to vehicles of categories M and N

Description of the regulation

This Regulation applies to vehicles of categories M and N. It specifies requirements for the location, identification, colour, and illumination of motor vehicle hand controls, tell-tales and indicators. It is designed to ensure the accessibility and visibility of vehicle controls, tell-tales and indicators, and to facilitate their selection under daylight and night-time conditions, in order to reduce the safety hazards caused by the diversion of the driver's attention from the driving task and by mistakes in selecting controls.

Main definitions:

- *Control*: Hand-operated part of a device that enables the driver to bring about a change in the state or functioning of a vehicle or vehicle's subsystem.
- *Device*: Element or an assembly of elements used to perform one or more functions.
- *Indicator*: Device that shows the magnitude of the physical characteristics that the instrument is designed to sense.
- *Tell-tale*: Optical signal that, when alight, indicates the actuation of a device, a correct or defective functioning or condition, or a failure to function.

Description the use in the Companion vehicles

As a preliminary and simple needs analysis we could say that probably a control and a tell-tale would be needed as a safety device. The main objective would be: firstly to let the driver control its introduction in the platoon (hand control) and switch on or switch off the autonomous control of the longitudinal distance; and secondly to inform the driver if he is in the platoon (tell-tale).

Control: It should be activated by the driver in order to “include” itself in the platoon. It could activate the Electronic Control Unit that links with the frontal vehicle. It should include an understandable symbol

Tell-tale: It indicates that the vehicle is linked with the platoon. It could be included in the control or fitted apart with a pertinent symbol.

Screen: It indicates the number of vehicles included in the platoon. At least the first vehicle should be always aware of the exact numbers of vehicles included.

Fulfilment analyses

In this moment there is no control or tell-tale for platooning in the UNECE Regulation No.121. However give to the drivers some platooning information or give the capacity to connect or deactivate the platoon control should be necessary.

Any change to this Regulation shall be discussed in the General Safety Working Group (GRSG) in the United Nations economic Commission for Europe (UNECE).

Current work in this regulation

There is no current work on this matter in this moment, although this regulation is in constant change as it must adapt itself to any vehicle new technology.

5.2.7. UNECE Regulation N°130: Uniform provisions concerning the approval of vehicles with regard to the Lane Departure Warning System LDWS. Regulation (EU) N° 351/2012

Scope of the regulation of the regulation:

UN ECE Regulation No. 130 defines the provisions concerning the approval of motor vehicles with regard to the Lane Departure Warning System (LDWS) of vehicles of categories M₂, N₂, M₃ and N₃.

Description of the regulation of the regulation:

The purpose of the LDWS is to warn the driver of an unintentional drift of the vehicle out of its travel lane by means of haptic, acoustic and/or optic signals.

5.2.1. & 5.4. Whenever the system is active, the LDWS shall warn the driver (by means of at least two warning means out of optical, acoustic and haptic, or one warning means out of haptic and acoustic, with spatial indication about the direction of unintended drift of the vehicle if the vehicle crosses over a visible lane marking for the lane in which it is running, on a road with a directional form that varies between straight and a curve having an inner lane marking with a minimum radius of 250 m, when there has been no purposeful demand to do so.

5.2.1.1 & 6.5. The LDWS shall provide the lane departure warning indication at the latest when the outside of the tyre of the vehicle's front wheel closest to the lane markings crosses a line 0.3 m beyond the outside edge of the visible lane marking to which the vehicle drifting.

5.2.1.2. The warning mentioned above may be suppressed when there is a driver action which indicates an intention to depart from the lane.

5.2.3. The LDWS shall be active at least at vehicle speeds above 60 km/h, unless manually deactivated.

Description the use in the Companion vehicles

LDWS facilitates to keep the vehicle in the road lane, furthermore if there is a near truck in front that no allows you to see properly the lines. It will take sense to include it in the vehicles.

In a future it would be logical to include too a LKAS. The Lane Keeping Assistance System keeps the vehicle in the road lane changing the direction of the steering when it is necessary.

Fulfilment analyses

The LDWS is accepted regarding this regulation. However if the LDWS is connected with the COMPANION's on-board system (in other that all the vehicles in the platoon keep the same maximum speed) would not be approved *a priori*. Consequently this point should be discussed.

Even more, the LKAS is not defined as a safety system so it is not defined in the regulations acts. Some LKAS in passenger vehicles are accepted as comfort systems once is demonstrated that also keeps drivers attention and control in the road.

Current work in this regulation:

Current works are going towards the implementation of the LKAS. In Annex D of this document [9.4 Annex D] there is the summary of LKAS requirements to discuss the LKAS Candidature of its introduction in the current regulation.

5.2.8. UNECE Regulation N°131: Uniform provisions concerning the approval of vehicles with regard to the Advanced Emergency Braking System AEBS. Regulation (EU) N° 347/2012

Scope of the regulation:

This Regulation applies to the approval of vehicles of category M₂, N₂, M₃ and N₃ with regard to the Advanced Emergency Braking System (AEBS).

Description of the regulation:

AEBS is an on-board system which has the purpose to avoid or mitigate the severity of a rear-end in lane collision by means of driver warnings and, at last, by means of autonomous braking.

5.1.1. Any vehicle fitted with an AEBS shall be equipped with an anti-lock braking function in accordance with the performance requirements of Annex 13 to Regulation No. 13

5.2.1. The system shall provide the driver with a collision warning (at least two modes selected from acoustic, haptic or optical) when the AEBS has detected the possibility of a collision with a preceding vehicle of category M, N or O in the same lane which is travelling at a slower speed, has slowed to a halt or is stationary having not being identified as moving.

The system will at depending on the calculated time to collision (TTC) distance to the preceding vehicle divided by the driving speed.

5.2.2. Subsequent to the warning phase, there shall be an [emergency braking / deceleration] phase having the purpose of significantly decreasing the speed of the subject vehicle.

5.2.3. The system shall be active at least within the vehicle speed range of 15 km/h up to the maximum design speed of the vehicle, and at all vehicle load conditions, unless manually deactivated.

5.3.1. & 5.3.2. The AEBS may provide the means for the driver to interrupt the collision warning phase, the warning braking phase and the emergency braking phase.

6.4.2.3. Any speed reduction during the warning phase shall not exceed either 15 km/h or 30% of the total speed reduction, whichever is higher.

6.4.5. The emergency braking phase shall not start before a time to collision (TTC) ≤ 3.0 seconds.

Annex 3 of R131. The table below sums up the mandatory requirements of the AEBS:

Warning and activation requirements

	Stationary target			Moving target				
	Timing of warning modes		Speed reduction	Timing of warning modes		Speed reduction	Target speed	
	At least 1 haptic or acoustic	At least 2		At least 1 haptic or acoustic	At least 2			
M ₃ , N ₂ >8t and N ₃	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	Not less than 10 km/h	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	No impact	32 ± 2 km/h	Until 1 November 2016 for the purpose of national or regional type approval
M ₃ , N ₂ >8t and N ₃	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	Not less than 20 km/h	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	No impact	12 ± 2 km/h	From 1 November 2016 for the purpose of national or regional type approval

Table 2: Warning and activation requirements

The Regulation cannot include all the traffic conditions and infrastructure features in the type-approval process. Actual conditions and features in the real world should not result in false warnings or false braking to the extent that they encourage the driver to switch the system off.

Description the use in the Companion vehicles:

A system capable of slowing down the vehicle (or stop it) autonomously must be implemented in order to minimize the possibility of a crash involving the platooning vehicles.

Taking into account that the brake performance changes depending on factors such as brake temperature, vehicle mass, etc., the actual AEBS required performance is not enough to guaranty a safe braking if the platoon vehicles are being drive in a very narrow distance between them.

It is necessary to drive the platoon vehicles in a distance bigger than the braking distance, **thus is needed to know the braking capacity at any given moment**. In order to adapt the distance to the preceding trailer, the on-board system may have to include some vehicle characteristics such as the vehicle braking capacity (depending on its speed and load) and register the constant evolution of the system.

Another considered solution is to change the AEBS functioning by vehicle-to-vehicle live communication so the reaction time is reduced thus reducing the braking distance

Fulfilment analyses

If the vehicles taking part in a platoon are driving in a distance between them enough to avoid any danger using a standard AEBS there will be no problem to homologate it. However if it is needed

to add any evolution in the AEBS system a discussion in the GRRF would be necessary to make it legal.

Current work in this regulation:

This regulation is suffering small changes of subjects which don't affect the application of the COMPANION project.

5.2.9. Regulation (EU) 1230/2012: Type-approval requirements for masses and dimensions of motor vehicles and their trailers

Scope of the regulation:

This Regulation applies to incomplete, complete and completed vehicles of categories M, N and O.

This Regulation lays down the requirements for the EC type-approval of motor vehicles and their trailers with regard to their masses and dimensions.

Description of the regulation:

(EU) Regulation on masses and dimensions provides, among other, prescriptions related to technically permissible maximum laden masses. Nevertheless, Article 5 to the mentioned Regulation states that, for the purposes of registration and entry into service of vehicles type-approved under this Regulation, national authorities shall determine, for each variant and version within the type of vehicle, all of the following masses that are permitted for national traffic or for international traffic under Directive 96/53/EC:

- (a) the registration/in-service maximum permissible laden mass;
- (b) the registration/in-service maximum permissible mass on the axle(s);
- (c) the registration/in-service maximum permissible mass on the group of axles;
- (d) the registration/in-service maximum permissible towable mass;
- (e) the registration/in-service maximum permissible laden mass of the combination.

Description the use in the Companion vehicles:

Taking into account that the vehicles which will take part in the Companion platoons will travel across different countries, if the national authorities shall determine the masses that are permitted for national traffic or for international traffic, the directive 96/53/EC, should be considered.

Fulfilment analyses

The trucks that will take part in the Companion platoons will be standard vehicles that will comply with this regulation in construction terms. However the fulfilment of the registration and entry into service of trucks in the international traffic it is not clear. Some high technically permissible maximum laden masses of a vehicle being part of the platoon, could be not allowed in some countries where the registration mass limits the maximum authorized mass of the motor vehicles, trailers and their axles.

The directive 96/53/EC must be analysed. It has been analysed in the following points

Current work in this regulation

A study should be conducted regarding the registration/in-service maximum permissible laden mass, in countries being part of the logistic tracks where the platoon is intended to pass through.

5.2.10. Regulation EU N° 1266/2009 adapting the Regulation EEC N°3821/85: Recording equipment in road transport (digital tachograph)

Scope of this regulation:

The scope for this regulation is about the recording equipment installation and their used in vehicles registered in a Member State which are used for the carriage of passengers or goods by road.

Description of this regulation:

The tachograph is a device that records the driving time, breaks, rest periods as well as periods of other work undertaken by a driver. This regulation on recording equipment in road transport provides the basis for the tachograph. This aimed at helping to enforce the rules on driving times and rest periods and monitor the driving times of professional drivers in order to prevent fatigue, and guarantee fair competition and road safety.

Since 2006, tachograph are digital, which allows a more secure and accurate recording and storage of data than the previous analogue tachograph. This device records all the vehicle's activities, for example distance, speed and driving times and rest periods of the driver. The system includes a printer for use in road side inspections and the driver has a card incorporating a microchip, which the driver must insert into the tachograph when taking control of the vehicle. This personal driver card ensures that inspections remain simple.

It is obligatory to install a digital tachograph in new vehicles having a mass of more than 3,5 tons (in goods transport)

Description of the influence on the companion system

Regarding the driving hours and resting time each vehicle in the platoon is considered as an individual vehicle. Consequently the tachograph will be used as usually.

Fulfilment analyses

No problem will be with this regulation for the companion system if each vehicle and carrier company fulfils it.

Current work in this regulation:

The European Commission proposed on 19 July 2011 to revise the tachograph legislation to make fraud more difficult and reduce the administrative burden by ensuring better compliance with rules on driving times and rest periods. The current legislation needs updating to make full use of new technological opportunities like satellite positioning

5.2.11. HMI Standardization

Description:

The importance of a safe human machine interaction (HMI) for in-vehicle information, control, and communication systems has been addressed by the development of safety guidelines, standards, and regulations that have evolved as the complexity of the driver cockpit has increased. With the increased penetration of both integrated and nomadic telematics devices, government and industry have appropriately responded with the generation of applicable guidelines covering the visual-manual driver vehicle interface.

With the increasing use of voice interfaces industry standards organizations (e.g., SAE) are currently working to develop guidelines in this area as well. In addition the National Highway Traffic Safety Administration (NHTSA) has announced its intention to issue voluntary guidelines covering vehicle integrated visual/manual, nomadic visual/manual, and voice driver/vehicle interfaces over the next few years

A non-extensive list of existing design guidelines and principles as well as ISO standards related to HMI development and validation can be found in annex E of this document [9.5 Annex E]

Description of the influence on the companion system

The on-board unit to be used in the COMPANION project should follow different guidelines and current standards to provide a non-distractive, useful and effective communication with the truck drivers. Depending of the automation level of the truck, drivers must be kept in the loop and being able to override the automated control through different audiovisual warnings. This is one of the main research topics in different international projects.

5.2.12. Short range communication standardization: ETSI ITS G5

Description:

The COMPANION On Board system to be developed in this project must comply with ETSI ITS G5 protocol stack in order to be a valid C-ITS station. ETSI G5 defines a reference station architecture with different layers following the schematically organization of the OSI model. Each layer has a set of functionalities and associated standards:

- *Application layer*: Grouped into "Road Safety", "Traffic Efficiency" and "Other Applications". Application classes impose more or less stringent requirements on C-ITS, with respect of: reliability, security, latency, etc. All ITS applications shall be associated with an ITS application priority according to its functional and operational requirements.
- *Facilities layer*: Provides support to ITS applications which can share generic functions and data according to their respective functional and operational requirements. Contains functionality from the OSI application layer, the OSI presentation layer and the OSI session layer with amendments dedicated to C-ITS, i.e. Application support, information support, communication support, session support, a facilities layer management.

- *Network and transport layer:* Contains functionality from the OSI network layer and the OSI transport layer with amendments dedicated to C-ITS: One or several networking protocols, one or several transport protocols, and a network and transport layer management. Different possible networking modes are identified (GeoNetworking protocol, IPv6 networking with mobility support, IPv6 over GeoNetworking). Different transport protocols are also identified (UDP/TCP, dedicated C-ITS transport protocols, others).
- *Access layer:* Support of multiple access technologies including legacy technologies. Each access technology consists of a:
 - o Physical layer (PHY) connecting physically to the communication medium
 - o A data link layer (DLL), which may be sub-divided into a medium access control sub-layer (MAC) managing the access to the communication medium, and a logical link control sub-layer (LLC)
 - o Management sub-layer to interface with the management layer.
- *Management:* contains management elements which may be functionality grouped as: Networking management, management of congestion control, management of service advertisement, common management information base (MIB), cross-interface management, etc.
- *Security:* contains security functionality related to the C-ITS communication protocol stack, the ITS station and ITS applications, e.g.: firewall and intrusion management, authentication, authorization and profile management, identity, crypto key and certificate management, a common security information base (SIB), etc.
- *Frequency allocation:* ITS G5 makes use of IEEE 802.11p as access layer. The European Union has allocated a band at 5.9GHz for its use on C-ITS as well as radiation limits and frequency masks and sideband attenuation. This allocated band is divided in different channels to be used by ITS stations and its applications.

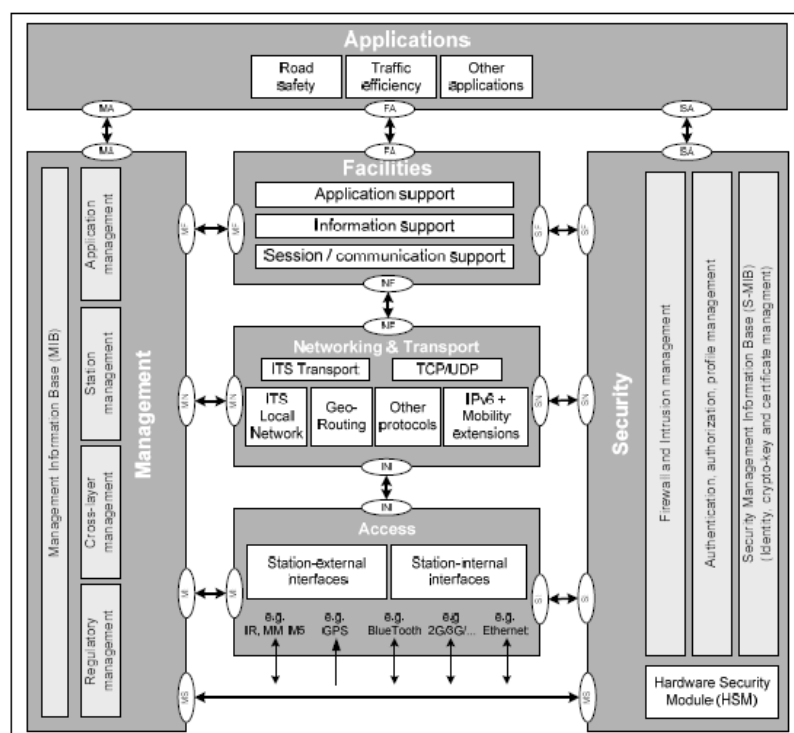


Figure 7. ETSI G5 Extended ITS station reference architecture

ETSI has also defined different standards that define the necessary testing to be performed in ITS stations towards the compliance certification with each of the standards defined in the protocol stack. These standards include TTCN-3 compliance testing scripts as for other communication systems.

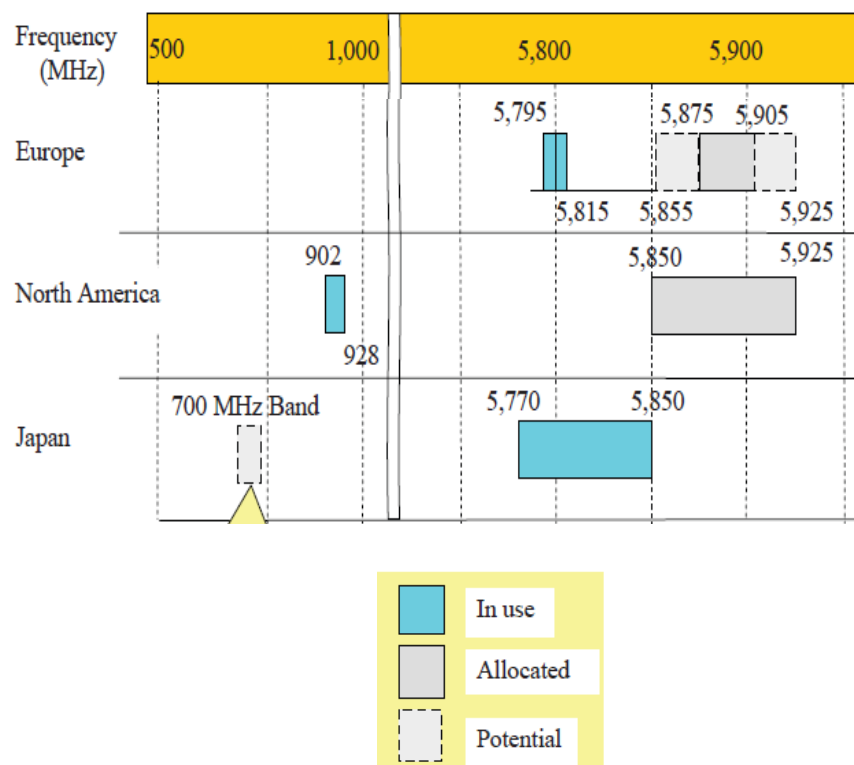


Figure 8. Frequency allocation for C-ITS communication systems in Europe, Japan and the United States (04/04/2014)

Current work is ongoing on interoperability issues. Compliance of the ITS stations does not guarantee that this devices will be able to communicate safely and robustly with other equipment developed by other vendors. ETSI is developing these new interoperability standards as well as starting with Release 2, which will focus in Day-2 applications and safety issues.

Description of the influence on the companion system

Short range communications allow robust, low latency and low cost communications between the vehicles, providing the necessary communications framework to enable coordinated platooning.

The on-board units of the platoon vehicles must comply with ETSI G5 protocol where possible, maximizing interoperability between different vendor and car manufacturer solutions. However, platooning is not a Day-1 applications and its communication requirements may not be covered by Release-1 standards. COMPANION must assess these gaps in the current standards and override them to accomplish the functionality of the system.

5.2.13. Long range communication standardization: ETSI IT G5

Description:

Beyond the short-range communications defined in the ETSI G5 protocol, other types of long range communications are available: GPRS/3G/4G/LTE. These technologies allow to connect the on board units with service providers or traffic management centers.

The mobile network systems evolve with a roadmap not specifically focused on ITS, but open to several application domains and driven by the market demand. In this situation, the ITS application domain can benefit from the availability of this technology without the need of specifically investing in the deployment and operation of a dedicated network infrastructure. The following drawing shows the roadmap from 2G to 4G technologies, highlighting evolution of techniques and performances.

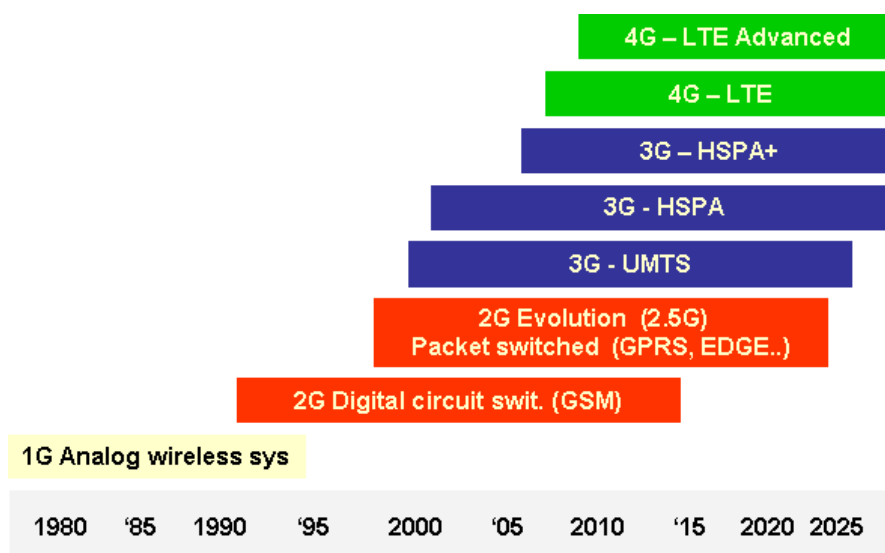


Figure 9 - Cellular Technologies Roadmap

2G and 3G networks have already proved fully suitable and are increasingly used all over Europe for a number of commercial ITS services and the new LTE technology being currently deployed by all major Mobile Network Operators will offer improved performances which will result useful to the ITS domain as well so increasing the possible choices for the system integrators. Long Term Evolution (LTE) is based on standards developed by the 3rd Generation Partnership Project (3GPP (www.3gpp.org)) within the Release 8 timeframe. LTE may also be referred (more formally) as Evolved UMTS Terrestrial Radio Access (E-UTRA) and Evolved UMTS Terrestrial Radio Access Network (E-UTRAN).

Description of the influence on the companion system

The COMPANION back office communications with the on-board unit in the vehicle will use long range communications based in cellular access technologies. These technologies provide a TCP/IP communication channel with high coverage rate (specially with 2G/GPRS) and moderate costs (directly dependant of the payload of the messages to be sent).

5.2.14. ISO 26262 Certification standard about functional safety

Description:

ISO 26262 is a functional safety standard that is intended to be applied to all the electric/electronic (E/E) systems that will be installed in a series production passenger vehicle with a maximum gross weight of up to 3.5 tons. The standard provides guidelines and regulations throughout the vehicle development cycle from the conceptual phase to the decommissioning.



Figure 10: Automotive safety lifecycle

In general ISO 26262:

- Provides an automotive safety lifecycle (Figure 10: Automotive safety lifecycleFigure 10) and supports tailoring the necessary activities during these lifecycle phases;
- Provides an automotive specific risk based approach to determine integrity levels [Automotive Safety Integrity Levels (ASILs)];
- Uses ASILs to specify application requirements of ISO 26262 so as to avoid unreasonable residual risk;
- Provides requirements for relations with suppliers.

The standard is divided into 10 parts distributed along the industry standard development V-cycle

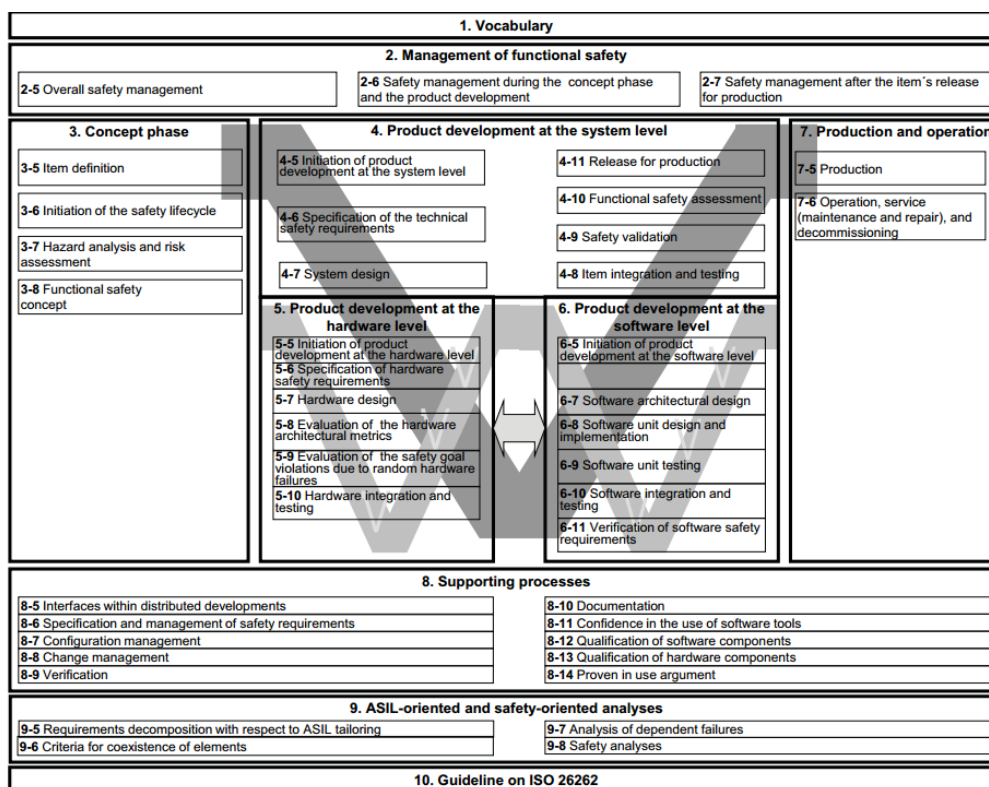


Figure 11 ISO 26262 and the V-model developing stages

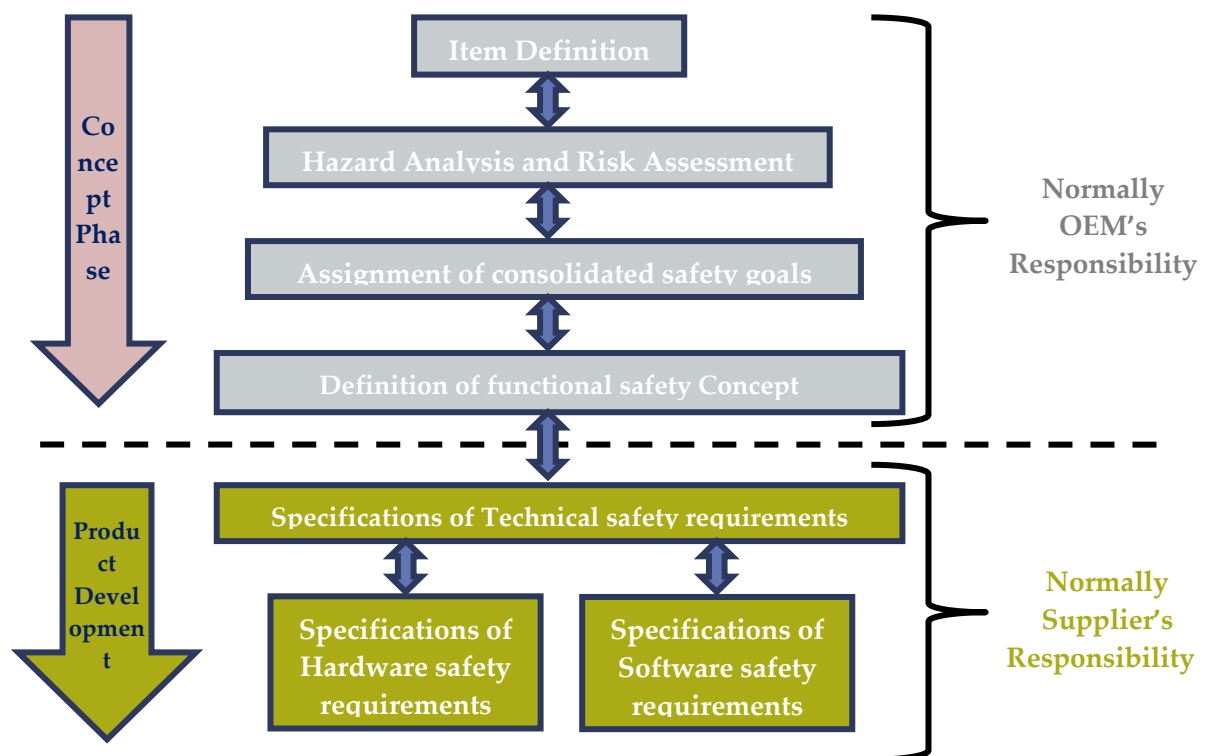


Figure 12 Interaction between car manufacturers and supplier in functional safety definition

Item Definition:

Item definition is the starting point of functional safety. An item is normally described as a system, a group of system or a function to which ISO 26262 is applied. This task involves documenting each item individually and then describing the purpose and the functionality of the item and also the dependencies between each item and its environment.

Hazard Analysis and Risk Assessment:

This phase includes 2 main tasks:

Hazard Analysis: Each requirement of the functional specifications is analysed in detail to determine all the possible hazard states for the function and verify if certain function is or isn't safety critical.

Risk Assessment: Once the safety critical hazards are identified, risk [Automotive Safety Integrity Levels (ASILs)] are assigned to each hazard with the help of allocation table defined in the standard.

Where the Risk is a function of:

- *Exposure*: How often the vehicle is in a situation in which the people involved e.g. driver, passengers or other road user may be put at risk.
- *Controllability*: How well the individuals involved can handle the infringement of the safety goal.
- *Severity*: Quantifies the seriousness of the consequences that may arise from a breach of a safety goal.

Assignment of consolidated safety goals

Safety goals must be defined for each hazard that is safety critical. Safety goals are generally the opposite of the hazard. They define in the most general terms, what the function should be able to do to avoid a particular hazard.

Defining of the Functional safety concept

This involves defining a generic strategy from a functional point of view to avoid the probably hazard in case of a failure and enter a safe state. This is the first step in defining safety strategies with the intention of entering a “Safe State” in the event of a failure.

Specifications of technical safety requirements

The technical aspects of the “Functional safety concept” are defined at this stage with/by the suppliers. These technical specifications will generate 2 separate documents:

- Specifications of the hardware safety requirements
- Specifications of the software safety requirements

Testing and Validation

Finally the OEM is also responsible for preparing the test cases and verifying that all the safety goals are met by the system as defined by the functional safety concept.

Description of the influence on the companion system

ISO26262 sets methodologies to assess the functional safety requirements to be fulfilled in the design, development and validation of automotive Electronic Control Units as the on-board system to be used in COMPANION. ISO26262 has focus on the vehicle level, determining the hazard and criticality of the different functionalities of the system; however it fails to correctly define safety levels when more than one vehicle is involved as it is in the case of platooning.

5.3. Regulation frames regarding vehicle's use:

5.3.1. UNECE Regulation N°105 (UNECE) - ADR

Description of the regulation

The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was done at Geneva on 30 September 1957 under the auspices of the United Nations Economic Commission for Europe, and it entered into force on 29 January 1968. The Agreement itself was amended by the Protocol amending article 14 (3) done at New York on 21 August 1975, which entered into force on 19 April 1985.

The Agreement itself is short and simple. The key article is the second, which says that apart from some excessively dangerous goods, other dangerous goods may be carried internationally in road vehicles subject to compliance with:

- the conditions laid down in Annex A for the goods in question, in particular as regards their packaging and labelling.
- the conditions laid down in Annex B, in particular as regards the construction, equipment and operation of the vehicle carrying the goods in question.

Description the use in the Companion vehicles

As vehicles transporting dangerous may be a part of the platoons defined in Companion project, it is important to take into account ADR specifics requirements, in order to define the routes in a proper way, avoiding countries where some transports may be forbidden or require the fulfilment of specific additional conditions, due to the fact that ADR is not a mandatory regulation, but an agreement between contracting parties.

As ADR agreement establishes requirements both for the packaging and labelling of goods and for the vehicles, it shall be taken into account that depending on the goods to be carried, a vehicles may be authorized or not to be driven into a certain country.

Fulfilment analyses

At the present time, all of the special vehicles for transport of dangerous goods which travel into different countries in Europe fulfil the necessary requirements for each of these countries.

As the routes are going to be decided taking into account several requirements, one of this requirements shall be the level of fulfilment of the ADR agreement of each vehicle and load, as well as the minimum requirements in each country, in order to avoid vehicles to enter countries for which they do not have ADR permission.

Current work in this regulation

ADR agreement is permanently under development (approximately one new version every two years).

However, the requirements for the vehicles are also contained in Regulation ECE 105, which is included into the list of mandatory regulatory acts to be fulfilled for European Whole Vehicle Type Approval, if the vehicle is designed and built for transport of dangerous goods. That allows the study of the Companion project to be focused especially in the future requirements for the goods themselves, as the requirements for the vehicle will advance in parallel in ADR agreement and Regulation ECE 105.

5.3.2. UNECE Treaty: Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage (ATP)

Description of the regulation

The Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage (ATP) done at Geneva on 1 September 1970 entered into force on 21 November 1976.

The ATP is an Agreement between States, and there is no overall enforcing authority. In practice, highway checks are carried out by Contracting Parties, and non-compliance may then result in legal action by national authorities against offenders in accordance with their domestic legislation. ATP itself does not prescribe any penalties.

ATP applies to transport operations performed on the territory of at least two of the Contracting Parties. In addition, a number of countries have also adopted the ATP as the basis for their national legislation.

This regulation sets the technical requirements for the special vehicles for ATP use, taking into account the goods to be transported and the conditions required for these goods.

It defines different types of special vehicle for ATP use:

- Insulated
- Refrigerated
- Mechanically refrigerated
- Heated

Description of the influence on the companion system:

Companion vehicles are going to travel along Europe, and may cross several countries. As ATP agreement is not a mandatory regulation, but an agreement between contracting parties, some of the countries in which the platoons can enter may have a different level of application.

Thus, as national requirements may differ, it is important in the case of vehicles for transport of perishable goods to take into account which countries will this platoon cross, in order to check if each of the vehicles is suitable to be driven in such countries.

Fulfilment analyses

At the present time, all of the special vehicles for transport of perishable goods which travel into different countries in Europe fulfil the necessary requirements for each of these countries.

As the routes are going to be decided taking into account several requirements, one of this requirements shall be the level of fulfilment of the ATP agreement of each vehicle and the minimum requirements in each country, in order to avoid vehicles to enter countries for which they do not have ATP permission.

Current work in this regulation:

The progress in ATP agreement shall be divided in two different levels.

First of all, there is the UNECE level. At this level, ATP agreement is permanently under development, taking into account the technical progress and the sanitary improvements in term of perishable goods conservation.

At a national level, there is also a permanent development, which tends to standardise the requirements along Europe. An European standard in terms of ATP would eliminate the problems that can occur at the present moment when deciding the route for a platoon in terms of ATP

5.3.3. Regulation (EC) No 1071/2009 Road transport operators: conditions for the pursuit of the occupation

Description of this regulation:

This Regulation is therefore intended to reinforce the harmonisation of the rules with the aim, in particular, of promoting fair competition between road transport companies and improving the level of professional qualification of staff.

This regulation establishing common rules concerning the conditions to be complied with to pursue the occupation of road transport operator and repealing Council Directive 96/26/EC

This Regulation lays down provisions relating to the occupation of road transport operator, which includes the occupations of **haulage operator** and **passenger transport operator**. It applies to all undertakings engaged in this occupation within the European Union (EU) and to undertakings which intend to engage in the occupation. Undertakings engaged in the occupation of road haulage operator using vehicles the mass of which exceed 3.5 tonnes, speed exceeding 40 km/h and transport services on with profit basis

LIST OF SUBJECTS REFERRED TO IN ARTICLE 8

The knowledge to be taken into consideration for the official recognition of professional competence by Member States must cover at least the subjects listed below for road haulage and road passenger transport. In relation to these subjects, applicant road haulage and road passenger transport operators must have the levels of knowledge and practical aptitude necessary for the management of a transport undertaking

Regarding the road safety

The applicant must, in particular, in relation to road haulage and passenger transport:

1. Know what qualifications are required for drivers (driving licence, medical certificates, certificates of fitness, etc.);
2. Be able to take the necessary steps to ensure that drivers comply with the traffic rules, prohibitions and restrictions in force indifferent Member States (speed limits, priorities, waiting and parking restrictions, use of lights, road signs, etc.);
3. Be able to draw up instructions for drivers to check their compliance with the safety requirements concerning the condition of the vehicles, their equipment and cargo, and concerning preventive measures to be taken
4. Be able to lay down procedures to be followed in the event of an accident and to implement appropriate procedures to prevent the recurrence of accidents or serious traffic offences;
5. Be able to implement procedures to properly secure goods and be familiar with the corresponding techniques; in relation to road passenger transport:
6. Have elementary knowledge of the layout of the road network in the Member States

Fulfilment analyses

Companion users are the responsible to fulfil this regulation. However their correct compliance also affects the other vehicles that are going to take part in the platoon and consequently this should be considered by the Companion system.

5.3.4. Regulation (EC) No 561/2006: Driving time in the road transport sector

Description of this regulation:

The Regulation lays down new and simpler provisions concerning driving times, breaks and rest periods for drivers of Lorries and buses. It defines the responsibilities of transport undertakings and drivers as well as possible exceptions. It contains provisions on the monitoring and evaluation of the Regulation, and on penalties in the event of infringements.

This Regulation shall apply to the **carriage by road of goods** by vehicles with a total mass exceeding 3.5 tonnes

European Union (EU) Member States can also decide to grant other exemptions subject to individual conditions on their own territory in the following cases.

- belonging to the public authorities provided they do not compete with private transport undertakings;
- operating on small islands which are not linked to the national territory;
- used for milk collection and the return of milk intended for animal feed
- specialised for transporting money and/or valuables;
- carrying animal waste not intended for human consumption

Driving time is subject to a number of rules, i.e.:

- the daily driving time should not exceed nine hours. Twice a week, this may be extended to ten hours;
- the weekly driving time shall not exceed 56 hours;
- the total driving time during any two consecutive weeks shall not exceed 90 hours;
- the driver should record as other work on the tachograph any work time during which he is not driving, as well as any time spent driving a vehicle not falling within the scope of this Regulation and the journey time on a ferry or train when he has no access to a bunk or couchette;
- after driving for four and a half hours a driver shall take an uninterrupted break of not less than 45 minutes or of 15 minutes followed by 30 minutes over the same period;
- a compulsory weekly rest period of at least 45 hours (regular weekly rest period) or 24 hours (reduced weekly rest period);
- if, over the course of two consecutive weeks, a driver can take only one reduced weekly rest period, the reduction shall be compensated for by an equivalent period of rest taken en bloc before the end of the third week;
- between two weekly rest periods, a driver may not take more than 3 reduced daily rest periods;

- where a driver chooses to do this, daily rest periods and reduced weekly rest periods may be taken in a vehicle. On the condition that the vehicle is stationary and has suitable sleeping facilities;
- when a driver takes a rest period where the vehicle is transported by ferry or train, that period may be interrupted not more than twice for a maximum of one hour in total. The driver should also have access to a bunk or couchette

Transport undertakings or other bodies offering the same service must ensure that their drivers are able to comply with Regulation (EEC) No 3821/85 on the **tachograph**:

- they may not award bonuses related to distances travelled or the amount of goods carried if that payment is such as to endanger road safety.
- they must ensure that transport time schedules are in line with this Regulation and that data from digital tachographs are downloaded at the right time and kept for at least 12 months.

Transport undertakings shall be **liable for infringements** committed by drivers of the undertaking. Except in cases where it cannot reasonably be held responsible, such as when a driver working for more than one transport undertaking has not provided sufficient information for them to be able to comply with this Regulation.

A Member State may approve some exceptions:

- after approval by the Commission, authorise exceptions for some transport operations in, from or to areas of its own territory with a population density of less than five persons per square kilometre;
- grant an exception for a period not exceeding 30 days in urgent cases and for transport operations carried out entirely on their territory;
- subject to approval by the Commission, grant an exemption in exceptional circumstances for transport operations carried out entirely on their territory.
- The driver may not comply with the Regulation so as to enable the vehicle to reach a suitable stopping place. However, he must indicate the reason for his journey manually on the record sheet or on a printout from the digital tachograph. In addition, under certain conditions, a driver carrying out an occasional international passenger transport service may push b
- The basic directive concerning certain aspects of the organisation of working time provides for the replacement of its general provisions with more specific requirements. This is the case for transport. For this particular sector, Regulation (EC) No 561/2006 lays down the maximum daily driving time and the minimum duration of the rest periods.

Fulfilment analyses

This is responsibility for the transport undertakings. However, as the routes are going to be decided taking into account several requirements, one of this requirements shall be the driving hours and to rest for each vehicle.

5.3.5. Directive 2011/82/EU: Facilitating the cross-border exchange of information on road safety related traffic offences

Description of this regulation:

This Directive aims to ensure a high level of protection for all road users in the Union by facilitating the cross-border exchange of information on road safety related traffic offences and thereby the enforcement of sanctions, where those offences are committed with a vehicle registered in a Member State other than the Member State where the offence took place.

This Directive shall apply to the following road safety related traffic offences: speeding; non-use of a seat-belt; failing to stop at a red traffic light; drink-driving; driving under the influence of drugs; failing to wear a safety helmet; use of a forbidden lane; illegally using a mobile telephone or any other communication devices while driving

Article 8: Information for road users in the Union

1. The Commission shall make available on its website a summary in all official languages of the institutions of the Union of the rules in force in Member States in the field covered by this Directive. Member States shall provide information on these rules to the Commission.

2. Member States shall provide road users with the necessary information about the rules applicable in their territory and the measures implementing this Directive in association with, among other organizations, road safety bodies, non-governmental organizations active in the field of road safety and automobile clubs

Description of the influence on the companion system

In traffic rules some differences are done regarding vehicles categories. However platoons are not taking into account.

Fulfilment analyses

These local rules may be taken into account in the rout calculation and also carriers should know what they need to travel through these countries. In the following table (Table 3) there is a summary of local limitations and requirements.

	Max. speed			Distance between vehicles (s)	Other specific rules							
	Highway (km/h)	Non-urban roads	Town		alcohol g/l (professional)	Position lights, mandatory	Snow tyres, mandatory	Best	Triangle	Medical kit	extinguisher	Others
<i>Austria</i>	80	70	50		0.1	No	Yes	Yes	Yes	Yes	No	(21)
	Federal Ministry of Transport, Innovation and Technology											
<i>Belgium</i>	90	90	50	3s	0.2	No	No	Yes	Yes	Yes	Yes	-
	Federal Public Service Mobility and Transport GD Mobility and Road Safety Direction B1											
<i>Bulgaria</i>	100	80	50	3s	0.5	Yes ⁽¹⁰⁾	Yes	Yes	Yes	Yes	yes	-
	Ministry of Regional Development and Public Works											
<i>Croatia</i>	90	80	50		0.0	Yes ⁽⁹⁾	Yes	No	No	No	No	-
	Ministry of Interior											

<i>Czech Republic</i>	80	80	50		0.0	Yes	Yes ⁽¹¹⁾	No	No	Yes	No	-
	Ministry of Transport											
<i>Denmark</i>	80	70	50		0.5	No	No	No	Yes	No	No	(21)
	The Police, Danish National Traffic Police											
<i>Estonia</i>	90	90	50		0.2	Yes	Yes ⁽¹²⁾	Yes	Yes	Yes	Yes	(21)
	Ministry of Economic Affairs and Communications											
<i>Finland</i>	80	80	50		0.2	Yes	Yes	No	Yes	Yes	Yes	(21)
	Ministry of Transport and communications											
<i>France</i>	90 ⁽¹⁾ /80 ⁽²⁾	80	50	3s	0.5	No	No	Yes	Yes	Yes	No	-
	DGEC/SCEE Sous - Direction de la sécurité et des émissions des véhicules SD6											
<i>Germany</i>	80	80/60 ^(3,4)	50	*	0.0	No	Yes	No	Yes	Yes	No	-
	Ministry of Transport, Building and Urban Development Ministry of Transport, Building and Urban Development: Referat LA 21(Driving License) Referat LA 22 (Traffic Regulations)											
<i>Greece</i>	85 ⁽¹⁾ /80 ⁽²⁾	80	50		0.2	No	No	No	Yes	Yes	Yes	-
	Ministry of infrastructure, transport & networks Directorate of Road Safety											
<i>Hungary</i>	80	70	50	3s	0.0	Yes	No	No	Yes	No	No	-
	Országos Rendőrfőkapitányság											
<i>Ireland</i>	90	80	50		0.5	Yes	No	No	No	No	No	-
	Department Of Transport Tourism and Sport											
<i>Italy</i>	100 ⁽¹⁾ 80 ⁽²⁾	80/70 ⁽⁶⁾	50	3s	0.0	Yes	Yes	Yes	Yes	No	No	-
	Ministero delle Infrastrutture e dei Trasporti – Dipartimento per i Trasporti, la navigazione ed i sistemi informativi e statistici / D.G. per la Motorizzazione / D. G. per la Sicurezza stradale / D. G. per il Trasporto Stradale e per l'Intermodalità											
<i>Latvia</i>	90/80 ⁽³⁾	90/80 ⁽³⁾	50		0.5	Yes	Yes ⁽¹²⁾	No	No	Yes	Yes	(22)
	Road Traffic Safety Directorate											
<i>Lithuania</i>	80/90 ⁽²⁾	70 ⁽⁷⁾ /80	50		0.2	Yes	Yes ⁽¹³⁾	Yes	Yes	Yes	Yes	-
	Ministry of Transport and Communiactions											
<i>Luxembourg</i>	90	75	50	3s	0.2	No	Yes ⁽¹⁴⁾	Yes	Yes	No	No	-
	Ministère du Développement durable et des Infrastructures Département des Transports											
<i>Malta</i>	60	60	40		0.8	No	no	No	No	No	Yes	-
	Transport Malta											
<i>Netherlands</i>	80	80	50	3s	0.5	No	No	No	Yes	No	No	-
	Ministry of Infrastructure and the Environment											
<i>Poland</i>	80	70	50		0.2	Yes	No	No	Yes	No	Yes	-
	Ministry of Infrastructure Road Transport Department											
<i>Portugal</i>	90 ⁽¹⁾ /80 ⁽²⁾ 70 ⁽⁴⁾	80/70 ⁽⁴⁾	50 40 ⁽⁴⁾	3s	0.5	No	No	Yes	Yes	No	No	-
	Instituto da Mobilidade e dos Transportes Terrestres Unidade Nacional de Trânsito											
<i>Romania</i>	110	90/80	50		0.0	Yes	Yes ⁽¹⁴⁾	Yes	Yes	No	Yes	-
	Ministry of Administration and Interior Ministry of Transport and Infrastructure											
<i>Slovakia</i>	90	90	50		0.0	Yes	Yes ⁽¹⁵⁾	Yes	Yes	No	No	-
	Ministry of Interior											
<i>Slovenia</i>	80 ⁽¹⁾ /90 ⁽²⁾	80	50		0.0	Yes	Yes ⁽¹⁶⁾	Yes	Yes	Yes	No	(23)
	Ministry of Transport											
<i>Spain</i>	80	80/70 ⁽⁸⁾	50	3s	0.3	No	No ⁽¹⁷⁾	Yes	Yes ⁽¹⁹⁾	No	Yes ⁽²⁰⁾	(24)
	Dirección General de Tráfico Dirección General de Transporte Terrestre. Ministerio de Fomento											
<i>Sweden</i>	90	70	50	3s	0.2	Yes	Yes ⁽¹⁸⁾	No	Yes	No	Yes	-
	Swedish Transport Agency											
<i>United Kingdom</i>	96/80 ⁽⁶⁾	64	48	3s	0.8	No	No	No	No	No	No	-
	Highways Agency Driving Documents Driver and Vehicle Licensing Agency											

(1) Motorway	(15) Driven wheels from 15 November to 15 March if the road is covered with snow and ice
(2) Expressway	(16) From 15 November to 15 March, and beyond these dates during wintry conditions
(3) Over 7.5 tones	(17) Wheel chains in heavy snow
(4) If trailer or semitrailer	(18) From 1 December to 1 March if the Swedish Police decides there are wintry conditions.
(5) Dual carriageways	(19) Two bests
(6) Over 12 tones	(20) Large commercial vehicles
(7) No asphalt	(21) Wheel chock mandatory
(8) Road shoulder <1.5m	(22) Emergency hazard
(9) In winter	(23) Replacement bulbs
(10) From 1 November to 1 March	(24) Spare wheel and tools for fitting it
(11) From 1 November to 31 March, in snow and ice	(*) Half part of the speed
(12) From 1 December 1 March	
(13) From 10 November until 31 March (only vehicles weighing 3500 kg or less)	
(14) In wintry conditions (snow and ice)	

Table 3: Maximum speed and other requirements for N3 vehicle and the local body's' stockholders

5.3.6. Directive 2006/126 EC: Driving licenses

Description of this regulation:

This Directive recasts the existing legislation harmonising the conditions for issuing national driving licences. The aim is to improve mutual recognition of licences and so make it easier for people to move within the European Union (EU) or to settle in an EU country other than the one in which they have passed a driving test.

The driving licence may authorise the holder to drive vehicles in the following categories:

- category A motorcycles weighing less than 750 kg;
- category B vehicles weighing less than 3,500 kg or caravans weighing less than 4,250 kg
- category B+E combinations consisting of a category B vehicle and trailer;
- category C vehicles weighing more than 3,500 kg;
- category C+E combinations consisting of a category C vehicle and trailer;
- category D vehicles having more than 8 seats;
- category D+E combinations consisting of a category D vehicle and trailer

EU countries must ensure that applicants for driving licenses possess the knowledge and skills and exhibit the behaviour required for driving a motor vehicle. In general, the tests introduced to this effect must consist of:

- a theory test;
- a test of skills and behaviour.

Fulfilment analyses

There are no troubles to drive across Europe with a European driving license; therefore there will be no specific requirement in the route calculation.

5.3.7. Directive 2002/15/EC Organisation of working time in respect of road transport activities

Description of this regulation:

This Directive supplements the provisions of Regulation (EC) No 561/2006 described above. The provisions of this Regulation in regard to breaks, rest periods and driving periods continue to apply to the self-employed drivers and to the mobile workers concerned.

The Directive establishes:

- The average weekly working time may not exceed 48 hours. It can be extended to 60 hours only if an average of 48 hours per week is not exceeded within a period of four months. For mobile workers, working time is the sum of the working hours spent working for different employers. The mobile worker must inform the employer concerned in writing of working time performed for another employer;
- an obligation to take a break after six hours of work in addition to the provisions on breaks in Regulation (EC) No 561/2006;
- Daily working time may not exceed 10 hours for each period of 24 hours for night workers
- Records are kept of the workers' working time. Member States must take the measures necessary to ensure that the employer posts or displays in a place accessible to all workers a copy of this Directive and of the corresponding domestic law. The employer is required to record the working time of mobile workers and to keep these records for at least one year.

Fulfilment analyses

In these cases the resting and driving time is defined by each country. So it would be carefully taken into account for the route calculation.

5.3.8. Directive 2000/30/EC: Technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Community.

Description of the directive:

This directive sets out the legal framework for roadside roadworthiness checks on commercial vehicles that are intended to carry passengers or goods. It supplements Directive 96/96/EC which introduces a mandatory annual roadworthiness test at a testing station for on-road commercial vehicles.

The directive provides for the introduction by the EU countries of regular, appropriate roadside checks to be carried out without discrimination as to the driver's nationality or vehicle registration, and which every year covers a significant, representative cross-section of commercial vehicles of all categories.

The roadside checks provided for in the directive shall be carried out in accordance with a checklist (in Annex 1 of current directive). A certificate setting out the results of the spot check is

to be handed to the driver of the vehicle, who must be in a position to present this on request in order to simplify or avoid subsequent checks.

Fulfilment analyses

The companion platoons will be formed by vehicles that have passed the roadworthiness test from their original country. As this directive announces, it is valid for all EU members, so no problem will be regarding this topic for the companion.

5.4. Regulation frames regarding infrastructures:

5.4.1. Directive 2006/103/EC: Taxation of heavy goods vehicles: Eurovignette Directive

Description of the directive:

The Directive sets common rules on distance-related tolls and time-based user charges (vignettes) for heavy goods vehicles (above 3.5 tonnes) for the use of certain infrastructure. These rules stipulate that the cost of constructing, operating and developing infrastructure can be leveraged through tolls and vignettes to road users. It does not cover: vehicles registered in the Canary Islands, Ceuta and Melilla, the Azores or Madeira and carrying out transport operations in these territories or between these territories and Spain or Portugal

The regulatory framework aims at:

- improving the functioning of the road transport internal market by reducing the differences in the levels and systems of tolls and vignettes applicable in Member States;
- taking better account of the principles of fair and efficient pricing by providing for greater differentiation of tolls and vignettes in line with costs associated with the road use.

Vehicle taxes

The Directive indicates which taxes are concerned in each individual country. Each Member State is responsible for adopting procedures for levying and collecting these taxes, which are charged by the Member State in which the vehicle is registered.

Member States may not set vehicle tax rates any lower than the minimum rates set out in the Directive. Under the Directive, Member States also have the option, in certain cases and subject to certain conditions, of applying reduced rates or granting exemptions.

Tolls and user charges

Member States are able to differentiate tolls according to a vehicle's emission category ("EURO" classification) and the level of damage it causes to roads, the place, the time and the amount of congestion. This makes it possible to tackle the problems of traffic congestion, including damage to the environment, on the basis of the "user pays" and "polluter pays" principles.

Tolls must be levied according to the distance travelled and the type of vehicle; vignettes are scaled according to the duration of the use made of the infrastructure and to the vehicle's emission class;

5.4.2. Local regulation regarding the road taxes:

Although the Directive lays down certain rules to be followed by those Member States if they wish to levy those charges, the application of tolls and vignettes is not mandatory for Member States. Each EU country follows this directive with their local regulations particularities.

In the following table there is the summary of these taxes payment modes for each EU country and the local bodies that regulates them.

- *Vignettes* a charge based on pre-paying for access to the network for a period ranging from one day to one year
- *Eurovignette* is a single common vignette that provides access across all of those countries, so is genuinely "interoperable". In three of those countries (Denmark, Belgium and Hungary), these systems are subject to plans to replace them.
- *Electronic network wide tolling* This covers both GPS based and DSRC based distance tolling Portugal's system is not on a network scale like most of the other examples.
- *Manual tolls*. Include countries with significant amounts of tolling, as it includes. Given quite a few countries have manual tolling; it is more a case of those for which manual tolls are regularly used on major highways, rather than incidental
- *No tolls*. Latvia and the UK are developing vignette systems.

	Road user charges	Local regulation bodies
<i>Austria</i>	Electronic network tolling	Federal Ministry of Transport, Innovation and Technology
<i>Belgium</i>	Eurovignette	Federal Public Service Mobility and Transport DG Land Transport
<i>Bulgaria</i>	Vignette	Road Infrastructure Agency
<i>Croatia</i>	Tolls	Ministry of the Sea, Transport and Infrastructure
<i>Czech Republic</i>	Electronic network tolling	Ministry of Transport
<i>Denmark</i>	Eurovignette	SKAT
<i>Estonia</i>	No tolls	Ministry of Economic Affairs and Communications
<i>Finland</i>	No tolls	Ministry of Finance
<i>France</i>	Manual tolls	APRR AREA
<i>Germany</i>	Electronic network tolling	Ministry of Transport, Building and Urban Development
<i>Greece</i>	Manual tolls	Ministry of infrastructure, transport & networks
<i>Hungary</i>	Vignette	Ministry of National Development Transport Infrastructure Department
<i>Ireland</i>	Manual tolls	Department Of Environment Department Of Transport, tourism and transport/Department of finance
<i>Italy</i>	Manual tolls	Ministero delle Infrastrutture e dei Trasporti - Dipartimento per le Infrastrutture Autostrade per l'Italia Spa
<i>Latvia</i>	No tolls	Ministry of Transport, Land Transport Department

<i>Lithuania</i>	Vignette	Ministry of Transport and Communications
<i>Luxembourg</i>	Eurovignette	Ministère du Développement durable et des Infrastructures Département des Transports
<i>Malta</i>	-	Transport Malta
<i>Netherlands (12)</i>	Eurovignette	Ministry of Finance, Tax Authority Tax and Customs Administration/Limburg/Department of International Issues
<i>Poland</i>	Electronic network tolling	General Directorate of National Roads and Motorways
<i>Portugal</i>	Electronic network tolling	Direcção - Geral das Contribuições e Impostos Estradas de Portugal, S.A Brisa, Auto- estradas de Portugal, S.A
<i>Romania</i>	Vignettes	Romanian National Company of Motorways and National Roads,
<i>Slovakia</i>	Electronic network tolling	Ministry of Transport, Construction and Regional Development
<i>Slovenia</i>	Manual tolls	Ministry of Transport
<i>Spain</i>	Manual toll	Dirección General de Carreteras
<i>Sweden</i>	Eurovignette	The County Tax Authority
<i>United Kingdom</i>	No tolls	Freight Policy & Lorry Charging Division Department for Transport

Table 4: Charging heavy goods vehicles in the EU and their local regulating bodies

The European Commission has published this map (Figure 13: July of 2012) depicting the EU Member States that have road pricing for heavy goods vehicles. It classifies countries into six groups:

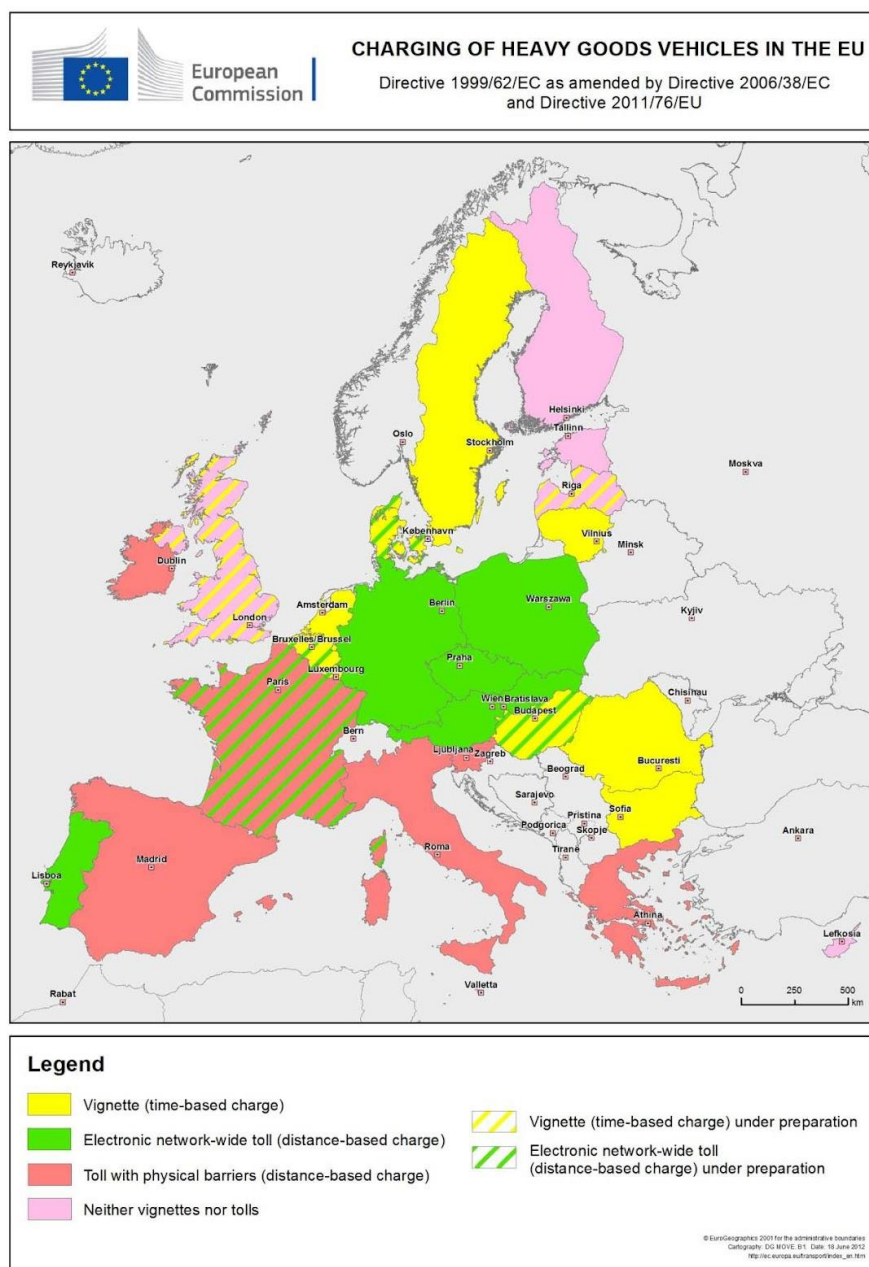


Figure 13: Charging heavy goods vehicles in the EU

Description of the influence on the companion system:

It is something that would be taken into account when the route calculation is done.

5.4.3. Directive 96/53/EC amended in 2002/7/EC Road safety: dimensions and maximum weights authorised for both national and international journeys

Description of this regulation:

Heavy goods vehicles transporting goods in Europe, buses and coaches, must comply with certain rules on weights and dimensions for road safety reasons and to avoid damages to roads, bridges and tunnels. Directive 96/53/EC set maximum common measures, ensuring that Member States

cannot restrict the circulation of vehicles which comply with these limits from performing international transport operations within their territories. However some EU members permit a higher maximum mass limit for the traffic circulation inside their frontiers.

These rules complement the requirements for type-approval of commercial vehicles laid out in Directive 97/27/EC. This directive (under responsibility of DG Enterprise) sets the framework for putting vehicles such as light-duty and heavy-duty vehicles, buses and trailers on the market, and applies only to new vehicles, whereas Directive 96/53/EC sets out rules for the circulation of all commercial vehicles, the new ones like the others

Member States may not authorise the normal use on roads within the national frontiers of goods vehicles or vehicle combinations that do not display the characteristics set out in **Annex I**, apart from the standard relating to maximum height. Any vehicles or vehicle combinations exceeding the maximum dimensions may only be used on the roads if a special authorisation has been received.

In international traffic terms no Member State may refuse or ban the use, on its territory, of vehicles registered or placed in service in other Member States for reasons deriving from their weights and dimensions. In the case of national traffic that State may also not ban the use, on its territory, of goods vehicles registered or placed in service in other Member States for reasons relating to their dimensions. These two situations only apply if those vehicles comply with the values laid down in Annex I, which sets out the maximum weights and dimensions and the attendant characteristics.

Member States will take any action needed in order to ensure that vehicles are provided with one of the three proofs set out below:

- a "manufacturer's" plate supplemented by a plate concerning dimensions; or
- a single plate containing the data from the two plates referred to above; or
- a single document issued by the competent authority in the Member State in which the vehicle is registered or was placed in service, and which contains the same data as those on the other plates.

ANNEX I: MAXIMUM WEIGHTS AND DIMENSIONS AND RELATED CHARACTERISTICS OF VEHICLES

1. Maximum authorized dimensions for the vehicles referred to in Article 1

1.1. Maximum length

- | | |
|----------------------------------|---------|
| - motor vehicle other than a bus | 12,00 m |
| - trailer | 12,00 m |
| - articulated vehicle | 16,50 m |
| - road train | 18,75 m |

1.2. Maximum width:

- | | |
|---|--------|
| - all vehicles | 2,55 m |
| - superstructures of conditioned vehicles | 2,60 m |

1.3. Maximum height (any vehicle)

4,00 m

2. Maximum authorized vehicle weight (in tonnes)

2.1. Vehicles forming part of a vehicle combination	
2.1.1. Two-axle trailer	18 tonnes
2.1.2. Three-axle trailer	24 tonnes
2.2. Vehicle combinations	
2.2.1. Road trains with five or six axles	
a) two-axle motor vehicle with three-axle trailer	40 tonnes
b) three-axle motor vehicle with two or three-axle trailer	40 tonnes
2.2.2. Articulated vehicles with five or six axles	
a) a) two-axle motor vehicle with three-axle semi-trailer	40 tonnes
b) b) three-axle motor vehicle with two or three-axle semi-trailer	40 tonnes
c) three-axle motor vehicle with two or three-axle semi-trailer carrying a 40-foot ISO container as a combined transport operation	44 tonnes
2.3. Motor vehicles	
2.3.1. Two-axle motor vehicles	18 tonnes
2.3.2. Three-axle motor vehicles	25 tonnes
	26 tonnes
where the driving axle is fitted with twin tyres and air suspension or suspension recognized as being equivalent within the Community as defined in Annex II, or where each driving axle is fitted with twin tyres and where the maximum weight for each axle does not exceed 9,5 tonnes	
2.3.3. Four-axle motor vehicles with two steering axles	32 tonnes
where the driving axle is fitted with twin tyres and air suspension or suspension recognized as being equivalent within the Community as defined in Annex II, or where each driving axle is fitted with twin tyres and where the maximum weight for each axle does not exceed 9,5 tonnes	
3. Maximum authorized axle weight of the vehicles referred to in Article 1 (1) (b)	
3.1. Single axles Single non-driving axle	10 tonnes
3.2. Tandem axles of trailers and semi-trailers The sum of the axle weights per tandem axle must not exceed, if the distance (d) between the axles is:	
3.2.1. less than 1 m ($d < 1,0$)	11 tonnes
3.2.2. between 1,0 m and less than 1,3 m ($1,0 \leq d < 1,3$)	16 tonnes
3.2.3. between 1,3 m and less than 1,8 m ($1,3 \leq d < 1,8$)	18 tonnes
3.2.4. 1,8 m or more ($1,8 \leq d$)	20 tonnes
3.3. Tri-axes of trailers and semi-trailers The sum of the axle weights per tri-axle must not exceed, if the distance (d) between the axles is:	
3.3.1. 1,3 m or less ($d \leq 1,3$)	21 tonnes
3.3.2. 3.3.2 over 1,3 m and up to 1,4 m ($1,3 < d \leq 1,4$)	24 tonnes
3.4. Driving axle	
3.4.1. Driving axle of the vehicles referred to in 2.2.1 and 2.2.2	11,5 tonnes
3.4.2. Driving axle of the vehicles referred to in points 2.2.3, 2.2.4, 2.3 and 2.4	11,5 tonnes
3.5. Tandem axles of motor vehicles The sum of the axle weights per tandem axle must not exceed, if the distance (d) between the axles is:	
3.5.1. less than 1 m ($d < 1,0$)	11,5 tonnes

3.5.2.	1,0 m or greater but less than 1,3 m ($1,0 \leq d < 1,3$)	16 tonnes
3.5.3.	1,3 m or greater but less than 1,8 m ($1,3 \leq d < 1,8$)	18 tonnes

4. Related characteristics of the vehicles referred to in Article 1 (1) (b)

- 4.1. All vehicles The weight borne by the driving axle or driving axles of a vehicle or vehicle combination must not be less than 25 % of the total laden weight of the vehicle or vehicle combination, when used in international traffic
- 4.2. Road trains The distance between the rear axle of a motor vehicle and the front axle of a trailer must not be less than 3,00 m.
- 4.3. Maximum authorized weight depending on the wheelbase The maximum authorized weight in tonnes of a four-axle motor vehicle may not exceed five times the distance in metres between the axles of the foremost and rearmost axles of the vehicle
- 4.4. Semi-trailers The distance measured horizontally between the axis of the fifth-wheel king pin and any point at the front of the semi-trailer must not exceed 2,04 m

Description of the influence on the companion system:

The maximum masses and maximum dimensions for each vehicle are well known for carriers and drivers, so they should not have any problem to comply this directive. However if the companion is going to calculate the route it should be take into account as a possible condition or restriction.

Fulfilment analyses

Considering that will only take part in the companion s N3 trucks (as it is written in the D2.1), the maximum masses and dimensions are at least the once defined by the current directive. However for each country the weight limit can be higher. In that case carriers could increase the charge of their vehicles. If the companion is going to calculate the route it should be take into account the upper maximum masses limitation for some EU states as a possible condition or restriction

Regarding that the companion could be considered as a road train (instead of separate vehicles) in order to avoid road, bridges, tunnels and other infrastructure damages, the whole platoon should not pass 44 tons of mass.

5.4.4. Local regulation regarding the diving maximum masses and dimensions:

By avoiding obstacles at borders and ensuring that no hauliers are exposed to unfair competition, the above directive aims to facilitate the internal market and to ensure free movement of goods in Europe. For national transport however, the Directive foresees a number of derogations and Member States can decide to apply standards that deviate from the Directive for transport within their own borders, for instance for the transport of large loads such as forestry goods or longer combination of vehicles in Nordic countries.

The following table summarises the local maximum permissible mas in goods transports road traffic and the local bodies' stockholders

	Maximum Weight				Maximum dimensions			Local regulation body
	non-drive axle (t)	drive axle (t)	Lorry2 axles (t)	Lorry 3 axles (t)	Height (m)	width (m)	Length (lorry or trailer) (m)	
<i>Austria</i>	10	11.5	18	26	4	2.55 ⁽³⁾	12	Federal Ministry of Transport Bundesanstalt für Verkehr Innovation and Technology
<i>Belgium</i>	10	12	19	26	4	2.55 ⁽³⁾	12	Federal Public Service Mobility and Transport GD Mobility and Road Safety Direction D1 (traffic regulations) Direction D2 (driving licence) Direction B1 (technical conditions of vehicle)
<i>Bulgaria</i>	10	11.5	18	26 ⁽²⁾	4	2.55	12	Ministry of Interior Ministry of Transport, Information Technology and Communications
<i>Croatia</i>	10	11.5	18	24	4	2.55 ⁽³⁾	12	Ministry of the Sea, Transport and Infrastructure
<i>Czech Republic</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministry of Transport
<i>Denmark</i>	10	11.5	18	26	4	2.55 ⁽³⁾	12	Danish Transport Authority
<i>Estonia</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministry of Economic Affairs and Communications
<i>Finland</i>	10	11.5	18	26 ⁽²⁾	4.20	2.60 ⁽⁶⁾	12	Ministry of Transport and Communications
<i>France</i>	13; 12	13; 12	19	26	.-.	2.55 ⁽³⁾	12	Ministère des transports STR TR4 -> R5
<i>Germany</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministry of Transport, Building and Urban Development Referat LA 23 (Vehicle Safety)
<i>Greece</i>	7; 10	13	19	26	4	2.55	12	Ministry of infrastructure, transport & networks Directorate of Vehicle Technology
<i>Hungary</i>	10	11.5	18	25	4	2.55 ⁽³⁾	12	Ministry of National Development Transport Infrastructure Department
<i>Ireland</i>	10	11.5 ⁽⁹⁾	18	26 ⁽²⁾	4.65	2.55 ⁽³⁾	12	Road Safety Authority
<i>Italy</i>	12	12	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministero dell e Infrastrutture e dei Trasporti - Dipartimento per i Trasporti, la navigazione ed i sistemi informativi e statistici
<i>Latvia</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Latvian State Roads
<i>Lithuania</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministry of Transport and Communiactions
<i>Luxembourg</i>	10	12 ⁽¹¹⁾	19	26	4	2.55 ⁽³⁾	12	Ministère du Développement durable et des Infrastructures Département des Transports
<i>Malta</i>	10	11.5	18	25	4	2.55 ⁽³⁾	12	Transport Malta
<i>Netherlands⁽¹²⁾</i>	10	11.5	21.5	21.5; 30.5 ⁽²²⁾	4	2.55 ⁽³⁾	12	Ministry of Infrastructure and the Environment
<i>Poland</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	General Directorate of National Roads and Motorways
<i>Portugal</i>	10	12	19	26	4	2.55 ⁽³⁾	12	Instituto da Mobilidade e dos Transportes Terrestres
<i>Romania</i>	10	11.5	18	25	4	2.55	12	Romanian National Company of Motorways and National Roads
<i>Slovakia</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministry of Transport, Construction and Regional Development
<i>Slovenia</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Ministry of Transport
<i>Spain</i>	10	11.5	18	25 26 ⁽³⁴⁾	4	2.55 ⁽³⁾	12	Dirección General de Tráfico Dirección General de Transporte Terrestre. Ministerio de Fomento
<i>Sweden</i>	10	11.5	18	26 ⁽²⁾	4	2.55 ⁽³⁾	12	Swedish Transport Administration
<i>United Kingdom</i>	10	11.5	18	26 ⁽²⁾	.-.	2.55 ⁽³⁾	12	Transport Technology and Standards Division, Department for Transport

- | | |
|---|---|
| <p>(2) Only with air suspension or similar, and ABS (Anti-lock Braking System)</p> <p>(3) Vehicles at controlled temperatures = 2.60 m</p> <p>(9) Weight per drive axle: mechanical suspension (national traffic) = 10.5t;
road friendly suspension (national traffic) = 11.5t;
international traffic =11.5 t</p> <p>(11)Weight per drive axle: mechanical suspension = 11.5t</p> | <p>(12) Under specific conditions EMS (European Modular System) combinations may have a maximum length of 25.25 m and maximum mass of 60t</p> <p>(22) Depending on the distance between the axles, number of driven axles, type of suspension and single or double mounted tire</p> <p>(34) When the driving axle is fitted and pneumatic suspension or recognized as equivalent to EU level, or where each driving axle is fitted with double tires and the MMA on each axle doesn't exceed 9'5 t =26t</p> |
|---|---|

Table 5: Summary of maximum masses and dimensions and the local body that regulates it in each EU country.

Description of the influence on the companion system:

The maximum masses possible to caring for each vehicle are well known for carriers and drivers. However if the companion is going to calculate the route it should be take into account as a possible condition or restriction.

Fulfilment analyses

As it is said in the Directive 96/53/EC all the vehicles that fulfils the masses and dimensions limitation described in it will have no problems to drive thought all the European countries. However if a vehicles don't complies the Directive96/53/EC but fulfils with the local regulations neither would them have any problem.

6. Discussions groups and current work for regulations

The agreements of vehicles characteristics and the rules road traffic are being discussed by several groups. Some of them are just regulatory groups which are continuously improving their agreements and others are simple discussing groups looking for the implementation of new technologies in the official rules. The most important and influence groups, which are defined in the following lines, are working about the autonomous or semiautonomous driving and so, their work is important for the Companion project.

6.1. Harmonization of Vehicle Regulations (WP.29) UNECE

The Inland Transport Committee (ITC), the highest policy-making body of the UNECE in the field of transport, has provided a pan-European intergovernmental forum, where UNECE member countries come together to forge tools for economic cooperation and negotiate and adopt international legal instruments on inland transport.

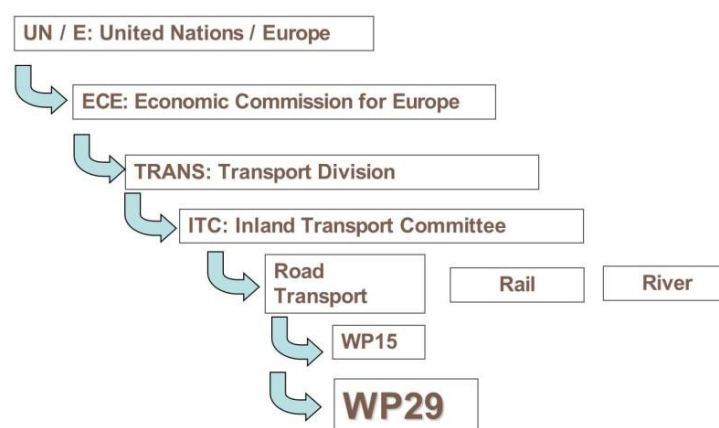


Figure 14: Hierarchical chart of the United Nations Transport committee

In the ITC, the subsidiary body World Forum for Harmonization of Vehicle Regulations (WP.29) (Figure 14) has established six permanent Working Parties (GRs), with the aim to incorporate into its regulatory framework the technological innovations of vehicles to make them safer and more environmentally sound:

- Noise (GRB)
- Lighting and Light-Signalling (GRE)
- Pollution and Energy (GRPE)
- Brakes and Running Gear (GRRF)
- General Safety Provisions (GRSG)
- Passive Safety (GRSP).

This group of experts conducts research and analysis to develop noise, active safety (specifically on braking and running matters), light, general safety and passive safety requirements. They convene officially twice a year and entrusts informal groups with specific problems that need to be solved urgently or that require special expertise.

To include any novelty, modification or extension in the regulation acts of the vehicle type approval, a new technical necessity should be announced in the WP29 (directly by their members or as a suggestion coming from the Ad Hoc working groups). Once the discussion about this necessity is accepted, the technical requirements for the new regulation are developed in a specific working group (Ad Hoc Working group). Finally it is presented to the correspondent responsible GR. After the proposal have been discussed and accepted in technical terms it is sent to the WP29 where its practicability will be discussed and accepted. Together with the WP29 the administrative committees Ac1 Ac2 and Ac3 (council about the 1998 Geneva agreement, 1958 Geneva agreement and the 1997 Vienne agreement) will give their approval.

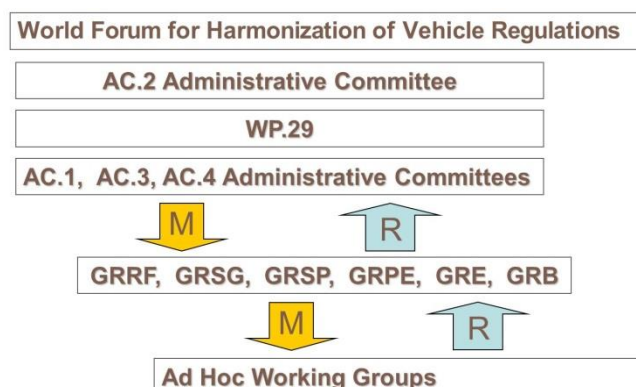


Figure 15: Regulation acts approval process.

6.2. GRRF

The Working Party on Braking and Running Gear (GRRF) is the main decision-making body under WP.29 for matters concerning vehicle handling and chassis systems (aka, active safety systems). GRRF reviews all significant proposals in this area and decides whether to forward them to the World Forum for final decisions on their adoption. Consequently is the GR where the Companion project will be presented and ti's feasibility will be discussed.

GRRF convenes officially twice a year, usually during February and September, and holds special ad hoc sessions as needed and also oversees subgroups of experts established to address active safety issues (Ad Hoc working groups).

6.3. ITS (UNECE)

The World Forum for Harmonization of Vehicle Regulations (WP.29) promotes ITS matters on-board of vehicles, such as Lane Departure Warnings Systems (LDWS), Advanced Emergency Braking Systems (AEBS) and on-board diagnostics (OBDs). Intelligent Transport Systems play an important role in shaping the future ways of mobility and the transport sector. However the huge potentials and benefits, can only be reaped if ITS solutions are put in place and internationally harmonized to the extent.

To this end, UNECE Working Parties have been and are dealing with Intelligent Transport Systems. The Working Party on Road Traffic Safety (WP.1), for example, is advancing on liability concerns, Variable Message Signs or safety risks related to driver distraction. The Working Party on Inland Water Transport (SC.3) resolves questions related to River Information Systems (RIS). The Working Party on the Transport of Dangerous Goods (WP.15) examines how Telematics can be used to enhance safety and security and the Working Party on Road Transport (SC.1) drives the Digital tachograph and e-CMR implementation. The World Forum for Harmonization of Vehicle Regulations (WP.29) promotes ITS matters on-board of vehicles, such as Lane Departure Warnings Systems (LDWS), Advanced Emergency Braking Systems (AEBS) and on-board diagnostics (OBDs).

6.4. Vienna convention

According to the analysis made by the Seventh framework programme project, ASSESS D2.4 – Legal methodological outline Public :

The Vienna Convention on Road Traffic forms the international law's framework for the embodiment of traffic law in the legal systems of the contracting parties which means that national law must not run contrary to the provisions of the Vienna Convention (VC).

Art. 8 (1) in Chapter II of the VC states that

“Every moving vehicle or combination of vehicles shall have a driver.”

Subsequently, Art. 8 (5) VC constitutes the driver's obligation to be able to control his vehicle permanently:

“Every driver shall at all times be able to control his vehicle or to guide his animals.”

The Convention contains requirements concerning conditions for the admission of motor vehicles and trailers to international traffic (chapter III VC and annex 5 VC) on the one hand, as well as driver-behaviour-related requirements on the other hand (chapter II VC “Rules of the Road” – such as Art. 8 cited above). In view of the actual correlation between a vehicle's technical construction on the one hand and its controllability on the other hand, the provisions of the Convention have to be comprehended as a unit. Hence, considering permissibility of IVSS also the provisions of chapter II VC must not be ignored. As mentioned above, national road traffic law must not run contrary to the Vienna Convention. Accordingly, it would be impermissible with regard to international law if a national legal system allowed IVSS that run contrary to the Vienna Convention.

National Road Traffic Codes like the German “*Straßenverkehrsordnung*” reflect the basic idea of permanent controllability expressed in the Vienna Convention. Due to its legal character as an international treaty obliging states, not the individual, the Convention does not provide any sanctions in case of infringements of the behavioural rules constituted in its chapter II, so that the driver will not face any consequences based on the Convention. However, national road traffic regulations which reflect and adopt parts of the Convention may well penalise infringements of the national road traffic regulations, of course.

Interventions of IVSS in the vehicle guidance which do not comply with the driver's will and which cannot be corrected or overridden may be considered as incompatible with the principle of controllability resulting from the Vienna Convention. Therefore, the technical design of IVSS may contribute to avoid practical consequences for the (non-) permissibility of an individual IVSS.

Consequently, the presence of technical provisions for overrideability of automated interventions may serve as an indicator for assessing an IVSS to be compliant with controllability in terms of the Vienna Convention on Road Traffic.

6.5. iMOBILITY forum

Having evolved from the original eSafety Forum, with different names that evolve with the scope of its objectives, the iMobility forum works towards what they describe as their vision: Safe, smart and clean mobility with zero accidents, zero delays, no negative impact on the environment and connected and informed citizens, where products and services are affordable and seamless, privacy is respected and security is provided. In the time period 2011-2020, the iMobility Forum estimates for ITS the following potential contributions:

- 30% reduction in the number of fatalities across Europe
- 30% reduction in the number of seriously injured persons across Europe
- 15% reduction of road traffic related congestion
- 20% improvements in energy-efficiency
- 50% increase in availability of real time traffic and travel information



Figure 16: iMobility Forum evolution over time

To work towards this vision, the Forum provides a platform for all ITS stakeholders in Europe to develop, implement and monitor work programs linked to roadmaps, international cooperation for the successful development and deployment of ITS. Strategic focus is on defining research and innovation priorities, the speeding up overall development/ deployment processes and will cover requirements for all stakeholders along the whole value chain.

At the end of the day, the iMobility Forum describes two main goals:

- 1) Ensure that the Forum contribution to the future R&I Frameworks, in particular H2020 is coherent and contributing to establishing effective development and deployment of ITS.

- 2) Ensure that the Forum contribution to R&I work programs is oriented towards supporting the transport and energy policy goals and contribute to European competitiveness, growth and jobs creation.

6.6. Car 2 Car Communication consortium

The CAR 2 CAR Communication Consortium (C2C-CC) is a non-profit, industry driven organisation initiated by European vehicle manufacturers and supported by equipment suppliers, research organisations and other partners.



Figure 17: Logo of Car2Car communication consortium.

The C2C-CC is dedicated to the objective of further increasing road traffic safety and efficiency by means of cooperative Intelligent Transport Systems (C-ITS) with Vehicle-to-Vehicle Communication (V2V) supported by Vehicle-to-Infrastructure Communication (V2I).

It supports the creation of European standards for communicating vehicles spanning all brands. As a key contributor the C2C-CC works in close cooperation with the European and international standardisation organisations. In cooperation with infrastructure stakeholders the C2C-CC promotes the joint deployment of cooperative ITS.

The objective is to deploy the first cooperative units by the year 2015, with a certain number of applications. This set of applications is commonly known as Day 1 apps. Further phases will start introducing new applications which are more technically complex or need a higher degree of penetration in the market of cooperative vehicles.

The goal of the CAR 2 CAR Communication Consortium is to standardize interfaces and protocols of wireless communications between vehicles and their environment in order to make the vehicles of different manufacturers interoperable and also enable them to communicate with road-side units. The mission and the objectives of the CAR 2 CAR Communication Consortium are:

- to create and establish an open European (possibly worldwide) industry standard for CAR 2 CAR Communication Systems
- to guarantee inter-vehicle operability
- to enable the development of active safety applications by specifying, prototyping and demonstrating the CAR 2 CAR system
- to promote the allocation of a royalty free European-wide exclusive frequency band for CAR 2 CAR applications
- to push the harmonization of CAR 2 CAR Communication standards worldwide
- to develop deployment strategies and business models to speed-up the market penetration

6.7. Euro ENCAP

Introduction

The **European New Car Assessment Programme** (Euro NCAP) is a voluntary vehicle safety rating system which originated in the UK but is now backed by the European Commission

They publish safety reports on new cars, and awards 'star ratings' based on the performance of the vehicles in a variety of crash tests, including front, side and pole impacts, impacts with pedestrians and the rear-impact test. The top overall rating is five stars.

Among Euro NCAP members are Governments, motor clubs and consumer organisations across the EU:



Figure 18: EuroNCAP members

Over the years, European automakers' cars have become much safer, partly as a result of the Euro NCAP standards. Test results are commonly presented by motor press, and in turn greatly influence consumer demand for a vehicle.

Testing is not mandatory, with vehicle models either being independently chosen by Euro NCAP or voluntarily tested by the manufacturers.^[9] In Europe, new cars are certified as legal for sale under the Whole Vehicle Type Approval regimen that differs from Euro NCAP.

The Euro NCAP accredited laboratories have followed an accreditation process to ensure that no differences exist between them. The test laboratories are:

- Applus+ IDIADA (Spain)
- ADAC (Germany)
- UTAC (France)
- TNO (The Netherlands)
- BAST (Germany)
- Thatcham (UK)
- CSI (Italy)

Rating

In 2009, Euro NCAP launched an integrated rating, where the performance of the vehicle in terms of active and passive safety was evaluated into a single qualification.

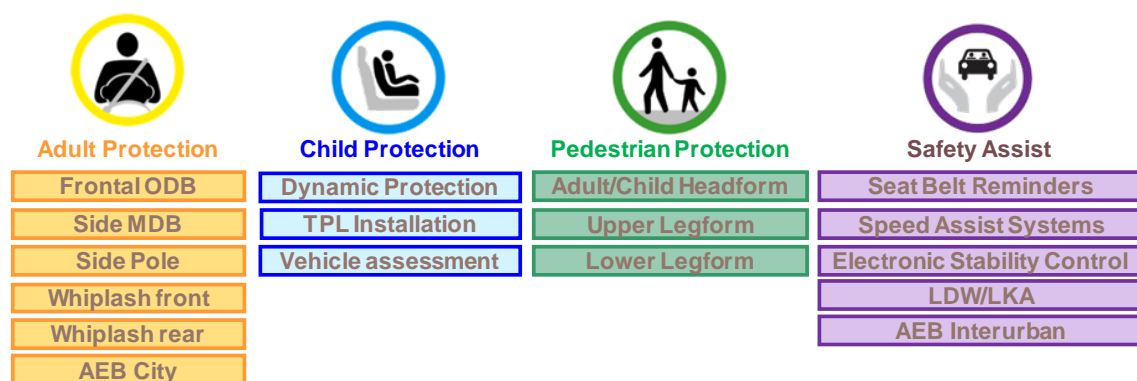


Figure 19: EuroNCAP areas and subareas

This overall safety rating is composed of scores in four areas: adult protection, child protection, pedestrian protection and safety assist. The overall score is calculated by weighing the four scores with respect to each other, while making sure that no area is underachieving certain minimum performance.

Euro NCAP awards

In addition, Euro NCAP Advanced is a reward system launched in 2010 for advanced safety technologies, complementing Euro NCAP's existing star rating scheme. Euro NCAP rewards and recognizes car manufacturers who make available new safety technologies which demonstrate a scientifically proven safety benefit for consumers and society

The following technologies have been rewarded:

- Blind Spot Monitoring (BSD)
- Lane Support Systems (LDW and LKA)
- Speed Alert Systems (SAS, ISA)
- Autonomous Emergency Braking (AEB)
- Attention Assist
- Automatic Emergency Call (eCall)
- Pre-crash systems
- Vision Enhancement Systems
- Active safety in Euro NCAP

Along the years, Euro NCAP has incorporated active safety systems into the assessment. Relevant steps are:

- ESC (at that time called "Speed Limitation Device")fitment criteria (2008)
- ESC test procedure (2009)
- Speed Alert Systems assessment procedure(2009)
- Intelligent Speed Assistance assessment procedure (2013)
- AEB Car-to-car City (low speeds) test and assessment procedure (2014)
- AEB Car-to-car Inter-urban (high speeds) test and assessment procedure (2014)
- LDW test procedure (2014)
- AEB for VRU (pedestrians) test and assessment procedures (2016)
- Euro NCAP is willing to combine passive safety and active safety items in order to create an incentive for avoidance systems without compromising on the levels reached in passive safety.

Outlook for the future

Euro NCAP will continue to increase the requirements for active safety systems. Among others, these action points are targeted until 2020:

- *Autonomous braking for cars and VRU*

Updated AEB C2C test & assessment procedure using state-of-the art (harmonised) test targets in real life scenarios with a focus on avoiding collisions that result from turning into oncoming or with overtaking vehicles and junction/intersection crossing.

Special case study / demonstrator on powered two-wheelers highlighting the potential of intervention and/or communication technology.

Updated AEB VRU test & assessment procedures to encompass pedestrians and pedal cyclists in daylight, darkness and obscure lighting conditions using state-of-the-art test targets in real-life scenarios.

Safety critical HMI guidelines and assessment of the quality of warning and distraction (applicable to all ADAS protocols). The behavioural aspects of the older population need specific attention.

- *Lateral support systems*

Lane Keep Assist test and assessment procedure.

Test and assessment procedure for advanced lateral support systems (extension to Lane Keep system assessment); taking into account unintended road departures with potential crash into a fixed object as a result, critical lane change manoeuvres.

Update to Speed Assistance Systems (SAS) protocol, with consideration given to nomad system integration, traffic sign recognition, conditional speed limits, traffic lights recognition, digital map data management, etc. as well as (narrow off-set) head-on collisions.

- *Speed & impaired driving*

Promotion of virtual co-pilot concept by identifying and rewarding key driver support technologies. Promoting manufacturers' innovations in the field of driver state monitoring.

- *Partial automated driving function.*

As a summary it can be stated that Euro NCAP challenges the automotive industry to keep developing state of the art vehicles for safety. In order to achieve that, Euro NCAP has a test and assessment programme that addresses many safety functions in the vehicles. This programme is constantly updated, according to new technologies. In the last years, most of the developments within the programme have been in the field of active safety. Among others, it is relevant to highlight test and assessment procedures for Autonomous Emergency Braking systems. Future challenges for Euro NCAP will be to further develop active safety procedures that, step by step, will get closer to certain automated driving levels, always from the safety perspective. Advanced rewards in 2015 and 2016 will be part of the Euro NCAP and a dedicated action of communication is planned to be made by Euro NCAP in 2017 via a dedicated campaign where they will publish test and judgements of the models equipped with such systems.

6.8. VRA

VRA – Vehicle and Road Automation is a support action funded by the European Union to create a collaboration network of experts and stakeholders working on deployment of automated vehicles and its related infrastructure. The VRA project is considered as the cooperation interface between EC funded projects, international relations and national activities on the topic of vehicle and road automation.



Figure 20: VRA logo

VRA is financed by the European Commission DG CONNECT and coordinated by ERTICO – ITS Europe. It aims to:

- Maintain an active European network of Vehicle and Road Automation experts and stakeholders
- Contribute to EU-US-Japan international collaboration on Vehicle and Road Automation
- Identify deployment needs for the different domains of Vehicle and Road Automation
- Promote the European Research on Vehicle and Road Automation through an innovative set of dissemination tools

VRA will address the identified deployment needs from different perspectives: the deployment scenarios, the legal and regulatory needs and finally the standardisation and certification requirements.

VRA spins off from the iMobility Forum Automation Working Group discussions in order to build together an open network to support the deployment of Vehicle and Road Automation over Europe and beyond. While the iMobility Forum Automation WG provides for future research needs and recommendations for the EC, the VRA support action is gathered past and current activities to feed and motivate these needs.

6.9. NHTSA – USA

The National Highway Traffic Safety Administration (NHTSA) is an agency of the Executive Branch of the U.S. government, part of the Department of Transportation. It describes its mission as “Save lives, prevent injuries, reduce vehicle-related crashes.”



Figure 21: NHTSA logo

As part of its activities, NHTSA is charged with writing and enforcing Federal Motor Vehicle Safety Standards as well as regulations for motor vehicle theft resistance and fuel economy, the latter under the rubric of the Corporate Average Fuel Economy (CAFE) system. NHTSA also licenses vehicle manufacturers and importers, allows or blocks the import of vehicles and safety-regulated vehicle parts, administers the vehicle identification number (VIN) system, develops the anthropomorphic dummies used in safety testing, as well as the test protocols themselves, and provides vehicle insurance cost information. The agency has asserted preemptive regulatory authority over greenhouse gas emissions, but this has been disputed by such state regulatory agencies as the California Air Resources Board.

NHTSA has started to define different approaches towards the introduction of automated driving in North American roads including a U.S wide legal framework as well as starting to define the potential requirement for roadworthiness of automated driving vehicles. The role of the US.DOT and NHTSA is relevant as it may enforce several regulation activities that may be followed by the different states or being mandatory wherever the federal government rules.

In February 2014, following the Ann Arbor Pilot, the U.S. DOT decided to start working in a federal regulation of V2X communications systems for safety applications towards a potential mandatory installation of this type of connectivity devices in new vehicle models. The U.S. DOT has declared that they plan to have this regulation finished for its approval before the end of the second Barack Obama's mandate.

6.10. MLIT –Japan

The Ministry of Land, Infrastructure, Transport and Tourism, abbreviated MLIT, is a ministry of the Japanese government. It is responsible for one-third of all the laws and orders in Japan and the largest Japanese ministry in terms of employees, as well as the second-largest organ of the Japanese government after the Ministry of Defence. The ministry has four external organs including the Japan Coast Guard and the Japan Tourism Agency.



Figure 22: MLIT logo

MLIT is deeply involved in the coordination of research and deployment programs in transportation. It has supported several cooperative vehicles initiatives towards deployment of different applications and services. MLIT gives support to the Autopilot initiative which plans to start automated driving activities in Japan Highways based in the merging of cooperative V2X technologies together with Lane Departure and Cooperative ACC systems.

6.11. Tri-lateral meeting – Japan/USA/EU

In practice, one of the main outputs of the VRA International Cooperation activities is the planning and organisation of three international tri-lateral meetings in addition to the ones organised by the US and JPN to promote international harmonization and sharing of good practices and recommendations. The international VRA meetings will consist of information exchange update of recent findings and formulate the needs for further steps and research. Round table discussions on common issues will be organised. The meetings will most likely be organised over two or three days. Different discussion topics have been defined in these tri-lateral meetings:

- Deployment paths
- Connectivity
- Human factors
- Digital infrastructure
- Cost-benefit analysis
- Testing and roadworthiness

7. Conclusions

The main purpose of this document is to analyse the current state of the community and local rules in order to follow any proposal adjustments to allow vehicle platooning. Due to this analysis some conclusions and legislations gaps and requirements have been found.

In general terms the autonomous driving is not possible according to the Vienna Convention of 1968 which states that “Every moving vehicle or combination of vehicles shall have a driver” and also that “Every driver shall at all times be able to control his vehicle or to guide his animals”. All the countries that signed the convention committed themselves to follow these bases.

However, given that vehicles taking part in the Companion are going to be driven semi autonomously and drivers will keep the control of their vehicle, the Companion platoons shall be accepted by the Vienna Convention. In any case the VRA (Vehicle and Road Automation) is working to change the current point of view in order to update some restricting points of the Vienna convention.

This poses a different problem: make vehicles running in semiautonomous mode possible in technical terms. Technical requirements, considering semiautonomous platoons, must be designed based on safety terms and also should be analysed regarding the regulatory acts.

The conclusions obtained are:

- 1) Knowing that the COMPANION vehicles will not be provided with any kind of autonomous **steering control**, no further study with regard UNECE Regulation No. 79 is needed. However, in order to provide assistance in steering and make easier to drive the truck in a narrow distance with the front vehicle, it would be advisable to install some kind of Advanced Driver Assistance Steering System related to lateral performance:
 - The LDWS (Lane Departure Warnings Systems) is regulated by the UNECE Regulation No. 130. Nevertheless, if the LDWS is connected with the COMPANION on-board system (to keep the same maximum speed for all the vehicles in the platoon) it would not be approved through ECE R130, so it should be discussed.
 - The LKAS (Lane Keeping Assistance System) is defined as a safety system and doesn't apply in this regulatory act. Some LKAS in passenger vehicles are accepted as comfort systems once is demonstrated that also keeps drivers attention and control in the road.
- 2) The platoons in the Companion are intended to be made by many different vehicles with an autonomous **longitudinal control**, it is necessary to standardize their speed. The vehicles that are taking part in a platoon of the Companion system will be equipped with SLD (Speed Limitation Device) and ASLD (Adjustable Speed Limitation Device) that shall set the maximum speed. However, the speed of the vehicles on a platoon will be continuously calculated and modified, thus, it will not be enough.

In order to make possible the control of the whole platoon, it is necessary to control not only the maximum permitted speed, but also the instant speed of each vehicle. Consequently a cruise control device is necessary. Furthermore, if these devices need to be connected with the COMPANION on-board system it would not be approved *a priori*, and it should be discussed.

Technical requirements of these systems are:

- The SLD system shall limit the maximum speed of N₃ vehicles as it is described in the UNECE Regulation N°89.
- The installation of ASD in N₃ vehicles is not applicable by the UNECE Regulation N°89, although it is covered for other vehicles categories. If the ASD installation were necessary, the regulation should be extended to cover truck vehicles.
- Regarding the ACC, it is considered to be a comfort element and is not necessary to fulfil any homologation requirements today however it is discussed in several working groups as defined before.

3) A system capable of **slowing down the vehicle (or stop it)** autonomously shall be implemented in order to minimize the possibility of a crash involving the platooning vehicles. Taking into account that the brake performance changes depending on factors such as brake temperature or vehicle mass, the actual AEBS's required performance is not enough to guaranty a safe braking if the platoon vehicles are being driven in a very narrow distance between them. Is needed to know the braking capacity at any given moment:

- In order to adapt the distance with the preceding trailer a cooperative AEBS should be developed. The on-board system may have to include some vehicle characteristics such as the vehicle braking capacity (depending on its speed and load) and register the constant evolution of the system braking capacity.
- Another considered solution is to change the AEBS functioning by vehicle-to-vehicle live communication so the reaction time is reduced thus reducing the braking distance

If the vehicles taking part in a platoon are driving in a distance between them enough to avoid any danger using a standard AEBS (UNECE Regulation n°131), the current homologation requirements are enough. But, if it is needed to add any evolution of the AEBS system, a discussion in the GRRF would be necessary to make it legal and to consider the extra requirements in the future regulations. Furthermore the "safe distance" between trucks should be also accepted by this regulation and consequently it shall be discussed.

4) When a platoon is driven in public roads, it would be necessary for all the drivers to have a good **front and rear vision**. If the vehicles in the platoon are driving really close it is considered that these fields of vision have to be provided by cameras as it is not possible to have direct vision with mirrors. It is not considered in the UNECE Regulation n°46, so it should be discussed.

5) In order to inform the other road users that they are interacting with a platoon, **special light-signalling devices** should be considered. Possible directions to work on:

- Light-signalling at the end of the platoon informing about dimensions: long cue of vehicles moving at the same time. Visible also during light time.
- Possibility of annulation or simultaneous use of some devices in the platoon vehicles: direction indicators, anti-fog devices, etc. That mainly depends on the distance among vehicles.
- New colours, characteristics, position and homologation of any new devices.

It is not considered in the UNECE Regulation n°48.06, so this is a potential file to work in.

6) As a preliminary and simple needs analysis, a **control and a tell-tale** would be needed as a safety device. The main objective would be:

- To let the driver control its introduction in the platoon (hand control) and switch on or switch off the autonomous control of the longitudinal distance
- To inform the driver if he is in the platoon (tell-tale)

In this moment there is no control or tell-tale for platooning in the UNECE Regulation No.121, so it should be discussed.

Different standards have been published that affect the different elements that compose the COMPANION on-board architecture. An effective, robust and reliable communication between vehicles and between vehicles and infrastructure must be achieved to consolidate the system functionalities while guaranteeing the safety of the system. These standards are not backed up by a proper legal framework or regulation, but must be observed by the project to maximize its impact in terms of user adoption and interoperability.

- 1) A functional, non-disturbing, while effective HMI must be used in order to establish the communication of the system and its recommendations with the drivers, which, at the end of the day, will have an important role in the acceptance and success of the coordinated platooning system. Different guidelines and standards support these objectives.
- 2) Short range communications related to the V2V (vehicle-to-vehicle) messaging between the trucks that form the platoon. ETSI (European Telecom Standardisation Institute), under the mandate of the EC has published a first release of standards that enable V2X communications. COMPANION, in order to maximize compliance and interoperability, should follow this protocol stack whenever possible but without having to sacrifice the functionality of the system. Identified gaps in the current standards and recommendations to achieve an efficient, cooperative platoon system shall be shared and analysed with the responsible Standards Developing Organization (SDOs)
- 3) Long range communications relate to V2I (vehicle-to-roadside) messaging between the vehicles and the off-board system of COMPANION. Cellular access technologies, which are highly tested and reliable, will provide this connectivity.
- 4) ISO 26262 should be observed in all the electronic equipment that must be used in the COMPANION project, especially if safety is addressed. This is the case of the on-board units to be equipped in the trucks. ISO 26262 is vehicle focused with scope limits when describing functional safety and hazard levels when more than one vehicle should be observed (e.g. platooning).

Furthermore, some Directives and local regulations should be taking into account in the route calculation:

- 1) Fulfilment of the **ADR** (European Agreement concerning the International Carriage of Dangerous Goods by Road) agreement of each vehicle and load, as well as the minimum requirements in each country, in order to avoid vehicles to enter countries for which they do not have ADR permission

- 2) The level of fulfilment of the **ATP** (Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment) agreement of each vehicle and the minimum requirements in each country.
- 3) Even though the **driving hours** and the time to rest is responsibility of the transport undertakings, it should be considered in the route calculation. If in the future the driver don't have to control the vehicle while it is taking part in a platoon and so it is not considered as driving time, the Regulation (EC) No 561/2006 and Directive 2002/15/EC that regulates resting time, as well as the Regulation EU N° 1266/2009 about the tachograph device, should be modified.
- 4) **Local rules about the road safety** and specific mandatory equipment such as maximum speed or the use of snow tyres may be taken into account in the route calculation even though carriers should know what they need to travel through these countries.
- 5) The application of **tolls and vignettes** is not mandatory for Member States. Each EU country applies their local regulations particularities.
- 6) The fulfilment of **maximum weights and dimensions** in order to keep road safety and to avoid damages to roads, bridges and tunnels. Member States cannot restrict the circulation of vehicles which comply with Directive 96/53/EC limits. However some EU members permit a higher maximum authorized vehicle weight for the traffic circulation inside their frontiers. On the other hand, the Companion could be considered as a road train instead of separate vehicles what, following the Directive 96/53/EC, would force the whole platoon not pass 44 tons of mass.

As a final conclusion it should be said that the vehicle which are going to merge into platoons should have installed some new or improved devices, such as described before, in order to make the platoons safe. In consequence, some regulations acts of the vehicle type approval should be discussed and updated in order that these devices were accepted and fulfilled the regulation specifications. Furthermore, for the route calculation it should be take into account some local regulations regarding the road traffic and the use of the road infrastructures.

8. References

Road traffic rules by country

http://ec.europa.eu/transport/road_safety/observatory/traffic_rules_etry_en.htm

http://ec.europa.eu/transport/road_safety/going_abroad/index_en.htm

<http://www.internationaltransportforum.org/IntOrg/road/ctrlbodies.html>

Maximum dimensions and masses

<http://www.internationaltransportforum.org/IntOrg/road/pdf/dimensions.pdf>

<http://www.internationaltransportforum.org/IntOrg/road/pdf/weights.pdf>

<http://www.internationaltransportforum.org/IntOrg/road/pdf/Coach.pdf>

Truck parking areas

<http://www.internationaltransportforum.org/Pub/pdf/09Parking.pdf>

European legislation:

http://europa.eu/legislation_summaries/transport/road_transport/index_en.htm

<http://www.unece.org/trans/main/wp29/wp29regs.html>

http://ec.europa.eu/enterprise/sectors/automotive/documents/directives/index_en.htm

Vienna convention

ASSESS D2.4 – Legal methodological outline Public

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<http://www.international-driving-permit.com/Convention-on-Road-Traffic/8-November-1968/EN/index.aspx>

Road taxes

http://ec.europa.eu/transport/modes/road/road_charging/charging_hgv_en.htm

http://www.theaa.com/allaboutcars/overseas/european_tolls_results.jsp?country=Slovakia

Standardization

<http://www.3gpp.org>

9. Annexes

9.1. Annex A: Summary of the annex IV of the Directive 2007/46

Summary of the annex IV of the Directive 2007/46 according the regulation acts applicable for N3 vehicles

Item	Subject	Regulatory act	Applicability N ₃
1	Permissible sound levels	Directive 70/157/EEC	X
3 A	Prevention of fire risks (liquid fuel tanks)	UNECE Regulation No 34.02	X
3 B	Rear underrun protective devices (RUPDs) and their installation; rear underrun protection (RUP)	UNECE Regulation No 58.02	X
4	Space for mounting and fixing rear registration plates	Regulation (EC) No 1003/2010	X
5	Steering equipment	UNECE Regulation No R79.01	X
6	Vehicle access and manoeuvrability	UNECE Regulation No 130/2012	X
7	Audible warning devices and signals	UNECE Regulation No 28.00	X
8	Devices for indirect vision and their installation.	UNECE Regulation No 46.02	X
9	Braking of vehicles and trailers	UNECE Regulation No 13.11	X ⁽³⁾
10	Electromagnetic compatibility EMC	UNECE Regulation No 10.04	X
11	Diesel smoke	ECE R24.03	
13 A	Protection of motor vehicles against unauthorised use	UNECE Regulation No 18.00	X ^(4A)
15 A	Seats, their anchorages and an head restraints	UNECE Regulation No 17.08	X
17 B	Speedometer equipment including its installation	UNECE Regulation No 39.00	X
18	Manufacturer's statutory plate and vehicle identification number	Regulation (EU) No 19/2011	X
19	Safety-belt anchorages, Isofix anchorages systems and Isofix top tether anchorages.	Regulation (EU) No 14.07	X
20	Installation of lighting and light-signalling devices on vehicles	UNECE Regulation No 48.05	X
27	Towing devices	Regulation (EU) No 1005/2010	X
31	Safety-belts, restraint systems, child restraint systems and Isofix child restraint systems	UNECE Regulation No 16.06	X
33	Location and identification of hand controls, tell-tales and indicators	UNECE Regulation No 121.00	X
34	Widescreen defrosting and demisting systems	Regulation (EU) No 672/2010	⁽⁵⁾
35	Widescreen wiper and washer systems	Regulation (EU) No 1008/2010	⁽⁶⁾
36	Heating systems	UNECE Regulation No 122.00	X
38	Head restraints (headrests), Whether or not incorporated in vehicle seats	UNECE Regulation No 25	X
40	Engine power	Directive 80/1269/EEC	X ⁽⁷⁾
41	Emissions (Euro IV and V) heavy duty vehicle	Directive 2005/55/EC R49.05	X
41 A	Emissions (Euro V) heavy duty vehicles/access to information	Regulation (EC) No 595/2009	X
42	Lateral protection of goods vehicles	UNECE Regulation No 73.01	X
43	Spray-suppression systems	Regulation (EU) No 109/2011	X
45	Safety glazing materials and their installation on vehicles	UNECE Regulation No 43.00	X

46	Tyres installation - commercial vehicles	Regulation (EU) No 458/2011	X
47	Speed limitation devices	UNECE Regulation No 89.00	X
48	Masses and dimensions	Regulation (EU) No 1230/2012	X
49	Commercial vehicles with regard to their external projections forward of the cab's rear panel	UNECE Regulation No 61.00	X
50 A	Mechanical coupling components of combinations of vehicles	UNECE Regulation No 55.01	X ⁽¹⁰⁾
50 B	Close-coupling device (CCD); fitting of an approved type of CCD	UNECE Regulation No 102	X ⁽¹⁰⁾
56	Vehicles for the carriage of dangerous goods	UNECE Regulation No 105.05	X ⁽¹³⁾
57	Front under-run protective devices(FUPDs) and their installation; front underrun protection (FUP)	UNECE Regulation No 93.00	X
62	Hydrogen system	Regulation (EC) No 79/2009	X
65	Advanced emergency braking system	Regulation (EU) No 347/2012	X
66	Lane departure warning system	Regulation (EU) No 351/2012	X
67	Specific components for liquefied petroleum gases (LPG) and their installation on motor vehicles	UNECE Regulation No 67	X
69	Electric safety	UNECE Regulation No 100	X
70	Specific components for CNG and their installation on motor vehicles	UNECE Regulation No 110	X

- (3) The fitting of an electronic stability control ("ESC") system is required in accordance with Article 12 of Regulation (EC) No 661/2009. Therefore, the requirements set out in Annex 21 to UNECE Regulation 13 shall be complied with for the purposes of EC type-approval of new types of vehicles as well as for the registration, sale and entry into service of new vehicles. The implementation dates set out in Article 13 of Regulation (EC) No 661/2009 shall apply instead of the dates set out in UNECE Regulation No 13.
- (4) The fitting of an ESC system is required in accordance with Article 12 of Regulation (EC) No 661/2009. Therefore, the requirements set out in Part A of Annex 9 to UNECE Regulation No 13-H shall be complied with for the purposes of EC type-approval of new types of vehicles as well as for the registration, sale and entry into service of new vehicles. The implementation dates set out in Article 13 Regulation (EC) No 661/2009 shall apply instead of the dates set out in UNECE Regulation No 13-H.
- (4A) If fitted, the protective device shall fulfil the requirements of UNECE Regulation No 18.
- (5) Vehicles of this category shall be fitted with a suitable windscreen defrosting and demisting device.
- (6) Vehicles of this category shall be fitted with a suitable windscreen washing and wiping devices.
- (7) In case of vehicles equipped with an electric power train, a vehicle type-approval in accordance with UNECE Regulation N° 85 is required.
- (10) Applies only to vehicles equipped with coupling(s).
- (13) Applies only when the manufacturer applies for type-approval of vehicles intended for the transport of dangerous goods.

9.2. Annex B: ETSI-ISO/CEN ITS STANDARDS

TYPES OF STANDARDS AND WORKING DOCUMENTS IN ETSI

- European Standard (EN)
- ETSI Standard (ES)
- ETSI Guide (EG)
- ETSI Technical Specification (TS)
- ETSI Technical Report (TR)
- ETSI Special Report (SR)
- ETSI Group Specification (GS)

9.2.1. Drafts

	IDENTIFICATION	TYPE	TITLE (Formal & Working)	STATUS
1	Doc. Nb. EN 302 665 Ver. 1.1.2 Ref. REN/ITS-0020047 Technical Body: ITS WG2 Details and Download	EN	Intelligent Transport Systems (ITS); Communications Architecture Architecture	Drafting Stage Current Status: Stable draft (2013-03-25) Next Status: Final draft for approval (2013-11-30)
2	Doc. Nb. EN 302 636-3 Ver. 0.0.10 Ref. REN/ITS-0030034 Technical Body: ITS WG3 Details and Download	EN	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network Architecture Geonetworking; network architecture	Drafting Stage Current Status: Stable draft (2014-02-27) Next Status: Start of TB approval process (2014-02-27)
3	Doc. Nb. TR 103 061-3 Ver. 0.0.3 Ref. RTR/ITS-00341 Technical Body: ITS WG3 Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 3: Conformance test specifications for Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; GeoNetworking validation report GeoNetworking validation report	Drafting Stage Current Status: Final draft for approval (2014-02-05) Next Status: Start of pre-processing (2014-03-04)
4	Doc. Nb. TR 103 061-2 Ver. 1.2.0 Ref. RTR/ITS-00138 Technical Body: ITS WG1 Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 2: Conformance test specifications for Decentralized Environmental Notification basic Service Messages (DENM); DENM validation report	Drafting Stage Current Status: Final draft for approval (2014-02-28) Next Status: TB approval (2014-05-02)

			DENM validation report	
5	Doc. Nb. TR 103 061-1 Ver. 1.2.0 Ref. RTR/ITS-00137 Technical Body: ITS WG1 Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 1: Conformance test specifications for Co-operative Awareness Messages (CAM); CAM validation report CAM validation report revision	Drafting Stage Current Status: Final draft for approval (2014-02-28) Next Status: TB approval (2014-05-02)
6	Doc. Nb. TS 102 941 Ver. 1.1.2 Ref. RTS/ITS-00524 Technical Body: ITS WG5 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Security; Trust and Privacy Management Trust and Privacy Management	Drafting Stage Current Status: Early draft (2013-01-11) Next Status: Stable draft (2014-04-30)
7	Doc. Nb. TS 102 917-3 Ref. RTS/ITS-00433 Technical Body: ITS WG4 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) G5 Radio Test ATS	Drafting Stage Current Status: TB adoption of WI (2013-02-20) Next Status: Start of work (2013-02-20)
8	Doc. Nb. TS 102 917-2 Ref. RTS/ITS-00435 Technical Body: ITS WG4 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 2: Test Suite Structure and Test Purposes (TSS & TP) G5 Radio Test TSS & TP	Drafting Stage Current Status: TB adoption of WI (2013-02-20) Next Status: Start of work (2013-02-20)
9	Doc. Nb. TS 102 917-1 Ref. RTS/ITS-00431 Technical Body: ITS WG4 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 1: Protocol Implementation Conformance Statement (PICS) G5 Radio Test PICS	Drafting Stage Current Status: TB adoption of WI (2013-02-20) Next Status: Start of work (2013-02-20)
10	Doc. Nb. TS 102 869-3 Ref. RTS/ITS-00151 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Decentralized Environmental Notification Messages	Drafting Stage Current Status: TB adoption of WI (2014-02-19) Next Status: Start of work (2014-02-19)

			(DENM); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) DENM ATS	
11	Doc. Nb. TS 102 869-2 Ref. RTS/ITS-00150 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Decentralized Environmental Notification Messages (DENM); Part 2: Test Suite Structure and Test Purposes (TSS & TP) DENM TSS&TP	Drafting Stage Current Status: TB adoption of WI (2014-02-19) Next Status: Start of work (2014-02-19)
12	Doc. Nb. TS 102 869-1 Ref. RTS/ITS-00149 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Decentralized Environmental Notification Messages (DENM); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma DENM PICS	Drafting Stage Current Status: TB adoption of WI (2014-02-19) Next Status: Start of pre-processing (2014-03-10)
13	Doc. Nb. TS 102 868-3 Ver. 1.2.0 Ref. RTS/ITS-0010027 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Co-operative Awareness Messages (CAM); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) CAM ATS	Drafting Stage Current Status: Final draft for approval (2014-02-27) Next Status: TB approval (2014-02-27)
14	Doc. Nb. TS 102 868-2 Ver. 1.2.0 Ref. RTS/ITS-0010026 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Co-operative Awareness Messages (CAM); Part 2: Test Suite Structure and Test Purposes (TSS & TP) CAM TSS&TP	Drafting Stage Current Status: Final draft for approval (2014-02-27) Next Status: TB approval (2014-11-02)
15	Doc. Nb. TS 102 724 Ref. RTS/ITS-00432 Technical Body: ITS WG4 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band	Drafting Stage Current Status: TB adoption of WI (2013-04-11) Next Status: Start of work (2013-04-11)

			Channel specifications 5 GHz	
16	Doc. Nb. TS 102 723-9 Ver. 0.0.1 Ref. DTS/ITS-0050009 Technical Body: ITS WG5 Details and Download	TS	Intelligent Transport Systems; OSI cross-layer topics; Part 9: Interface between security entity and facilities layer Cross-layer topics	Drafting Stage Current Status: Early draft (2012-04-19) Next Status: WG approval (2014-11-02)
17	Doc. Nb. TS 102 723-8 Ver. 1.0.1 Ref. DTS/ITS-0050008 Technical Body: ITS WG5 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 8: Interface between security entity and network and transport layer Cross-layer topics	Drafting Stage Current Status: End of pre-processing (2013-05-21) Next Status: TB approval (2014-11-02)
18	Doc. Nb. TS 102 723-7 Ver. 1.1.1 Ref. DTS/ITS-0050007 Technical Body: ITS WG5 Details and Download	TS	Intelligent Transport Systems; OSI cross-layer topics; Part 7: Interface between security entity and access layer Cross-layer topics	Drafting Stage Current Status: Start of work (2009-04-24) Next Status: WG approval (2014-11-02)
19	Doc. Nb. TS 102 723-6 Ver. 1.1.1 Ref. DTS/ITS-0020020 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems; OSI cross-layer topics; Part 6: Interface between management entity and security entity Cross-layer topics	Drafting Stage Current Status: Start of work (2009-04-24) Next Status: WG approval (2014-11-02)
20	Doc. Nb. TS 102 723-3 Ref. RTS/ITS-00265 Technical Body: ITS WG2 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 3: Interface between management entity and access layer Cross-layer topics	Drafting Stage Current Status: TB adoption of WI (2013-04-12) Next Status: Start of work (2013-04-12)
21	Doc. Nb. TS 102 723-10 Ref. RTS/ITS-00436 Technical Body: ITS WG4 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 10: Interface between access layer and networking & transport layer Interface(s) between Access Layer and Network & Transport Layer	Drafting Stage Current Status: TB adoption of WI (2013-04-11) Next Status: Start of work (2013-04-11)
22	Doc. Nb. TS 102 687 Ver. 0.0.2 Ref. RTS/ITS-00430 Technical Body: ITS WG4 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Decentralized Congestion Control Mechanisms for Intelligent Transport Systems operating in the 5 GHz range; Access layer part DCC Access ITS 5 GHz	Drafting Stage Current Status: Early draft (2014-01-13) Next Status: Stable draft (2014-04-01)

9.2.2. Published

	IDENTIFICATION	TYPE	TITLE (Formal & Working)	STATUS
1	Doc. Nb. EN 302 665 Ver. 1.1.1 Ref. DEN/ITS-0020012 Technical Body: ITS WG2 Details and Download	EN	Intelligent Transport Systems (ITS); Communications Architecture Architecture	Published Current Status: Publication (2010-09-24)
2	Doc. Nb. EN 302 663 Ver. 1.2.1 Ref. REN/ITS-0040028 Technical Body: ITS WG4 Details and Download	EN	Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band Access layer ITS 5 GHz	Published Current Status: Publication (2013-07-05)
3	Doc. Nb. EN 302 636-2 Ver. 1.2.1 Ref. REN/ITS-0030033 Technical Body: ITS WG3 Details and Download	EN	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 2: Scenarios Geonetworking; scenarios	Published Current Status: Publication (2013-11-07)
4	Doc. Nb. EG 202 798 Ver. 1.1.1 Ref. DEG/ITS-0020022 Technical Body: ITS WG2 Details and Download	EG	Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing ITS testing framework	Published Current Status: Publication (2011-01-13)
5	Doc. Nb. ES 202 663 Ver. 1.1.0 Ref. DES/ITS-0040015 Technical Body: ITS WG4 Details and Download	ES	Intelligent Transport Systems (ITS); European profile standard for the physical and medium access control layer of Intelligent Transport Systems operating in the 5 GHz frequency band European Profile 5 GHz	Published Current Status: Publication (2010-01-14)
6	Doc. Nb. TR 103 061-5 Ver. 1.1.1 Ref. DTR/ITS-0030018 Technical Body: ITS WG3 Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 5: IPv6 over GeoNetworking validation report IPv6 over GeoNetworking validation report	Published Current Status: Publication (2012-11-08)
7	Doc. Nb. TR 103 061-4 Ver. 1.1.1 Ref. DTR/ITS-0030019 Technical Body: ITS WG3 Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 4: Conformance test specification for GeoNetworking Basic Transport Protocol (BTP); GeoNetworking BTP validation report Geo BTP validation report	Published Current Status: Publication (2012-11-08)
8	Doc. Nb. TR 103 061-3 Ver. 1.1.1 Ref. DTR/ITS-0030020 Technical Body: ITS WG3 Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 3: Conformance test specification for Geographical addressing and forwarding for point-to-point and point- to-multipoint communications; GeoNetworking validation report GeoNetworking validation report	Published Current Status: Publication (2012-11-08)
9	Doc. Nb. TR 103 061-2 Ver. 1.1.1	TR	Intelligent Transport Systems (ITS);	Published

	Ref. DTR/ITS-0010012 Technical Body: ITS WG1 Directives: Details and Download		Testing; Part 2: Conformance test specification for Decentralized Environmental Notification basic Service Message (DENM); DENM validation report DENM validation report	Current Status: Publication (2012-11-08)
10	Doc. Nb. TR 103 061-1 Ver. 1.1.1 Ref. DTR/ITS-0010011 Technical Body: ITS WG1 Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Testing; Part 1: Conformance test specification for Co-operative Awareness Messages (CAM); CAM validation report CAM validation report	Published Current Status: Publication (2012-11-08)
11	Doc. Nb. TS 102 985-3 Ver. 1.1.1 Ref. DTS/ITS-0020028-3 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma ATS for ISO 29281	Published Current Status: Publication (2012-07-25)
12	Doc. Nb. TS 102 985-2 Ver. 1.1.1 Ref. DTS/ITS-0020028-2 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 2: Test Suite Structure and Test Purposes (TSS&TP) TSS&TP for ISO 29281	Published Current Status: Publication (2012-07-25)
13	Doc. Nb. TS 102 985-1 Ver. 1.1.1 Ref. DTS/ITS-0020028-1 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 1: Protocol Implementation Conformance Statement (PICS) proforma PICS for ISO 29281	Published Current Status: Publication (2012-07-25)
14	Doc. Nb. TR 102 960 Ver. 1.1.1 Ref. DTR/ITS-0040029 Technical Body: ITS WG4 Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (RTTT DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range; Evaluation of mitigation methods and techniques Mitigation CEN DSRC vs. ITS	Published Current Status: Publication (2012-11-15)
15	Doc. Nb. TS 102 943 Ver. 1.1.1 Ref. DTS/ITS-0050017 Technical Body: ITS WG5 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Security; Confidentiality services Security; Confidentiality services	Published Current Status: Publication (2012-06-19)
16	Doc. Nb. TS 102 942 Ver. 1.1.1 Ref. DTS/ITS-0050016 Technical Body: ITS WG5 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Security; Access Control Security; Access Control	Published Current Status: Publication (2012-06-19)
17	Doc. Nb. TS 102 941 Ver. 1.1.1	TS	Intelligent Transport Systems (ITS);	Published

	Ref. DTS/ITS-0050015 Technical Body: ITS WG5 Directives: Details and Download		Security; Trust and Privacy Management Trust and Privacy Management	Current Status: Publication (2012-06-19)
18	Doc. Nb. TS 102 940 Ver. 1.1.1 Ref. DTS/ITS-0050014 Technical Body: ITS WG5 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Security; ITS communications security architecture and security management Security architecture and Management	Published Current Status: Publication (2012-06-19)
19	Doc. Nb. TS 102 917-3 Ver. 1.1.1 Ref. DTS/ITS-0040027 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) G5 Radio Test ATS	Published Current Status: Publication (2013-01-18)
20	Doc. Nb. TS 102 917-2 Ver. 1.1.1 Ref. DTS/ITS-0040026 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 2: Test Suite Structure and Test Purposes (TSS & TP) G5 Radio Test TSS & TP	Published Current Status: Publication (2013-01-18)
21	Doc. Nb. TS 102 917-1 Ver. 1.1.1 Ref. DTS/ITS-0040025 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 1: Protocol Implementation Conformance Statement (PICS) G5 Radio Test PICS	Published Current Status: Publication (2013-01-18)
22	Doc. Nb. TS 102 916-3 Ver. 1.1.1 Ref. DTS/ITS-0040024 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the methods to ensure coexistence of Cooperative ITS G5 with RTTT DSRC; Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) DSRC/G5 Radio Test ATS	Published Current Status: Publication (2012-05-22)
23	Doc. Nb. TS 102 916-2 Ver. 1.1.1 Ref. DTS/ITS-0040023 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the methods to ensure coexistence of Cooperative ITS G5 with RTTT DSRC; Part 2: Test Suite Structure and Test Purposes (TSS&TP) DSRC/G5 Radio Test TSS & TP	Published Current Status: Publication (2012-05-22)
24	Doc. Nb. TS 102 916-1 Ver. 1.1.1 Ref. DTS/ITS-0040022 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Test specifications for the methods to ensure coexistence of Cooperative ITS G5 with RTTT DSRC; Part 1: Protocol Implementation Conformance Statement (PICS) DSRC/G5 Radio Test PICS	Published Current Status: Publication (2012-05-22)

25	Doc. Nb. TS 102 894-2 Ver. 1.1.1 Ref. DTS/ITS-0010022 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary Applications and facilities layer common data dictionary	Published Current Status: Publication (2013-08-01)
26	Doc. Nb. TS 102 894-1 Ver. 1.1.1 Ref. DTS/ITS-0010004 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Users and applications requirements; Part 1: Facility layer structure, functional requirements and specifications Facility layer structure, functional requirements and specifications;	Published Current Status: Publication (2013-08-01)
27	Doc. Nb. TS 102 871-3 Ver. 1.1.1 Ref. DTS/ITS-0030013 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) GeoNetworking/ITS-G5 ATS and PIXIT	Published Current Status: Publication (2011-06-14)
28	Doc. Nb. TS 102 871-2 Ver. 1.1.1 Ref. DTS/ITS-0030015 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 2: Test Suite Structure and Test Purposes (TSS&TP) GeoNetworking ITS-G5 TSS&TP	Published Current Status: Publication (2011-06-14)
29	Doc. Nb. TS 102 871-1 Ver. 1.1.1 Ref. DTS/ITS-0030014 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma GeoNetworking/ITS-G5 PICS	Published Current Status: Publication (2011-06-14)
30	Doc. Nb. TS 102 870-3 Ver. 1.1.1 Ref. DTS/ITS-0030010 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Geonetworking Basic Transport Protocol (BTP); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) BTP ATS and PIXIT	Published Current Status: Publication (2011-03-23)
31	Doc. Nb. TS 102 870-2 Ver. 1.1.1 Ref. DTS/ITS-0030012 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking Basic Transport Protocol (BTP); Part 2: Test Suite Structure and Test Purposes (TSS&TP) BTP TSS&TP	Published Current Status: Publication (2011-03-23)
32	Doc. Nb. TS 102 870-1 Ver. 1.1.1 Ref. DTS/ITS-0030011 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking Basic Transport Protocol (BTP); Part 1: Test requirements and Protocol	Published Current Status: Publication (2011-03-23)

			Implementation Conformance Statement (PICS) proforma BTP PICS	
33	Doc. Nb. TS 102 869-3 Ver. 1.2.1 Ref. RTS/ITS-0010029 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Decentralized Environmental Notification Messages (DENM); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) DENM ATS	Published Current Status: Publication (2013-08-01)
34	Doc. Nb. TS 102 869-3 Ver. 1.1.1 Ref. DTS/ITS-0010008-3 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Decentralized Environmental Notification Messages (DENM); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) DNM ATS	Published Current Status: Publication (2011-03-31)
35	Doc. Nb. TS 102 869-2 Ver. 1.2.1 Ref. RTS/ITS-0010028 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Decentralized Environmental Notification Messages (DENM); Part 2: Test Suite Structure and Test Purposes (TSS&TP) DNM TSS&TP	Published Current Status: Publication (2013-08-01)
36	Doc. Nb. TS 102 869-2 Ver. 1.1.1 Ref. DTS/ITS-0010008-2 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Decentralized Environmental Notification Messages (DENM); Part 2: Test Suite Structure and Test Purposes (TSS&TP) DNM TSS&TP	Published Current Status: Publication (2011-03-31)
37	Doc. Nb. TS 102 869-1 Ver. 1.2.1 Ref. RTS/ITS-0010036 Technical Body: ITS WG1 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Decentralized Environmental Notification Messages (DENM); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma DENM PICS	Published Current Status: Publication (2013-08-01)
38	Doc. Nb. TS 102 869-1 Ver. 1.1.1 Ref. DTS/ITS-0010008-1 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Decentralized Environmental Notification Messages (DENM); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma DNM PICS	Published Current Status: Publication (2011-03-31)
39	Doc. Nb. TS 102 868-3 Ver. 1.1.1 Ref. DTS/ITS-0010007-3 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages	Published Current Status: Publication (2011-03-30)

			(CAM); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) CAM ATS	
40	Doc. Nb. TS 102 868-2 Ver. 1.1.1 Ref. DTS/ITS-0010007-2 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 2: Test Suite Structure and Test Purposes (TSS&TP) CAM TSS&TP	Published Current Status: Publication (2011-03-30)
41	Doc. Nb. TS 102 868-1 Ver. 1.1.1 Ref. DTS/ITS-0010007-1 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specification for Co-operative Awareness Messages (CAM); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma CAM PICS	Published Current Status: Publication (2011-03-30)
42	Doc. Nb. TR 102 863 Ver. 1.1.1 Ref. DTR/ITS-0010006 Technical Body: ITS WG1 Details and Download	TR	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM); Rationale for and guidance on standardization LDM Rationale and Guidance	Published Current Status: Publication (2011-06-07)
43	Doc. Nb. TR 102 862 Ver. 1.1.1 Ref. DTR/ITS-0040021 Technical Body: ITS WG4 Details and Download	TR	Intelligent Transport Systems (ITS); Performance Evaluation of Self-Organizing TDMA as Medium Access Control Method Applied to ITS; Access Layer Part STDMA Scenarios	Published Current Status: Publication (2011-12-05)
44	Doc. Nb. TR 102 861 Ver. 1.1.1 Ref. DTR/ITS-0040020 Technical Body: ITS WG4 Details and Download	TR	Intelligent Transport Systems (ITS); STDMA recommended parameters and settings for cooperative ITS; Access Layer Part STDMA Recommend	Published Current Status: Publication (2012-01-27)
45	Doc. Nb. TS 102 860 Ver. 1.1.1 Ref. DTS/ITS-0020023 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); Classification and management of ITS application objects Classification and management of applications	Published Current Status: Publication (2011-05-12)
46	Doc. Nb. TS 102 859-3 Ver. 1.1.1 Ref. DTS/ITS-0030016 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) IP over GeoNetworking ATS and PIXIT	Published Current Status: Publication (2011-03-30)
47	Doc. Nb. TS 102 859-2 Ver. 1.1.1	TS	Intelligent Transport Systems (ITS);	Published

	Ref. DTS/ITS-0030009 Technical Body: ITS WG3 Details and Download		Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 2: Test Suite Structure and Test Purposes (TSS&TP) IP over GeoNetworking TSS & TP	Current Status: Publication (2011-03-30)
48	Doc. Nb. TS 102 859-1 Ver. 1.1.1 Ref. DTS/ITS-0030017 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma IP over GeoNetworking PICS	Published Current Status: Publication (2011-03-30)
49	Doc. Nb. TS 102 792 Ver. 1.1.1 Ref. DTS/ITS-0040013 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in the 5 GHz frequency range Mitigation DSRC ITS	Published Current Status: Publication (2012-10-29)
50	Doc. Nb. TS 102 731 Ver. 1.1.1 Ref. DTS/ITS-0050001 Technical Body: ITS WG5 Details and Download	TS	Intelligent Transport Systems (ITS); Security; Security Services and Architecture Security Services and Architecture	Published Current Status: Publication (2010-09-21)
51	Doc. Nb. TS 102 724 Ver. 1.1.1 Ref. DTS/ITS-0040016 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band Channel specifications 5 GHz	Published Current Status: Publication (2012-10-29)
52	Doc. Nb. TS 102 723-5 Ver. 1.1.1 Ref. DTS/ITS-0020019 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 5: Interface between management entity and facilities layer Cross-layer topics	Published Current Status: Publication (2012-11-09)
53	Doc. Nb. TS 102 723-4 Ver. 1.1.1 Ref. DTS/ITS-0020018 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 4: Interface between management entity and networking & transport layer Cross-layer topics	Published Current Status: Publication (2012-11-09)
54	Doc. Nb. TS 102 723-3 Ver. 1.1.1 Ref. DTS/ITS-0020017 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 3: Interface between management entity and access layer Cross-layer topics	Published Current Status: Publication (2012-11-09)
55	Doc. Nb. TS 102 723-2 Ver. 1.1.1 Ref. DTS/ITS-0020016 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 2: Management information base Architecture of AL adaptation	Published Current Status: Publication (2012-11-09)

56	Doc. Nb. TS 102 723-11 Ver. 1.1.1 Ref. DTS/ITS-0030008 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 11: Interface between networking and transport layer and facilities layer Cross-layer topics	Published Current Status: Publication (2013-12-03)
57	Doc. Nb. TS 102 723-10 Ver. 1.1.1 Ref. DTS/ITS-0040018 Technical Body: ITS WG4 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 10: Interface between access layer and networking & transport layer Interface(s) between Access Layer and Network & Transport Layer	Published Current Status: Publication (2012-11-09)
58	Doc. Nb. TS 102 723-1 Ver. 1.1.1 Ref. DTS/ITS-0020015 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 1: Architecture and addressing schemes Architecture of AL adaptation	Published Current Status: Publication (2012-11-09)
59	Doc. Nb. TS 102 708-2-3 Ver. 1.2.1 Ref. RTS/ITS-0020033 Technical Body: ITS WG2 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 2: Application Layer; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma DSRC APL ATS	Published Current Status: Publication (2012-03-20)
60	Doc. Nb. TS 102 708-2-2 Ver. 1.2.1 Ref. RTS/ITS-0020032 Technical Body: ITS WG2 Details and Download	TS	Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 2: Application Layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP) DSRC APL TSS&TP	Published Current Status: Publication (2012-02-29)
61	Doc. Nb. TS 102 708-2-1 Ver. 1.2.1 Ref. RTS/ITS-0020031 Technical Body: ITS WG2 Directives: Details and Download	TS	Intelligent Transport Systems (ITS); RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band; Part 2: Application Layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification DSRC APL PICS	Published Current Status: Publication (2012-02-29)
62	Doc. Nb. TR 102 707 Ver. 1.1.1 Ref. DTR/ITS-0020013 Technical Body: ITS WG2 Details and Download	TR	Intelligent Transport Systems (ITS); ETSI object identifier tree; ITS domain ITS OID	Published Current Status: Publication (2009-05-25)
63	Doc. Nb. TR 102 698 Ver. 1.1.1 Ref. DTR/ITS-0010003 Technical Body: ITS WG1 Details and Download	TR	Intelligent Transport Systems (ITS); Vehicular Communications; C2C-CC Demonstrator 2008; Use Cases and Technical Specifications Vehicular Communications C2C-CC Demonstrator 2008	Published Current Status: Publication (2009-06-18)
64	Doc. Nb. TS 102 687 Ver. 1.1.1 Ref. DTS/ITS-0040014 Technical Body: ITS WG4	TS	Intelligent Transport Systems (ITS); Decentralized Congestion Control	Published Current Status: Publication (2011-07-01)

	Details and Download		Mechanisms for Intelligent Transport Systems operating in the 5 GHz range; Access layer part DCC ITS 5 GHz	
65	Doc. Nb. TR 102 638 Ver. 1.1.1 Ref. DTR/ITS-0010001 Technical Body: ITS WG1 Details and Download	TR	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Definitions	Published Current Status: Publication (2009-06-29)
66	Doc. Nb. TS 102 637-3 Ver. 1.1.1 Ref. DTS/ITS-0010002-3 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service Basic set of applications; environmental notification	Published Current Status: Publication (2010-09-08)
67	Doc. Nb. TS 102 637-2 Ver. 1.1.1 Ref. DTS/ITS-0010002-2 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service Basic set of applications; cooperative awareness basic service	Published Current Status: Publication (2010-04-30)
68	Doc. Nb. TS 102 637-1 Ver. 1.1.1 Ref. DTS/ITS-0010002-1 Technical Body: ITS WG1 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 1: Functional Requirements Basic set of applications; functional requirements	Published Current Status: Publication (2010-09-08)
69	Doc. Nb. TS 102 636-6-1 Ver. 1.1.1 Ref. DTS/ITS-0030005 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 6: Internet Integration; Sub-part 1: Transmission of IPv6 Packets over GeoNetworking Protocols Geonetworking; Protocols	Published Current Status: Publication (2011-03-30)
70	Doc. Nb. TS 102 636-5-1 Ver. 1.1.1 Ref. DTS/ITS-0030006 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol Geonetworking; transport protocols	Published Current Status: Publication (2011-02-02)
71	Doc. Nb. TS 102 636-4-2 Ver. 1.1.1 Ref. DTS/ITS-0030007 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 2: Media-dependent functionalities for ITS-G5 Geonetworking; geographical addressing; media dependent	Published Current Status: Publication (2013-10-28)
72	Doc. Nb. TS 102 636-4-1 Ver. 1.1.1	TS	Intelligent Transport System (ITS);	Published

	Ref. DTS/ITS-0030001 Technical Body: ITS WG3 Details and Download		Vehicular communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to- point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality Geonetworking; geographical addressing; media independent	Current Status: Publication (2011-06-14)
73	Doc. Nb. TS 102 636-3 Ver. 1.1.1 Ref. DTS/ITS-0030004 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network architecture Geonetworking; network architecture	Published Current Status: Publication (2010-03-16)
74	Doc. Nb. TS 102 636-2 Ver. 1.1.1 Ref. DTS/ITS-0030003 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 2: Scenarios Geonetworking; scenarios	Published Current Status: Publication (2010-03-16)
75	Doc. Nb. TS 102 636-1 Ver. 1.1.1 Ref. DTS/ITS-0030002 Technical Body: ITS WG3 Details and Download	TS	Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 1: Requirements Geonetworking; requirements	Published Current Status: Publication (2010-03-23)
76	Doc. Nb. TR 101 607 Ver. 1.1.1 Ref. DTR/ITS-0001 Technical Body: ITS Directives: Details and Download	TR	Intelligent Transport Systems (ITS); Cooperative ITS (C-ITS); Release 1 Cooperative ITS Release 1	Published Current Status: Publication (2013-05-03)

9.3. Annex C: ISO/CEN STANDARDS

STANDARD	DESCRIPTION
<i>Applications, Messages and Data specifications</i>	
<i>CEN/ISO TS 17425</i>	Intelligent transport systems — Co-operative systems — Data exchange specification for in-vehicle presentation of external road and traffic related data
<i>CEN/ISO TS 17426</i>	Intelligent Transport Systems — Cooperative Systems — Contextual speeds
<i>CEN/ISO TS 17427</i>	Intelligent Transport Systems — Cooperative Systems — Roles and responsibilities in the context of co-operative ITS based on architecture(s) for co-operative systems
<i>CEN/ISO TS 18750</i>	Intelligent transport systems — Cooperative ITS — Definition of a global concept for local dynamic maps
<i>CEN/ISO TS 19091</i>	Intelligent transport systems — Cooperative ITS — SPaT
<i>CEN/ISO TS 19321</i>	Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures
<i>Application and message support</i>	
<i>ISO 16788</i>	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS IPv6 Security
<i>ISO 16789</i>	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS IPv6 Optimization
<i>CEN/ISO TS 17419</i>	Intelligent Transport Systems — Cooperative Systems — Classification and management of ITS applications in a global context
<i>CEN/ISO TS 17423</i>	Intelligent Transport Systems — Cooperative Systems — Application requirements for selection of communication profiles
<i>TS 17429</i>	Intelligent Transport Systems — Cooperative Systems — Profiles for processing and transfer of information between ITS stations for applications related to transport infrastructure management
<i>ISO 17515-1</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — LTE
<i>ISO 21210</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — IPv6 Networking
<i>ISO 21215</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — M5
<i>ISO 21217</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture
<i>ISO 21218</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — Medium service access points
<i>ISO 24102-1</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 1: Local management
<i>ISO 24102-2</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 2: Remote management
<i>ISO 24102-3</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points

<i>ISO 24102-4</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 4: Station-internal management communication
<i>ISO 24102-5</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 5: Fast service advertisement protocol (FSAP)
<i>ISO 24102-6</i>	Intelligent Transport Systems — Communications access for land mobiles (CALM) — ITS station management — Part 6: Flow management
<i>ISO 25111</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — General requirements for using public networks
<i>ISO 29281-1</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — Non-IP networking — Part 1: Fast networking & transport layer protocol (FNTTP)
<i>Conformance testing</i>	
<i>ISO 18377</i>	Intelligent transport systems — Communications access for land mobiles (CALM) — Conformance requirements
<i>ETSI TS 102 985 1</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 1: Protocol implementation conformance "statement (PICS) proforma
<i>ETSI TS 102 985 2</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 2: Test suite structure & test purposes (TSS&TP)
<i>ETSI TS 102 985 3</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 3: Abstract test suite and partial PIXIT (ATS) specification
<i>ETSI TS 102 797 1</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 1: Protocol Implementation Conformance Statement (PICS) proforma
<i>ETSI TS 102 797 2</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 2: Test suite structure & test purposes (TSS&TP)
<i>ETSI TS 102 797 3</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 3: Abstract test suite (ATS) and partial PIXIT proforma
<i>ETSI TS 102 760-1</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218); Part 1: Protocol Implementation Conformance Statement (PICS) proforma
<i>ETSI TS 102 760-2</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218); Part 2: Test suite structure & test purposes (TSS&TP)
<i>ETSI TS 102 760-3</i>	Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218); Part 3: Abstract test suite (ATS) and partial PIXIT proforma
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test suite architecture

<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 17429 — Part 1: Protocol Implementation Conformance Statement (PICS) proforma
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 17429 — Part 2: Test suite structure & test purposes (TSS&TP)
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 17429 — Part 3: Abstract test suite (ATS) and partial PIXIT proforma
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 19091 — Part 1: Protocol Implementation Conformance Statement (PICS) proforma
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 19091 — Part 2: Test suite structure & test purposes (TSS&TP)
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 19091 — Part 3: Abstract test suite (ATS) and partial PIXIT proforma
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 19321 — Part 1: Protocol Implementation Conformance Statement (PICS) proforma
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 19321 — Part 2: Test suite structure & test purposes (TSS&TP)
<i>CEN/ISO TS (new WI)</i>	Intelligent transport systems — Cooperative ITS — Test specifications for CEN/ISO TS 19321 — Part 3: Abstract test suite (ATS) and partial PIXIT proforma

9.4. Annex D: Candidate of LKAS requirements

LKAS/ad-hoc-01-05;
19-20 November 2013

Candidate of LKAS requirements

① Japanese Guideline
② ISO

③ LDWS
④ ITS Guideline

⑤ Others (Japanese original idea)

Items	Option	Reference	Requirements	Reasons
1. Definition	1	①	LKAS is the device which are provided by motor vehicle manufacturers for the purpose of reducing the operating load of the driver when he attempts to keep his motor vehicle within the lane.	To align with the definition of Japanese Guideline.
	2	②	The main system function of a Lane Keeping Assistance System (LKAS) is to support the driver in keeping the vehicle within the current lane. LKAS acquires information on the position of the vehicle within the lane and, when required, sends commands to actuators to influence the lateral movement of the vehicle. LKAS provides status information to the driver.	To align with the definition of LKAS ISO.
	3	⑤	LKAS is the system which detects lane marking and supports the driver to keep the vehicle within the lane. However, such systems which purpose only warning or which keep the vehicle within the lane by only braking control to the driver are out of the scope.	In order to clarify that such systems which purpose only warning or which keep the vehicle within the lane by only braking control to the driver are out of the scope.
2. Scope	1	R79	M, N, O	To align with the scope of R79.
	2	③	Category 2 and 3 (M2, M3, N2, N3)	To align with the scope of LDWS.
	3	⑤	M, N	Mainly, LKAS is assumed to be installed in vehicles category M and N.

3. Operational requirements				
A. Requirements for activation				
Operating speed	1	①	LKAS may start to operate above 50km/h. (LKAS shall not start to operate below 50km/h.)	Because LKAS is the system assumed to be operated on an expressway.
	2	③	LKAS shall start to operate at least at vehicle speeds above 60km/h when all other operating conditions for are satisfied. (LKAS may start to operate less than 60km/h.)	To align with the requirement of LDWS.
	3	②	LKAS shall be operational between 72km/h and the maximum speed which is 108km/h or the maximum possible vehicle speed, whichever is less. (In this speed range, when all the operating conditions are satisfied, the system shall start to operate.)	To align with the requirement of LKAS ISO.
Acceleration etc. caused by the operation of the system	1	①	The lateral acceleration caused by the system operation while cornering shall not exceed 2 m/s^2 . In case of the system keeping the center of the lane, the lateral acceleration caused by the system operation while straight running shall be 0.5 m/s^2 or less. And also in case of the system operating near the lane marking, the lateral acceleration caused by the system operation while straight running shall be 1 m/s^2 or less.	The value of lateral acceleration (2 m/s^2) is the one which is occurred while running on the curved road of the Japanese expressway with the speed limit (80km/h).
	2	⑤	The lateral acceleration caused by the system operation shall not exceed [xx] m/s^2 .	Because if there is no limitation of the value of lateral acceleration occurred by the system operation, the driver might misunderstand that the system could go through any curved road. And also in order to prevent a rollover occurred by rapid steering operation by the system.
	3	②	Lateral acceleration shall not exceed 3 m/s^2 , and lateral jerk shall not exceed 5 m/s^3 .	To align with the requirement of LKAS ISO.
	4		The lane keeping action shall not cause a longitudinal deceleration larger than 3 m/s^2 . If the lane keeping action causes a longitudinal deceleration larger than 1.0 m/s^2 , this shall not cause a speed reduction more than 18km/h.	To align with the requirement of LKAS ISO.
Road shape	1	③	At least, the system shall be operational on a curved road which has the radius more than 250m. (LKAS may operate on a curved road which has the radius less than [250]m.)	To align with the requirement of LDWS.
	2	⑤	At least, the system shall be operational on a straight road which has the radius more than [1000]m. (LKAS may operate on a curved road which has the radius less than [1000]m.)	In order to be accepted such kind of LKAS which is operational on a straight road.
	3	②	As the one of examples, The system shall be tested on a curved road which has the radius 800m.	To align with the requirement of LKAS ISO.

Lane marking	1	③	The system shall be operational on the lane marking which is required in the LDWS regulation.	To align with the requirement of LDWS.
	2	⑤	The system shall be operational on the lane marking which is required in each countries.	The detection systems of LKAS for lane marking must be more accurate than one of LDWS.
LKAS performance requirement	1	⑤	When the LKAS is tested, the value of departure of the outside of the tire closest to the lane markings shall not exceed more than [XX]cm.	In order to prevent lane departure accidents certainly. And also in order to prevent lane departure triggered by the system operation. This requirement is prescribed in the test procedure of LKAS..
	2		When the LKAS is tested, the outside of the tire closest to the lane markings shall not depart from the lane marking.s.	In order to prevent lane departure accidents certainly. And also in order to prevent lane departure triggered by the system operation This requirement is prescribed in the test procedure of LKAS.
	3	②	When the LKAS is tested, the outer edges of the tyres of the vehicle shall not exceed the lane boundary more than 0.4m for light vehicles, and 1.1m for heavy vehicles.	To align with the requirement of LKAS ISO
	4	GRRF74-40	When the LKAS is tested, it shall start to activate at least when the outside of the tire closest to the lane markings crosses a line 0.3m beyond. (The value of departure is not specified.)	To align with the requirement of LDWS. This requirement is prescribed in the test procedure of LKAS..

B. Requirements for deactivation				
Functional limitation of the system	1	①	An announcement shall be made through acoustic and optical means in the following cases. (a) The operation of the device is cancelled without the driver's intention while the device is operating. (b) There is the possibility that the device can no longer render the assist to the running of the vehicle within the lane while the device is operating.	Because an announcement might not be recognized by the driver immediately by only an optical means, plural means including an acoustic means are provided to the driver.
	2	④	An announcement shall be made through at least two means out of optical, acoustic and haptic in the above (a) and (b).	It is referred to LDWS regulation paragraph 5.4.1.. And also following "Guidelines on establishing requirements for high-priority warning signals" paragraph 3.8., and "Design Principles for Control Systems of ADAS" paragraph 4.3.
Requirement for the end of the system operation		①, ②	When the system operation is ended, it shall not be ended suddenly but shall be faded out smoothly.	To align with the requirement of Japanese Guideline and LKAS ISO.

C. Requirements relevant to driver				
Holding a steering wheel by the driver	1	①	The operation shall be cancelled when there is no steering operation of the driver for more than 5s.	In order to make the driver understand that LKAS is not the autonomous steering system.
	2	④	An announcement shall be made through at least two means out of optical, acoustic and haptic if there is no steering operation of the driver for a certain time, after that the system operation shall be continued .	Because to keep the safety by continuing the system operation if the driver's situation recognition is become uncertain. (Concern : Does that requirement increase driver distraction?)
	3		An announcement shall be made through at least two means out of optical, acoustic and haptic if there is no steering operation of the driver for a certain time, after that the system operation may be cancelled . (equal to "may be continued")	In order to make the driver understand that LKAS is not the autonomous steering system. Because the driver might be confused if the system operation is cancelled without any announcement, .
	4		An announcement shall be made through an optical means if there is no steering operation of the driver for a certain time, after that the system operation shall be continued .	In order to make the driver understand that LKAS is not the autonomous steering system. (Concern : Does that requirement increase driver distraction?)
	5		An announcement shall be made through an optical means if there is no steering operation of the driver for a certain time, after that the system operation shall be cancelled/may be cancelled . (equal to "may be continued")	In order to make the driver understand that LKAS is not the automated driving system.
	6	⑤	If there is no steering operation of the driver for a certain time, the system operation shall be continued/may be continued .	(Concern : Does that requirement increase driver distraction?)
Override	1	①, ②, ④	Override steering operation by the driver shall be given priority to the system.	It is basic requirement for driving assistance. Due to following Vienna convention. Due to following "Design Principles for Control Systems of ADAS".
	2	④	Override steering operation by the driver may be given priority to the system.	(Concerns : Inconsistency with Vienna convention, inconsistency with AEBS)
	3		The system operation shall be given priority to steering operation by the driver.	(Concerns : Inconsistency with Vienna convention, inconsistency with AEBS)
Condition of non-operational being allowed	1	③	The system operation may be suppressed when there is a driver's action which indicates an intention of a lane change.	To align with the requirement of LDWS.
	2	②	Specific driver's actions, e.g. the turn signal, can be considered as a suppression request.	To align with the requirement of LKAS ISO.
	3	⑤	No requirement	It is considered to be included in the requirement of override.

D. Information for driver				
ON/OFF switch	1	①, ④	The device may be equipped with a switch whereby at driver's intention the driver can select the status of operational/non-operational of the device.	In order to be decided the system status of operational/non-operational by driver's will. Due to following "Design Principles for Control Systems of ADAS" .
	2	③	The device may be equipped with a means to deactivate the LKAS function, and the LKAS function shall be automatically reinstated at the status of operational of each new ignition "on" (run) cycle.	To align with the requirement of LDWS.
	3	⑤	The device shall not be equipped with a means to deactivate the LKAS function, that means the LKAS function shall always be at the status of operational.	In order to make the safety system operate certainly.
Malfunction warning /Status display	1	①, ③, ④	The status of the switch operational/non-operational, the status of the system operating/not operating, and the situation of system malfunctions shall be indicated to the driver through an optical means.	In order to indicate the status of the system to the driver correctly.
	2	⑤	In the case of above ①, the teltail with the specific symbol for LKAS shall be used.	In order to indicate the status of the system to the driver more understadably.
	3		In the case of above ①, the teltail with the specific color for LKAS shall be used.	In order to indicate the status of the system to the driver more understadably.
	4	②	The teltale with the symbol referred to ISO2575 shall be used.	To align with the requirement of LKAS ISO.
Information to be known to users		①	Necessary information shall be known appropriately to the users through the instruction manuals, caution labels and so forth.	In order to make the driver understand usage correctly. It is one of the measure for prevention of over reliance.
E. The other requirements				
Failsafe	1	①	The device shall be capable of monitoring the operating conditions of the device concerned so that any malfunction may be detected. And in cases where the device should encounter any malfunction, the device shall have a function which makes it possible for the operation of the device concerned to be stopped safely.	In order to indicate malfunctions to the driver, and to stop the device safely same as the other electronic devices.
	2		The principal functions of the device shall be preferably of a dual system.	This item is not required in AEBS and LDWS.
Conformity with the safety aspects of complex electronic control systems		R79 etc.	Concerning the conformity with the safety aspects of complex electronic control systems, the LKAS shall satisfy the requirement in Annex CEL (e.g. Annex 6 in R79).	In order to satisfy the requirement of the conformity with the safety aspects of complex electronic control systems.
EMC		③	The LKAS shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by compliance with Regulation No. 10, 03/04 Series of Amendments	In order to satisfy the safety requirement of EMC.

9.5. Annex F: HMI guidelines and standards

9.5.1. Reference Guidelines (not exhaustive)

1. ISO/TR 16352:2005 - Road vehicles -- Ergonomic aspects of in-vehicle presentation for transport information and control systems -- Warning systems
2. ISO/TR 12204:2012- Road vehicles -- Ergonomic aspects of transport information and control systems -- Introduction to integrating safety critical and time critical warning signals
3. Design Guidelines for Safety of In-Vehicle Information Systems (2004), Transportation Research Laboratory (TRL), A. Stevens, A. Quimby, A. Board, T. Kersloot and P. Burns.
4. Human Factors Design Guidelines for Advanced Traveler Information Systems (ATIS) and Commercial Vehicle Operations (CVO) (1997), Developed by Battelle under contract from the U.S. Department of Transportation, Federal Highway, Technical Report FHWA-RD-98-057, J.L. Campbell, C. Carney, B.H. Kantowitz.
5. HARDIE Design Guidelines Handbook: Human Factors Guidelines for Information Presentation by ATT Systems (1996), Commission of the European Communities, Luxembourg, T. Ross, K. Midtland, M. Fuchs, A. Pauzie, A. Engert, B. Duncan, G. Vaughan, M. Vernet, H. Peters, G. Burnett, A. May.
6. SAE J2364 - Recommended Practice Navigation and Route Guidance Function Accessibility While Driving (2004), Society of Automotive Engineers (SAE).
7. SAE J2365 – Recommended Practice Calculation of the Time to Complete In-Vehicle Navigation and Route Guidance Tasks (2002), Society of Automotive Engineers (SAE).
8. A Safety Checklist for the Assessment of In-Vehicle Information Systems: Scoring Proforma (1999), Transportation Research Laboratory (TRL), Project Report PA3536-A/99, A. Stevens, P.A. Board, A. Quimby.
9. Preliminary Human Factors Guidelines for Driver Information Systems (1993), The University of Michigan Transportation Research Institute (UMTRI) under contract from the U.S. Department of Transportation, Federal Highway, Technical Report UMTRI-93-21 (also published as FHWA-RD-94-087, P. Green, W. Levinson, G. Paelke, C. Serafin

9.5.2. International Organization for Standardization (ISO) standards

- **ISO 15005** - Road vehicles -- Ergonomic aspects of transport information and control systems -- Dialogue management principles and compliance procedures
- **ISO 15006** - Road vehicles -- Ergonomic aspects of transport information and control systems -- Specifications for in-vehicle auditory presentation
- **ISO 15007-1** - Road vehicles -- Measurement of driver visual behaviour with respect to transport information and control systems -- Part 1: Definitions and parameters FG Distraction – Report on User Interface Requirements for Automotive Applications
- **ISO 15007-2** - Road vehicles -- Measurement of driver visual behaviour with respect to transport information and control systems -- Part 2: Equipment and procedures
- **ISO 15008** - Road vehicles -- Ergonomic aspects of transport information and control systems -- Specifications and test procedures for in-vehicle visual presentation
- **ISO TC 16951** - Road vehicles -- Ergonomic aspects of transport information and control systems (TICS) Procedures for determining priority of on-board messages presented to drivers

- **ISO 16673** - Road vehicles -- Ergonomic aspects of transport information and control systems --
Occlusion method to assess visual demand due to the use of in-vehicle systems
- **ISO 2575** - Road vehicles -- Symbols for controls, indicators and tell-tales
- **ISO 4040** - Road vehicles -- Location of hand controls, indicators and tell-tales in motor vehicles
- **ISO 4513** - Road vehicles -- Visibility -- Method for establishment of eyellipses for driver's eye location
- **ISO 17287** - Road vehicles -- Ergonomic aspects of transport information and control systems --
Procedure for assessing suitability for use while driving
- **ISO 26022:2010**- Road vehicles -- Ergonomic aspects of transport information and control systems --
Simulated lane change test to assess in-vehicle secondary task demand