



COMMISSION OF THE EUROPEAN COMMUNITIES

Brussels, 20/XII/2007  
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**COMMISSION DECISION**

**of 20/XII/2007**

**concerning the technical specification of interoperability relating to “safety in railway tunnels” in the trans-European conventional and high speed rail system**

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### concerning the technical specification of interoperability relating to “safety in railway tunnels” in the trans-European conventional and high speed rail system

(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community,

Having regard to Directive 2001/16/EC of 19 March 2001 of the European Parliament and of the Council on the interoperability of the conventional rail system,<sup>1</sup> and in particular Article 6 (1) thereof,

Having regard to Directive 96/48/EC of 23 July 1996 of the European Parliament and of the Council on the interoperability of the high speed rail system,<sup>2</sup> and in particular Article 6 (1) thereof,

Whereas:

- (1) In accordance with Article 5(1) of Directive 2001/16/EC, and Article 5(1) of Directive 96/48/EC, each of the subsystems shall be covered by one TSI. Where necessary, a subsystem may be covered by several TSIs and one TSI may cover several subsystems. The decision to develop and/or to review a TSI and the choice of its technical and geographical scope requires a mandate in accordance with Article 6(1) of Directive 2001/16/EC and Article 6(1) of 96/48/EC.
- (2) The first step in establishing a TSI is to have a draft TSI drawn up by the European Association for Railway Interoperability (AEIF) which was appointed as the joint representative body.
- (3) The AEIF has been given a mandate to draw up a draft TSI for “safety in railway tunnels” in accordance with Article 6(1) of Directive 2001/16/EC.
- (4) The draft TSI has been examined by the Committee set up by Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and referred to in Article 21 of Directive 2001/16/EC.
- (5) Directives 2001/16/EC and 96/48/EC and the TSIs do apply to renewals but not to maintenance-related replacements. However Member States are encouraged, when

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<sup>1</sup> OJ L 110, 20.4.2001, p.1.

<sup>2</sup> OJ L 235, 17.9.1996, p.6.

they are able to do so and where it is justified by the scope of the maintenance-related work, to apply the TSIs to maintenance-related replacements.

- (6) In its current version the TSI does not fully deal with all essential requirements. In accordance with Article 17 of Directive 2001/16/EC, and Article 17 of Directive 96/48/EC, technical aspects which are not covered are identified as ‘Open Points’ in Annex C of this TSI.
- (7) In accordance with Article 17 of Directive 2001/16/EC and Article 17 of Directive 96/48/EC, individual Member States are to inform the other Member States and the Commission of the relevant national technical rules in use for implementing essential requirements related to these “open points”, as well as of the bodies it appoints for carrying out the procedure for the assessment of conformity or suitability for use and the checking procedure in use for verifying the interoperability of subsystems within the meaning of Article 16(2) of Directive 2001/16/EC. For this latter purpose, Member States should apply, as far as possible, the principles and criteria provided for in Directives 2001/16/EC and 96/48/EC. Wherever possible Member States should make use of the bodies notified under Article 20 of Directive 2001/16/EC and Article 20 of 96/48/EC. The Commission should carry out an analysis of the information forwarded by the Member States, in the form of national rules, procedures, bodies in charge of implementing procedures, and duration of these procedures, and, where appropriate, should discuss with the Committee the need for the adoption of any measures.
- (8) The TSI in question should not demand the use of specific technologies or technical solutions except where this is strictly necessary for the interoperability of the trans-European conventional rail system.
- (9) The TSI is based on best available expert knowledge at the time of preparation of the relevant draft. Developments in technology, operational, safety or social requirements may make it necessary to amend or supplement this TSI. Where applicable, a review or updating procedure should be initiated in accordance with Article 6(3) of Directive 2001/16/EC, or Article 6(3) of Directive 96/48/EC.
- (10) To encourage innovation and in order to take into account the experience acquired, the attached TSI should be subject to a periodical revision at regular intervals.
- (11) Where innovative solutions are proposed the manufacturer or the contracting entity shall state the deviation from the relevant section of the TSI. The European Rail Agency will finalise the appropriate functional and interface specifications of the solution and develop the assessment methods.
- (12) The mandate requested that the "safety of railway tunnels" TSI covered the prevention and mitigation of accidents and incidents in tunnels, especially those originated by fire hazards. All relevant potential risks were to be addressed in this context including those linked with derailment, collision, fire and release of dangerous substances. However, these objectives and risks would be taken into account only insofar they had an impact on the subsystems as described in the Directives and if the resulting specifications could be associated to relevant essential requirements. Several subsystems were expected to be considered, mainly: infrastructure, rolling stock, operation and traffic management, maintenance, described in Annex II of the Directives.

- (13) Railway tunnel experts from the International Union of Railways (UIC) and the United Nations Economic Commission for Europe (UNECE) have evaluated and assembled, in the 2000-2003 period, the best measures currently applied in Europe to ensure safety in new and existing tunnels. The experts from Infrastructure Managers, Railway Undertakings, rolling stock manufacturers and scientists gathered in the TSI working party in the 2003-2005 period have started their selection by considering these recommendations of best practice. Like the experts of UIC and UNECE, those of AEIF were of the opinion that the strength of railways lies in the prevention of accidents. Preventative measures are generally more cost-effective than mitigating or rescue measures. A combination of measures with preventative and mitigating character completed with self-rescue and rescue measures will best serve the aim of optimal safety at reasonable costs.
- (14) The main objective of the underlying Directives 96/48/EC and 2001/16/EC is interoperability. The aim was to harmonise the currently practiced safety measures and technical rules, in order to permit interoperability and to offer a similar approach for safety and safety measures to passengers all over Europe. In addition, a train that is complying with this TSI (and the rolling stock TSI) should be accepted, in general, in all tunnels on the trans-European network.
- (15) Safety levels in the Community rail system are generally high, in particular compared to road transport. Tunnels are even safer, from a statistical point of view, than the rest of the network. It is important however that safety is at the very least maintained during the current railways restructuring phase, which will separate functions of previously integrated railway companies and move the railway sector further from self-regulation to public regulation. This was the main rationale for Directive 2004/49/EC on safety on the Community's railways and amending Council Directive 95/18/EC on the licensing of railway undertakings and Directive 2001/14/EC on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification (the Railway Safety Directive<sup>3</sup>); safety should be further improved, when reasonably practicable and taking into account the competitiveness of the rail transport mode.
- (16) The objective of this TSI was to guide the technical progress in tunnel safety towards harmonised and cost-efficient measures; they should be as far as reasonably practicable the same all over Europe.
- (17) This TSI applies to tunnels in the countryside with a small traffic volume as well as to those in the heart of urban areas with a great number of trains and passengers. This TSI prescribes only minimal requirements: TSI conformity does not constitute per se a guarantee for safe placing in service and safe operation. All parties involved in work on safety matters shall co-operate in order to achieve the appropriate level of safety for the tunnel concerned, in accordance with the provisions in this TSI and the interoperability directives. Member States are invited to verify, whenever they open a new tunnel, or when interoperable trains are running into existing tunnels, whether the local circumstances (including type and density of traffic) require additional measures to those specified in this TSI. They can do that by mean of a risk analysis or any other state-of-the-art methodology. These verifications are part of the safety certification

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<sup>3</sup>

OJ L 164, 30.4.2004, p.44.

and authorisation processes provided for in articles 10 and 11 of the Railway Safety Directive.

- (18) Some Member States already have safety measures in place which require a higher level of safety than that mandated in this TSI. Such existing rules are to be considered in the context of article 8 of on the Railway Safety Directive. In addition, in accordance with Article 4 of the same directive, Member States shall ensure that railway safety is generally maintained and, where reasonably practicable, continuously improved, taking into consideration the development of Community legislation and technical and scientific progress and giving priority to the prevention of serious accidents.
- (19) Member States are free to request for specific situations more stringent measures, as long as these measures do not hamper interoperability. Article 8 of the Railway Safety Directive and clause 1.1.6 of this TSI allow for this possibility. Such higher requirements may be based on a scenario analysis and risk analysis and may concern the subsystems "infrastructure", "energy" and "operation". Member States are expected to consider such higher requirements in the light of the economical viability of the railway and after consultation of the concerned Infrastructure Managers, Railway Undertakings and rescue services.
- (20) In order to define the measures to be taken for the tunnel and for the train, only a restricted number of accident types have been defined. Relevant measures have been identified, which will suppress or significantly reduce the risks arising from these accident types. They have been developed, in the categories prevention, mitigation, evacuation, and rescue. Annex D of this TSI shows the qualitative relationship between the accident types and the measures, indicating which measures deal with each class of accident types. Consequently, the application of this TSI does not guarantee an absence of fatality risk.
- (21) As regards the role and responsibility of the rescue services, national authorities are competent to define it. The measures specified in this TSI in the field of rescue are based on the assumption that rescue services intervening in a tunnel accident shall protect lives, not material values such as vehicles or structures. This TSI further specified the expected task of the rescue services for each accident type.
- (22) The provisions of this Decision are in conformity with the opinion of the Committee set up by Article 21 of Council Directive 96/48/EC,

HAS ADOPTED THIS DECISION:

#### *Article 1*

A Technical Specification for Interoperability ("TSI") relating to "safety in railway tunnels" in the trans-European conventional system referred to in Article 6(1) of Directive 2001/16/EC and in the trans-European high speed rail system referred to in Article 6(1) of Directive 96/48/EC is hereby adopted by the Commission.

The TSI shall be as set out in the Annex to this Decision.

The TSI shall be fully applicable to the trans-European conventional rail system as defined in Annex I to Directive 2001/16/EC, and the trans-European high speed rail system as defined in Annex I to Directive 96/48/EC, account being taken of Article 2 of this Decision.

#### *Article 2*

1. With regard to those issues classified as “Open points” set out in Annex C of the TSI, the conditions to be complied with for the verification of the interoperability pursuant to Article 16(2) of Directive 96/48/EC and Article 16(2) of Directive 2001/16/EC shall be those applicable technical rules in use in the Member State which authorise the placing in service of the subsystems covered by this Decision.
2. Each Member State shall notify to the other Member States and to the Commission within six months of the notification of this Decision:
  - (a) the list of the applicable technical rules mentioned in paragraph 1;
  - (b) the conformity assessment and checking procedures to be applied with regard to the application of these rules;
  - (c) the bodies it appoints for carrying out those conformity-assessment and checking procedures.

#### *Article 3*

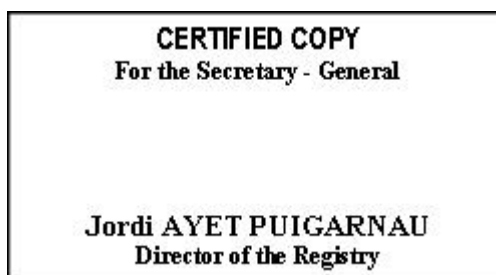
This Decision shall apply from 1 July 2008.

#### *Article 4*

This Decision is addressed to the Member States.

Done at Brussels, 20/XII/2007.

*For the Commission*  
*Jacques BARROT*  
*Vice-President of the Commission*



**EN**

**Directive 2001/16/EC - Interoperability of the trans-European conventional rail system**

**Directive 96/48/EC on the Interoperability of the trans-European high speed rail system**

**Draft Technical Specification for Interoperability**

**Subsystems: “Infrastructure”, “Energy”, “Operations and traffic management”, “Control-Command and signalling”, “Rolling Stock”**

**Aspect: “Safety in railway tunnels”**

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## 1. INTRODUCTION

### 1.1. Technical scope

#### 1.1.1. Tunnel safety as a part of general safety

This TSI applies to new, renewed and upgraded subsystems. It concerns the following subsystems mentioned Annex II to Directives 96/48/EC and 2001/16/EC, as amended by Directive 2004/50/EC: infrastructure (“INF”), energy (“ENE”), control-command (“CCS”), operation (“OPE”) and rolling stock (“RST”).

Safety in tunnels is influenced by general railway safety measures (such as signalling), which are not specified in this TSI. Only specific measures, designed to reduce specific tunnel risks, are prescribed here.

General railway safety measures:

Risks related to pure railway operation, such as derailment and collision with other trains, are addressed by general railway safety measures. The influence of the tunnel environment and therefore some of the corresponding countermeasures are addressed in this TSI to the extent that they influence safety in railway tunnels.

Tunnel-specific measures:

The purpose of this TSI is to define a coherent set of measures for the infrastructure, energy, command-control & signalling, rolling stock and traffic operation & management subsystems, thus delivering an optimal level of safety in tunnels in the most cost-efficient way. It shall permit free movement of trains complying with Directives 96/48/EC (on high speed lines) and 2001/16/EC (on conventional lines) under harmonised safety conditions in railway tunnels on the trans-European rail system.

#### 1.1.2. Tunnel length

- All specifications in this TSI apply to tunnels of more than 1 km in length, unless stated otherwise.
- Tunnels of more than 20 km in length require a special safety investigation that may lead to the specification of additional safety measures not included in this TSI in order to admit interoperable trains (trains complying with the relevant TSIs) in an acceptable fire-safety environment.
- Successive tunnels are NOT considered as one tunnel, if the two following requirements are fulfilled:
  - (A) the separation between them in open air is longer than 500 m
  - (B) there is an access/egress facility to a safe area within the open section

#### 1.1.3. Fire safety categories of passenger rolling stock

Rolling stock admitted in tunnels shall belong to either of the following two fire safety categories A and B (the following definitions are harmonised with HS RST TSI 4.2.7.2.1 and prEN45545 part 1):

#### 1.1.3.1. Rolling stock for tunnels up to 5 km in length

Rolling stock which is designed and built to operate on underground sections and tunnels of not more than 5 km in length, with side evacuation available is defined as category A. In the event of activation of a fire alarm, the train will continue to a safe area (see definition in 4.2.2.6.1), not more than 4 minutes running time away, assuming the train is able to run at 80 km/h. At the safe area, passengers and staff can evacuate the train. If it is not possible for the train to continue, it will be evacuated using the infrastructure facilities in the tunnels.

#### 1.1.3.2. Rolling stock for all tunnels

Rolling stock which is designed and built to operate in all tunnels of the trans-European Network is defined as category B. Fire barriers are provided to facilitate the protection of passengers and staff from the effects of heat and smoke on board a burning train for 15 minutes. The fire barriers and additional measures for running capability would permit such trains to leave a 20 km long tunnel and reach a safe area, assuming the train is able to run at 80 km/h. If it is not possible for the train to leave the tunnel, it will be evacuated using the infrastructure facilities provided for the tunnel.

#### 1.1.3.3 Rolling stock in tunnels with underground stations

If there are underground stations as defined in 1.1.4 which are specified as locations for evacuation in the emergency plan and if the distances between consecutive underground stations and the nearest underground station to the portal are less than 5 km, the trains shall fulfil the requirements of category A.

#### 1.1.4. Underground stations

In respect of railway subsystems, stations that are in tunnels shall fulfil the relevant specifications of this TSI.

In addition, parts of the station open to the public shall be in conformity with the national fire safety rules.

If these two conditions are fulfilled, then an underground station can be considered as a safe area as specified in 4.2.2.6.1.

#### 1.1.5. Dangerous goods

The general safety measures concerning the carriage of dangerous goods are defined in OPE TSI and RID. No tunnel specific measure is prescribed in this TSI. The Relevant National Authority may prescribe specific measures according to clause 1.1.6.

#### 1.1.6. Particular safety requirements in member states

Generally, the specifications of this TSI are harmonised requirements. The existing safety level shall not be reduced in a country as stipulated in Directive 2004/49/EC Article 4.1 (Safety Directive). Member states can retain more stringent requirements,

as long as these requirements do not prevent the operation of trains complying with Directive 2001/16/EC as amended by Directive 2004/50/EC.

They can prescribe new and more stringent requirements in accordance with Directive 2004/49/EC (Safety Directive) Art 8; such requirements shall be notified to the Commission before they are introduced. Such higher requirements must be based on a risk analysis and must be justified by a particular risk situation. They shall be the result of a consultation of the IM and of the relevant authorities for rescue, and they shall be subject to a cost-benefit assessment. .

#### 1.1.7. Risk scope, risks that are not covered by this TSI

This TSI covers specific risks to the safety of passengers and on-board staff in tunnels for the subsystems above.

Risks not covered by this TSI are as follows:

- Terrorism, as a deliberate and premeditated act which is designed to cause wanton destruction, injury and loss of life.
- health and safety of staff involved in the maintenance of the fixed installations in tunnels.
- financial loss due to damage to structures and trains.
- trespass into the tunnel
- impact of a derailed train on the tunnel structure: according to expert judgment, the impact of a derailed train will not be sufficient to reduce the load carrying capacity of the tunnel structure.
- safety problems caused by aerodynamic effects of passing trains are not addressed within this TSI (see HS INS TSI)

## 1.2. Geographical scope

The geographical scope of this TSI is the trans-European conventional rail system as described in Annex I to Directive 2001/16/EC and the trans-European High-Speed rail system as described in Annex I to Directive 96/48/EC.

## 1.3. Content of this TSI

In accordance with Article 5(3) of 2001/16/EC as amended by Directive 2004/50/EC, this TSI:

- (a) indicates its intended scope (part of the network or rolling stock referred to in Annex I to the Directive; subsystem or part of subsystem referred to in Annex II to the Directive) – Chapter 2;
- (b) lays down essential requirements for each subsystem concerned and its interfaces vis-à-vis other subsystems – Chapter 3;
- (c) establishes the functional and technical specifications to be met by the subsystem and its interfaces vis-à-vis other subsystems. If necessary, these specifications may vary according to the use of the subsystem, for example according to the categories of line, hub and/or rolling stock provided for in Annex I to the Directive – Chapter 4;

- (d) determines the interoperability constituents and interfaces covered by European specifications, including European standards, which are necessary to achieve interoperability within the trans-European conventional rail system – Chapter 5;
- (e) states, in each case under consideration, the procedures for the assessment of conformity or suitability for use. This includes in particular the modules defined in Decision 93/465/EEC or, where appropriate, the specific procedures to be used to assess either the conformity or the suitability for use of interoperability constituents and "EC" verification of subsystems – Chapter 6;
- (f) indicates the strategy for implementing the TSI. In particular, it is necessary to specify the stages to be completed in order to make a gradual transition from the existing situation to the final situation in which compliance with the TSI shall be the norm – Chapter 7;
- (g) indicates, for the staff concerned, the professional qualifications for the operation of the subsystem concerned, as well as for the implementation of the TSI – Chapter 4.

Moreover, in accordance with Article 5(5), provision may be made for specific cases for each TSI; these are indicated in Chapter 7.

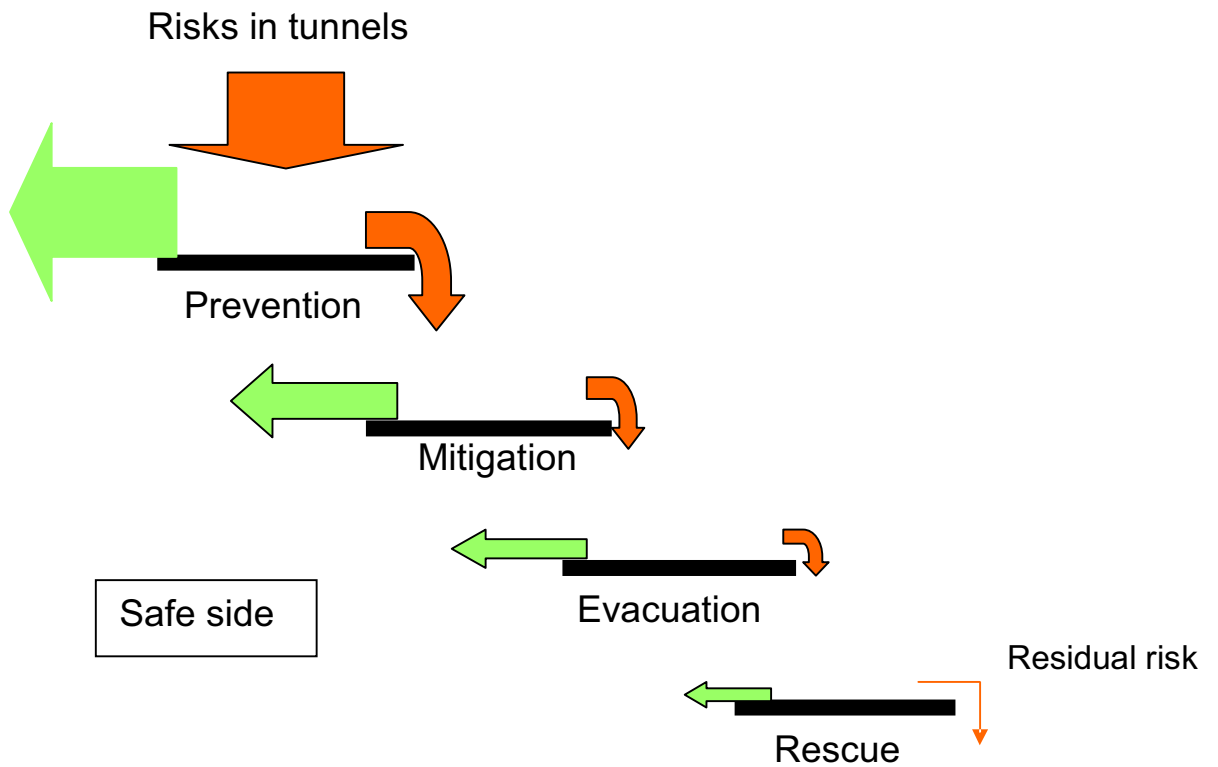
Lastly, this TSI also comprises, as detailed in Chapter 4, the operating and maintenance rules specific to the scope indicated in paragraphs 1.1 and 1.2 above.

## **2. DEFINITION OF ASPECT/SCOPE**

### **2.1. General**

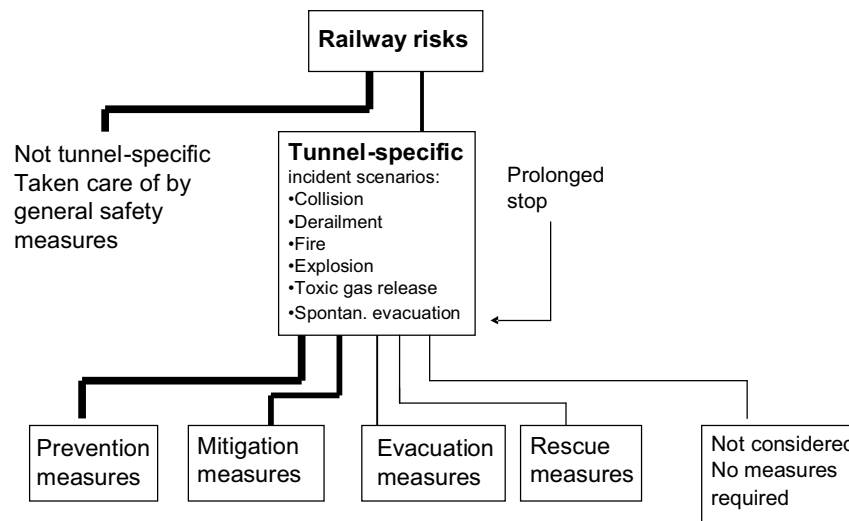
The TSI “Safety in Railway Tunnels” extends to all parts of the railway system relevant for the safety of passengers and on-board staff in railway tunnels during operation. The subsystems concerned have been defined in section 1.1 Technical scope; it is also stated there that only tunnel specific safety measures are addressed in this TSI. Chapter 2.2 deals with the risk scenarios in tunnels.

The line of defence for the promotion of safety in tunnels comprises four successive layers: Prevention, mitigation, evacuation and rescue. The largest contribution is in the area of prevention followed by mitigation and so on. A major feature of railways is their inherent ability to prevent accidents through the traffic running on a guideway and being controlled and regulated using a signalling system. The layers of safety combine to produce a low level of residual risk.



## 2.2. The risk scenarios

This TSI assumes that the pure “railway risks” are covered by appropriate measures, deriving generally from the safety standards applying in the rail industry, and reinforced by the other TSIs which are being finalised or will be mandated to the European Railway Agency (ERA). However this TSI will also look at measures which could offset or mitigate the difficulty of evacuation or rescue operations following a railway accident.



Relevant measures have been identified, which will suppress or significantly reduce the risks arising from these scenarios. They have been developed, in the categories prevention / mitigation / evacuation / rescue; however they do not appear under these headings in this TSI but under the headings of the concerned subsystems concerned.

The measures prescribed can be considered as a response to the following three types of incidents

2.2.1. “Hot” incidents: Fire, explosion followed by fire, emission of toxic smoke or gases.

The main danger is fire. It is assumed that the fire starts in one passenger train or power-unit and is fully developed 15 minutes after ignition. It is discovered and the alarm is raised during these first 15 minutes.

Whenever possible the train leaves the tunnel.

If the train comes to a stop, passengers are evacuated, directed by the train crew, or by self-rescue, to a safe area.

2.2.2. “Cold” incidents: collision, derailment

The tunnel specific measures concentrate on access/egress facilities to support evacuation and the intervention of rescue forces. The difference with the hot scenarios is that there is no time constraint due to the presence of a hostile environment created by a fire.

2.2.3. Prolonged stop



Prolonged stop (an unplanned stop in a tunnel, without a fire on board, for longer than 10 minutes) is not, by itself, a threat to passengers and staff. However it may lead to panic and to spontaneous, uncontrolled evacuation that exposes people to dangers present in a tunnel environment. Measures shall be provided to keep such a situation under control.

#### 2.2.4. Exclusions

The scenarios that have not been dealt with are listed in section 1.1.7.

### 2.3. The role of rescue services

The definition of the role of the rescue services is a matter for the Relevant National Authority. The measures specified in this TSI for rescue are based on the assumption that rescue services intervening in a tunnel accident shall protect lives as a first priority and not material values such as vehicles or structures. It is assumed that they are expected to:

In a “hot” incident type

- Try to rescue people unable to reach a safe area
- Provide initial medical support to evacuees
- Fight a fire insofar as required to protect themselves and people caught in the accident
- Conduct evacuation from safe areas inside the tunnel to open air

In a “cold” incident type

- Provide initial help to people with critical injuries
- Free trapped people
- Evacuate people

No demands on time or performance requirements are included in this TSI. Considering that accidents in railway tunnels involving multiple fatalities are rare, it is implicit that there might be events, with an extremely low probability, against which even well equipped rescue services would be powerless, such as a major fire involving a freight train.

Detailed scenarios adapted to local conditions shall be developed for the emergency plans to be approved by the Relevant National Authority. If the expectations of the rescue services expressed in those plans go beyond the assumptions described above, then additional appropriate measures or equipment can be provided.

Annex D shows the qualitative relationship between the incident types and the measures. In addition Annex D gives a full description how the measures contribute to the four layers of defence mentioned in 2.1: prevention, mitigation, evacuation and rescue.

### 3. ESSENTIAL REQUIREMENTS

This chapter lays down the essential requirements in Annex III to the Directive which apply to the subsystem, part of the subsystem or aspect concerned.

For each of these essential requirements, details are provided on how they are taken into account by the TSI, for example through a functional or technical specification, an operating rule or a condition relating to the level of staff competence.

#### 3.1. Essential requirements as set out in Directive 2001/16EC

Directive 2001/16/EC as amended by Directive 2004/50/EC sets out, in annex III, the following essential requirements to be met on the trans-European conventional system:

- Safety
- Reliability and Availability
- Health
- Environmental Protection
- Technical compatibility.

Safety and Technical compatibility are considered relevant for this TSI. (Reliability and Availability can be considered as a prerequisite for safety and should not be diminished as a result of the provisions of this TSI. Health and Environmental Protection involve the same detailed essential requirements in Annex III to the Directive).

#### 3.2. Detailed essential requirements related to tunnel safety

The detailed essential requirements listed in Annex III of Directive 2001/16/EC as amended by Directive 2004/50/EC, which are relevant for tunnel safety, are quoted below in italics.

*Section 1.1.1 of Annex III (General): The design, construction or assembly, maintenance and monitoring of safety-critical components and, more particularly, of the components involved in train movements must be such as to guarantee safety at the level corresponding to the aims laid down for the network, including those for specific degraded situations.*

This essential requirement is satisfied by the functional and technical specification in sections 4.2 Functional and technical specifications of the subsystems, 4.5 Maintenance rules.

*Section 1.1.4 of Annex III (General): The design of fixed installations and rolling stock and the choice of the materials must be aimed at limiting the generation, propagation and effects of fire and smoke in the event of fire.*

This essential requirement is satisfied by the functional and technical specifications in sections 4.2.2.3 Fire protection requirements for structures 4.2.2.4 Fire safety requirements for building material and 4.2.5.1 Material properties for rolling stock

*Section 2.1.1 of Annex III (Infrastructure): Appropriate steps must be taken to prevent access to or undesirable intrusions into installations.*

This essential requirement is satisfied by the functional and technical specifications in section 4.2.2.2 Prevent unauthorised access to emergency exits and equipment rooms.

*Appropriate provisions must be laid down to take account of the particular safety conditions in very long tunnels*

This essential requirement is satisfied by this TSI as a whole; it applies to tunnels with a length between 1 and 20 km. For tunnels longer than 20 km see 1.1.2

*Section 2.2.1 of Annex III (Energy): Operation of the energy-supply system must not impair the safety either of trains or of persons (users, operating staff, trackside dwellers and third parties).*

This essential requirement is satisfied by the functional and technical specifications in sections 4.2.3.1 Segmentation of overhead line or conductor lines, 4.2.3.2 Overhead line or conductor rail earthing, 4.2.3.5 Reliability of electrical installations and 4.2.3.4 Requirements for electrical cables in tunnels.

*Section 2.4.1 of Annex III (Rolling Stock) In the event of danger, devices must enable passengers to inform the driver and permit accompanying staff to contact him.*

This essential requirement is satisfied by the functional and technical specifications in section 4.2.5.3 of the HS RST TSI Passenger alarm. The present SRT TSI refers to this essential requirement in sections 4.2.5.7 Communication means on trains and 4.2.5.8 Emergency brake override.

*Emergency exits must be provided and indicated.*

This essential requirement is satisfied by the functional and technical specifications in sections 4.4.6 Provision of on-train safety and emergency information to passengers and 4.2.5.11 Escape design of passenger rolling stock.

*Appropriate provisions must be laid down to take account of the particular safety conditions in very long tunnels.*

This essential requirement is satisfied by the functional and technical specifications in sections 4.2.5.3 Fire protection for freight trains, 4.2.5.4 Fire barriers for passenger rolling stock 4.2.5.5 Additional measures for running capability of passenger rolling stock with a fire on board, 4.2.5.6 On-board fire detectors.

*An emergency lighting system of sufficient intensity and duration is compulsory on board trains.*

This essential requirement is satisfied by the functional and technical specifications in section 4.2.5.9 Emergency lighting system in the train.

*Trains must be equipped with a public address system, which provides a means of communication to the public from on-board staff and ground control.*

This essential requirement is satisfied by the functional and technical specifications in sections 4.2.5.7 Communication means on trains.

*Section 2.6.1 of Annex III (Operation and traffic management): Alignment of the network operating rules and the qualifications of drivers and on-board staff and of the staff in the control centres must be such as to ensure safe operation, bearing in mind the different requirements of cross-border and domestic services.*

*The maintenance operation and intervals, the training and qualifications of the maintenance and control centre staff and the quality insurance system set up by the operators concerned in the control and maintenance centres must be such as to ensure a high level of safety.*

This essential requirement is satisfied by the functional and technical specifications in sections 4.4.1 Checking the conditions of trains and appropriate actions, 4.4.2 Emergency rule, 4.4.5 Route book, 4.4.3 Tunnel emergency plan and exercises and 4.6.1 Tunnel specific competence of the train crew and other staff.

## 4. CHARACTERISATION OF THE SUBSYSTEM

### 4.1. Introduction

The trans-European conventional rail system, to which Directive 2001/16/EC as amended by Directive 2004/50/EC applies and of which the subsystems are parts, is an integrated system for which the consistency must be verified. This consistency has been checked in relation to the development of the specifications within this TSI, its interfaces with respect to the systems in which it is integrated and also the operating and maintenance rules for the railway.

Taking account of all the applicable essential requirements, the aspect of safety in railway tunnels of the subsystems CR INS / ENE / CCS / OPE / RST is characterised by the provisions of chapter 4.2.

This TSI applies to new, renewed and upgraded subsystems (infrastructure, energy, control-command and signalling, operation, rolling stock) in tunnels. The conditions of application for renewed and upgraded subsystems are defined in art 14.3 of Directive 2001/16/EC as amended by Directive 2004/50/EC, and an implementation strategy is outlined in chapter 7. The requirements for upgrade or renewal (described in chapter 7) may be less extensive than those for the target subsystems (described in chapter 4).

The functional and technical specifications of the domain and its interfaces, described in sections 4.2 and 4.3, shall not impose the use of specific technologies or technical solutions, except where this is strictly necessary for the interoperability of the trans-European High Speed rail network. Innovative solutions, which do not fulfil the requirements, specified in this TSI and/or which are not assessable as stated in this TSI require new specifications and / or new assessment methods. In order to allow technological innovation, these specifications and assessment methods shall be developed by the process described in clause 6.2.4.

### 4.2. Functional and technical specifications of the subsystems

In the light of the essential requirements in Chapter 3, the functional and technical specifications of those aspects specific to tunnel safety in the above-mentioned subsystems are as follows:

#### 4.2.1. Overview of the specifications

##### *Subsystem Infrastructure*

Installation of switches and crossings

Prevent unauthorised access to emergency exits and equipment rooms

Fire protection requirements for structures

Fire safety requirements for building material

Fire detection

Facilities for self-rescue, evacuation and rescue in the event of an incident

    Definition of safe area

    General

    Lateral and/or vertical emergency exits to the surface.

    Cross-passages to the other tube

    Alternative technical solutions

Escape walkways

Emergency lighting on escape routes

Emergency communication  
Access for rescue services  
Rescue areas outside tunnels  
Water supply

*Subsystem Energy*

Segmentation of overhead line or conductor rails  
Overhead line or conductor rail earthing  
Electricity supply  
Requirements for electrical cables in tunnels  
Reliability of electrical installations

*Subsystem control-command and signalling*

Hot axle box detectors

*Subsystem rolling stock*

Material properties for rolling stock  
Fire extinguishers for passenger rolling stock  
Fire protection for freight trains  
    Running capability  
    Driver's protection  
    Fire protection of trains with passengers and freight or road vehicles  
Fire barriers for passenger rolling stock  
Additional measures for running capability of passenger rolling stock with a fire on board  
    General objectives and required running capability for passenger trains  
    Requirements for brakes  
    Requirement for traction  
On board fire detectors  
Communication means on trains  
Emergency brake override  
Emergency lighting system in the train  
Switching off of air conditioning in the train  
Escape design of passenger rolling stock  
    Passengers' emergency exits  
    Passenger access door  
Rescue service's information and access

*Operating Rules*

Checking the condition of trains and appropriate actions  
    Before the train commences its service  
    While the train is running  
        Safety-relevant equipment  
        Hot axle box incidents  
Emergency rule  
Tunnel emergency plan and exercises  
    Content  
    Identification  
    Exercises  
Earthing procedures  
Route Book

Provision of on-train safety and emergency information to passengers  
Co-ordination between tunnel control centres

*Maintenance Rules*

. Inspection of tunnel condition  
. Maintenance of rolling stock  
    Passenger rolling stock  
    Freight rolling stock

*Professional Qualifications*

Tunnel specific competence of the train crew and other staff

*Health and Safety Conditions*

. Self-rescue device

#### 4.2.2. Subsystem Infrastructure

For the installation of safety equipment in tunnels, allowance shall be made for the actions of aerodynamic effects produced by passing trains.

##### 4.2.2.1. Installation of switches and crossings

The infrastructure manager shall ensure that only the minimum number of switch and crossing layouts is installed in accordance with the design, safety and operational requirements.

##### 4.2.2.2. Prevent unauthorised access to emergency exits and equipment rooms

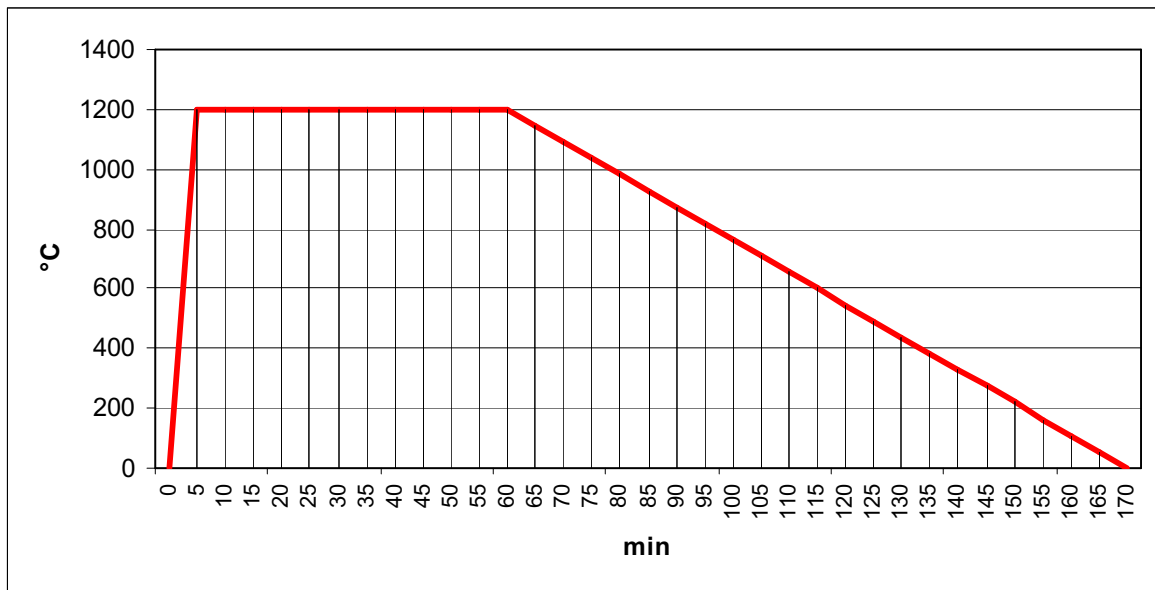
For equipment rooms and emergency exits, physical systems, e.g. locks, shall be used to prevent unauthorised access from outside; from inside, it shall always be possible to open the doors for evacuation.

##### 4.2.2.3. Fire protection requirements for structures

This specification applies to all tunnels, irrespective of their length.

The integrity of the structure shall be maintained, in the event of fire, for a period of time sufficiently long to permit self-rescue and evacuation of passengers and staff and the intervention of rescue services without the risk of structural collapse.

The fire performance of the finished tunnel surface, whether in situ rock or concrete lining, has to be assessed. It shall withstand the temperature of the fire for a particular duration of time. The specified "temperature-time curve" (EUREKA-curve) is given in the following figure. It is to be used for the design of concrete structures only.



#### 4.2.2.4. Fire safety requirements for building material

This specification applies to all tunnels, irrespective of their length.

This specification applies to building material and installations inside tunnels other than structures, which are covered in 4.2.2.3. They shall have low flammability, be non-flammable or protected, depending on the design requirements. The material for tunnel substructure shall fulfil the requirements of classification A2 of EN 13501-1:2002. Non-structural panels and other equipment shall fulfil the requirements of classification B of EN 13501-1:2002.

#### 4.2.2.5. Fire detection

Technical rooms are enclosed spaces with doors for access/egress inside or outside the tunnel with safety installations which are necessary for the following functions: self rescue and evacuation, emergency communication, rescue and fire fighting and traction power supply. They shall be equipped with detectors which alert the infrastructure manager in case of fire.

#### 4.2.2.6. Facilities for self-rescue, evacuation and rescue in the event of an incident

##### 4.2.2.6.1. Definition of safe area

Definition: a safe area is a place inside or outside a tunnel where all of the following criteria apply

- Conditions are survivable
- Access for people is possible aided and unaided
- People may accomplish self-rescue if the opportunity is available, or may wait to be rescued by the rescue services using procedures detailed in the emergency plan
- Communication shall be possible, either by mobile phone or by fixed connection to the control centre of the IM.



#### 4.2.2.6.2. General

The design of a tunnel shall take into account the need for provision of facilities to allow the self-rescue and evacuation of train passengers and staff and allow the rescue services to rescue people in the event of an incident in a tunnel.

The technical solutions described in 4.2.2.6.3 to 4.2.2.6.5 fulfil this requirement and one of them shall be selected

#### 4.2.2.6.3. Lateral and/or vertical emergency exits to the surface.

These exits shall be provided at least every 1000 m.

The minimum dimensions of lateral and or vertical emergency exits to the surface shall be 1.50 m wide and 2.25 m high. The minimum dimensions of the doors opening shall be 1.40 m wide x 2.00 m high. Requirements for exits that function as main access routes for rescue services are described in 4.2.2.11. Access for rescue services.

All exits shall be equipped with lighting and signs.

#### 4.2.2.6.4. Cross-passages to the other tube

Cross-passages between adjacent independent tunnels enable the adjacent tunnel to be employed as a safe area. They must be equipped with lights and signs. Minimum dimensions of the cross-passage are 2.25 m height x 1.50 m width. The minimum dimensions of the doors are 2.00 m height and 1.40 m width. Cross-passages in conformity with these requirements shall be provided at least every 500 m.

#### 4.2.2.6.5. Alternative technical solutions

Alternative technical solutions providing a safe area with a minimum equivalent safety level are permitted. A technical study shall be undertaken to justify the alternative solution which must be agreed by the Relevant National Authority.

#### 4.2.2.7. Escape walkways

This specification applies to all tunnels of more than 500 m in length.

Walkways shall be constructed in a single track tunnel on at least one side of the track and in a double track tunnel on both sides of the tunnel. In wider tunnels with more than two tracks access to a walkway shall be possible from each track.

The width of the walkway shall be a minimum of 0.75 m. The minimum vertical clearance above the walkway shall be 2.25 m.

The minimum level of the walkway shall be within the height of the rail.

Local constrictions caused by obstacles in the escape area shall be avoided. The presence of obstacles shall not reduce the minimum width to less than 0.7 m, and the length of the obstacle shall not exceed 2 m.

Handrails shall be installed approximately 1 m above walkway providing a route to a safe area. Handrails shall be placed outside the required minimum clearance of the

walkway. Handrails shall be angled at 30° to 40° to the longitudinal axis of the tunnel at the entrance to and exit from an obstacle.

#### 4.2.2.8. Emergency lighting on escape routes

This specification applies to all continuous tunnels of more than 500 m length.

Emergency lighting shall be provided to guide passengers and staff to a safe area in the event of emergency.

Illumination by means other than electricity is acceptable, provided that it fulfils the intended function.

Illumination is required as follows:

Single-track tube: one side (same as walkway)

Double-track tube: both sides.

Position of lights: above walkway, as low as possible, not to interfere with the free space for the passage of persons, or built-in into handrails.

The luminance shall be at least 1 lux at walkway level.

Autonomy and reliability: guaranteed power supply for emergency or other requirements to ensure availability for at least 90 minutes.

If the emergency light is switched off under normal operating conditions, it shall be possible to switch it on by both of the following means

- manually from inside the tunnel at intervals of 250 m
- by the tunnel operator using remote control

#### 4.2.2.9. Escape signage

This specification applies to all tunnels of more than 100 m length.

The escape signage indicates the emergency exits, the distance and the direction to a safe area. All signs shall be designed according to the requirements of Directive 92/58/EC of 24 June 1992 concerning the provision of health and/or safety signs at work and to ISO 3864-1.

Escape signs shall be installed on the sidewalls. The maximum distance between escape signs shall be 50 m.

Signs shall be provided in the tunnel to indicate the position of emergency equipment, where such equipment is present.

#### 4.2.2.10. Emergency communication

Radio communication between the train and the control centre shall be provided in each tunnel with GSM-R. There is no need for additional communication systems such as emergency telephones.

Radio continuity shall be provided for permitting the rescue services to communicate with their on-site command facilities. The system shall allow the rescue services to use their own communication equipment.

#### 4.2.2.11. Access for rescue services

Rescue services shall be able to enter the tunnel in the case of an incident, via the tunnel portals and/or appropriate emergency exits (see 4.2.2.6.3). These access routes

shall be at least 2.25 m wide and 2.25 m high. The IM shall describe in the emergency plan those facilities dedicated as access routes.

If road accessibility is required in the emergency plan, it should be as close as possible to the planned rescue area. Alternative means of access shall be described in the emergency plan.

#### 4.2.2.12. Rescue areas outside tunnels

Rescue areas of minimum 500 m<sup>2</sup> shall be provided near the tunnel at the access roads. Existing roads can be considered as rescue areas. If road access is not reasonably practicable, alternative solutions shall be provided in consultation with the rescue services

#### 4.2.2.13. Water supply

Water supply shall be provided at access points to the tunnel in consultation with the rescue services. The capacity shall be minimum 800 litres per minute for two hours. The water source can be a hydrant or any water supply of minimum 100m<sup>3</sup> such as a basin, river or other means. The method for bringing the water to the site of the incident shall be described in the emergency plan.

### 4.2.3. Subsystem Energy

This section applies to the infrastructure part of the subsystem Energy.

#### 4.2.3.1. Segmentation of overhead line or conductor rails

This specification applies to tunnels of more than 5 km in length.

The traction energy supply system in tunnels shall be divided up into sections, each not exceeding 5 km. This specification applies only if the signalling system permits the presence of more than one train in the tunnel on each track simultaneously.

The location of the switches shall be arranged in accordance with the requirements of the tunnel emergency plan, and so that the number of switches in the tunnel is minimised.

Remote control and switching of each “switching section” shall be provided.

A means of communication means and lighting shall be provided at the switching location to enable safe manual operation and maintenance of the switching equipment.

#### 4.2.3.2. Overhead line or conductor rail earthing

Earthing devices shall be provided at tunnel access points and close to the separation points between sections (see 4.2.3.1). These shall be either fitted manually or remote controlled fixed installations.

Communication and lighting means necessary for earthing operations shall be provided.

Procedures and responsibilities for earthing shall be defined between the infrastructure manager (IM) and the rescue services in the emergency plan (See 4.4.4 Earthing procedures)

#### 4.2.3.3. Electricity supply

The electricity power distribution system in the tunnel shall be suitable for rescue services' equipment in accordance with the emergency plan for the tunnel.

Some national rescue services groups may be self sufficient in relation to power supply. In this case, the option of not providing power supply facilities for the use of such groups may be appropriate. Such a decision, however, must be described in the emergency plan.

#### 4.2.3.4. Requirements for electrical cables in tunnels

In case of fire, exposed cables shall have the characteristics of low flammability, low fire spread, low toxicity and low smoke density. These requirements are fulfilled by compatibility of the cables with EN 50267-2-1 (1998), EN 50267-2-2 (1998) and EN 50268-2 (1999)

#### 4.2.3.5. Reliability of electrical installations

Electrical installations relevant for safety (Fire detection, emergency lighting, emergency communication and any other system identified by the Infrastructure Manager or contracting entity as vital to the safety of passengers in the tunnel) shall be protected against damage arising from mechanical impact, heat or fire. The distribution system shall be designed to enable the system to tolerate unavoidable damage by (for example) energizing alternative links. The electrical supply shall be capable of full operation in the event of the loss of any one major element. Emergency lights and communication systems shall be provided with 90 minutes backup.

### 4.2.4. Subsystem control-command and signalling

*This section applies to the trackside part of the CCS Subsystem.*

#### 4.2.4.1. Hot axle box detectors

Line-side hot axle box detection or predictive equipments shall be installed on networks with tunnels at strategic positions so that there is a high probability of detecting a hot axle box before the train enters a tunnel and that a defective train can be stopped ahead of the tunnel(s).

The IM shall designate line-side hot axle box detectors and their location in the Infrastructure Register. The RU shall include information about these in the Route Book.

#### 4.2.5. Subsystem rolling stock

##### 4.2.5.1. Material properties for rolling stock

The selection of materials and components shall take into account the fire behaviour properties.

Passenger rolling stock: clause 4.2.7.2.2 of HS RST TSI applies also to CR rolling stock.

Freight rolling stock: See clause 4.2.7.2.2.4 of CR RST TSI (freight wagons, version EN07 dated 05.01.2005) Material requirement

##### 4.2.5.2. Fire extinguishers for passenger rolling stock

The provisions of clause 4.2.7.2.3.2 of HS RST TSI apply also for CR passenger rolling stock.

##### 4.2.5.3. Fire protection for freight trains

###### 4.2.5.3.1. Running capability

No specific running capability with a fire on board is requested for freight traction units or wagons (in addition to the specifications of CR RST TSI freight wagons) although the objective of bringing the train out of the tunnel also applies to freight trains. On board fire detectors shall be specified for freight traction units as for passenger power units (4.2.5.6).

###### 4.2.5.3.2. Driver's protection

Minimum requirement for fire protection of the driver: Traction units shall have a fire barrier to protect the driver's cab. The fire barriers shall satisfy requirements for integrity for a minimum of 15 minutes. The fire performance test shall be carried out in accordance with the requirements of EN 1363-1 partition test.

*(Remark: protection of the driver see also 4.7.1)*

###### 4.2.5.3.3. Fire protection for trains with passengers and freight or road vehicles

In trains transporting passengers and freight or road vehicles, the passenger coaches shall fulfil the relevant prescriptions of chapter 4.2.5 of this TSI. National laws can specify additional requirements in the field of operation, in order to account for the additional risk of such trains, as long as these requirements do not prevent the running of trains complying with Directive 2001/16/EC as amended by Directive 2004/50/EC. (Exceptions for national, bilateral, multilateral or multinational agreements are listed in chapter 7.4)). Traction units shall fulfil the requirements for passenger locomotives. For freight wagons, the relevant TSIs apply.

##### 4.2.5.4. Fire barriers for passenger rolling stock

Clause 4.2.7.2.3.3 of HS RST TSI "Fire resistance" applies also to CR rolling stock,

#### 4.2.5.5. Additional measures for running capability of passenger rolling stock with a fire on board:

##### 4.2.5.5.1. General objectives and required running capability for passenger trains

This section includes measures which shall be achieved to improve the probability that a passenger train with a fire on board will continue to operate for:

- 4 minutes for rolling stock in fire safety category A according to 1.1.3.1. This shall be deemed to be satisfied by fulfilment of the requirements for brakes (4.2.5.5.2)
- 15 minutes for rolling stock in fire safety category B according to 1.1.3.2. This shall be deemed to be satisfied by fulfilment of the requirements for brakes and traction (4.2.5.5.2 and 4.2.5.5.3)

For tunnels longer than 20 km, the need for additional infrastructure and operations safety measures shall be considered. A fire safety category B train complying with the requirements of the relevant TSIs shall not be prevented from operating in tunnels longer than 20 km.

##### 4.2.5.5.2. Requirements for brakes

The requirements for brakes in clause 4.2.7.2.4 of the HS RST TSI shall apply also to CR rolling stock of fire safety categories A and B.

##### 4.2.5.5.3. Requirement for traction

The requirements for traction in clause 4.2.7.2.4 of the HS RST TSI shall apply also to CR rolling stock of fire safety category B.

##### 4.2.5.6. On board fire detectors

The requirements of clause 4.2.7.2.3.1 of the HS RST TSI apply also to CR rolling stock.

##### 4.2.5.7. Communication means on trains

The requirements of clause 4.2.5.1 of the HS RST TSI apply also to CR rolling stock.

##### 4.2.5.8. Emergency brake override

The provisions in clause 4.2.5.3 “Passenger alarm” of the HS RST TSI also apply to CR rolling stock.

##### 4.2.5.9. Emergency lighting system in the train

The provisions in clause 4.2.7.13 “Emergency lighting” of HS RST TSI apply also to CR passenger rolling stock, except that an autonomy of 90 minutes after the main energy supply has failed is required

#### 4.2.5.10. Switching off of air conditioning in the train

The provisions in clause 4.2.7.12.1 HS RST TSI “Passenger and train crew areas equipped with air conditioning” apply also to CR passenger rolling stock

#### 4.2.5.11. Escape design of passenger rolling stock

##### 4.2.5.11.1. Passengers’ emergency exits

Arrangement, operation and signage of emergency exits in CR passenger rolling stock shall satisfy the requirements of clause 4.2.7.1.1, letters A to C, of HS RST TSI.

##### 4.2.5.11.2. Passenger access door

The doors shall be provided with an individual internal and external emergency-opening device in conformity with clause 4.2.2.4.2.1, letter g, of the HS RST TSI.

#### 4.2.5.12. Rescue service’s information and access

The rescue services shall be provided with a description of rolling stock to permit them to handle emergencies. In particular information should be provided on how to obtain access to the interior of the rolling stock.

### 4.3. Functional and technical specifications of the interfaces

#### 4.3.1. General

The SRT TSI being a transverse TSI specifies measures relating to several other subsystems in one of the following ways:

- Simply referring to a specific clause in the other subsystem
- Referring to a specific clause in the other subsystem and completing it with particular requirements for railway tunnels (e.g. clause 4.5.1 Inspection of tunnel condition)
- Referring to a specific clause in the other subsystem and declaring that this clause shall also apply to a subsystem for which currently no TSI exists (e.g. clause 4.2.5.2 “Fire extinguishers for passenger rolling stock” refers to HS RST TSI 4.2.7.2.3.2 and states that it shall apply also for CR rolling stock).

The list of interfaces is given below. References to clauses in other TSIs have to be considered as recommendations for the CR TSIs that are referred to.

#### 4.3.2. Interfaces with the Infrastructure subsystem

CR SRT TSI	HS INS TSI
4.2.2.7 Escape walkways	4.2.23.2 Emergency walkways in tunnels
4.5.1. Inspection of tunnel condition	4.5.1 Maintenance plan

The references of interfaces to CR INS are to be specified at a later stage, when the CR INS TSI is available

#### 4.3.2.1. Escape walkways

The definition of escape walkways is described in the CR SRT TSI 4.2.2.7. The HS INS TSI has referred to this specification. The CR SRT TSI is responsible for it.

#### 4.3.2.2. Inspection of tunnel condition

The inspection of tunnel condition is based on the general specifications of the maintenance plan in clause 4.5.1 of HS TSI INS and of the future CR TSI INS with the additional requirements described in clause 4.5.1. of this TSI.

#### 4.3.3. Interfaces with the Energy subsystem

CR SRT TSI	HS ENE TSI
4.2.3.1 Segmentation of overhead line or conductor rails	4.2.7. Continuity of power supply in case of disturbances

The references of interfaces to CR ENE are to be specified at a later stage, when the CR ENE TSI is available

#### 4.3.3.1. Sectioning of traction energy supply systems

The SRT clause 4.2.3.1 Segmentation of overhead line or conductor rails and the HS ENE TSI clause 4.2.7 deal with the same issues: sectioning of the overhead contact line system and continuity of operation. They are linked.

#### 4.3.4. Interfaces with the Control-Command-Signalling subsystem

CR SRT TSI	HS CCS TSI	CR CCS TSI
4.2.4.1 Detectors for hot axle boxes		4.2.4.1

The hot axle box detectors have to be able to detect a hot axle box. The SRT TSI defines no subsystem specification, only the location of the hot axle box detectors.



#### 4.3.5. Interfaces with the Traffic Management and Operation subsystem

CR SRT TSI	HS OPE TSI	CR OPE TSI
4.4.1 Checking the condition of trains and appropriate actions		4.2.2.7.1 4.2.3.3 4.2.3.3.2 4.2.3.6.3 4.2.3.7
4.4.3 Tunnel emergency plan and exercises		4.2.3.7
4.4.5 Route book		4.2.1.2.2
4.4.6 Provisions of on-train safety and emergency information to passengers		4.2.3.7
4.6.1 Tunnel specific competence of the train crew and other staff		4.6 and annexes H and J

##### 4.3.5.1. Tunnel emergency plan and exercises

In addition to the requirements for the management of emergency situations as described in clause 4.2.3.7 of the CR OPE TSI, the specific requirements for a tunnel emergency plan are described in clause 4.4.3 of this TSI.

##### 4.3.5.2. Route book

On lines with tunnels the Route Book has to specify in addition to the requirements described in clause 4.2.1.2.2 of CR OPE TSI, the requirements described in clause 4.4.5 of this TSI.

##### 4.3.5.3. Provisions of on-train safety and emergency information to passengers

In addition to the requirements for management of the emergency situations as described in clause 4.2.3.7 of the CR OPE TSI, the tunnel safety specific requirements are described in clause 4.4.6 of this TSI.

##### 4.3.5.4. Tunnel specific competence of the train crew and other staff

In addition to the requirements of CR OPE TSI 4.6 dealing with the professional and linguistic competency and the assessment process required for staff to attain this competency, the SRT TSI clause 4.6.1 specifies the competences required to manage degraded situations in tunnels.

#### 4.3.6. Interfaces with the rolling stock subsystem

CR SRT TSI	HS RST TSI	CR WAG TSI
4.2.5.1 Material properties for rolling stock	4.2.7.2.2	4.2.7.2.1
4.2.5.2 Fire extinguishers for rolling stock	4.2.7.2.3.2	
4.2.5.3 Fire protection for freight trains		
4.2.5.4 Fire barriers for passenger rolling stock	4.2.7.2.3.3	
4.2.5.5 Additional measures to improve running capability of passenger rolling stock with a fire on board	4.2.7.2.4	
4.2.5.6 On board fire detectors	4.2.7.2.3.1	
4.2.5.7 Communication means on trains	4.2.5.1	
4.2.5.8 Emergency brake override	4.2.5.3	
4.2.5.9 Emergency lighting system in the train	4.2.7.13	
4.2.5.10 Switching off of air conditioning in the train	4.2.7.12.1	
4.2.5.11 Escape design of passenger rolling stock	4.2.7.1.1 A-C 4.2.2.4.2.1 g	

The references to interfaces with CR RST other than freight wagons are to be specified at a later stage, when the relevant CR RST TSI is available.

##### 4.3.6.1. Material properties for rolling stock

Clause 4.2.5.1 specifies the fire behaviour properties of materials and components. It requires the same properties for CR passenger rolling stock as for HS rolling stock and therefore refers to clause 4.2.7.2.2 of the HS RST TSI. For CR freight rolling stock, the relevant properties are defined in clause 4.2.7.2.1 of the CR WAG TSI.

##### 4.3.6.2. Other rolling stock specifications

*The specifications 4.2.5.2, 4.2.5.4 to 4.2.5.11 of the SRT TSI for CR rolling stock are the same as those for HS rolling stock.*

#### 4.3.7. Interfaces with the PRM subsystem

CR SRT TSI	PRM TSI
4.2.2.7 Escape walkways	4.2.2.3 Wheelchair spaces

##### 4.3.7.1. Escape walkways

The dimensions for escape walkways are chosen in relation to the CR PRM TSI, where a width of 0,75 m is requested for the use of wheelchairs.

#### 4.4. Operating rules

The following operating rules do not form any part of the assessment of the subsystems.

In light of the essential requirements in Chapter 3, the operating rules specific to tunnel safety in the subsystems concerned by this TSI are as follows:

#### 4.4.1. Checking the condition of trains and appropriate actions

The condition of safety relevant equipment on the train shall be checked

- During maintenance of rolling stock, by the RU or by the entity responsible for the maintenance of the rolling stock (See section 4.5.2)
- Before the train begins its service, by the RU,
- While the train is running, by the RU.

This requirement completes CR OPE TSI 4.2.2.7

##### 4.4.1.1. Before the train commences its service.

The requirement of CR OPE TSI 4.2.3.3 is important for SRT

##### 4.4.1.2. While the train is running

The requirements of CR OPE TSI 4.2.3.3.2, 4.2.3.6.3 and 4.2.3.7 are important for SRT

##### 4.4.1.2.1. Safety-relevant equipment

If one of the following items of equipment is found to be defective while the train is running:

- Public address system,
- Emergency lighting,
- Door unlocking system
- Emergency brake override system
- Fire detection
- Train radio

The RU shall have plans for continuation of safe operation of trains under the resulting degraded conditions or to stop.

The IM shall be informed immediately by the train crew.

##### 4.4.1.2.2. Hot axle box incidents

If a hot axle box is detected:

- The defective train shall stop as soon as possible at an appropriate place ahead of the tunnel(s).
- The IM shall be informed of the location where the train stops immediately
- The defective parts shall be checked by the train crew
- The RU shall have rules to permit safe operation to continue under the resulting degraded conditions.

#### 4.4.2. Emergency rule

The IM's operation rules shall adopt and develop in more detail, if necessary, the principle that in case of an incident (except a derailment, that requires an immediate stop)

- The train shall be brought to a halt before entering a tunnel, or driven out of a tunnel.
- In tunnels with underground stations, the train may be evacuated at an underground platform. The procedures for this situation shall be developed by the IM and the RU and be detailed in the emergency plan

In all cases, the IM shall be informed immediately by the train crew and no additional scheduled train shall be permitted to enter the tunnel.

#### 4.4.3. Tunnel emergency plan and exercises

An emergency plan shall be developed under the direction of the Infrastructure Manager, in co-operation, where appropriate, with the railway undertakings, the rescue services and the relevant authorities for each tunnel. It shall fulfil the requirements of CR OPE TSI 4.2.3.7 "Managing an emergency situation" and meet the following additional specifications.

If the tunnels on the route are similar, the emergency plan may be generic.

##### 4.4.3.1. Content

The emergency plan shall be consistent with the self-rescue, evacuation and rescue facilities provided.

The emergency plan shall contain as a minimum:

- The tasks, the names, the addresses and telephone numbers of all relevant organisations; any changes in this respect shall be reported immediately and the emergency plan updated accordingly by the IM.
- The identification of the tunnel must be unique, and a precise description and plan of the access routes for the rescue services
- The measures provided and the strategy for evacuation of passengers from the tunnel in the event of an incident in the tunnel. In the event of a prolonged stop (defined in 2.2 Risk scenarios), it shall be possible to make a decision and to start an appropriate course of action leading to evacuation of passengers (start real evacuation or have an appropriate evacuation train set in movement) within 60 minutes after the train has come to a rest. The decision must be based on an assessment of the relative risks of the passengers remaining on board the train or being moved to a safe area.
- Isolation and Earthing procedures (see 4.4.4)

##### 4.4.3.2. Identification

All doors leading to emergency exits or cross-passages (see 4.2.2.6.) are to be uniquely defined and marked on both sides. This identification shall be defined in the emergency plan and in the Route Book and shall be used in all communications between railway undertakings, the infrastructure manager and the rescue services. Any relevant change in this respect must be reported immediately; the emergency plan has to be updated appropriately by the IM and the Route book by the RU according to clause 4.2.1.2.2.2 CR OPE TSI.

#### 4.4.3.3.Exercises

Prior to opening of a single tunnel or a series of tunnels, a full-scale exercise comprising evacuation and rescue procedures, involving all categories of personnel defined within the emergency plan, shall take place.

The emergency plan shall define how all organisations involved can be familiarised with the infrastructure and how often visits to the tunnel and table top or other exercises have to take place.

#### 4.4.4. Isolation and Earthing procedures

If the rescue services require disconnection of the traction power supply, they shall receive a guarantee that the relevant sections of catenaries or conductor rails have been disconnected before entering the tunnel or a section of the tunnel.

It is the responsibility of the infrastructure manager to disconnect the traction power supply. The responsibility for earthing shall be defined in the emergency plan. Provision shall be made for isolation of the section in which the incident has taken place.

#### 4.4.5. Route Book

The Route Book defined in CR OPE TSI 4.2.1.2.2.1 shall indicate the relevant safety information for tunnels.

#### 4.4.6. Provision of on-train safety and emergency information to passengers

As specified in the CR OPE TSI 4.2.3.7 the RUs shall have processes to inform passengers of on board emergency and safety procedures in tunnels. Such information shall be provided in the language of the country the train is running in as a minimum, plus English. As far as possible, visual information (pictograms) shall be used. The core content and minimum requirement for information should be:

- Keep corridors, doors, emergency exits and fire extinguishers free of luggage, bicycles etc
- In case of fire, and if you are able to do so, try to extinguish the fire by using the on-board extinguishers
- Alert the train crew.
- If there is no immediate danger, await instructions from the train crew.
- If necessary or if instructed move to another coach
- Once the train is stationary, follow the instructions given by the train crew.
- If leaving the train in the event of an emergency follow the emergency exit signs
- Beware of trains travelling on adjacent tracks

#### 4.4.7. Co-ordination between tunnel control centres

Co-ordination procedures between the relevant control centres (e.g. energy, operations, tunnel installations) involved shall be in accordance with the requirements of the emergency plan.

### 4.5. Maintenance rules

In light of the essential requirements in Chapter 3, the maintenance rules specific to tunnel safety in the subsystems concerned by this TSI are as follows:

#### 4.5.1. Inspection of tunnel condition

This specification applies to all tunnels, independently of their length.

In the maintenance plan, established by the HS INS TSI 4.5.1 and also by the future CR INS TSI, the following additional inspection rules have to be taken into account:

- annual visual inspections carried out by the IM
- detailed inspections according to the IM's maintenance plan
- special inspections after accidents, natural events that may have affected the tunnel condition
- after and during implementation of renewal and/or upgrading works and before restoring train operation in a tunnel, an inspection has to be undertaken, with appropriate means, to ensure that the stability of the structure is guaranteed and that there are no infringements of the gauge.

#### 4.5.2. Maintenance of rolling stock

##### 4.5.2.1. Passenger rolling stock

The maintenance plan for rolling stock used to form a passenger train shall specifically include checking the following safety related equipment:

- Public address system
- Emergency lighting
- Door unlocking system
- Emergency brake override system
- Switching off of air conditioning
- Train radio
- On-board fire detectors (when installed) test of functioning.
- Escape design

##### 4.5.2.2. Freight rolling stock

The maintenance plan for traction units used to form a freight train shall specifically include checking the presence of at least one self-rescue device on a traction unit.

### 4.6. Professional qualifications

The professional qualifications of staff required for the operation specific to tunnel safety in the subsystems concerned by this TSI and in accordance with the operating rules in clause 4.4. of this TSI are as follows:

#### 4.6.1. Tunnel specific competence of the train crew and other staff

All professional staff driving and accompanying a train, as well as staff that authorise train movements, shall have the knowledge and the ability to apply that knowledge to manage degraded situations in the event of an incident. For staff undertaking the tasks of driving and/or accompanying trains, the general requirements are specified in CR OPE TSI 4.6 “Professional qualifications” and annexes H (Minimum elements relevant to professional qualification for the task of driving a train) and J (Minimum elements relevant to professional qualification for the tasks associated with accompanying trains).

All train crew shall have knowledge of the appropriate safety behaviour in tunnels and in particular be able to evacuate a train in a tunnel. This involves instructing the passengers to go to the next coach or to exit the train, and to lead them outside the train to a safe place.

Auxiliary train staff (e.g. catering, cleaning), who do not form part of the train crew as defined below shall, in addition to their basic instruction, be trained to support the actions of the train crew<sup>1</sup>.

Professional training of engineers and managers responsible for maintaining and operating the subsystems shall include the subject of safety in railway tunnels.

### **4.7. Health and safety conditions**

The health and safety conditions of staff required for operation specific to tunnel safety in the subsystems concerned by this TSI and for the implementation of the TSI are as follows:

#### 4.7.1. Self-rescue device

Manned traction units of freight trains shall be equipped with a self-rescue device for the driver and other persons on board, satisfying the specifications of one of the two standards EN 402:2003 or 403:2004 .The RU has to choose one out of the two different solutions defined in these standards

### **4.8. Infrastructure and Rolling stock registers**

In accordance with Article 24(1) of Directive 2001/16/EC, each TSI shall indicate precisely the information that must be included in the registers of infrastructure and of rolling stock.

#### 4.8.1. Register of infrastructure

See annex A of this TSI

#### 4.8.2. Rolling Stock Register

See Annex B of this TSI

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<sup>1</sup> Train crew is defined in the OPE TSI Glossary as follows: Members of the on-board staff of a train, who are certified as competent and appointed by a Railway Undertaking to carry out specific, designated safety related tasks on the train, for example the driver or the guard.

## 5. INTEROPERABILITY CONSTITUENTS

There are no interoperability constituent defined in the SRT TSI.

## 6. ASSESSMENT OF CONFORMITY AND/OR SUITABILITY FOR USE OF THE CONSTITUENTS AND VERIFICATION OF THE SUBSYSTEM

### 6.1. Interoperability constituents

Not applicable, since no interoperability constituent has been defined in SRT TSI.

### 6.2. Subsystems

#### 6.2.1. Conformity assessment (general)

The contracting entity such as a railway undertaking, an infrastructure manager, a rolling stock manufacturer or an authorised representative established within the community shall lodge an application for assessment of conformity of the Rolling Stock or Energy or Control-Command and Signalling or Infrastructure subsystems with a Notified Body of its choice

At the moment, a distinction has to be made between:

- the subsystems for which a TSI already exists: CR CCS, CR OPE, CR RST (wagons)
- the subsystems for which a TSI does not already exist: CR RST other than wagons, CR ENE, CR INS

For the first situation, the assessment against the SRT TSI has to be made within the framework of the assessment of the relevant subsystem against its specific TSI. For the second situation (CR RST other than wagons, CR INS and CR ENE), the assessment is either described in this chapter or in the relevant chapters of the existing HS TSIs (RST, INS, ENE).

Where the specification in CR SRT TSI chapter 4 is adequate, no further information for assessment is provided in this chapter.

The reference is made in the following table.

Specification	Reference
4.2.2.1. Installation of switches and crossings	CR SRT TSI 6.2.7.1
4.2.2.2 Prevent unauthorised access to emergency exits and equipment rooms	CR SRT TSI 6.2.7.2
4.2.2.3 Fire protection requirements for structures	CR SRT TSI 6.2.7.3
4.2.2.4 Fire safety requirements for building material	CR SRT TSI 4.2.2.4
4.2.2.5 Fire detection	CR SRT TSI 4.2.2.5
4.2.2.6 Facilities for self-rescue, evacuation and rescue in the event of an incident	CR SRT TSI 6.2.7.4



<b>Specification</b>	<b>Reference</b>
4.2.2.7 Escape walkways	CR SRT TSI 4.2.2.7
4.2.2.8 Emergency lighting on escape routes	CR SRT TSI 4.2.2.8
4.2.2.9 Escape signage	CR SRT TSI 4.2.2.9
4.2.2.10 Emergency communication	CR SRT TSI 6.2.7.5
4.2.2.11 Access for rescue services	CR SRT TSI 6.2.7.5
4.2.2.12 Rescue areas outside tunnels	CR SRT TSI 6.2.7.5
4.2.2.13 Water supply	CR SRT TSI 6.2.7.5
4.2.3.1 Segmentation of overhead line or conductor rails	CR SRT TSI 4.2.3.1
4.2.3.2 Overhead line or conductor rail earthing	CR SRT TSI 6.2.7.5
4.2.3.3 Electricity supply	CR SRT TSI 6.2.7.5
4.2.3.4 Requirements for electrical cables in tunnels	CR SRT TSI 4.2.3.4
4.2.3.5 Reliability of electrical installations	CR SRT TSI 6.2.7.6
4.2.4.1 Hot axle box detectors	CR SRT TSI 6.2.7.7
4.2.5.1 Material properties for rolling stock	HS RST TSI/ CR WAG TSI
4.2.5.2 Fire extinguishers for passenger rolling stock	HS RST TSI
4.2.5.3 Fire protection for freight trains	CR SRT TSI 4.2.5.3
4.2.5.4 Fire barriers for passenger rolling stock	HS RST TSI
4.2.5.5 Additional measures for running capability of passenger rolling stock with a fire on board:	CR SRT TSI 4.2.5.5
4.2.5.6 On board fire detectors	HS RST TSI
4.2.5.7 Communication means on trains	HS RST TSI
4.2.5.8 Emergency brake override	CR SRT TSI 4.2.5.8
4.2.5.9 Emergency lighting system in the train	CR SRT TSI 4.2.5.9
4.2.5.10 Switching off of air conditioning in the train	HS RST TSI
4.2.5.11 Escape design of passenger rolling stock	CR SRT TSI 4.2.5.11
4.2.5.12 Rescue service's information and access	CR SRT TSI 6.2.8.1
4.4.1 Checking the condition of trains and appropriate actions	CR OPE TSI
4.4.2 Emergency rule	CR OPE TSI
4.4.3 Tunnel emergency plan and exercises	CR OPE TSI
4.4.4 Earthing procedures	CR OPE TSI
4.4.5 Route Book	CR OPE TSI
4.4.6 Provision of on-train safety and emergency information to passengers	CR OPE TSI
4.4.7 Co-ordination between tunnel control centres	CR OPE TSI
4.5.1 Inspection of tunnel condition	CR SRT TSI 6.2.5
4.5.2 Maintenance of Rolling Stock	CR SRT TSI 6.2.5
4.6.1. Tunnel specific competence of the train crew and other staff	CR SRT TSI 4.6.1
4.7.1. Self-rescue device	CR SRT TSI 6.2.8.2

This Notified Body shall have been authorised:

- ◆ Either to assess each of the subsystems mentioned above
- ◆ Or to assess one of the subsystems only, but, in such a case, it shall contract arrangements with other notified bodies notified for assessment of the other subsystems for the assessment of the relevant requirements concerning the other subsystems (see section 4.2 of this TSI)

The EC declaration(s) of verification in accordance with Article 18(1) and Annex VI of Directive 2001/16/EC modified by Directive 2004/50/EC, related to the subsystem(s) concerned shall be drawn up by the applicant(s).

The EC declaration(s) of verification is/are required to obtain authorisation to place the subsystem(s) into service.

The conformity assessment of a Subsystem shall be performed according to one or a combination of the following modules according to clause 6.2.2 and Annex E of this TSI :

**Modules for the EC verification of subsystems (see Annex F)**

Module SB: Type examination for design and development phases

Module SD: Product quality management system for production phase

Module SF: Product verification for production phase

Module SG: Unit verification

Module SH2: Full quality management system with design examination for design, development and production phases

The approval process and the contents of the assessment shall be defined between the applicant and a Notified Body according to the requirements defined in this TSI and in conformance with the rules set out in section 7 of this TSI.

6.2.2. Conformity assessment procedures (modules)

The applicant shall choose one of the modules or module combinations indicated in the following table.

Table: Assessment procedures

<b>Subsystem to be assessed</b>	Module SB+SD	Module SB+SF	Module SG	Module SH2
Rolling Stock Subsystem	X	X		X
Energy subsystem	X	X	X	X
Infrastructure subsystem			X	X
Control-Command and Signalling			X	X

The characteristics of the subsystem to be assessed during the relevant phases are indicated in Annex E. The applicant shall confirm that each subsystem produced complies with the type. An “X” in column 4 of table E in Annex E indicates that the relevant characteristics shall be verified by testing each single subsystem.

The assessment of the maintenance subsystem is described in clause 6.2.5.

6.2.3. Existing solutions

If an existing solution is already assessed for an application under comparable conditions and in service, then the following process applies:

The applicant shall demonstrate that results of tests and verifications for the previous assessment of the application are in conformity with the requirements of this TSI. In this case the previous type assessment of the subsystem related characteristics shall remain valid in the new application.

#### 6.2.4. Innovative solutions

If a subsystem includes an innovative solution as defined in section 4.1, the manufacturer or the contracting entity shall state the deviation from the relevant clause of the TSI and submit them to the European Railway Agency (ERA). The ERA shall produce and finalise the appropriate functional and interface specifications of this solution and develop the assessment methods.

The appropriate functional and interface specifications and assessment methods shall be incorporated in the TSI by the revision process. After entry into force of a decision of the Commission, taken in accordance with Article 21(2) of Directive 2001/16/EC, as modified by Directive 2004/50/EC, the innovative solution is permitted to be used before being incorporated into the TSI.

#### 6.2.5. Assessment of maintenance

According to article 18.3 of Directive 2001/16/EC as modified by Directive 2004/50/EC, the Notified Body shall compile the Technical File, which includes the Maintenance File. That means in particular that the Notified Body shall verify:

- the existence of the maintenance file,
- the existence for rolling stock inside the maintenance file of the items detailed in clause 4.2.10.2 of the HS RST TSI,

but it does not have to check the validity of the content of the maintenance file.

The conformity assessment of maintenance is the responsibility the Relevant National Authority.

#### 6.2.6. Assessment of operational rules

The Railway Undertaking or Infrastructure Manager shall demonstrate compliance with the requirements of this TSI. They can do this as part of the Safety Management System as described in Directive 2004/49/EC. Compliance with operation rules of this TSI do not require separate assessment by a Notified Body, unless required by the OPE TSI.

The relevant Competent Authority shall carry out an assessment of any new or amended operational procedures and processes, prior to implementation, before granting a new or revised safety authorisation/certificate. This assessment shall be a part of the process for granting the safety certificate / authorisation.

## 6.2.7. Additional requirements for assessment of specifications concerning the IM

### 6.2.7.1. Installation of switches and crossings

The Notified body shall check the existence in the technical file of a technical study justifying the location of switches and crossings in the tunnel and confirming that only the minimum number of switch and crossing layouts has been installed in accordance with the requirements of 4.2.2.1.

### 6.2.7.2. Prevent unauthorised access to emergency exits and equipment rooms

The assessment shall confirm that:

- Emergency exit doors to the surface and doors to equipment rooms are provided with suitable locks
- The locks provided are consistent with the overall strategy for security for the tunnel and adjacent infrastructure
- Emergency exits are not lockable from the inside and may be opened by an evacuating passenger
- Access arrangements are in place for the rescue services

### 6.2.7.3. Fire protection requirements for structures

The Notified Body shall assess conformity with the fire protection requirements for structures, defined in 4.2.2.3, by using the results of calculations made by the Infrastructure Manager or the contracting entity.

### 6.2.7.4. Facilities for self-rescue, rescue and evacuation in the event of an incident

The Notified Body shall check that the solution adopted is clearly identified by a statement in the technical file and is in conformity with the requirements of 4.2.2.6. In the case of 4.2.2.6.5 Alternative technical solution the Notified Body shall check that the appropriate technical study has been carried out and was subsequently approved by the Relevant National Authority.

### 6.2.7.5. Access and equipment for rescue services

The Notified Body shall confirm, by verification of the technical file and also considering evidence of consultation with the rescue services, that the requirements in the following clauses have been met:

- 4.2.2.10 Emergency communication
- 4.2.2.11 Access for rescue services
- 4.2.2.12 Rescue areas outside tunnels
- 4.2.2.13 Water supply
- 4.2.3.2 Overhead line or conductor rail earthing
- 4.2.3.3 Electricity supply

### 6.2.7.6. Reliability of electrical installations

The Notified Body shall confirm only that a failure mode assessment complying with the functional requirements of 4.2.3.5 has been carried out.

#### 6.2.7.7.Hot axle box detectors

The Notified body shall confirm that hot axle box detectors or predictive equipment has been provided in accordance with the requirements of clause 4.2.4.1 and that the Infrastructure Manager has established procedures for action following alarm which prevent suspect rolling stock from entering or stopping in a tunnel.

#### 6.2.8. Additional requirements for assessment of specifications concerning the RU

The specifications for CR RST made in this TSI are the same as those described in the HS RST TSI. Therefore the assessment for rolling stock specifications has to be undertaken in accordance with the assessment specifications in HS RST TSI chapter 6, except the following clauses where additional requirements and information is provided:

4.2.5.3 Fire protection for freight trains

4.2.5.12 Rescue services information and access

##### 6.2.8.1.Rescue service's information and access

The Notified Body shall check by evidence of consultation with the rescue services that the requirements of 4.2.5.12 are satisfied.

##### 6.2.8.2.Self-rescue device

The conformity assessment is described in EN401:1994, EN402:2003, EN403:2004.

## **7. IMPLEMENTATION**

This SRT TSI specifies the basic parameters required either in new, renewed and upgraded tunnels (on conventional lines) or new, renewed and upgraded CR rolling stock, in order to harmonise the current level of overall safety in tunnels throughout Europe. This can be achieved mainly through an optimal combination of safety requirements applied to the infrastructure, rolling stock and operation subsystems. In order to make a gradual transition from the existing situation to the final situation in which compliance with the TSI shall be the norm, this chapter defines the implementation strategy for the SRT TSI.

### **7.1. Application of this TSI to subsystems to be put into service**

#### 7.1.1. General

Chapters 4 to 6 apply in full to the subsystems falling within the geographical scope of this TSI (cf. paragraph 1.2) which will be put into service after this TSI enters into force

In particular they refer both to new tunnels and new tunnel projects. For projects at an advanced stage of development, and for contracts already awarded see Art 7(a) of Directive 2001/16/EC.

#### 7.1.2. Newly built rolling stock constructed to an existing design

Newly built rolling stock constructed to a design existing before entry into force of this TSI and already authorised by one or more Member States, for operation on defined lines is permitted to be placed into service within four years after this TSI enters into force without an assessment of conformity with the SRT TSI, as long as the train remains on its defined lines of operation.

However, if this rolling stock is intended to run on lines with tunnels > 1 km in length, it shall be equipped with an emergency brake override device in conformity with clause 4.2.5.8 of this TSI

#### 7.1.3. Existing rolling stock intended to run in new tunnels

Unless it would lower the overall level of safety defined by notified national rules, no restriction shall be placed upon the operation of existing trains in respect of TSI compliant tunnels.

### **7.2. Application of this TSI to subsystems already in service**

#### 7.2.1. Introduction

Subsystems already in service will be upgraded and renewed in accordance with the conditions laid down in Article 14(3) of the Directive 2001/16/EC.

In this particular context, the migration strategy (see 7.2.2) indicates the manner in which each existing subsystem inside the tunnel undergoing renewal or to upgrading processes shall be adapted to meet the requirements of the TSI.

Upgrading and renewal are defined in Directive 2001/16EC Art 2, alineaas l, m, and n. However, the measures prescribed thereafter all apply to both upgrading and renewal actions.

To enable a proactive implementation of this TSI, Member States are encouraged to promote and support the implementation strategy. Whenever subsystems of a tunnel section or of rolling stock already in service are to be upgraded or renewed, the opportunity to include other parts that are not included within the plans for upgrade and renewal, but that can be brought into conformity with this TSI, should be considered, particularly where there are significant safety benefits and improvement can be achieved at limited additional cost.

In the event that a subsystem relevant to tunnel safety is re-assessed against any other TSI as a result of renewal or upgrading works it shall only require re-assessment against this TSI in respect of those systems and components directly affected by the works.

#### 7.2.2. Upgrade and renewal measures for tunnels of more than 1 km, subsystems INS and ENE

When upgrading or renewal of parts of the following subsystems affecting tunnel safety are undertaken, then the following measures shall be implemented. Assemblies and components that are not included in the scope of a particular upgrade or renewal programme do not have to be made compliant at the time of such a programme.

##### 7.2.2.1.INS

- 4.5.1 Inspection of tunnel condition (responsible entity: IM)
- 4.2.2.2 Prevent unauthorised access to emergency exits and equipment rooms (responsible entity: IM)
- 4.2.2.4 Fire safety requirements for building materials (only for the new material to be installed. Responsible entity: IM, procurement entity)
- 4.2.2.9 Escape signage (responsible entity: IM)
- 4.2.2.10 Emergency communication (responsible entity: IM)

##### 7.2.2.2.ENE

4.2.3.4 Requirements for electrical cables in tunnels, when replacing cables (responsible entity: IM)

#### 7.2.3. Upgrade and renewal measures for the subsystems CCS, OPE, RST

When upgrading or renewal of parts of the following subsystems affecting tunnel safety are undertaken, then the following measures shall be implemented. Assemblies and components that are not included in the scope of a particular upgrade or renewal programme do not have to be made compliant at the time of such a programme.

7.2.3.1.CCS : no measure required

7.2.3.2.OPE:

OPE measures shall be implemented in existing tunnels independently of renewal or upgrading actions in other subsystems, according to the requirements in CR OPE TSI chapter 7

- 4.4.3 Tunnel emergency plan and exercises (responsible: IM)
- 4.4.4 Earthing procedures (responsible: IM)
- 4.4.5 Route book (responsible: RU)
- 4.6.1 Tunnel specific competence of the train crew and other staff (responsible: IM and RU)
- 4.4.6 Provision of on-train safety and emergency information to passengers (responsible: RU)

7.2.3.3.RST (Passenger rolling stock)

- 4.2.5.1 Material properties for rolling stock (only for the new material to be installed) (responsible: RU, procurement entity)
- 4.2.5.2 Fire extinguishers for passenger rolling stock (responsible: RU, procurement entity)
- 4.2.5.7 Communication means on trains (responsible: RU, procurement entity)
- 4.2.5.8 Emergency brake override (responsible: RU) except for locomotive-hauled trains where national decisions shall apply
- 4.2.5.9 Emergency lighting system in the train (responsible: RU, procurement entity)
- 4.2.5.10 Switching off air conditioning in the train (responsible: RU)
- 4.2.5.11.1 Escape design of passenger rolling stock (responsible: RU, procurement entity)
- 4.2.5.12 Rescue services information and access (responsible: RU, procurement entity)

The measures required for freight wagons are as specified in the CR RST TSI (freight wagons).

#### 7.2.4. Other existing tunnels

This TSI does not apply to existing subsystems not subject to renewal or upgrading. It is not applicable to tunnels shorter than 1000 m subject to upgrade or renewal.

In order to harmonise the safety level on the TEN, attention is drawn to the recommendation of UNECE (TRANS/AC.9/9, 01.12.2003 that says in part E *“There are a great many tunnels already in service. Many of them were built when safety considerations were less stringent than today. Obviously they cannot be adapted at reasonable cost to the dimensions suggested for new tunnels. But safety in railway tunnels does not depend only on structural measures - it can be enhanced also through rolling stock and operational measures.*



*Therefore, the Group recommends that safety plans<sup>2</sup> for existing tunnels should be established, assessing their safety level and proposing to raise this level, if necessary, through measures that could be realized at reasonable costs. The Group expects these measures to be selected among the minimal standard measures for new tunnels, the first priority being given to non-structural measures.”*

### **7.3. TSI revision**

In conformity with article 6(3) of Directive 2001/16/EC as modified by Directive 2004/50/EC, the Agency “shall be responsible for preparing the review and updating of TSIs and making appropriate recommendations to the Committee referred to in Article 21 in order to take account of developments in technology or social requirements”.

In addition, the progressive adoption and revision of other TSIs may also impact this TSI. Proposed changes to this TSI shall be subject to rigorous review and updated TSIs will be published on an indicative periodic basis of 3 years.

The Agency shall be notified of any innovative solutions under consideration in order to determine its future inclusion within the TSI.

### **7.4. Exceptions for national, bilateral, multilateral or multinational agreements**

#### **7.4.1. Existing agreements**

Where agreements contain requirements related to tunnels, then Member States shall notify the Commission, within 6 months after the entry into force of this TSI, of the following agreements under which trains related to the scope of this TSI are operated:

- (a) national, bilateral or multilateral agreements between Member States and Railway Undertakings or Infrastructure Managers, agreed on either a permanent or a temporary basis and necessitated by the very specific or local nature of the intended transport service;
- (b) bilateral or multilateral agreements between Railway Undertakings, Infrastructure Managers or Member States which deliver significant levels of local or regional interoperability;
- (c) international agreements between one or more Member States and at least one third country, or between Railway Undertakings or Infrastructure Managers of Member States and at least one Railway Undertaking or Infrastructure Manager of a third country, which deliver significant levels of local or regional interoperability.

The compatibility of these agreements with EU legislation including their non discriminatory character and, in particular, this TSI, will be assessed and the Commission will take the necessary measures such as, for example, the revision of this TSI to include possible specific cases or transitional measures.

These agreements remain permitted until the necessary measures are taken including EU level agreements related to this TSI with Russian Federation and all the other CIS countries having a border with the EU.

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<sup>2</sup> Safety plan is defined in part D of the UNECE-recommendations.

The RID Agreement and COTIF instruments shall not be notified because they are known.

#### 7.4.2. Future agreements or modification of existing agreements

Any future agreement or modification of existing agreements shall take into account EU legislation and, in particular, this TSI. Member States shall notify the Commission with such agreements/modifications. The same procedure as §7.4.1 then applies.

### **7.5. Specific cases**

#### 7.5.1. Introduction

The following special provisions are permitted in the specific cases below.

These specific cases belong to two categories: the provisions apply either permanently (case "P"), or temporarily (case "T"). In temporary cases, it is recommended that the Member States concerned should conform with the relevant subsystem either by 2010 (case "T1"), an objective set out in Decision No 1692/96/EC of the European Parliament and of the Council of 23 July 1996 on Community guidelines for the development of the trans-European transport network, or by 2020 (case "T2") .

#### 7.5.2. List of specific cases

None

**ANNEX A - INFRASTRUCTURE REGISTER**  
Requirements for the Infrastructure Register

Data Item	Interoperability Critical	Safety Critical
<b>Basic Data</b>		
Type of traffic (passengers, freight, dangerous goods or a combination, including freight-passenger regimes)		
Type of line		
Start and end of tunnel (in line kilometres)	✓	
Type of tunnel (single, double bored)	✓	
Location of underground station (position in tunnel- or line-km)	✓	✓
<b>Technical information</b>		
tunnel length (in m)	✓	✓
maximum speed (in km/h) Speed regime (minimum and max speeds for types or trains)	✓	✓
Cross section (in m <sup>2</sup> )	✓	✓
location of emergency exits (in line kilometres)	✓	✓
Type of emergency exit (shaft with stairs, elevator, horizontal, length of passage)		
For double bored tunnels: location of cross passages	✓	
Emergency lighting	✓	✓
Emergency communication (System, channel, etc.)	✓	✓
location of access for rescue services	✓	
location of rescue areas	✓	
fire extinguishing water tubes (existing, dry, filled)	✓	
volume of fire extinguishing water capacity	(✓)	
overhead line earthing device (automatic/ manual)	✓	✓
>5 km: segmentation of overhead line, location of switches	✓	
minimum width of escape walkway	✓	
loading gauge (two level coaches)	✓	
Extra available safety measures (type and location):	✓	✓
Length of underground station (in m)	✓	
Distance to surface of underground station (in m)	✓	
Access/exit facilities of underground station (stairs, elevator, escalator)		✓
Ventilation of underground station		✓
Special fire protection measures in underground station (e.g. water mist)		✓
<b>Operational information</b>		
Name of all railway control centres involved	✓	✓
Name of responsible rescue control centre	✓	✓
Name of other control centres involved		✓
Emergency plan (yes/no)	✓	✓
Required fire safety category of passenger rolling stock (1.1.3)	✓	✓

**ANNEX B - ROLLING STOCK REGISTER**  
Requirements for the rolling stock register

Data Item	Interoperability Critical	Safety Critical
Basic Data		
Name of rolling stock		
Type A. High speed B. Conventional C. Freight  a. Electrical locomotive b. Diesel locomotive c. EMU d. DMU e. Normal Passenger coach f. Double deck passenger coach g. Sleeping car h. Others (e.g. steam)	✓	
Fire safety category of passenger rolling stock (A or B, see 1.1.3)	✓	✓
Rolling stock not made for operation in tunnels		
Technical information		
Hot axle box detectors (on board or not)	✓	✓
Material fire properties (ignitability)		✓
Fire barriers (locations, minutes)	✓	✓
Emergency brake override (yes/no)	✓	✓
On board fire detectors (traction unit, technical cabinets etc.)		✓
Communication means on trains (yes/no)		✓
Communication to control centre (yes/no)	✓	✓
Emergency lighting system in the train (yes/no)		✓
Switching off of air conditioning (local and/or central, manual and/or automatically)		✓
Passengers' emergency exits (type and distance in meters)	✓	✓
Provision of on-train safety and emergency information to passengers (yes/no & languages)	✓	✓
Rescue service's information and access		✓

The rolling stock register also requires basic information like:

## 2. Parties involved

- Owner or keeper
- Notified body that has certified the rolling stock.
- National authority that has notified the notified body.
- National authority that emitted the authorisation for placing into service

## 3. Conformity assessment:

- Certificate of conformity
- EC declaration of verification
- Authorisation for placing in service
- TSI's that have been applied

## **ANNEX C – OPEN POINTS**

Conformity assessment procedure for maintenance rules referred to in Chapter 6 – section F4

## ANNEX D – THE RELATIONSHIP BETWEEN INCIDENT TYPES AND MEASURES

As suggested in a workshop with DG TREN and rescue services, the three “umbrella” risk scenarios defined in section 2.2

- 2.2.1 “Hot” incidents: fire, explosion followed by fire, emission of toxic smoke or gases
- 2.2.2 “Cold” incidents: collision derailment
- 2.2.3 Prolonged stop: spontaneous evacuation

have been correlated to the measures defined in this TSI. The following table shows the qualitative relationship between the incident types and the measures, indicating which measures deal with each type of incident.

The line of defence for the promotion of safety in tunnels comprises four successive layers: Prevention, mitigation, evacuation and rescue.

As an example: for “hot” incidents, the underlying strategy is:

**Prevention:** the use of appropriate designs of materials (4.2.5.1) with a low flammability reduces the risk of a starting of a fire. In addition checking (4.4.1) the condition of a train and appropriate action limits the start of a fire.

**Mitigation:** the use of appropriate designs of materials (4.2.5.1) with low fire spread considerably reduces the amount of heat and smoke release and the speed of fire spreading in passenger trains. The use of fire extinguishers (4.2.5.2) could limit the growth of fire. If a fire is discovered, the alarm (4.2.5.7) is raised. Passengers will first seek refuge in a sound part of the train and are protected by fire barriers (4.2.5.4) for class B trains. Air conditioning is switched off to prevent spread of smoke (4.2.5.10). Whenever possible the train leaves the tunnel. The emergency brake override system (4.2.5.8) prevents an unwanted stop in a tunnel and additional measures are present to maintain the running capability (4.2.5.5) of a train with a fire on board.

**Evacuation and rescue:** In case a train comes to an unwanted stop in the tunnel, the use of appropriate designs of materials (4.2.5.1) with low fire spread, low toxicity and low smoke density of the material contributes to maintain a tunnel climate acceptable for evacuation. If the train comes to a stop, passengers are evacuated, directed by the train crew (4.6.1), to a safe area. The rolling stock (4.2.5.11) and the tunnel infrastructure (4.2.2.6 - 4.2.2.10) are designed to allow for evacuation in a tunnel. The rescue services are informed how to obtain access to the tunnels (4.2.2.11) and to the interior of the rolling stock (4.2.5.12)

Legend: INS, ENE, CCS measures blue, RST measures green, OPE measures yellow

**A Hot incident**

Fire, explosion, toxic gas release

Prevention	Mitigation	Evacuation and rescue
4.2.5.1 Material properties for rolling stock	4.2.5.1 Material properties for rolling stock	4.2.5.1 Material properties for rolling stock
4.4.1 Checking the condition of trains and appropriate action	4.2.2.4 Fire safety requirements for building material	4.2.2.3 Fire protection requirements for structures
	4.2.3.1 Segmentation of overhead line or conductor rails	4.2.2.7 Escape walkways
	4.2.3.4 Requirement for electrical cables in tunnels	4.2.2.8 Emergency lighting on escape routes
	4.2.3.5 Reliability of electrical installations	4.2.2.10 Emergency communication
	4.2.4.1 Hot axle box detectors	4.2.2.11 Access for rescue services
	4.2.5.2 Fire extinguishers for passenger rolling stock	4.2.2.12 Rescue areas outside tunnels
	4.2.5.3 Fire protection for freight trains	4.2.2.13 Water supply
	4.2.5.4 Fire barriers for passenger rolling stock	4.2.3.2 Overhead line or conductor rail earthing
	4.2.5.5 Additional measures for running capability of passenger rolling stock	4.2.3.3 Electricity supply
	4.2.5.7 Communication means on trains	4.2.5.11 Escape design of passenger rolling stock
	4.2.5.8 Emergency brake override	4.2.5.12 Rescue services information and access
	4.2.5.9 Emergency lighting system in the train	4.4.3 Tunnel emergency plan and exercises
	4.2.5.10 Switching off of air condition in the train	4.4.4 Earthing procedures
	4.4.2 Emergency rule	4.7.1 Self-rescue device (for staff of freight trains)
	4.4.5 Route book	
	4.4.6 Provision of on-train safety and emergency information to passengers	
	4.4.7 Coordination between tunnel and control centres	
	4.6.1 Tunnel-specific competence of the train crew and other staff	



**B incident**  
Collision,  
derailment

<b>Cold</b>	<b>Prevention</b>	<b>Mitigation</b>	<b>Evacuation and rescue</b>
	4.2.2.1 Installation of switches and crossings	4.2.3.1 Segmentation of overhead line or conductor rails	4.2.2.6 Facilities for self-rescue, evacuation and rescue in the event of an incident
	4.5.1 Inspection of tunnel condition	4.2.3.5 Reliability of electrical installations	4.2.2.7 Escape walkways
		4.2.5.7 Communication means on trains	4.2.2.8 Emergency lighting on escape routes
			4.2.2.9 Escape signage
		4.4.5 Route book	4.2.2.10 Emergency communication
		4.4.6 Provision of on-train safety and emergency information to passengers	4.2.2.11 Access for rescue services
		4.4.7 Coordination between tunnel and control centres	4.2.2.12 Rescue areas outside tunnels
		4.6.1 Tunnel-specific competence of the train crew and other staff	4.2.2.13 Water supply
		4.4.2 Emergency rule	4.2.3.2 Overhead line or conductor rail earthing
		4.2.5.9 Emergency lighting system in the train	4.2.3.3 Electricity supply
			4.2.5.11 Escape design of passenger rolling stock
			4.2.5.12 Rescue services information and access
			4.4.3 Tunnel emergency plan and exercises
			4.4.4 Earthing procedures

**C stop**

**Prolonged Prevention**

**Mitigation**

**Evacuation and rescue**

Spontaneous evacuation

4.2.5.7 Communication means on trains	4.4.2 Emergency rule	4.2.2.6 Facilities for self-rescue, evacuation and rescue in the event of an incident
4.4.6 Provision of on-train safety and emergency information to passengers	4.4.3 Tunnel emergency plan and exercises	4.2.2.7 Escape walkways
4.4.7 Coordination between tunnel and control centres		4.2.2.8 Emergency lighting on escape routes
4.6.1 Tunnel-specific competence of the train crew and other staff		4.2.2.9 Escape signage
4.2.5.9 Emergency lighting system in the train		4.2.2.10 Emergency communication
		4.2.2.11 Access for rescue services
		4.2.2.12 Rescue areas outside tunnels

## ANNEX E – ASSESSMENT OF THE SUBSYSTEMS

### E.1 SCOPE

This annex indicates the assessment of conformity of the subsystems

### E.2 CHARACTERISTICS AND MODULES

The sub-system characteristics that must be assessed in the different phases of design, development and production are marked by X in Table E.

Table E. – Assessment

1	2	3	4	5	6
		Design and development phase	Production phase		
	Characteristics to be assessed	Design review	Construction, assembling, mounting	Assembly (before putting into service)	Validation under full operation condition
4.2.2.1.	Installation of switches and crossings	X			
4.2.2.2.	Prevent unauthorised access to emergency exits and equipment rooms	X		X	
4.2.2.3.	Fire protection requirements for structures	X			
4.2.2.4.	Fire safety requirements for building material	X			
4.2.2.5.	Fire detection	X		X	
4.2.2.6.	Facilities for self-rescue, evacuation and rescue in the event of an incident	X			
4.2.2.6.1.	Definition of safe area				
4.2.2.6.2.	General				

1	2	3	4	5	6
		Design and development phase	Production phase		
	Characteristics to be assessed	Design review	Construction, assembling, mounting	Assembly (before putting into service)	Validation under full operation condition
4.2.2.6.3.	Lateral and/or vertical emergency exits to the surface.	X			
4.2.2.6.4.	Cross-passages to the other tube	X			
4.2.2.6.5.	Alternative technical solutions	X			
4.2.2.7.	Escape walkways	X			
4.2.2.8.	Emergency lighting on escape routes	X		X	
4.2.2.9.	Escape signage	X			
4.2.2.10.	Emergency communication	X			
4.2.2.11.	Access for rescue services	X			
4.2.2.12.	Rescue areas outside tunnels	X			
4.2.2.13.	Water supply	X			
4.2.3.1.	Segmentation of overhead line or conductor rails	X		X	
4.2.3.2.	Overhead line or conductor rail earthing	X		X	
4.2.3.3.	Electricity supply	X			
4.2.3.4.	Requirements for electrical cables in tunnels	X			
4.2.3.5.	Reliability of electrical installations	X			
4.2.5.1.	Material properties for	X			

1	2	3	4	5	6
		Design and development phase	Production phase		
	Characteristics to be assessed	Design review	Construction, assembling, mounting	Assembly (before putting into service)	Validation under full operation condition
	rolling stock				
4.2.5.2.	Fire extinguishers for passenger rolling stock	X			
4.2.5.3.	Fire protection for freight trains	X			
4.2.5.4.	Fire barriers for passenger rolling stock	X			
4.2.4.1.	Hot axle box detectors	X			
4.2.5.5.	Additional measures for running capability of passenger rolling stock with a fire on board:	X			
4.2.5.5.1.	General objectives and required running capability for passenger trains				
4.2.5.5.2.	Requirements for brakes	X			
4.2.5.5.3.	Requirement for traction	X			
4.2.5.6.	On board fire detectors	X			
4.2.5.7.	Communication means on trains	X			
4.2.5.8.	Emergency brake override	X	X		
4.2.5.9.	Emergency lighting system in the train	X			X
4.2.5.10.	Switching off of air conditioning in the train	X			X
4.2.5.11	Escape design of passenger	X			

1	2	3	4	5	6
		Design and development phase	Production phase		
	Characteristics to be assessed	Design review	Construction, assembling, mounting	Assembly (before putting into service)	Validation under full operation condition
	rolling stock				
4.2.5.12.	Rescue service's information and access	X			
4.4.1	<p>Checking the conditions of trains and appropriate actions</p> <p><i>Note: section 6.2.6 explains why the assessment of operational rules shall be the responsibility of the Safety Authority of each Member State concerned, and why they do not require separate assessment by a Notified Body. The specifications in chapters 4.4 and 4.6 therefore are not mentioned in this table.</i></p>				
4.5.1.	Inspection of tunnel condition	X			
4.5.2.	Maintenance of rolling stock	X			
4.7.1.1.	Self-rescue masks	X			

## ANNEX F - MODULES FOR THE EC VERIFICATION OF SUBSYSTEMS

### F.1 List of the modules

#### Modules for Subsystems

- Module SB : Type examination
- Module SD : Product quality management system
- Module SF : Product verification
- Module SG : Unit verification
- Module SH2 : Full quality management system with design examination

#### Module for Maintenance Arrangements

- Module Conformity Assessment Procedure

### F.2 Modules for Interoperability Constituents

Not applicable (no interoperability constituents)

### F.3 Modules for the EC Verification of Subsystems

#### F.3.1 Module SB: Type Examination

1. This module describes the EC verification procedure whereby a notified body checks and certifies at the request of an contracting entity or its authorised representative established within the Community, that a type of an infrastructure, energy, control-command or rolling stock subsystem, representative of the production envisaged,
  - complies with this TSI and any other applicable TSI, which demonstrate that the essential requirements<sup>3</sup> of Directive 01/16/EC have been met
  - complies with the other regulations deriving from the Treaty.

The type examination defined by this module could include specific assessment phases - design review, type test or review of manufacturing process, which are specified in the relevant TSI.

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<sup>3</sup> The essential requirements are reflected in the technical parameters, interfaces and performance requirements, which are set out in Chapter 4 of the TSI.

2. The contracting entity<sup>4</sup> shall lodge an application for EC verification (through type examination) of the subsystem with a notified body of his choice.

The application shall include :

- name and address of the contracting entity or its authorised representative
- the technical documentation, as described in point 3.

3. The applicant shall place at the disposal of the notified body a specimen of the subsystem<sup>5</sup>, representative of the production envisaged and hereinafter called 'type'.

A type may cover several versions of the subsystem provided that the differences between the versions do not affect the provisions of the TSI.

The notified body may request further specimens if needed for carrying out the test programme.

If so required for specific test or examination methods and specified in the TSI or in the European specification<sup>6</sup> referenced to in the TSI, a specimen or specimens of a subassembly or assembly or a specimen of the subsystem in a pre-assembled condition shall to be provided.

The technical documentation and specimen(s) shall enable the design, manufacture, installation, maintenance and operation of the subsystem to be understood, and shall enable conformity with the provisions of the TSI to be assessed.

The technical documentation shall include:

- a general description of the subsystem, overall design and structure,
- the infrastructure or rolling stock register, including all information as specified in the TSI
- conceptual design and manufacturing information, for example drawings, schemes of components, subassemblies, assemblies, circuits, etc.,
- descriptions and explanations necessary for the understanding of the design and manufacturing information, the maintenance and the operation of the subsystem,
- the technical specifications, including European specifications, that have been applied,

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<sup>4</sup> In the module, “the contracting entity” means “the subsystem contracting entity, as defined in the directive, or his authorised representative established within the Community”.

<sup>5</sup> The relevant section of a TSI may define specific requirements in this regard.

<sup>6</sup> The definition of an European specification is indicated in the directives 96/48/EC and 01/16/EC. The guide for application of HS TSIs explains the way to use the European Specifications



- any necessary supporting evidence for the use of the above specifications, in particular where European specifications and the relevant clauses have not been applied in full,
- a list of the interoperability constituents to be incorporated into the subsystem,
- copies of the EC declarations of conformity or suitability for use of interoperability constituents and all the necessary elements defined in annex VI of the directives,
- evidence of conformity with the other regulations deriving from the treaty (including certificates)
- technical documentation regarding the manufacture and the assembly of the subsystem,
- a list of manufacturers, involved in the subsystem's design, manufacturing, assembly and installation,
- conditions for use of the subsystem (restrictions of running time or distance, wear limits etc),
- conditions for maintenance and technical documentation regarding the maintenance of the subsystem
- any technical requirement that shall be taken into account during production, maintenance or operation of the subsystem
- results of design calculations made, examinations carried out, etc.,
- test reports.

If the TSI requires further information for the technical documentation, this shall be included.

#### 4. The notified body shall:

##### 4.1. Examine the technical documentation,

4.2 Verify that the specimen(s) of the subsystem or of assemblies or subassemblies of the subsystem, has (have) been manufactured in conformity with the technical documentation, and carry out or have carried out the type tests in accordance with the provisions of the TSI and the appropriate European specifications. Such manufacture shall be verified using an appropriate assessment module.

4.3. Where a design review is requested in the TSI, perform an examination of the design methods, the design tools and the design results to evaluate their capability to fulfil the requirements for conformity for the subsystem at the completion of the design process

4.4. Identify the elements which have been designed in accordance with the relevant provisions of the TSI and the European specifications as well as the elements which

have been designed without applying the relevant provisions of those European specifications;

- 4.5 Perform or have performed the appropriate examinations and necessary tests in accordance with points 4.2. and 4.3 to establish where the relevant European specifications have been chosen, these have actually been applied;
  - 4.6. Perform or have performed the appropriate examinations and necessary tests in accordance with point 4.2. and 4.3. to establish whether the solutions adopted meet the requirements of the TSI when the appropriate European specifications have not been applied.
  - 4.7. Agree with the applicant the location where the examinations and necessary tests will be carried out.
5. Where the type meets the provisions of the TSI, the notified body shall issue a type-examination certificate to the applicant. The certificate shall contain the name and address of the contracting entity and the manufacturer(s) indicated in the technical documentation, conclusions of the examination, conditions for its validity and the necessary data for identification of the approved type.
- A list of the relevant parts of the technical documentation shall be annexed to the certificate and a copy kept by the notified body.
- If the contracting entity is denied a type-examination certificate, the notified body shall provide detailed reasons for such denial.
- Provision shall be made for an appeals procedure.
6. Each notified body shall communicate to the other notified bodies the relevant information concerning the type-examination certificates issued, withdrawn or refused
  7. The other notified bodies may receive on request copies of the type-examination certificates issued and/or their additions. The annexes to the certificates shall be kept at the disposal of the other notified bodies.
  8. The contracting entity shall keep with the technical documentation copies of type-examination certificates and any additions throughout the service life of the subsystem. It shall be sent to any member state which so requests.
  9. During the production phase, the applicant shall inform the notified body that holds the technical documentation concerning the type-examination certificate of all modifications which may affect the conformity with the requirements of the TSI or the prescribed conditions for use of the subsystem . The subsystem shall receive additional approval in

such cases. In this case, the notified body shall perform only those examinations and tests, those are relevant and necessary to the changes. This additional approval may be given either in the form of an addition to the original type-examination certificate, or by issue of a new certificate after withdrawal of the old certificate.

### **F.3.2 Module SD: Production Quality Management System**

1. This module describes the EC verification procedure whereby a notified body checks and certifies, at the request of an contracting entity or its authorised representative established within the Community, that an infrastructure, energy or rolling stock subsystem, for which already a type-examination certificate has been issued by a notified body,
  - complies with this TSI and any other applicable TSI, which demonstrate that the essential requirements<sup>7</sup> of Directive 01/16/EC have been met
  - complies with the other regulations deriving from the Treaty,

and may be placed in service.

2. The notified body carries out the procedure, under the condition, that :
  - the type examination certificate issued prior to the assessment remains valid for the subsystem subject to the application,
  - the contracting entity<sup>8</sup> and the main contractor involved are satisfying the obligations of point 3.

The " main contractor" refers to companies, whose activities contribute to fulfil the essential requirements of the TSI. It concerns:

- the company responsible for the whole subsystem project (including in particular responsibility for subsystem integration),
- other companies only involved in a part of the subsystem project, (performing for example assembly or installation of the subsystem).

It does not refer to manufacturer sub contractors supplying components and interoperability constituents.

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<sup>7</sup> The essential requirements are reflected in the technical parameters, interfaces and performance requirements, which are set out in Chapter 4 of the TSI.

<sup>8</sup> In the module, "the contracting entity" means "the subsystem contracting entity, as defined in the directive. or his authorised representative established within the Community".

3. For the subsystem that is subject of the EC verification procedure, the contracting entity, or the main contractor when employed, shall operate an approved quality management system for manufacture and final product inspection and testing as specified in point 5 and which shall be subject to surveillance as specified in point 6.

When the contracting entity itself is responsible for the whole subsystem project (including in particular responsibility for subsystem integration), or the contracting entity is directly involved in the production (including assembly and installation), it has to operate an approved quality management system for those activities, which shall be subject to surveillance as specified in point 6.

If a main contractor is responsible for the whole subsystem project (including in particular responsibility for subsystem integration), it shall operate in any case an approved quality management system for manufacture and final product inspection and testing, which shall be subject to surveillance as specified in point 6.

#### EC verification procedure

- 4.1 The contracting entity shall lodge an application for EC verification of the subsystem (through production quality management system), including co-ordination of the surveillance of the quality management systems, as under point 5.3 and 6.5. with a notified body of its choice. The contracting entity shall inform the manufacturers involved of this choice and of the application.

The application shall enable the design, manufacture, assembly, installation, maintenance and operation of the subsystem to be understood, and shall enable conformity with the type as described in the type-examination certificate and the requirements of the TSI to be assessed.

The application shall include:

- | • name and address of the contracting entity or its authorised representative
  
- the technical documentation regarding the approved type, including the type examination certificate, as issued after completion of the procedure defined in module SB,  
and, if not included in this documentation,
  
- a general description of the subsystem, its overall design and structure,

- the technical specifications, including European specifications<sup>9</sup>, that have been applied,
  - any necessary supporting evidence for the use of the above specifications, in particular where these European specifications, and the relevant clauses have not been applied in full. This supporting evidence shall include the results of tests carried out by the appropriate laboratory of the manufacturer or on his behalf.
  - the infrastructure or rolling stock register, including all information as specified in the TSI,
  - the technical documentation regarding the manufacture and the assembly of the subsystem,
  - evidence of conformity to other regulations deriving from the treaty (including certificates) for the production phase
  - a list of the interoperability constituents to be incorporated into the subsystem,
  - copies of the EC declarations of conformity or suitability for use with which the constituents shall be provided, and all the necessary elements defined in annex VI of the directives,
  - a list of manufacturers, involved in the subsystem's design, manufacturing, assembly and installation,
- the demonstration, that all stages, as mentioned under point 5.2, are covered by quality management systems of the contracting entity, if involved, and/or of the main contractor , and the evidence of their effectiveness,
  - indication of the notified body, responsible for the approval and surveillance of these quality management systems.

4.3 The notified body shall first examine the application concerning the validity of the type examination and the type examination certificate.

If the notified body considers the type examination certificate no longer remains valid or is not appropriate and that a new type examination is necessary, it shall justify its decision.

## Quality management system

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<sup>9</sup> The definition of an European specification is indicated in the directives 96/48/EC and 01/16/EC. The guide for application of HS TSIs explains the way to use the European Specifications

5.1 The contracting entity, if involved, and the main contractor, when employed, shall lodge an application for assessment of their quality management systems with a notified body of their choice.

The application shall include:

- all relevant information for the subsystem envisaged,
- the quality management system documentation.
- the technical documentation of the approved type and a copy of the type examination certificate, issued after the completion of the type examination procedure of module SB.

For those only involved in a part of the subsystem project, the information to be provided is only that for the relevant part.

5.2 For the contracting entity or the main contractor responsible for the whole subsystem project, the quality management systems shall ensure overall compliance of the subsystem with the type as described in the type-examination certificate and overall compliance of the subsystem with the requirements of the TSI. For other contractors, their quality management system(s) has (have) to ensure compliance of their relevant contribution to the subsystem with the type as described in the type-examination certificate and with the requirements of the TSI.

All the elements, requirements and provisions adopted by the applicant(s) shall be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality management system documentation shall ensure a common understanding of the quality policies and procedures such as quality programmes, plans, manuals and records.

It shall contain in particular an adequate description of the following items for all applicant(s):

- the quality objectives and the organisational structure,
- the corresponding manufacturing, quality control and quality management techniques, processes and systematic actions that will be used,
- the examinations, checks and tests that will be carried out before, during and after manufacture, assembly and installation, and the frequency with which they will be carried out,
- the quality records, such as inspection reports and test data, calibration data, qualification reports of the personnel concerned, etc.,

and also for the contracting entity or the main contractor responsible for the whole subsystem project:

- responsibilities and powers of the management with regard to overall subsystem quality, including in particular the subsystem integration management.

The examinations, tests and checking shall cover all of the following stages:

- structure of subsystem, including, in particular, civil-engineering activities, constituent assembly, final adjustment,
- final testing of the subsystem,
- and, where specified in the TSI, the validation under full operation conditions.

5.3 The notified body chosen by the contracting entity shall examine, if all stages of the subsystem as mentioned under point 5.2 are sufficiently and properly covered by the approval and surveillance of the quality management system(s) of the applicant(s)<sup>10</sup>.

If the conformity of the subsystem with the type as described in the type-examination certificate and the compliance of the subsystem with the requirements of the TSI is based on more than one quality management system, the notified body shall examine in particular,

- if the relations and interfaces between the quality management systems are clearly documented
- and if overall responsibilities and powers of the management for the compliance of the whole entire subsystem for the main contractor are sufficiently and properly defined.

5.4 The notified body referenced to in point 5.1. shall assess the quality management system to determine whether it satisfies the requirements referenced in point 5.2. It presumes compliance with these requirements if the applicant implements a quality system for production, final product inspection and testing in respect of the Standard EN/ISO 9001 - 2000, which takes into consideration the specificity of the subsystem for which it is implemented.

When an applicant operates a certified quality management system, the notified body shall take this into account in the assessment.

The audit shall be specific for the subsystem concerned, taking into consideration the specific contribution of the applicant to the subsystem. The auditing team shall have at least one member experienced as an assessor in the subsystem technology concerned. The evaluation procedure shall include an assessment visit to the applicant's premises.

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<sup>10</sup> For the rolling stock TSI, the notified body may participate to the final in service test of locomotives or train set in the conditions specified in the relevant chapter of the TSI.

The decision shall be notified to the applicant. The notification shall contain the conclusions of the examination and the reasoned assessment decision.

5.5 The contracting entity, if involved, and the main contractor shall undertake to fulfil the obligations arising out of the quality management system as approved and to uphold it so that it remains adequate and efficient.

They shall keep the notified body that has approved the quality management system, informed of any significant change that will affect the fulfilment of the TSI requirements by the subsystem.

The notified body shall evaluate the modifications proposed and decide whether the amended quality management system will still satisfy the requirements referenced in point 5.2 or whether a re-assessment is required.

It shall notify its decision to the applicant. The notification shall contain the conclusions of the examination and the reasoned assessment decision.

## 6. Surveillance of the quality management system(s) under the responsibility of the notified body

6.1 The purpose of surveillance is to make sure that the contracting entity, if involved, and the main contractor, duly fulfil the obligations arising out of the approved quality management system(s).

6.2 The contracting entity, if involved, and the main contractor shall send to the notified body referenced in point 5.1 (or have sent) all the documents needed for that purpose including the implementation plans and technical records concerning the subsystem (as far as relevant for the specific contribution of the applicants to the subsystem), in particular:

- the quality management system documentation, including the particular means implemented to ensure that:
- for the contracting entity or main contractor, responsible for the whole subsystem project,
  - overall responsibilities and powers of the management for the compliance of the whole entire subsystem are sufficiently and properly defined,
- for each applicant,
  - the quality management system is correctly managed for achieving integration at subsystem level,
- the quality records as foreseen by the manufacturing part (including assembly and installation) of the quality management system, such as inspection reports and test data, calibration data, qualification reports of the personnel concerned, etc.



6.3 The notified body shall periodically carry out audits to make sure that the contracting entity, if involved, and the main contractor, maintain and apply the quality management system and shall provide an audit report to them. When those operate a certified quality management system, the notified body shall take this into account in the surveillance.

The frequency of the audits shall be at least once a year, with at least one audit during the time period of performing relevant activities (manufacture, assembly or installation) of the subsystem being the subject of the EC verification procedure mentioned under point 8.

6.4 Additionally the notified body may pay unexpected visits to the relevant sites of the applicant(s). At the time of such visits, the notified body may conduct complete or partial audits and may carry out or cause to be carried out tests, in order to check the proper functioning of the quality management system where necessary. It shall provide the applicant(s) with an inspection report and also, audit and/or test reports, as appropriate.

6.5 The notified body chosen by the contracting entity and responsible for the EC verification, if not carrying out the surveillance of all the quality management system(s) concerned, shall co ordinate the surveillance activities of any other notified body responsible for that task, in order:

- to be ensured that correct management of interfaces between the different quality management systems relating to subsystem integration has been performed,
- to collect, in liaison with the contracting entity, the necessary elements for the assessment to guarantee the consistency and the overall supervision of the different quality management systems.

This co ordination includes the rights of the notified body:

- to receive all documentation (approval and surveillance), issued by the other notified bodies,
- to witness the surveillance audits in point 6.3,
- to initiate additional audits as in point 6.4 under its responsibility and together with the other notified bodies.

7. The notified body as referenced in point 5.1. shall have entrance for inspection purposes, audit and surveillance to the locations of building sites, production workshops, locations of assembly and installations, storage areas and where appropriate, prefabrication and testing facilities and, more general, to all premises which it considers necessary in order to carry

out its tasks, in accordance with the applicant's specific contribution to the subsystem project.

8. The contracting entity, if involved, and the main contractor shall, for a period of 10 years after the last subsystem has been manufactured, keep at the disposal of the national authorities:
  - the documentation referenced in the second indent of the second subparagraph of point 5.1,
  - the updating referenced in the second subparagraph of point 5.5,
  - the decisions and reports from the notified body, which are, referenced in points 5.4, 5.5 and 6.4.
  
9. Where the subsystem meets the requirements of the TSI, the notified body shall then, based on the type examination and the approval and surveillance of the quality management system(s), draw up the certificate of conformity intended for the contracting entity, who shall in turn draw up the EC declaration of verification intended for the supervisory authority in the Member State within which the subsystem is located and/or operates.

The EC declaration of verification and the accompanying documents shall be dated and signed. The declaration shall be written in the same language of the technical file and shall contain at least the information included in Annex V of the Directive.
  
10. The notified body chosen by the contracting entity shall be responsible for compiling the technical file that has to accompany the EC declaration of verification. The technical file shall include at least the information indicated in the Art 18 (3) of the Directive, and in particular as follows:
  - all necessary documents relating to the characteristics of the subsystem,
  - a list of interoperability constituents incorporated into the subsystem,
  - copies of the EC declarations of conformity and, where appropriate, of the EC declarations of suitability for use, which said constituents shall be provided in accordance with Article 13 of the Directive, accompanied, where appropriate, by the corresponding documents (certificates, quality management system approvals and surveillance documents) issued by the notified bodies,
  - all elements relating to the maintenance, the conditions and limits for use of the subsystem,
  - all elements relating to the instructions concerning servicing, constant or routine monitoring, adjustment and maintenance,
  - the type-examination certificate for the subsystem and the accompanying technical documentation as defined in the module SB,

- evidence of conformity with other regulations deriving from the treaty (including certificates)
- certificate of conformity of the notified body as mentioned under point 9, accompanied by corresponding verification and/or calculation notes and countersigned by itself, stating that the project complies with the Directive and the TSI, and mentioning, where appropriate, reservations recorded during performance of the activities and not withdrawn. The certificate should also be accompanied by the inspection and audit reports drawn up in connection with the verification, as mentioned in points 6.3 and 6.4 and in particular:
- the infrastructure or rolling stock register, including all information as specified in the TSI.

11. Each notified body shall communicate to the other notified bodies the relevant information concerning the quality management system approvals issued, withdrawn or refused. The other notified bodies may receive on request copies of the quality management system approvals issued.

12. The records accompanying the certificate of conformity shall be lodged with the contracting entity. The contracting entity within the Community shall keep a copy of the technical file throughout the service life of the subsystem and for a further period of three years; it shall be sent to any other Member State which so requests.

### **F.3.3 Module SF: Product Verification**

1. This module describes the EC verification procedure whereby a notified body checks and certifies at the request of an contracting entity or its authorised representative established within the Community, that an infrastructure, energy or rolling stock subsystem, for which a type-examination certificate has already been issued by a notified body,
  - complies with this TSI and any other applicable TSI, which demonstrate that the essential requirements<sup>11</sup> of Directive 01/16/EC have been met
  - complies with the other regulations deriving from the Treaty

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<sup>11</sup> The essential requirements are reflected in the technical parameters, interfaces and performance requirements, which are set out in Chapter 4 of the TSI.

and may be placed into service

2. The contracting entity<sup>12</sup> shall lodge an application for EC verification (through product verification) of the subsystem with a notified body of his choice.

The application shall include :

- The name and address of the contracting entity or its authorised representative
- the technical documentation.

3. Within that part of the procedure the contracting entity checks and attests that the subsystem concerned is in conformity with the type as described in the type examination certificate and satisfies the requirements of the TSI that apply to it.

The notified body shall carrying out the procedure under the condition that the type examination certificate issued prior to the assessment remains valid for the subsystem subject to the application.

4. The contracting entity shall take all measures necessary in order that the manufacturing process (including assembly and integration of interoperability constituents by main contractor<sup>13</sup> when employed) ensures conformity of the subsystem with the type as described in the type-examination certificate and with the requirements of the TSI that apply to it.

5. The application shall enable the design, manufacture, installation, maintenance and operation of the subsystem to be understood, and shall enable conformity with the type as described in the type-examination certificate and the requirements of the TSI to be assessed.

The application shall include:

- the technical documentation regarding the approved type, including the type examination certificate, as issued after completion of the procedure defined in module SB,

and, if not included in this documentation,

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<sup>12</sup> In the module, “the contracting entity” means “the subsystem contracting entity, as defined in the directive. or his authorised representative established within the Community”.

<sup>13</sup> The " main contractor" refers to companies, whose activities contribute to fulfil essential requirements of the TSI. It concerns the company that can be responsible for the whole subsystem project or other companies only involved in a part of the subsystem project, (performing for example assembly or installation of the subsystem).

- a general description of the subsystem, overall design and structure,
- the infrastructure or rolling stock register, including all information as specified in the TSI,
- conceptual design and manufacturing information, for example drawings, schemes of components, subassemblies, assemblies, circuits, etc.,
- the technical documentation regarding the manufacture and the assembly of the subsystem,
- the technical specifications, including European specifications<sup>14</sup>, that have been applied,
- any necessary supporting evidence for the use of the above specifications, in particular where these European specifications and the relevant clauses have not been applied in full,
- evidence of conformity to other regulations deriving from the treaty (including certificates) for the production phase
- a list of the Interoperability Constituents, to be incorporated into the subsystem,
- copies of the EC declarations of conformity or suitability for use with which said constituents shall be provided and all the necessary elements defined in annex VI of the directives,
- a list of manufacturers involved in the subsystem's design, manufacture, assembly and installation,

If the TSI requires further information for the technical documentation, this shall be included.

6. The notified body shall first examine the application concerning the validity of the type examination and the type examination certificate.

If the notified body considers the type examination certificate no longer remains valid or is not appropriate and that a new type examination is necessary, it shall justify its decision.

The notified body shall carry out the appropriate examinations and tests in order to check the conformity of the subsystem with the type, as described in the type examination certificate and with the requirements of the TSI. The notified body shall examine and testing of every subsystem manufactured as a serial product, as specified in point 4

7. Verification by examination and testing of every subsystem (as a serial product)

7.1. The notified body shall carry out the tests, examinations and verifications, to ensure conformity of the subsystems, as serial products as provided for in the TSI. The examinations, tests and checking shall extend to the stages as provided for in the TSI.

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<sup>14</sup> The definition of an European specification is indicated in the directives 96/48/EC and 01/16/EC. The guide for application of HS TSIs explains the way to use the European Specifications

7.2 Each subsystem (as serial product) shall be individually examined, tested and verified<sup>15</sup> in order to verify its conformity with the type as described in the type-examination certificate and the requirements of the TSI that apply to it. When a test is not set out in the TSI, (or in a European Standard quoted in the TSI), the relevant European Specifications or equivalent tests are applicable.

8. The notified body shall agree with the contracting entity (and the main contractor) the locations where the tests will be carried out and shall agree that final testing of the subsystem and, whenever required in the TSI, tests or validation under full operating conditions, are carried out by the contracting entity under direct supervision and attendance of the notified body.

The notified body shall have entrance for testing and verification purposes to production workshops, locations of assembly and installations, and where appropriate, prefabrication and testing facilities in order to carry out its tasks as provided for in the TSI.

9. Where the subsystem meets the requirements of the TSI, the notified body shall draw up the certificate of conformity intended for the contracting entity, which in turn draws up the EC declaration of verification intended for the supervisory authority in the Member State where the subsystem is located and/or operates.

These NB activities shall be based on the type examination and the tests, verifications and checks carried out on all serial products as indicated in point 7 and required in the TSI and/or in the relevant European specifications.

The EC declaration of verification and the accompanying documents shall be dated and signed. The declaration shall be written in the same language of the technical file and shall contain at least the information included in Annex V of the Directive.

10. The notified body shall be responsible for compiling the technical file that has to accompany the EC declaration of verification. The technical file shall include at least the information indicated in Art.18 (3) of the Directives, and in particular as follows :

- all necessary documents relating to the characteristics of the subsystem
- the infrastructure or rolling stock register, including all information as specified in the TSI,
- the list of interoperability constituents incorporated into the subsystem,
- copies of the EC declarations of conformity and, where appropriate, of the EC declarations of suitability for use, which the constituents shall be provided in accordance with Article13 of the Directive, accompanied, where appropriate,

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<sup>15</sup> In particular, for the rolling stock TSI, the notified body will participate in the final in service testing of rolling stock or train set. This will be indicated in the relevant chapter of the TSI

by the corresponding documents (certificates, quality management system approvals and surveillance documents ) issued by the notified bodies,

- all elements relating to the maintenance, the conditions and limits for use of the subsystem,
- all elements relating to the instructions concerning servicing, constant or routine monitoring, adjustment and maintenance,
- the type-examination certificate for the subsystem and accompanying technical documentation, as defined in the module SB
- certificate of conformity of the notified body as mentioned in point 9, accompanied by corresponding calculation notes and countersigned by itself, stating that the project complies with the directive and the TSI, and mentioning, where appropriate, reservations recorded during performance of activities and not withdrawn. The certificate should also be accompanied, if relevant, by the
- inspection and audit reports drawn up in connection with the verification.

11. The records accompanying the certificate of conformity shall be lodged with the contracting entity.

The contracting entity shall keep a copy of the technical file throughout the service life of the subsystem and for a further period of three years; it shall be sent to any other Member State which so requests.

### **F.3.4 Module SG : Unit verification**

1. This module describes the EC verification procedure whereby a notified body checks and certifies, at the request of an contracting entity or its authorised representative established within the Community, that an infrastructure, energy, control-command or rolling stock subsystem

- complies with this TSI and any other applicable TSI, which demonstrate that the essential requirements<sup>16</sup> of Directive 01/16/EC have been met
- complies with the other regulations deriving from the Treaty,

and may be placed in service.

2. The contracting entity<sup>17</sup> shall lodge an application for EC verification (through unit verification) of the subsystem with a notified body of his choice.

The application shall include :

- name and address of the contracting entity or its authorised representative

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<sup>16</sup> The essential requirements are reflected in the technical parameters, interfaces and performance requirements, which are set out in Chapter 4 of the TSI.

<sup>17</sup> In the module, “the contracting entity” means “the subsystem contracting entity, as defined in the directive. or his authorised representative established within the Community”.

- the technical documentation.
3. The technical documentation shall enable the design, manufacture, installation and operation of the subsystem to be understood, and shall enable conformity assessment with the requirements of the TSI.

The technical documentation shall include:

- a general description of the subsystem, its overall design and structure,
- the infrastructure or rolling stock register, including all information as specified in the TSI,
- conceptual design and manufacturing information, for example drawings, schemes of components, sub-assemblies, assemblies, circuits, etc.,
- descriptions and explanations necessary for the understanding of the design and manufacturing information, the maintenance and the operation of the subsystem,
- the technical specifications, including European specifications<sup>18</sup>, that have been applied,
- any necessary supporting evidence for the use of the above specifications, in particular where European specifications and the relevant clauses have not been applied in full,
- a list of the interoperability constituents to be incorporated into the subsystem,
- copies of the EC declarations of conformity or suitability for use with which said constituents shall be provided and all the necessary elements defined in annex VI of the directives,
- evidence of conformity with other regulations deriving from the treaty (including certificates)
- technical documentation regarding the manufacture and the assembly of the subsystem,
- a list of manufacturers involved in the subsystem's design, manufacturing, assembly and installation,
- conditions for use of the subsystem (restrictions of running time or distance, wear limits etc),
- conditions for maintenance and technical documentation regarding the maintenance of the subsystem ,
- any technical requirement that shall be taken into account during production, maintenance or operation of the subsystem,
- results of design calculations made, examinations carried out, etc.,

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<sup>18</sup> The definition of an European specification is indicated in the directives 96/48/EC and 01/16/EC. The guide for application of HS TSIs explains the way to use the European Specifications



- all other appropriate technical evidences, which can demonstrate that previous checking or tests have been successfully performed, under comparable conditions, by independent and competent bodies

If the TSI requires further information for the technical documentation, this shall be included.

4. The notified body shall examine the application and the technical documentation, and identify the elements which have been designed in accordance with the relevant provisions of the TSI and the European specifications, as well as the elements which have been designed without applying the relevant provisions of those European specifications.

The notified body shall examine the subsystem and verify that the appropriate and necessary tests to establish whether, where the relevant European specifications have been chosen, these have actually been applied or whether the solutions adopted meet the requirements of the TSI when the appropriate European specifications have not been applied.

The examinations, tests and checks shall extend to the following stages as provided for in the TSI:

- overall design
- structure of the subsystem, including, in particular and when relevant, civil-engineering activities, constituent assembly, overall adjustments
- final testing of the subsystem
- and, whenever specified in the TSI, the validation under full operational conditions.

The notified body may take into account evidence of examinations, checking or tests that have been successfully performed, under comparable conditions by other bodies<sup>19</sup> or by (or on the behalf of) the applicant, when this is specified by the relevant TSI. The notified body will then decide as to whether it shall use the results of these checks or tests.

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<sup>19</sup> The conditions to entrust checking and tests must be similar than the conditions, respected by a notified body to subcontract activities (see §6.5 of the Blue Guide on the New Approach).

The evidences gathered by the notified body shall be suitable and sufficient to show the conformity with the requirement of the TSI and that all required and appropriate checks and tests have been carried out.

Any evidence to be used that originates from other parties shall be considered prior to any tests or checks being carried out, since the notified body may wish to undertake any assessment, witnessing or review of the tests or checks at the time they are performed.

The extent of such other evidence shall be justified by documented analysis using, among others, the factors listed below<sup>20</sup>. This justification shall be included in the technical file.

In all case the notified body keeps the final responsibility of them.

5. The notified body shall agree with the contracting entity the locations where the tests will be carried out and shall agree that final subsystem tests and, whenever required in the TSI, tests in full operating conditions, are carried out by the contracting entity under direct

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<sup>20</sup> The notified body shall investigate the various parts of the subsystem work and establish before, during and on completion of the work:

- the risk and safety implications of the subsystem and its various parts
- the use of existing equipment and systems:
  - used identically as before
  - used before but adapted for use in the new work
- the use of existing designs, technologies, materials and production techniques.
- the arrangements for design, production, testing and commissioning
- the operational and service duty
- previous approvals from other competent bodies
- the accreditations of other involved bodies:
  - it is permissible for the nb to take account of valid accreditation to EN45004, providing that no conflict of interest exists, that accreditation covers the testing being performed and that accreditation is current.
  - where no formal accreditation exists, the nb shall confirm that the systems for control of competence, independence, testing and material handling processes, facilities and equipment and other processes relevant to the contribution to the subsystem are controlled.
  - in all cases, the notified body shall consider the appropriateness of the arrangements and decide the level of witnessing required
- the use of homogenous lots and systems consistent with module f

supervision and attendance of the notified body.

6. The notified body shall have entrance for testing and verification purposes to the locations of design, building sites, production workshops, locations of assembly and installations, and where appropriate, prefabrication and testing facilities in order to carry out its tasks as provided for in the TSI.
7. Where the subsystem meets the requirements of the TSI, the notified body shall then, based on the tests, verifications and checks carried out as required in the TSI and/or in the relevant European specifications, draw up the certificate of conformity intended for the contracting entity, who shall in turn draw up the EC declaration of verification intended for the supervisory authority in the Member State where the subsystem is located and/or operates.  
The EC declaration of verification and the accompanying documents shall be dated and signed. The declaration shall be written in the same language as the technical file and shall contain at least the information included in Annex V of the Directive.
8. The notified body shall be responsible for compiling the technical file that has to accompany the EC declaration of verification. The technical file has to include at least the information indicated in Art.18 (3) of the Directive, and in particular as follows :
  - all necessary documents relating to the characteristics of the subsystem
  - the list of interoperability constituents incorporated into the subsystem,
  - copies of the EC declarations of conformity and, where appropriate, of the EC declarations of suitability for use, which the constituents shall be provided in accordance with Article13 of the Directive, accompanied, where appropriate, by the corresponding documents (certificates, quality management system approvals and surveillance documents ) issued by the notified bodies,
  - all elements relating to the maintenance, the conditions and limits for use of the subsystem,
  - all elements relating to the instructions concerning servicing, constant or routine monitoring, adjustment and maintenance,
    - certificate of conformity of the notified body as mentioned in point 7, accompanied by verification and/or corresponding calculation notes and countersigned by itself, stating that the project complies with the directive and the TSI, and mentioning, where appropriate, reservations recorded during performance of activities and not withdrawn ; the certificate should also be accompanied, if relevant, by the inspection and audit reports drawn up in connection with the verification,
    - evidence of conformity with other regulations deriving from the treaty (including certificates)
    - the infrastructure or rolling stock register, including all information as specified in the TSI.

9. The records accompanying the certificate of conformity shall be lodged with the contracting entity  
The contracting entity shall keep a copy of the technical file throughout the service life of the subsystem and for a further period of three years; it shall be sent to any other Member State which so requests.

### **F.3.5 Module SH2 : Full Quality Management System with Design Examination**

1. This module describes the EC verification procedure whereby a notified body checks and certifies, at the request of an contracting entity or its authorised representative established within the Community, that an infrastructure, energy, control-command or rolling stock subsystem
- complies with this TSI and any other applicable TSI, , which demonstrate that the essential requirements<sup>21</sup> of Directive 01/16/EC have been met
  - complies with the other regulations deriving from the Treaty and may be placed in service
2. The notified body shall carry out the procedure, including a design examination of the subsystem, under the condition, that the contracting entity<sup>22</sup> and the main contractor involved are satisfying the obligations of point. 3  
The "main contractor" refers to companies, whose activities contribute to fulfil the essential requirements of the TSI. It concerns the company:
- responsible for the whole subsystem project (including in particular responsibility for subsystem integration),
  - other companies involved only in a part of the subsystem project (performing for example design, assembly or installation of the subsystem).
- It does not refer to manufacturer sub contractors supplying components and interoperability constituents.

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<sup>21</sup> The essential requirements are reflected in the technical parameters, interfaces and performance requirements, which are set out in Chapter 4 of the TSI.

<sup>22</sup> In the module, "the contracting entity" means "the subsystem contracting entity, as defined in the directive. or his authorised representative established within the Community".

3. For the subsystem that is subject of the EC verification procedure, the contracting entity or the main contractor, when employed, shall operate an approved quality management system for design, manufacture and final product inspection and testing as specified in point 5 and which shall be subject to surveillance as specified in point 6

The main contractor responsible for the whole subsystem project (including in particular responsibility for subsystem integration), shall operate in any case an approved quality management system for design, manufacture and final product inspection and testing, which shall be subject to surveillance as specified in point 6.

In the case that the contracting entity itself is responsible for the whole subsystem project (including in particular responsibility for subsystem integration) or that the contracting entity is directly involved in the design and/or production (including assembly and installation), it shall operate an approved quality management system for those activities, which shall be subject to surveillance as specified in point 6.

Applicants which are only involved in assembly and installation, are permitted to operate only an approved quality management system for manufacture and final product inspection and testing

#### 4. EC verification procedure

4.1 The contracting entity shall lodge an application for EC verification of the subsystem (through full quality management system with design examination), including coordination of surveillance of the quality management systems as in points 5.4. and 6.6., with a notified body of its choice. The contracting entity shall inform the manufacturers involved of his choice and of the application.

4.2 The application shall enable the design, manufacture, assembly, installation, maintenance and operation of the subsystem to be understood, and shall enable conformity with the requirements of the TSI to be assessed.

The application shall include:

- name and address of the contracting entity or its authorised representative,
- the technical documentation including:
  - a general description of the subsystem, overall design and structure,
  - the technical design specifications, including European specifications<sup>23</sup>, that have been applied,
  - any necessary supporting evidence for the use of the above specifications, in particular where the European specifications and the relevant clauses have not been applied in full.
  - the test programme
  - the infrastructure or rolling stock register, including all information as specified in the TSI,
  - the technical documentation regarding the manufacture, the assembly of the subsystem,
  - a list of the interoperability constituents to be incorporated into the subsystem,
  - copies of the EC declarations of conformity or suitability for use with which the constituents shall be provided and all the necessary elements defined in annex VI of the directives,
  - evidence of conformity to other regulations deriving from the treaty (including certificates)
  - a list of all manufacturers, involved in the subsystem's design, manufacturing, assembly and installation,
  - conditions for use of the subsystem (restrictions of running time or distance, wear limits etc),
  - conditions for maintenance and technical documentation regarding the maintenance of the subsystem
  - any technical requirement that shall be taken into account during production, maintenance or operation of the subsystem
- the explanation, of how all stages, as mentioned in point 5.2, are covered by quality management systems of the main contractor and/or of the contracting entity, if involved, and the evidence of their effectiveness,
- indication of the notified body (ies) responsible for the approval and surveillance of these quality management systems.
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4.3 The contracting entity shall present the results of examinations, checking and tests<sup>24</sup> including type tests when required, carried out by its appropriate laboratory or on their

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<sup>23</sup> The definition of an European specification is indicated in the directives 96/48/EC and 01/16/EC. The guide for application of HS TSIs explains the way to use the European Specifications

<sup>24</sup> The presentation of the results of the tests can be at the same time as the application or later.

behalf.

4.4 The notified body shall examine the application concerning the design examination and assess the results of the tests. Where the design meets the provisions of the Directive and of the TSI that apply to it shall issue a design examination certificate to the applicant. The certificate shall contain the conclusions of the design examination, conditions for its validity, the necessary data for identification of the design examined and, if relevant, a description of the subsystem's functioning.

If the contracting entity is denied a design examination certificate, the notified body shall provide detailed reasons for such denial.

Provision shall be made for an appeals procedure.

4.5 During the production phase, the applicant shall inform the notified body that holds the technical documentation concerning the design examination certificate of all modifications which may affect the conformity with the requirements of the TSI or the prescribed conditions for use of the subsystem . The subsystem shall receive additional approval in such cases. In this case, the notified body shall perform only those examinations and tests, those are relevant and necessary to the changes. This additional approval may be given either in the form of an addition to the original design examination certificate, or by issue of a new certificate after withdrawal of the old certificate.

## 5. Quality management system

5.1 .The contracting entity, if involved, and the main contractor, when employed, shall lodge an application for assessment of their quality management systems with a notified body of their choice.

The application shall include:

- all relevant information for the subsystem envisaged,
- the quality management system documentation.

For those only involved in a part of the subsystem project, the information to be provided is only that for the relevant part.

5.2 For the contracting entity or the main contractor responsible for the whole subsystem project, the quality management system shall ensure overall compliance of the subsystem with the requirements of the TSI.

The quality management system(s), for other contractors, has (have) to ensure compliance of their relevant contribution to the subsystem, with the requirements of the TSI.

All the elements, requirements and provisions adopted by the applicants shall be documented in a systematic and orderly manner in the form of written policies, procedures and instructions. This quality management system documentation shall

ensure a common understanding of the quality policies and procedures such as quality programmes, plans, manuals and records.

The system shall contain in particular an adequate description of the following items :

- for all applicants:
  - the quality objectives and the organisational structure,
  - the corresponding manufacturing, quality control and quality management techniques, processes and systematic actions that will be used,
  - the examinations, checking and tests that will be carried out before, during and after design, manufacture, assembly and installation and the frequency with which they will be carried out,
  - the quality records, such as inspection reports and test data, calibration data, qualification reports of the personnel concerned, etc.,
- for the main contractor, as far as relevant for its contribution to the design of the subsystem :
  - the technical design specifications, including European specifications that will be applied and, where the European specifications will not be applied in full, the means that will be used to ensure that the requirements of the TSI that apply to the subsystem will be met,
  - the design control and design verification techniques, processes and systematic actions that will be used when designing the subsystem,
  - the means to monitor the achievement of the required design and subsystem quality and the effective operation of the quality management systems in all phases including production.
- and also for the contracting entity or the main contractor responsible for the whole subsystem project:
  - responsibilities and powers of the management with regard to overall subsystem quality, including in particular the subsystem integration management.

The examinations, tests and checking shall cover all of the following stages:

- overall design,
- structure of the subsystem, including, in particular, civil-engineering activities, constituent assembly, final adjustment,
- final testing of the subsystem,
- and, where specified in the TSI, the validation under full operation conditions.



5.3 The notified body chosen by the contracting entity shall examine, if all stages of the subsystem as mentioned in point 5.2 are sufficiently and properly covered by the approval and surveillance of the quality management system(s) of the applicant(s)<sup>25</sup>.

If the compliance of the subsystem with the requirements of the TSI is based on more than one quality management system, the notified body shall examine in particular,

- if the relations and interfaces between the quality management systems are clearly documented  
and if overall responsibilities and powers of the management for the compliance of the whole entire subsystem for the main contractor are sufficiently and properly defined.

5.4 The notified body referenced in point 5.1. shall assess the quality management system to determine whether it satisfies the requirements of point 5.2. It presumes compliance with these requirements if the applicant implements a quality system for design, production, final product inspection and testing in respect of the Standard EN/ISO 9001 - 2000, which takes into consideration the specificity of the subsystem for which it is implemented.

When an applicant operates a certified quality management system, the notified body shall take this into account in the assessment.

The audit shall be specific for the subsystem concerned, taking into consideration the specific contribution of the applicant to the subsystem. The auditing team shall have at least one member experienced as an assessor in the subsystem technology concerned. The evaluation procedure shall include an assessment visit to the applicant's premises.

The decision shall be notified to the applicant. The notification shall contain the conclusions of the examination and the reasoned assessment decision.

5.5 The contracting entity, if involved, and the main contractor shall undertake to fulfil the obligations arising out of the quality management system as approved and to uphold it so that it remains adequate and efficient.

They shall keep the notified body that has approved their quality management system informed of any significant change that will affect the fulfilment of the requirements by the subsystem.

The notified body shall evaluate any modifications proposed and decide whether the amended quality management system will still satisfy the requirements of point 5.2 or whether a re-assessment is required.

It shall notify its decision to the applicant. The notification shall contain the conclusions of the examination and the reasoned assessment decision.

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<sup>25</sup> In particular, for the rolling stock TSI, the notified body will participate in the final in service testing of rolling stock or train set. This will be indicated in the relevant chapter of the TSI

6. Surveillance of the quality management system(s) under the responsibility of the notified body

6.1 The purpose of surveillance is to make sure that the contracting entity, if involved, and the main contractor duly fulfil the obligations arising out of the approved quality management system(s).

6.2 The contracting entity, if involved, and the main contractor shall send the notified body referenced in point 5.1. (or have sent) all the documents needed for that purpose and in particular the implementation plans and technical records concerning the subsystem (as far as relevant for the specific contribution of the applicant to the subsystem), including:

- the quality management system documentation, including the particular means implemented to ensure that
- for the contracting entity or the main contractor, responsible for the whole subsystem project,
  - overall responsibilities and powers of the management for the compliance of the whole entire subsystem are sufficiently and properly defined,
- for each applicant,
  - the quality management system is correctly managed for achieving integration at subsystem level,
- the quality records as foreseen by the design part of the quality management system, such as results of analyses, calculations, tests, etc.,
- the quality records as foreseen by the manufacturing part (including assembly, installation and integration) of the quality management system, such as inspection reports and test data, calibration data, competency records of the personnel concerned, etc.

6.3 The notified body shall periodically carry out audits to make sure that the contracting entity, if involved, and the main contractor maintain and apply the quality management system and shall provide an audit report to them. When they operate a certified quality management system, the notified body shall take this into account in the surveillance.

The frequency of the audits shall be at least once a year, with at least one audit during the time period of performing the relevant activities (design, manufacture, assembly or installation) for the subsystem being the subject of the EC verification procedure mentioned in point 4.

6.4. Additionally the notified body may pay unexpected visits to the sites mentioned in point 5.2 of the applicant(s). At the time of such visits, the notified body may conduct

complete or partial audits and may carry out or cause to be carried out tests in order to check the proper functioning of the quality management system where necessary. It shall provide the applicant(s) with an inspection report and audit and/or test reports as appropriate.

6.5. The notified body chosen by the contracting entity and responsible for the EC verification, if not carrying out the surveillance of all the quality management system(s) concerned as under point 5, shall co ordinate the surveillance activities of any other notified bodies responsible for that task, in order :

- to be ensured that correct management of interfaces between the different quality management systems relating to subsystem integration has been performed.
- to collect, in liaison with the contracting entity, the necessary elements for the assessment to guarantee the consistency and the overall supervision of the different quality management systems.

This co ordination includes the right of the notified body

- to receive all documentation (approval and surveillance), issued by the other notified body(s),
- to witness the surveillance audits as in point 5.4.,
- to initiate additional audits as in point 5.5. under its responsibility and together with the other notified body(s).

7. The notified body as referenced under point 5.1. shall have entrance for inspection purposes, audit and surveillance to the locations of design, building sites, production workshops, locations of assembly and installation, storage areas and, where appropriate, prefabrication or testing facilities and, more general, to all premises which it considers necessary for its task, in accordance with the applicant's specific contribution to the subsystem project.

8. The contracting entity, if involved, and the main contractor shall, for a period of 10 years after the last subsystem has been manufactured, keep at the disposal of the national authorities:

- the documentation referenced in the second indent of the second subparagraph of point 5.1,
- the updating referenced in the second subparagraph of point 5.5,
- the decisions and reports from the notified body which are referenced in the points 5.4, 5.5 and 6.4

9. Where the subsystem meets the requirements of the TSI, the notified body shall then, based on the design examination and the approval and surveillance of the quality management system (s), draw up the certificate of conformity intended for the contracting entity, who shall in turn draw up the EC declaration of verification intended for the

supervisory authority in the Member State within which the subsystem is located and/or operates.

The EC declaration of verification and the accompanying documents shall be dated and signed. The declaration shall be written in the same language of the technical file and shall contain at least the information included in Annex V of the Directive.

10. The notified body chosen by the contracting entity shall be responsible for compiling the technical file that has to accompany the EC declaration of verification. The technical file shall include at least the information indicated in Art 18 (3) of The Directive, and in particular as follows:

- all necessary documents relating to the characteristics of the subsystem
- the list of interoperability constituents incorporated into the subsystem,
- copies of the EC declarations of conformity and, where appropriate, of the EC declarations of suitability for use, which the constituents shall be provided in accordance with Article 13 of the Directive, accompanied, where appropriate, by the corresponding documents (certificates, quality management system approvals and surveillance documents) issued by the notified bodies,
- evidence of conformity to other regulations deriving from the treaty (including certificates)
- all elements relating to the maintenance, the conditions and limits for use of the subsystem,
- all elements relating to the instructions concerning servicing, constant or routine monitoring, adjustment and maintenance
- certificate of conformity of the notified body as mentioned under point 9, accompanied by corresponding verification and/or calculation notes and countersigned by itself, stating that the project complies with the Directive and the TSI, and mentioning, where appropriate, reservations recorded during performance of the activities and not withdrawn.  
The certificate should also be accompanied, if relevant, by the inspection and audit reports drawn up in connection with the verification, as mentioned in points 6.4. and 6.5.;
- the infrastructure or rolling stock register, including all information as specified in the TSI.

11. Each notified body shall communicate to the other notified bodies the relevant information concerning the quality management system approvals and the EC design examination certificates, which it has issued, withdrawn or refused.

The other notified bodies may receive on request copies of :

- the quality management system approvals and additional approvals issued and
- the EC design examination certificates and additions issued

12. The records accompanying the certificate of conformity shall be lodged with the contracting entity  
The contracting entity shall keep a copy of the technical file throughout the service life of the subsystem and for a further period of three years; it shall be sent to any other Member State which so requests.

#### **F.4 Assessment of Maintenance Arrangements: Conformity Assessment Procedure**

This is an open point.

## ANNEX G – GLOSSARY

<b>c</b>	
cross-passage	short tunnel to connect two or more parallel tunnels, to provide a connection, used for rescue, maintenance and installations, sometimes also for aerodynamic reasons
<b>e</b>	
earthing	Measure to connect the overhead line or conductor rail directly to the earth to avoid inadmissible high contact voltage during works at electrified lines
emergency communication	(1) Communication between RU staff and IM in the case of emergency  (2) Railway independent communication system for rescue services and state authorities
Emergency plan	An emergency plan is a plan developed under the direction of the Infrastructure Manager, in co-operation, where appropriate, with Railway Undertakings, Rescue services and relevant authorities for each tunnel.  The emergency plan shall be consistent with the self-rescue, evacuation and rescue facilities provided.
<b>i</b>	
IM	Infrastructure Manager
protected electric cable	a protected electric cable is a cable, which is prevented from releasing products of combustion into the environment in the event of a fire
<b>m</b>	
maintenance plan	regulation for maintenance including inspection, repair and reconstruction with relevant specifications
<b>o</b>	
operation categories	safety definition for vehicles used for different networks
<b>r</b>	

rescue area	<p>area for rescue services to install different equipment (e.g. triage, on scene commando, pumping station, etc.)</p> <p>It is also possible to evacuate people from this place</p>
rescue services	includes fire brigades, medical organisations (e.g. red cross, etc), technical organisations (e.g. THW in Germany), special army units or police units (e.g. genie corps, SAR)
RU	Railway Undertaking
<b>s</b>	
safe area	<p>Definition of clause 4.2.2.6.1: A safe area is a place inside or outside a tunnel where all of the following criteria apply</p> <ul style="list-style-type: none"> <li>• Conditions are survivable</li> <li>• Access for people is possible aided and unaided</li> <li>• People may accomplish self-rescue if the opportunity is available, or may wait to be rescued by the rescue services using procedures detailed in the emergency plan</li> <li>• Communication shall be possible, either by mobile phone or by fixed connection to the control centre of the IM.</li> </ul>
successive tunnels	if two or more tunnels following each other without a separation of more than 500 m in open air and without an access to a safe area within the open section, the tunnels are defined as only one tunnel and the appropriate specifications have to be fulfilled. 500 m is as maximum the length of a train with additional space on both sides (bad braking etc.).
<b>t</b>	
technical room	room with technical equipment for railway applications (e.g. signalling, energy supply, traction control, etc.)
temperature-time curve	specification for the design and assessment of structural parts; here: specification for the “design fire”, acting temperature depending on action time
train crew	Members of the on-board staff of a train, who are certified as competent and appointed by a Railway Undertaking to carry out specific, designated safety related tasks on the train, for example the driver or the guard.
tunnel length	the tunnel length is measured from portal to portal at level top of rail; range defined in 1.1.2
<b>u</b>	
underground station	station between tunnels, under the surface, with parts open to the public