Revision of the SRT TSI

	Drafted by	*Validated by*	*Approved by*
Name	Antoine DEFOSSEZ		
Position	Project Officer		
Date	01/03/2019		
Signature			

Version	*Date*	*Comments*
1.0	1/03/2019	Consolidated version based on the document adopted at the RISC 84 FOR INFORMATION ONLY
2.0	28/06/2019	Consolidated version based on the Annex V of Commission Implementing Regulation (EU) 2019/776[1] FOR INFORMATION ONLY

[1] Commission Implementing Regulation (EU) 2019/776 of 16 May 2019 amending Commission Regulations (EU) No 321/2013, (EU) No 1299/2014, (EU) No 1301/2014, (EU) No 1302/2014, (EU) No 1303/2014 and (EU) 2016/919 and Commission Implementing Decision 2011/665/EU as regards the alignment with Directive (EU) 2016/797 of the European Parliament and of the Council and the implementation of specific objectives set out in Commission Delegated Decision (EU) 2017/1474

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

Contents

1. Introduction 4
1.1. Technical scope 4
1.1.1. Scope related to tunnels 4
1.1.2. Scope related to rolling stock 4
1.1.3. Scope related to operational aspects 4
1.1.4. Risk scope, risks that are not covered by this TSI 5
1.2. Geographical scope 5
2. Definition of aspect/scope 5
2.1. General 5
2.2. The risk scenarios 6
2.2.1. 'Hot' incidents: Fire, explosion followed by fire, emission of toxic smoke or gases. .7
2.2.2. 'Cold' incidents: collision, derailment 7
2.2.3. Prolonged stop 7
2.2.4. Exclusions 7
2.3. The role of emergency response services 8
2.4. Definitions 8
3. Essential requirements 10
3.1. Infrastructure and energy subsystems 10
3.2. Rolling stock subsystem 11
4. Characterisation of the subsystem 12
4.1. Introduction 12
4.2. Functional and technical specifications of the subsystems 12
4.2.1. Subsystem Infrastructure 12
4.2.2. Subsystem Energy 17
4.2.3. Subsystem rolling stock 17
4.3. Functional and technical specifications of the interfaces 18
4.3.1. Interfaces with the Control-Command-Signalling subsystem 18
4.3.2. Interfaces with the Traffic Management and Operation subsystem 18
4.4. Operating rules 19
4.4.1. Emergency rule 19
4.4.2. Tunnel emergency plan 19
4.4.3. Exercises 20
4.4.4. Isolation and Earthing procedures 20
4.4.5. Provision of on-train safety and emergency information to passengers 20
4.4.6. Operational rules related to trains running in tunnels 20
4.5. Maintenance rules 21
4.5.1. Infrastructure 21
4.5.2. Maintenance of rolling stock 21
4.6. Professional qualifications 21
4.6.1. Tunnel specific competence of the train crew and other staff 21

4.7. Health and safety conditions 22
4.7.1. Self-rescue device 22
5. Interoperability constituents 22
6. Assessment of conformity and/or suitability for use of the constituents and verification of the subsystem 22
6.1. Interoperability constituents 22
6.2. Subsystems 22
6.2.1. EC verification (general) 22
6.2.2. Procedures for EC verification of a subsystem (modules) 22
6.2.3. Existing solutions 23
6.2.4. Innovative solutions 23
6.2.5. Assessment of maintenance 23
6.2.6. Assessment of conformity for the Safety requirements applying to the Infrastructure and Energy subsystems 23
6.2.7. Additional requirements for assessment of specifications concerning the IM 24
6.2.8. Additional requirements for assessment of specifications concerning the RU 25
7. Implementation 25
7.1. Application of this TSI to new subsystems 25
7.1.1. General 25
7.1.2. New rolling stock 25
7.1.3. New Infrastructure 25
7.2. Application of this TSI to subsystems already in service 25
7.2.1. Upgrade or renewal of rolling stock 25
7.2.2. Upgrade and renewal measures for tunnels 26
7.2.3. Operation subsystem 27
7.2.4. Operation of new rolling stock in existing tunnels 27
7.3. Specific cases 27
7.3.1. General 27
7.3.2. Operational rules related to trains running in tunnels (clause 4.4.6) 27
Appendix A: Standards or Normative Documents Referred to in this TSI 28
Appendix B: Assessment of the Subsystems 29

1. INTRODUCTION

1.1. Technical scope

(a) This TSI concerns the following subsystems as defined in Directive (EU) 2016/797: control-command and signalling ('CCS'), infrastructure ('INF'), energy ('ENE'), operation ('OPE'), and rolling stock (locomotives and passenger units 'LOC&PAS').

(b) The purpose of this TSI is to define a coherent set of tunnel specific measures for the infrastructure, energy, rolling stock, control-command and signalling and operation subsystems, thus delivering an optimal level of safety in tunnels in the most cost-efficient way.

(c) It shall permit free movement of vehicles which are in compliance with this TSI to run under harmonised safety conditions in railway tunnels.

(d) Only measures, designed to reduce specific tunnel risks, are prescribed in the present TSI. Risks related to pure railway operation, such as derailment and collision with other trains, are addressed by general railway safety measures.

(e) The existing safety level shall not be reduced in a country as stipulated in Directive (EU) 2016/798 Art 4.1. Member states can retain more stringent requirements, as long as these requirements do not prevent the operation of TSI compliant trains.

(f) Member States can prescribe new and more stringent requirements for specific tunnels in accordance with Directive (EU) 2016/798 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 Infrastructure Manager and of the relevant authorities for emergency response, and they shall be subject to a cost-benefit assessment.

1.1.1. Scope related to tunnels

(a) This TSI applies to new, renewed and upgraded tunnels which are located on the network of the Union rail system, and which are in accordance with the definition in clause 2.4 of this TSI.

(b) Stations that are in tunnels shall be in conformity with the national rules on fire safety. When they are used as safe areas, they shall comply only with the specifications for clauses 4.2.1.5.1, 4.2.1.5.2 and 4.2.1.5.3. of this TSI. When they are used as evacuation and rescue points, they shall comply only with the specifications of clauses 4.2.1.7 (c) and 4.2.1.7 (e) of this TSI.

1.1.2. Scope related to rolling stock

(a) This TSI applies to rolling stock which is in the scope of the LOC&PAS TSI.

(b) Rolling stock categorised "A" or "B" according to the previous SRT TSI (Commission Decision 2008/163/EC) shall retain its category in this TSI as defined in clause 4.2.3.

1.1.3. Scope related to operational aspects

(a) This TSI applies to the operation of all units of rolling stock which are running in tunnels described in clause 1.1.1.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

1.1.3.1. Operation of freight trains

(a) When each vehicle of a freight train or dangerous goods train as defined in clause 2.4 complies with the structural TSIs which apply to it (LOC&PAS, SRT, NOI, CCS, WAG) and when the dangerous goods wagon(s) comply with Annex II of Directive 2008/68/EC , the freight train or dangerous goods train operated according to the requirements of the OPE TSI shall be allowed to circulate in all tunnels of the network of the Union rail system.

1.1.4. Risk scope

1.1.4.1. Risks covered by this TSI

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

(b) Where a risk analysis comes to the conclusion that other tunnel incidents might be of relevance, specific measures to deal with these scenarios shall be defined.

1.1.4.2. Risks not covered by this TSI

(a) Risks not covered by this TSI are as follows:

(1) Health and safety of staff involved in maintenance of the fixed installations in tunnels.

(2) Financial loss due to damage to structures and trains, and consequently the losses resulting from non-availability of the tunnel for repairs.

(3) Trespass into the tunnel through the tunnel portals.

(4) Terrorism, as a deliberate and premeditated act which is designed to cause wanton destruction, injury and loss of life.

(5) Risks for people in the neighbourhood of a tunnel where collapse of the structure could have catastrophic consequences.

1.2. Geographical scope

(a) The geographical scope of this TSI is the network of the Union rail system as described in Annex I of Directive (EU) 2016/797 with the exclusion of the cases referred to in Article 1(3) and 1(4) of Directive (EU) 2016/797.

2. DEFINITION OF ASPECT/SCOPE

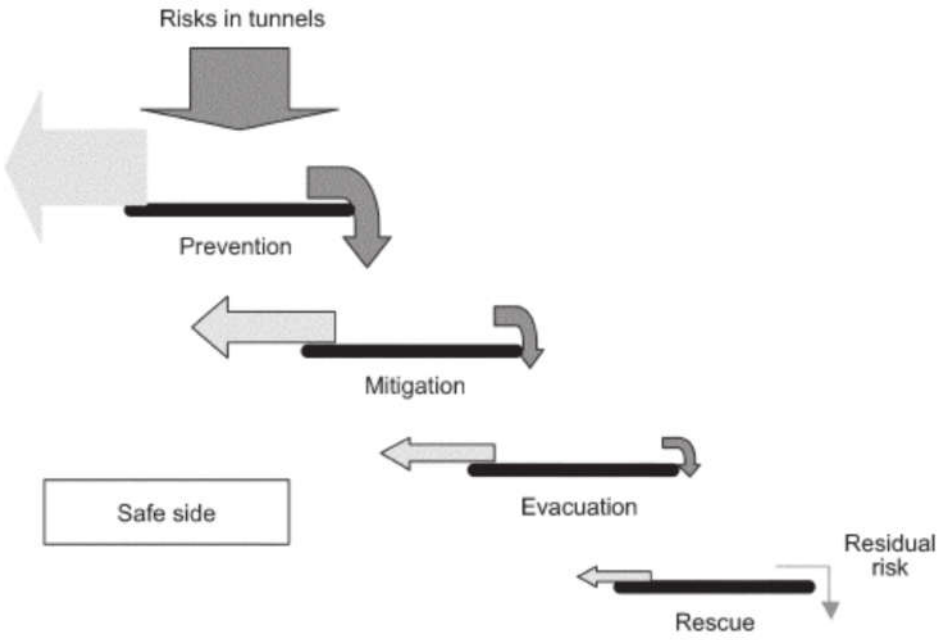
2.1. General

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

(b) The largest contribution is in the area of prevention followed by mitigation and so on.

(c) The layers of safety combine to produce a low level of residual risk.

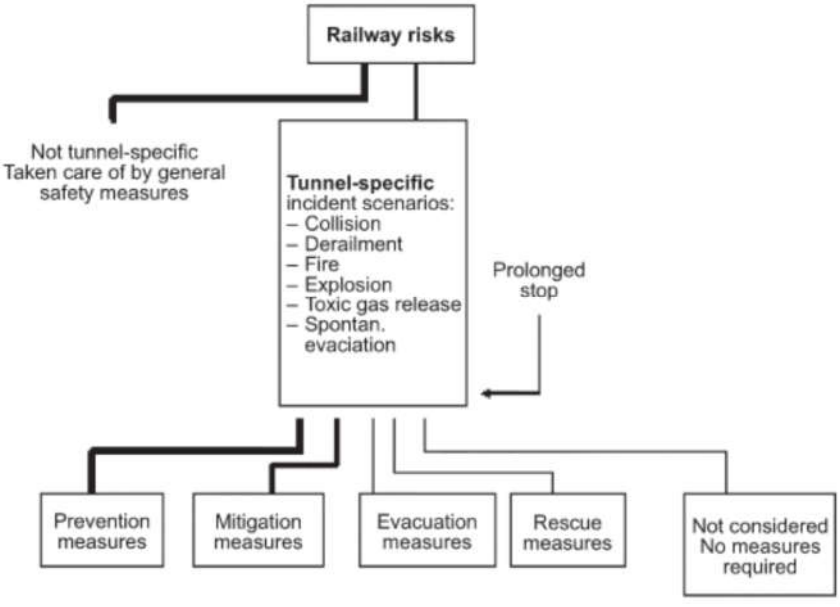
Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.



(d) A major feature of railways is their inherent ability to prevent accidents through the traffic running on a guide-way and generally being controlled and regulated using a signalling system.

2.2. The risk scenarios

(a) This TSI provides measures which could prevent or mitigate the difficulty of evacuation or rescue operations following a tunnel-specific railway incident.



Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(b) Relevant measures have been identified, which will control or significantly reduce the risks arising from the tunnel-specific incident scenarios identified above.

(c) 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.

(d) The measures prescribed can be considered as a response to the following three types of incident.

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

(a) The main danger is fire. Fire is understood as a combination of heat, flames and smoke.

(b) The fire starts on a train.
The fire is detected, either by on-board fire detectors, or by persons on-board. The driver is notified of a problem, either that there is a fire by an automatic notification or that there is a problem in general by passengers using the passenger alarm.
The driver is instructed to act appropriately depending on the local circumstances.
Ventilation is shut down to prevent smoke distribution. For rolling stock of category B, the passengers in the affected area will move to a non-affected area of the train where they are protected from fire and fumes
Whenever possible the train leaves the tunnel. Passengers are evacuated, directed by the train crew, or by self-rescue, to a safe area in the open air.
If appropriate, the train may stop at an evacuation and rescue point inside the tunnel. Passengers are evacuated, directed by the train crew, or by self-rescue, to a safe area.
If a fire extinguishing system can extinguish the fire, the incident will become a 'cold' incident.

(c) The fire starts in the tunnel.
If fire starts in a tunnel or in a technical room, the driver is instructed to act appropriately depending on the local circumstances in compliance with the tunnel-specific incident scenarios, described in the Emergency Plan.

2.2.2. 'Cold' incidents: collision, derailment

(a) The tunnel specific measures concentrate on access/egress facilities to support evacuation and the intervention of the emergency response services.

(b) The difference compared to the hot incidents is that there is no time constraint due to the presence of a hostile environment created by a fire.

2.2.3. Prolonged stop

(a) Prolonged stop (an unplanned stop in a tunnel, without the occurrence of a hot or cold incident, for longer than 10 minutes) is not by itself a threat to passengers and staff.

(b) However it may lead to spontaneous uncontrolled evacuation that exposes people to dangers present in a tunnel environment.

2.2.4. Exclusions

(a) The scenarios that have not been dealt with are listed in clause 1.1.4.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

2.3. The role of emergency response services

(a) The definition of the role of the emergency response services is a matter for the relevant national legislation.

(b) The measures specified in this TSI for rescue are based on the assumption that the emergency response services intervening in a tunnel incident shall protect lives as a priority.

(c) It is assumed that they are expected to:

(1) In a 'hot' incident type

- 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 incident
- Conduct evacuation from safe areas to the final place of safety

(2) In a 'cold' incident type

- Rescue people
- Provide initial help to people with critical injuries
- Free trapped people
- Conduct evacuation to the final place of safety

(d) No demands on time or performance requirements are included in this TSI.

(e) Considering that incidents in railway tunnels involving multiple fatalities are rare, it is implicit that there might be events, with an extremely low probability, for which even well-equipped emergency response services would be restricted, such as a major fire involving a freight train.

(f) If the expectations of the emergency response services expressed in emergency plans go beyond the assumptions described above, the need for additional measures or tunnel equipment can be considered.

2.4. Definitions

For the purpose of this TSI the following definitions are used:

(a) Railway tunnel: A railway tunnel is an excavation or a construction around the track provided to allow the railway to pass for example higher land, buildings or water. The length of a tunnel is defined as the length of the fully enclosed section, measured at rail level. A tunnel in the context of this TSI is 0.1km or longer. Where certain requirements apply only to longer tunnels, thresholds are mentioned in the relevant clauses.

(b) Safe area: a safe area is a temporary survivable space, inside or outside the tunnel, for passengers and staff to find refuge after they have evacuated from a train.

(b1) Final place of safety: the final place of safety is the place where passengers and staff will no longer be impacted by the effects of the initial incident (e.g. smoke opacity and toxicity, temperature). It is the termination point of the evacuation.

(c) Evacuation and rescue point: an evacuation and rescue point is a defined location, inside or outside the tunnel, where fire fighting equipment can be used by the emergency response services and where passengers and staff can evacuate from a train.

(d) Technical rooms: Technical rooms are enclosed spaces with doors for access/egress inside or outside the tunnel with safety installations which are necessary for at least one of the following functions: self-rescue, evacuation, emergency communication, rescue and fire fighting, signalling and communication equipment, and traction power supply.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(e) Freight train: A freight train is a train composed of one or more locomotive(s) and one or more wagon(s). A freight train including at least one wagon carrying dangerous goods is a dangerous goods train.

(f) All definitions related to rolling stock are defined in the LOC&PAS TSI and the WAG TSI.

(g) CSM on risk assessment: this term is used to designate the annex 1 of the Commission Implementing Regulation (EU) No 402/2013 of 30 April 2013 on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009

3. ESSENTIAL REQUIREMENTS

(a) The following table indicates basic parameters of this TSI and their correspondence to the essential requirements as set out and numbered in Annex III to Directive (EU) 2016/797 .

(b) For meeting the essential requirements, the corresponding parameters of sections 4.2.1, 4.2.2 and 4.2.3 shall apply.

3.1. Infrastructure and energy subsystems

(a) In order to meet the essential requirement 'Safety' applying to the Infrastructure and Energy subsystems, the CSM on risk assessment may be applied as an alternative to the corresponding parameters of sections 4.2.1 and 4.2.2.

(b) Accordingly, for the risks identified in point 1.1.4 and the scenarios listed in point 2.2, the risk can be assessed by:

(1) a comparison with a reference system,

(2) an explicit risk estimation and evaluation.

For meeting the essential requirements other than 'Safety', the corresponding parameters of sections 4.2.1 and 4.2.2 shall apply.

Element of the infrastructure sub-system	**Ref. Clause**	**Safety**	**Reliability Availability**	**Health**	**Environmental protection**	**Technical compatibility**	**Accessibility**
Prevent unauthorised access to emergency exits and technical rooms	4.2.1.1.	2.1.1					
Fire resistance of tunnel structures	4.2.1.2.	1.1.4 2.1.1					
Fire reaction of building material	4.2.1.3.	1.1.4 2.1.1		1.3.2	1.4.2		
Fire detection	4.2.1.4.	1.1.4 2.1.1					
Evacuation facilities	4.2.1.5.	1.1.5 2.1.1					
Escape walkways	4.2.1.6.	2.1.1					
Evacuation and rescue points	4.2.1.7 except (b)	2.1.1					
Evacuation and rescue points	4.2.1.7 (b)					1.5	

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

Element of the infrastructure sub-system	Ref. Clause	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
Emergency communication	4.2.1.8.	2.1.1					
Electricity supply for emergency response services	4.2.1.9	2.1.1					
Reliability of electrical systems	4.2.1.10	2.1.1					
Sectioning of contact line	4.2.2.1.	2.2.1					
Earthing of contact line	4.2.2.2.	2.2.1					

3.2. Rolling stock subsystem

(c) For meeting the essential requirements, the corresponding parameters of section 4.2.3 shall apply.

Element of the rolling stock sub-system	Ref. Clause	Safety	Reliability Availability	Health	Environmental protection	Technical compatibility	Accessibility
Measures to prevent fire	4.2.3.1	1.1.4 2.4.1		1.3.2	1.4.2		
Measures to detect and control fire	4.2.3.2	1.1.4 2.4.1					
Requirements related to emergencies	4.2.3.3	2.4.1	2.4.2			1.5 2.4.3	
Requirements related to evacuation	4.2.3.4	2.4.1					

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

4. CHARACTERISATION OF THE SUBSYSTEM

4.1. Introduction

(a) The Union rail system, to which Directive (EU) 2016/797 applies and of which the subsystems are parts, has been developed to become an integrated system for which the consistency must be verified.

(b) 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 rules for the railway.

(c) Taking account of all the applicable essential requirements, the basic parameters related to safety in railway tunnels are set out for the subsystems infrastructure, energy and rolling stock in section 4.2 of this TSI. The operational requirements and responsibilities are set out in the OPE TSI and in section 4.4 of this TSI.

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. Subsystem Infrastructure

4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms

This specification applies to all tunnels.

(a) Unauthorised access to technical rooms shall be prevented.

Where emergency exits are locked for security purposes, it shall always be possible to open them from inside.

4.2.1.2. Fire resistance of tunnel structures

This specification applies to all tunnels.

(a) In the event of fire, the integrity of the tunnel lining shall be maintained for a period of time that is sufficiently long to permit self-rescue, evacuation of passengers and staff and intervention of the emergency response services. That period of time shall be in accordance with the evacuation scenarios considered and reported in the emergency plan.

4.2.1.3. Fire reaction of building material

This specification applies to all tunnels.

(a) This specification applies to construction products and building elements inside tunnels. These products shall fulfil the requirements of Commission Regulation (EU) 2016/364[2]:

(1) Tunnel building material shall fulfil the requirements of classification A2

(2) Non-structural panels and other equipment shall fulfil the requirements of classification B.

[2] Commission Delegated Regulation (EU) 2016/364 of 1 July 2015 on the classification of the reaction to fire performance of construction products pursuant to Regulation (EU) No 305/2011 of the European Parliament and of the Council (OJ L 68, 15.3.2016, p. 4).

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(3) Exposed cables shall have the characteristics of low flammability, low fire spread, low toxicity and low smoke density. These requirements are fulfilled when the cables fulfil at least the requirements of classification B2ca, s1a, a1. If the classification is lower than B2ca, s1a, a1, the class of cables may be determined by the infrastructure manager after a risk assessment, taking into account the characteristics of the tunnel and the intended operational regime. For the avoidance of doubt, different classificationsof cable may be used for different installations within the same tunnel provided that the requirements of this point are met.

(b) Materials that would not contribute significantly to a fire load shall be listed. They are allowed to not comply with the above.

4.2.1.4. Fire detection in technical rooms

This specification applies to all tunnels of more than 1 km in length.

(a) Fire in technical rooms shall be detected in order to alert the infrastructure manager.

4.2.1.5. Evacuation facilities

4.2.1.5.1 Safe area

This specification applies to all tunnels of more than 1 km in length.

(a) A safe area shall allow the evacuation of trains that use the tunnel. It shall have a capacity corresponding to the maximum capacity of the trains planned to be operated on the line where the tunnel is located.

(b) The safe area shall maintain survivable conditions for passengers and staff during the time needed for the complete evacuation from the safe area to a final place of safety.

(c) In case of underground/ undersea safe areas, the provisions shall allow people to move from the safe area to the surface without having to re-enter the affected tunnel tube.

(d) The lay-out of an underground safe area and its equipment shall take into account the control of smoke, in particular to protect people who use the self-evacuation facilities.

4.2.1.5.2 Access to the safe area

This specification applies to all tunnels of more than 1 km in length.

(a) Safe areas shall be accessible for people who commence self-evacuation from the train as well as for the emergency response services.

(b) One of the following solutions shall be selected for access points from a train to the safe area:

(1) Lateral and/or vertical emergency exits to the surface. These exits shall be provided at least every 1 000 m.

(2) Cross-passages between adjacent independent tunnel tubes, which enable the adjacent tunnel tube to be employed as a safe area. Cross-passages shall be provided at least every 500 m.

(c) Doors giving access from the escape walkway to the safe area shall have a minimum clear opening of 1,4m wide and 2,0m high. Alternatively it is permitted to use multiple doors next to each other which are less wide as long as the flow capacity of people is demonstrated to be equivalent or higher.

(d) After passing the doors, the clear width shall continue to be at least 1,5m wide and 2,25m high.

(e) The way in which the emergency response services access the safe area shall be described in the emergency plan.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

4.2.1.5.3 Communication means in safe areas

This specification applies to all tunnels of more than 1 km in length.

Communication shall be possible, either by mobile phone or by fixed connection from underground safe areas to the control centre of the Infrastructure Manager.

4.2.1.5.4 Emergency lighting

This specification applies to all tunnels of more than 0,5 km in length.

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

(b) Illumination shall comply with the following requirements:
   (1) Single-track tube: on the side of the walkway
   (2) Multiple-track tube: on both sides of the tube
   (3) Position of lights:
      - above the walkway, so as not to interfere with the free space for the passage of persons, or
      - built into the handrails.
   (4) The maintained illuminance shall be at least 1 lux at a horizontal plane at walkway level.

(c) Autonomy and reliability: an alternative electricity supply shall be available for an appropriate period of time after failure of the main supply. The time required shall be consistent with the evacuation scenarios and reported in the Emergency Plan.

(d) 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:
   (1) manually from inside the tunnel at intervals of 250 m
   (2) by the tunnel operator using remote control

4.2.1.5.5 Escape signage

This specification applies to all tunnels.

(a) The escape signage indicates the emergency exits, the distance and the direction to a safe area.

(b) 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 the specification referenced in appendix A, index 1.

(c) Escape signs shall be installed on sidewalls along escape walkways.

(d) The maximum distance between escape signs shall be 50 m.

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

(f) All doors leading to emergency exits or cross-passages shall be marked.

4.2.1.6. Escape walkways

This specification applies to all tunnels of more than 0,5 km in length.

(a) Walkways shall be constructed in a single track tunnel tube on at least one side of the track and in a multiple track tunnel tube on both sides of the tunnel tube. In tunnel tubes with more than two tracks, access to a walkway shall be possible from each track.
   (1) The width of the walkway shall be at least 0.8 m.
   (2) The minimum vertical clearance above the walkway shall be 2.25m.
   (3) The height of the walkway shall be at bottom-of-rail level or higher.
   (4) 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.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(b) Continuous handrails shall be installed between 0.8m and 1.1m above the walkway providing a route to a safe area.
  (1) Handrails shall be placed outside the required minimum clearance of the walkway.
  (2) Handrails shall be angled at 30° to 40° to the longitudinal axis of the tunnel at the entrance to and exit from an obstacle.

4.2.1.7. Evacuation and rescue points

This specification applies to all tunnels of more than 1 km in length.

(a) For the purpose of this clause, two or more consecutive tunnels will be considered as a single tunnel unless both of the following conditions are met:
  (1) The separation between tunnels in open air is longer than the maximum length of the passenger train intended to be operated on the line + 100 m and
  (2) The open air area and track situation around the separation between tunnels allow passengers to move away from the train. The open air area shall contain all passengers of the maximum capacity of the train intended to be operated on the line.

(b) Evacuation and rescue points shall be created
  (1) Outside both portals of every tunnel of >1km and
  (2) Inside the tunnel, according to the category of rolling stock that is planned to be operated, as summarized in the table below:

Rolling stock category according to paragraph 4.2.3	Maximum distance from the portals to an evacuation and rescue point and between evacuation and rescue points
Category A	5 km
Category B	20 km

(c) Requirements for all evacuation and rescue points:
  (1) The evacuation and rescue points shall be equipped with water supply (minimum 800l/min during 2 hours) close to the intended stopping point of the train. The method of supplying the water shall be described in the emergency plan.
  (2) The intended stopping position of the affected train shall be indicated to the train driver. This shall not require specific on-board equipment (all TSI compliant trains must be able to use the tunnel)
  (3) The evacuation and rescue points shall be accessible to the emergency response services. The way the emergency response services access the evacuation and rescue point and deploy equipment shall be described in the emergency plan.
  (4) It shall be possible to switch off and earth the contact line, either locally or remotely.

(d) Requirements for evacuation and rescue points outside the portals of the tunnel
In addition to the requirements in 4.2.1.7 (c), evacuation and rescue points outside the portals of the tunnel shall comply with the following requirements:
  (1) The open air area around the evacuation and rescue point shall offer a minimum surface of 500 m².

(e) Requirements for evacuation and rescue points inside the tunnel
In addition to the requirements in 4.2.1.7 (c), evacuation and rescue points inside the tunnel shall comply with the following requirements

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(1) A safe area shall be accessible from the stopping position of the train. Dimensions of the evacuation route to the safe area shall consider the evacuation time (as specified in clause 4.2.3.4.1) and the planned capacity of the trains (referred to in clause 4.2.1.5.1) intended to be operated in the tunnel. The adequacy of the sizing of the evacuation route shall be demonstrated.

(2) The safe area that is paired with the evacuation and rescue point shall offer a sufficient standing surface relative to the time passengers are expected to wait until they are evacuated to a final place of safety.

(3) There shall be an access to the affected train for emergency response services without going through the occupied safe area.

(4) The lay-out of the evacuation and rescue point and its equipment shall take into account the control of smoke, in particular to protect people who use the self-evacuation facilities to access the safe area.

4.2.1.8. Emergency communication

This specification applies to all tunnels of more than 1 km in length.

(a) Radio communication between the train and the infrastructure manager control centre shall be provided in each tunnel with GSM-R.

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

4.2.1.9. Electricity supply for emergency response services

This specification applies to all tunnels of more than 1 km length.

(a) The electricity supply system in the tunnel shall be suitable for the emergency response services equipment in accordance with the emergency plan for the tunnel. Some national emergency response services groups may be self-sufficient in relation to electricity supply. In this case, the option of not providing electricity supply facilities for the use of such groups may be appropriate. Such a decision, however, must be described in the emergency plan.

4.2.1.10. Reliability of electrical systems

This specification applies to all tunnels of more than 1 km length.

(a) Electrical systems identified by the Infrastructure Manager as vital to the safety of passengers in the tunnel shall be kept in use as long as necessary according to the evacuation scenarios considered in the emergency plan.

(b) Autonomy and reliability: an alternative electricity supply shall be available for an appropriate period of time after failure of the main supply. The time required shall be consistent with the evacuation scenarios considered and included in the emergency plan.

4.2.1.11. Communication and lighting at switching locations

This specification applies to all tunnels of more than 1km in length

(a) When the contact line is divided into sections that can be locally switched, a means of communication and lighting shall be provided at the switching location.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

4.2.2. Subsystem Energy

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

4.2.2.1. Sectioning of contact line

This specification applies to all tunnelsof more than 1 km length.

(a) The traction power supply system in tunnels may be divided into sections.

(b) In such case, it shall be possible to switch off each section of the contact line, either locally or remotely..

4.2.2.2. Earthing of contact line

This specification applies to all tunnels of more than 1 km length.

(a) Earthing devices shall be provided at tunnel access points and, if the earthing procedures allow the earthing of a single section, close to the separation points between sections. These shall be either portable devices or manually or remotely controlled fixed installations.

(b) Communication and lighting means necessary for earthing shall be provided.

4.2.3. Subsystem rolling stock

(a) In the context of this TSI the subsystem rolling stock is subdivided into the following categories.

- (1) Category A passenger rolling stock (including passenger locomotives) for operation on lines within the scope of this TSI, where the distance between evacuation and rescue points or the length of tunnels does not exceed 5km.
- (2) Category B passenger rolling stock (including passenger locomotives) for operation in all tunnels on lines within the scope of this TSI, irrespective of the length of the tunnels.
- (3) Freight locomotives and self-propelling units designed to carry payload other than passengers, such as mail and freight for example, for operation in all tunnels on lines within the scope of this TSI, irrespective of the length of the tunnels. Locomotives designed to haul freight trains as well as passenger trains fall under both categories and shall respect the requirements of both categories.
- (4) Self-powered on-track machines, when in transport mode, for operation in all tunnels on lines within the scope of this TSI, irrespective of the length of the tunnels.

(b) The rolling stock category shall be recorded in the technical file and will remain valid regardless of future revisions of this TSI.

4.2.3.1. Measures to prevent fire

This section is applicable to all categories of rolling stock.

4.2.3.1.1 Material requirements

Requirements are set out in the LOC&PAS TSI clause 4.2.10.2.1. These requirements shall also apply to the on-board CCS equipment.

4.2.3.1.2 Specific measures for flammable liquids

Requirements are set out in the LOC&PAS TSI clause 4.2.10.2.2.

4.2.3.1.3 Hot axle box detection

Requirements are set out in the LOC&PAS TSI clause 4.2.10.2.3.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

4.2.3.2. Measures to detect and control fire

4.2.3.2.1 Portable fire extinguishers
Requirements are set out in the LOC&PAS TSI clause 4.2.10.3.1.
4.2.3.2.2 Fire detection systems
Requirements are set out in the LOC&PAS TSI clause 4.2.10.3.2.
4.2.3.2.3 Automatic fire fighting system for freight diesel units
Requirements are set out in the LOC&PAS TSI clause 4.2.10.3.3.
4.2.3.2.4 Fire containment and control systems for passenger rolling stock
Requirements are set out in the LOC&PAS TSI clause 4.2.10.3.4.
4.2.3.2.5 Fire containment and control systems for freight locomotives and freight self-propelling units
Requirements are set out in the LOC&PAS TSI clause 4.2.10.3.5.

4.2.3.3. Requirements related to emergencies

4.2.3.3.1. Emergency lighting system in the train
Requirements are set out in the LOC&PAS TSI clause 4.2.10.4.1.
4.2.3.3.2 Smoke control
Requirements are set out in the LOC&PAS TSI clause 4.2.10.4.2.
4.2.3.3.3. Passenger alarm and communication means
Requirements are set out in the LOC&PAS TSI clause 4.2.10.4.3.
4.2.3.3.4 Running capability
Requirements are set out in the LOC&PAS TSI clause 4.2.10.4.4.

4.2.3.4. Requirements related to evacuation

4.2.3.4.1 Passenger emergency exits
Requirements are set out in the LOC&PAS TSI clause 4.2.10.5.1.
4.2.3.4.2 Driver's cab emergency exits
Requirements are set out in the LOC&PAS TSI clause 4.2.10.5.2.

4.3. Functional and technical specifications of the interfaces

4.3.1. Interfaces with the Control-Command-Signalling subsystem

Interface with the CCS subsystem			
SRT TSI		**CCS TSI**	
Parameter	Clause	Parameter	Clause
Radio communication	4.2.1.8 (a)	Mobile communication functions for railways GSM-R	4.2.4
Material characteristics	4.2.1.3	Essential requirements	Chapter 3
Material characteristics	4.2.3.1.1	Essential requirements	Chapter 3

4.3.2. Interfaces with the Traffic Management and Operation subsystem

Interface with the OPE subsystem			
SRT TSI		**OPE TSI**	
Parameter	**Clause**	**Parameter**	**Clause**

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

Interface with the OPE subsystem			
SRT TSI		**OPE TSI**	
Emergency rule	4.4.1	Ensuring that the train is in running order Train departure Degraded Operation	4.2.2.7 4.2.3.3 4.2.3.6
Tunnel emergency plan Exercises Provision of on-train safety and emergency information to passengers	4.4.2 4.4.3 4.4.5	Managing an emergency situation	4.2.3.7
Tunnel specific competence of the train crew and other staff	4.6.1	Professional competency	4.6.1

4.4. Operating rules

(a) Operating rules are developed within the procedures described in the Infrastructure Manager safety management system. These rules take into account the documentation related to operation which forms a part of the technical file as required in Article 15(4) and set out in Annex IV of Directive (EU) 2016/797 .

(b) The following operating rules do not form any part of the assessment of the structural subsystems.

4.4.1. Emergency rule

These rules apply to all tunnels.

In light of the essential requirements in Chapter 3, the operating rules specific to tunnel safety are:

(a) The operational rule is to monitor the train condition before entering a tunnel in order to detect any defect detrimental to its running behaviour and to take appropriate action.

(b) In the case of an incident outside the tunnel, the operational rule is to stop a train with a defect that could be detrimental to its running behaviour before entering a tunnel.

(c) In the case of an incident inside the tunnel the operational rule is to drive the train out of a tunnel, or to the next evacuation and rescue point.

4.4.2. Tunnel emergency plan

These rules apply to tunnels of more than 1km in length.

(a) An emergency plan shall be developed under the direction of the Infrastructure Manager(s), in co-operation with the emergency response services and the relevant authorities for each tunnel. Station managers shall be equally involved if one or more stations are used as a safe area or an evacuation and rescue point. In case the emergency plan concerns an existing tunnel, Railway Undertakings already operating in the tunnel must be consulted. In case the emergency plan concerns a new tunnel, Railway Undertakings planning to operate in the tunnel may be consulted.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(b) The emergency plan shall be consistent with the self-rescue, evacuation, fire-fighting and rescue facilities available.
(c) Detailed tunnel-specific incident scenarios adapted to the local tunnel conditions shall be developed for the emergency plan.
(d) Once developed, the emergency plan shall be communicated to Railway Undertakings intending to use the tunnel

4.4.3. Exercises

These rules apply to tunnels of > 1km.
(a) Prior to the 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.
(b) 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. Switching off and Earthing procedures

These rules apply to all tunnels.
(a) In the case it is required to switch off the traction power supply system the infrastructure manager shall make sure that relevant sections of the contact line have been switched off, and inform the emergency response services before they enter the tunnel or a section of the tunnel.
(b) It is the responsibility of the infrastructure manager to switch off the traction power supply.
(c) Procedures and responsibilities for earthing of the contact line shall be defined between the Infrastructure Manager and the emergency response services, and reported in the emergency plan. Provision shall be made for switching off the section in which the incident has taken place.

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

(a) Railway undertakings shall inform passengers of on board emergency and safety procedures related to tunnels.
(b) When such information is in written or spoken form, it shall be presented in the language of the country the train is running in as a minimum, plus English.
(c) An operating rule shall be in place describing how the train crew ensures the complete evacuation of the train when this is necessary, including those people with hearing impairments that may be in closed areas.

4.4.6. Operational rules related to trains running in tunnels

(a) Vehicles in conformity with the TSI as defined in clause 4.2.3 shall be permitted to operate in tunnels in accordance with the following principles:
    (1) Category A passenger rolling stock shall be deemed to comply with the tunnel safety requirements for rolling stock on lines where the distance between evacuation and rescue points, or the length of tunnels does not exceed 5km.
    (2) Category B passenger rolling stock shall be deemed to comply with the tunnel safety requirements for rolling stock on all lines.
    (3) Freight locomotives shall be deemed to comply with the tunnel safety requirements for rolling stock on all lines. However, Infrastructure Managers of tunnels longer than 20km are permitted to require locomotives with a

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

running capability equivalent to that of category B passenger rolling stock for hauling freight trains in such tunnels. This requirement shall be clearly stated in the Network Statement of the IM.

(4) On-track machines shall be deemed to comply with the tunnel safety requirements for rolling stock on all lines.

(5) Freight trains shall be admitted in all tunnels according to the conditions specified in clause 1.1.3.1. Operational rules may manage the safe operation of freight and passenger traffic, by separating these types of traffic for example.

(b) Operation of Category A rolling stock is permitted on lines where the distance between evacuation and rescue points, or the length of tunnels exceeds 5km, in the case where there are no passengers on board.

(c) Operational rules shall be put in place to avoid spontaneous, uncontrolled evacuation in the case of a prolonged stop of a train in a tunnel without the occurrence of a hot or cold incident.

4.5. Maintenance rules

4.5.1. Infrastructure

(a) Before placing a tunnel into service a maintenance file shall be prepared setting out at least:

(1) Identification of elements which are subject to wear, failure, ageing or other forms of deterioration or degradation,

(2) Specification of the limits of use of the elements under (1) and a description of the measures to be taken to prevent these limits being exceeded,

(3) Identification of those elements which are relevant to emergency situations and their management,

(4) Necessary periodic checks and servicing activities to ensure the proper functioning of the parts and systems under (3).

4.5.2. Maintenance of rolling stock

The maintenance requirements for rolling stock are set out in the LOC&PAS TSI.

4.6. Professional qualifications

(a) The professional qualifications of staff required for operations specific to tunnel safety within the subsystems covered 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

(a) All professional staff driving and accompanying a train, as well as staff that authorise train movements, shall have the knowledge and ability to apply that knowledge to manage degraded situations in the event of an incident.

(b) For staff undertaking the tasks of accompanying trains, the general requirements are specified in the OPE TSI.

(c) Train crew as defined in the OPE TSI shall have knowledge of the appropriate safety behaviour in tunnels and in particular be able to evacuate the people on board a train, when the train is stopped in a tunnel.

(d) This involves in particular instructing the passengers to go to the next coach or to exit the train, and to lead them outside the train to a safe area.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

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

(f) 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

(a) The health and safety conditions of staff required for operations specific to tunnel safety for the subsystems concerned by this TSI and for the implementation of the TSI are as follows:

4.7.1. Self-rescue device

(a) 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 either the specification referenced in appendix A, index 2 or the specification referenced in appendix A, index 3. The RU shall choose one of the two solutions defined in these specifications.

5. INTEROPERABILITY CONSTITUENTS

There are no interoperability constituents 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 constituents have been defined in the SRT TSI.

6.2. Subsystems

6.2.1. EC verification (general)

(a) The EC verification of a Subsystem shall be performed according to one or a combination of the following modules as defined in Decision 2010/713/EU:

- Module SB: EC-type examination
- Module SD: EC verification based on quality management system of the production process
- Module SF: EC verification based on product verification
- Module SG: EC verification based on unit verification
- Module SH1: EC verification based on full quality management system plus design examination

(b) 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. Procedures for EC verification of a subsystem (modules)

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

Assessment procedures

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

Subsystem to be assessed	Module SB+SD	Module SB+SF	Module SG	Module SH1
Rolling Stock Subsystem	X	X		X
Energy subsystem			X	X
Infrastructure subsystem			X	X

(b) The characteristics of the subsystem to be assessed during the relevant phases are indicated in appendix B.

6.2.3. Existing solutions

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

(b) The applicant shall demonstrate that the 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

(a) Innovative solutions are technical solutions which do meet the functional requirements and spirit of this TSI, but are not fully in compliance with it.

(b) If an innovative solution is proposed, the manufacturer or his authorised representative established within the European Union shall apply the procedure described in Article 8.

6.2.5. Assessment of maintenance

(a) According to Article 15 (4) of Directive (EU) 2016/797, the applicant shall be responsible for compiling the technical file, containing the documentation requested for operation and maintenance.

(b) The notified body shall verify only that the documentation requested for operation and maintenance, as defined in clause 4.5 of this TSI, is provided. The notified body is not required to verify the information contained in the documentation provided.

6.2.6. Assessment of conformity to the Safety requirements applying to the Infrastructure and Energy subsystems

(a) This clause applies when a comparison with a reference system or an explicit risk estimation is used to meet the essential requirement ‘Safety’ applying to the Infrastructure and Energy subsystems.

(b) In such case, the applicant shall:

(1) determine the risk acceptance principle, the methodology for the risk assessment, the safety requirements to be fulfilled by the system and the demonstration that they are fullfilled;

(2) determine the risk acceptance levels with the relevant national authority/authorities;

(3) designate the independent assessment body as defined in the CSM on risk assessment. This assessment body can be the notified body selected for the

Any printed copy is uncontrolled. The version in force is available on Agency’s intranet/extranet.

Infrastructure or Energy subsystem if recognised or accredited as per Article 7 of the CSM on risk assessment.

(c) A safety assessment report shall be provided in compliance with the requirements defined in the CSM on risk assessment.

(d) The EC certificate issued by the notified body shall explicitly mention the risk acceptance principle used for meeting the 'Safety' requirement of this TSI. It shall also mention the methodology applied for the risk assessment and the risk acceptance levels.

6.2.7. Additional requirements for assessment of specifications concerning the IM

6.2.7.1. Not used

6.2.7.2. Fire resistance of tunnel structures

(a) The Notified Body shall assess conformity with the fire protection requirements for structures, defined in 4.2.1.2, by using the results of calculations and/or tests made by the applicant, or by an equivalent method.

(1) To demonstrate that the integrity of the tunnel lining is maintained during a period of time that is sufficiently long to permit self-rescue, evacuation of passengers and staff and intervention of the emergency response services, demonstration that the tunnel lining can withstand a temperature of 450°C at ceiling level during that same period of time is sufficient.

This verification is not needed for rock tunnels without additional support.

6.2.7.3. Fire reaction of building material

(a) For the assessment of 4.2.1.3 (b), the Notified Body shall only check that the list of material that would not contribute significantly to a fire is present.

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

(a) 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 clause 4.2.1.5. For assessing the evolution of the conditions in the safe area during an incident, the Notified Body shall verify that doors and structures separating the safe area from the tunnel can withstand the elevation of temperature in the closest tube.

6.2.7.5. Emergency lighting in upgraded/renewed tunnels

(a) In case of upgraded/renewed tunnels as required by clause 7.2.2.1, the assessment consists in the verification of the existence of the lighting. It is not necessary to apply detailed requirements.

6.2.7.6. Reliability of electrical systems

(a) The Notified Body shall confirm only that a failure mode assessment complying with the functional requirements of 4.2.1.10 has been carried out.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

6.2.8. Additional requirements for assessment of specifications concerning the RU

6.2.8.1. Self-rescue device

(a) The conformity assessment is described in the specifications referenced in Appendix A, indexes 2, 3, 4.

7. IMPLEMENTATION

This section defines the implementation strategy for the SRT TSI.

(a) This TSI does not require modifications of subsystems which are already in service unless they are upgraded or renewed.

(b) If not defined otherwise in section 7.3 'Specific Cases', all new TSI compliant category B rolling stock is deemed to achieve a higher fire and tunnel safety level than non-TSI compliant rolling stock. This assumption is used to justify the safe operation of new TSI-compliant rolling stock in old non-TSI compliant tunnels. Therefore, all TSI compliant category B trains are deemed to be technically compatible with all non-TSI compliant tunnels within the geographical scope of this TSI in accordance with Article 21(3) of Directive (EU) 2016/797 .

(c) Notwithstanding the above, measures over and above those set out in this TSI may be necessary to achieve the desired tunnel safety level. Such measures may only be imposed on the subsystems Infrastructure, Energy and Operations and shall not restrict the authorisation or use of TSI compliant rolling stock.

7.1. Application of this TSI to new subsystems

7.1.1. General

(a) This TSI is applicable to all subsystems in its scope which are placed into service after the date of application of this TSI, except when defined otherwise in the sections below.

(b) The application of this TSI to on-track machines is voluntary. Where on-track machines are not assessed and declared to be in conformity with this TSI, they shall be subject to national rules.

7.1.2. New rolling stock

(a) For new rolling stock, the implementation rules set out in clause 7.1.1 of the LOC&PAS TSI shall be applied.

7.1.3. New Infrastructure

(a) This TSI is applicable to all new Infrastructure in its scope.

7.2. Application of this TSI to subsystems already in service

7.2.1. Upgrade or renewal of rolling stock

(a) In case of renewal or upgrade of existing rolling stock, the implementation rules as set out in the clause 7.1.2 of LOC&PAS TSI shall be applied.

7.2.2. Upgrade and renewal measures for tunnels

(a) In case of the upgrade or renewal of a tunnel,according to Article 15(7) and Annex IV of Directive (EU) 2016/797, the notified body issues certificates of verification for those parts of the subsystem composing the tunnel under the scope of the upgrade or renewal.

7.2.2.1. Upgrade or renewal of a tunnel

(a) A tunnel is considered to be upgraded or renewed in the context of this TSI when any major modification or substitution work are carried out on a subsystem (or part of it) composing the tunnel.

(b) 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.

(c) When upgrading or renewal works are carried out, the following parameters apply if they are in the scope of work:

- 4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms
- 4.2.1.3. Fire reaction of building material
- 4.2.1.4. Fire detection in technical rooms
- 4.2.1.5.4 Emergency lighting: when provided, it is not necessary to apply detailed requirements
- 4.2.1.5.5 Escape signage
- 4.2.1.8. Emergency communication

(d) The tunnel emergency plan shall be revised.

7.2.2.2. Extension of a tunnel

(a) A tunnel is considered to be extended in the context of this TSI when its geometry is affected (e.g. extension in length, connection to another tunnel).

(b) When a tunnel extension is carried out, then the following measures shall be implemented for assemblies and components included in the extension. For their application, the tunnel length to consider is the total tunnel length after extension:

- 4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms
- 4.2.1.2. Fire resistance of tunnel structures
- 4.2.1.3. Fire reaction of building material
- 4.2.1.4. Fire detection in technical rooms
- 4.2.1.5.4 Emergency lighting
- 4.2.1.5.5 Escape signage
- 4.2.1.6. Escape walkways
- 4.2.1.8. Emergency communication
- 4.2.1.9. Electricity supply for emergency response services
- 4.2.1.10. Reliability of electrical systems
- 4.2.1.11 Communication and lighting at switching locations
- 4.2.2.1. Sectioning of contact line
- 4.2.2.2. Earthing of contact line

(c) The CSM on risk assessment shall be implemented as described in point 6.2.6 for defining the relevance of applying the other measures of clause 4.2.1.5 and the measures of clause 4.2.1.7 to the complete tunnel resulting from the extension.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

(d) When applicable, the tunnel emergency plan shall be revised.

7.2.3. Operation subsystem

(a) Operational aspects and their implementation are set out in the OPE TSI.
(b) When commissioning an upgraded or renewed tunnel, the requirements for new tunnels in this TSI apply.

7.2.4. Operation of new rolling stock in existing tunnels

(a) The category of new rolling stock intended to be operated in existing tunnels shall be selected according to clause 4.4.6 (a).
(b) However, a Member State may allow operation of new rolling stock of category A in existing tunnels longer than 5km under the condition that the operation of such new rolling stock offers an equivalent or improved level of fire safety compared to the operation of previous rolling stock. The equivalent or improved level of safety to passengers and staff shall be demonstrated using the Common Safety Method on risk assessment.

7.3. Specific cases

7.3.1. General

(a) The specific cases, as listed in the following clause, describe special provisions that are needed and authorised on particular networks of each Member State.
(b) These specific cases are classified as:
- "P" cases: "permanent" cases.
- "T0": "temporary" cases of indefinite duration, where the target system shall be reached by a date still to be determined.
- "T1" cases: "temporary" cases, where the target system shall be reached by 31 December 2025.
- "T2" cases: "temporary" cases, where the target system shall be reached by 31 December 2035.

All specific cases and their relevant dates shall be re-examined in the course of future revisions of the TSI with a view to limiting their technical and geographical scope based on an assessment of their impact on safety, interoperability, cross border services, TEN-T corridors, and the practical and economic impacts of retaining or eliminating them. Special account shall be given to availability of EU funding. Specific cases shall be limited to the route or network where they are strictly necessary and taken account of through route compatibility procedures.

(c) Any specific case applicable to rolling stock within the scope of this TSI in detailed in the LOC&PAS TSI.

7.3.2. Operational rules related to trains running in tunnels (clause 4.4.6)

- **Specific case Italy** ("T0")

Additional prescriptions for rolling stock intended to be operated in existing Italian tunnels are detailed in the LOC&PAS TSI, clause 7.3.2.20.

- **Specific case Channel Tunnel** ("P")

Additional prescriptions for passenger rolling stock intended to be operated in the Channel Tunnel are detailed in the LOC&PAS TSI, clause 7.3.2.21.

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

Appendix A: Standards or Normative Documents Referred to in this TSI

	TSI		
Index N°	Characteristics to be assessed	Clause	Normative document
1	Design of escape signage	4.2.1.5.5	ISO 3864-1:2011
2	Specification and assessment of self-rescue device	4.7.1 6.2.8.1	EN 402:2003
3	Specification and assessment of self-rescue device	4.7.1 6.2.8.1	EN 403:2004
4	Assessment of self-rescue device	6.2.8.1	EN 13794:2002

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.

Appendix B: Assessment of the Subsystems

For rolling stock, the sub-system characteristics that must be assessed in the different phases of design , development and production are specified in the LOC&PAS TSI.
For infrastructure and energy, the sub-system characteristics that must be assessed in the different phases of design, development and production are marked by X in the following table.

Characteristics to be assessed	Project phase		Particular assessment procedures
	Design review	Assembly before putting into service	
	1	2	3
4.2.1.1. Prevent unauthorised access to emergency exits and technical rooms	X	X	
4.2.1.2. Fire resistance of tunnel structures	X		6.2.7.2
4.2.1.3. Fire reaction of building material	X		6.2.7.3
4.2.1.4. Fire detection in technical rooms	X	X	
4.2.1.5. Evacuation facilities	X	X	6.2.7.4 6.2.7.5
4.2.1.6. Escape walkways	X	X	
4.2.1.7 Evacuation and rescue points	X	X	
4.2.1.8 Emergency communication	X		
4.2.1.9. Electricity supply for emergency response services	X		
4.2.1.10. Reliability of electrical systems	X		6.2.7.6
4.2.2.1. Sectioning of contact line	X	X	
4.2.2.2. Earthing of contact line	X	X	

Any printed copy is uncontrolled. The version in force is available on Agency's intranet/extranet.