European Railway Agency

Guide for the application of the SRT TSI

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0. DOCUMENT INFORMATION

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Table 1 : Status of the document

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1. SCOPE OF THIS GUIDE

1.1. Scope

This document is an annex to the Guide for the application of TSIs. It provides information on the application of the Technical Specification for Interoperability on Safety in Railway Tunnels adopted by Commission Regulation 1303 of 18 November 2014.

The guide should be read and used only in conjunction with the SRT TSI. It is intended to facilitate its application, but does not replace it.
The general part of the 'Guide for the application of TSIs' should also be considered.

1.2. Content of the guide

In section 2 of this document, extracts of the original text of the SRT TSI are provided, in a shaded text box, and these are followed by text that provides guidance.

Guidance is not provided for clauses where the SRT TSI requires no further explanation.

Guidance is provided for voluntary application. It does not mandate any requirement in addition to those set out in the SRT TSI.

Guidance is given by means of further explanatory text and, where relevant, by reference to standards that demonstrate compliance with the SRT TSI; relevant standards are listed in section 3 of this document.

The guide also contains some recommendations for the implementation strategy.

1.3. Reference documents

Reference documents are listed in the general part of the 'Guide for the application of TSIs' which is available on ERA's website: http://www.era.europa.eu/Document-Register/Pages/TSI-Application-Guide-general-part.aspx

1.4. Definitions and abbreviations

Definitions and abbreviations are given in the SRT TSI, clause 2.4 and in the general part of the 'Guide for the application of TSIs'.

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2. CLARIFICATIONS ON THE SRT TSI

2.1. Foreword

This document takes into account the experience gained while drafting the TSIs and related documents (EC Decisions: 2008/232/EC, 2008/163/EC, 2008/284/EC, 2011/291/EC and 2012/464/EC).

2.2. Essential requirements

The essential requirements cover:

- safety,
- reliability and availability,
- health,
- environmental protection,
- technical compatibility.

and are addressed in chapter 3 of the TSI.

2.3. Characteristics of the subsystem

The following clauses refer to the chapters, sections and clauses of the TSI referenced within this chapter.

2.3.1. Scope related to tunnels (clause 1.1.1)

(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 of 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 fire fighting points, they shall comply only with the specifications of clauses 4.2.1.7 (c) and 4.2.1.7 (e) of this TSI.

National rules include requirements for evacuation and fire safety in underground stations. The boundaries between the tunnel structure and the station area are best decided on a project-specific basis (i.e. case by case).

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2.3.2. Risk scope, risks that are not covered by this TSI (clause 1.1.4)

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

The IM and the RU are required to control the tunnel-specific risks as part of their safety management system (SMS). Consequently, the TSI does not require the IM to perform a risk analysis for every single tunnel.

2.3.3. Prevent unauthorised access to emergency exits and technical rooms (clause 4.2.1.1)

This specification applies to all tunnels.

[…]

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

All emergency escape doors should be fitted with an easy to open exit device (sometimes referred to as anti-panic locks) from the inside without the use of a key or a tool.

2.3.4. Fire resistance of tunnel structures (clause 4.2.1.2)

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 sufficiently long to permit self-rescue, evacuation of passengers and staff and intervention of emergency response services. That period of time shall be in accordance with the evacuation scenario and reported in the Emergency Plan.

(b) In the cases of immersed tunnels and tunnels which can cause the collapse of important neighbouring structures, the tunnel main structure shall withstand the temperature of the fire for a period of time allowing evacuation of the endangered tunnel zones and neighbouring structures. This period of time shall be reported in the emergency plan.

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"Important neighbouring structures" can be elevated, permanently occupied constructions (such as offices, lodgings, business premises) or serve as a temporary gathering of people (such as theatres or cinemas) as well as all multi-storey structures which are only subject to short-term occupancy (such as multi-storey car parks and warehouses), airports, power plants, motorways, etc.

At the beginning of a tunnel project, the IM, in consultation with the relevant authorities, should define which important neighbouring structures can potentially collapse due to failure of the projected main tunnel structure.

The emergency doors giving access to a safe area are not considered to be part of the tunnel structure. Therefore, they are not subject to the requirements in 4.2.1.2 (a) and (b).

2.3.5. Fire reaction of building material (clause 4.2.1.3)

(b) Tunnel building material shall fulfil the requirements of classification A2 of Commission Decision 2000/147/EC[1]. Non-structural panels and other equipment shall fulfil the requirements of classification B of Commission Decision 2000/147/EC.

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

The IM should identify the tunnel building materials which are captured by the requirements of clause (b). The materials mentioned in clause (b) and clause (c) can be listed together.

EN 13501-1:2007+A1:2009 is a European harmonised standard supporting Decision 2000/147/EC.

Some examples of materials not contributing significantly to the fire load are:

- Anti-panic devices in doors
- Lighting bulbs, LEDs, switches.
- Escape Signage
- Signalling system balises, ordinary signals
- Polymer rail pads
- Polymer sleeper boots

[1] *Commission Decision 2000/147/EC of 8 February 2000 implementing Council Directive 89/106/EEC as regards the classification of the reaction to fire performance of construction products (OJ L 50, 23.2.2000, p. 14–18).*

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2.3.6. Evacuation facilities (clause 4.2.1.5)

The PRM TSI specifies the technical characteristics that apply to stations in order to enhance their accessibility for persons with disabilities and persons with reduced mobility. The technical requirements prescribed in the PRM TSI do not apply to tunnels. However, the presence of persons with disabilities and/or persons with reduced mobility should be considered in the emergency plan.

2.3.7. Access to the safe area (clause 4.2.1.5.2)

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

[...]

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

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

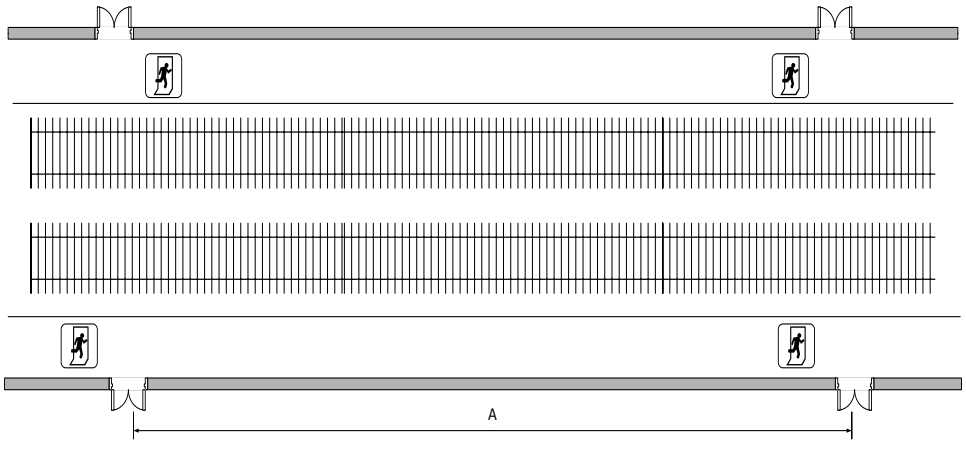
(2) Cross-passages between adjacent independent tunnel tubes, which enable the adjacent tunnel tube to be employed as a safe area. Cross-passages shall be provided at least every 500 m.

[...]

The distance between doors giving access to a safe area should be measured as follows:

- Between the doors centres
- Parallel to the tunnel lining

In the example below, A is the distance between the doors giving access to the safe area.



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[...]

(3) Alternative technical solutions providing a safe area with a minimum equivalent safety level are permitted. The equivalent level of safety to passengers and staff shall be demonstrated using the Common Safety Methods on risk assessment[2].

Some particular, non-exhaustive examples of alternative technical solutions are given below.

- Tunnels with particular geometry not covered by the TSI, e.g.
  - a single bore tunnel that splits into two bores below the ground (in the area where the tunnel splits in two);
  - two double bore tunnels crossing at different heights below ground;
  - and other particular tunnel geometries
- Tunnels of any geometry where the distance between the access points to the safe areas is greater than 500/1000 m, but this is balanced by additional safety measures providing at least the same safety level as the specified solutions in the TSI, such as a ventilation system, additional access points in a given area, larger walkways, etc.

  For example, two consecutive tunnels of a high speed line with the following characteristics:
  - single track in two tubes
  - around 11 km long each
  - Intervention shafts (passage between the tunnel and the ground level) to be used by the emergency response services

  are equipped with cross passages approximately every 150 m in the shaft areas, and up to as much as every 850 m in the tunnel zones furthest from the shafts.

  Additionally, the tunnels are equipped with positive and controllable ventilation to manage the direction of air and smoke linked with simple emergency plans to be activated depending on the defined circumstances for a particular tunnel incident.

2 Commission Regulation (EC) No 352/2009 of 24 April 2009 on the adoption of a common safety method on risk evaluation and assessment as referred to in Article 6(3)(a) of Directive 2004/49/EC of the European Parliament and of the Council *(OJ L 108, 29.4.2009, p 4).*

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[...]

(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 the emergency response services access the safe area shall be described in the emergency plan.

The evacuation route includes in particular the width of the walkway and the cross passages between the walkway and the safe area, that are necessary for evacuation.

The clearway defined by a width of 1.5m and a height of 2.25m in point (d) above is sufficient for the evacuation of passengers and if needed the intervention of the emergency response services. However, in the case of evacuation routes with complex geometry (e.g. bends, chicanes) additional clear width and height may be beneficial to permit evacuation of people on stretchers if necessary. This additional clearance should be adopted by the applicant on a voluntary basis.

2.3.8. Communication means in safe areas (clause 4.2.1.5.3)

[...]

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

The communication to the control centre of the IM can be established by the RU, the emergency response services or the IM, either directly, or through a telephone operator, as is the case for emergency telephone numbers.

If the tunnel on a line is fitted with GSM-R, it should be possible to communicate with the control centre of the IM through the GSM-R mobile phone system. The passengers are not expected to contact the IM control centre as this will be subject to the emergency procedures agreed between the RU, IM and the emergency response services.

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2.3.9. Emergency lighting on escape routes (clause 4.2.1.5.4)

[…]

(b) Illumination shall comply with the following requirements:

(3) Position of lights:

- *above the walkway, as low as possible, so as not to interfere with the free space for the passage of persons, or*
- *built into the handrails.*

In case of smoke in the tunnel, the smoke plume will concentrate at the ceiling and will progressively get lower: for that reason, it is advisable to locate the emergency lightning as low as possible above the floor of the escape route. The emergency lights will then trace the way to escape and remain visible, thus providing more illumination on the escape route under smoke conditions for a longer period of time.

In particular situations where it is expected that the smoke will behave differently due to the particular tunnel geometry, or where a ventilation system (not a requirement of the TSI) has been provided, it may be possible for lights to be located above the handrails.

The use of LED lighting is permitted.

2.3.10. Escape signage (clause 4.2.1.5.5)

This specification applies to all tunnels.

[…]

(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-passage shall be marked.

In order to avoid people entering a technical area with no exit during self-evacuation, it is recommended that the doors leading to the technical rooms are marked accordingly.

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2.3.11. Escape walkways (clause 4.2.1.6)

In single bore tunnels equipped with at least 2 tracks supported by a concrete slab, it may be acceptable to use the adjacent track as a walkway, provided the slab track meets the requirements for walkways in the TSI.

In such cases, the conditions of its use of the slabtrack as an escape walkway, should be described in the emergency plan.

2.3.12. Fire fighting points (clause 4.2.1.7)

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 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 along a safe space. The safe space shall contain all passengers of the maximum capacity of the train intended to be operated on the line.

(b) Fire fighting 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:

Tunnel length	*Rolling stock category according to paragraph 4.2.3*	*Maximum distance from the portals to a fire fighting point and between fire fighting points*
1 to 5 km	*Category A or B*	*No fire fighting point required*
5 to 20 km	*Category A*	*5 km*
5 to 20 km	*Category B*	*No fire fighting point required*
>20 km	*Category A*	*5 km*
>20 km	*Category B*	*20 km*

[...]

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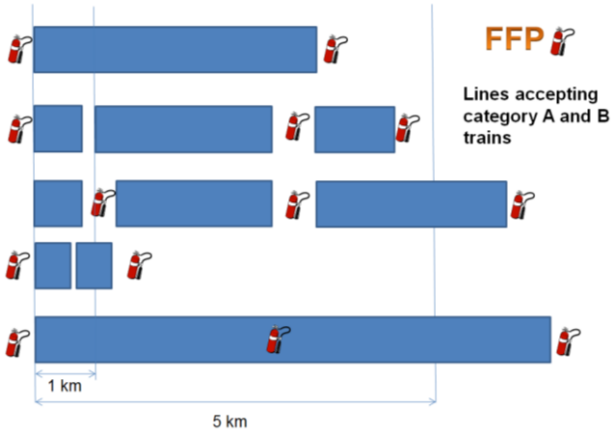
This guidance is intended to clarify the requirements for the distribution of fire fighting points within tunnels, including the case for a line fitted with consecutive tunnels.

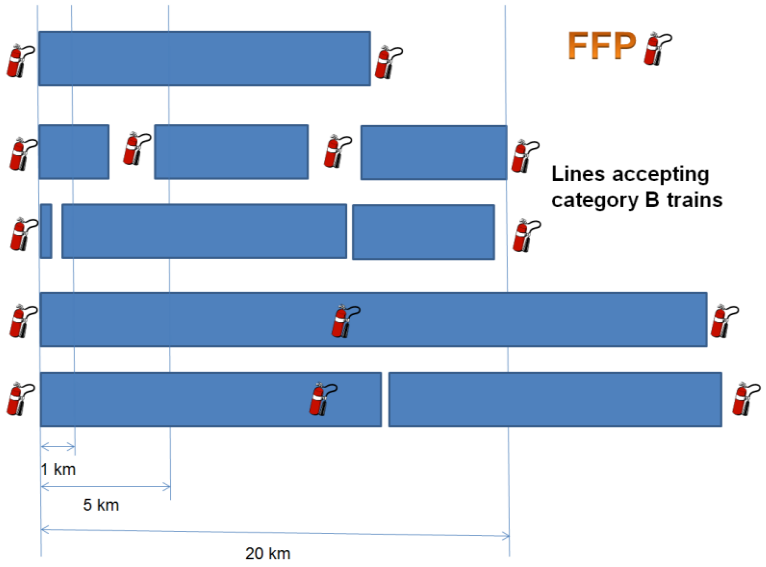
New tunnels shorter than 1km may require fire fighting points at one of their portals when they are followed by another tunnel and:

- the sum of the lengths of both tunnels is greater than 1km and
- the open air area between consecutive tunnels is not sufficient for a safe evacuation.

However, new tunnels longer than 1km may not require a fire fighting point at both portals when they are followed by another tunnel and the open air area in between them is not sufficient for a safe evacuation.

Some examples of TSI compliant configurations of fire fighting points and tunnels are given below. Fire fighting points do not have to be provided when the requirements of either 4.2.1.7 (a) (1) or 4.2.1.7. (a) (2) are not satisfied.





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The separation between consecutive tunnels defined in point 4.2.1.7 (a) (1) is linked to the maximum length of the trains that will operate in the tunnel. This is required to ensure that all passenger and staff exits of any train travelling on a line fitted with several tunnels, will remain outside a tunnel if the train is evacuated in the separation gap between consecutive tunnels. Therefore,

- Only the longest train operating with passengers should be taken into consideration. Passenger trains with no passengers on board should not be considered (e.g. a passenger train being towed by another after a breakdown)
- The maximum train length is no longer defined in the revised LOC&PAS TSI. Therefore, the IM may take into account the maximum train length already imposed by other requirements for operation of trains on the line where the consecutive tunnels are fitted, e.g. length of the platforms at the stations.
- If a line is dedicated to freight traffic, the separation between tunnels in open air may be 100 m + the length of the longest freight locomotive operating on the line.

[...]

(b) Fire fighting 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: [...]

The Fire Fighting Point locations outside the tunnel portals do not have to coincide exactly with the portal position. It may be placed further away from the portal position outside the tunnel due to, topographical reasons, the length of the train, or urban environmental constraints, for example.

In all cases, the distances between fire fighting points defined in table 4.2.1.7 (b) (2), must be respected.

[...]

(c) Requirements for all fire fighting points:

(1) The fire fighting 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 fire fighting points shall be accessible to emergency response services. The way the emergency response services access the fire fighting point and deploy equipment shall be described in the emergency plan.

[...]

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The water flow of 800 l/min is a minimum value. Local and operational aspects such as the response time of the emergency response services, the type of water source, and the method of supplying the water, should be considered by the applicant.

The water source can be a hydrant or any water supply such as a basin, river or other means.

(c) Requirements for all fire fighting points:

[...]

(4) It shall be possible to switch off the traction energy supply and earth the fire fighting points electrical installation, either locally or remotely..

This may be achieved either by direct operation or by a remote control system activated from a control centre at the request from:

- The train staff, from the train cab
- The train staff, IM staff or the emergency response services, from communication equipment inside the tunnel

(d) Requirements for fire fighting points outside the portals of the tunnel

In addition to the requirements in 4.2.1.7 (c), fire fighting points outside the portals of the tunnel shall comply with the following requirements:

(1) The open air area around the fire fighting point shall offer a minimum surface of 500 m².

The open air area around the fire fighting point may consist of roads, parks or other areas suitable for evacuation and rescue operations. It does not need to be a dedicated area as long as it complies with points 4.2.1.7. (c) and 4.2.1.7 (d).

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(e) Requirements for fire fighting points inside the tunnel

In addition to requirements in 4.2.1.7 (c), fire fighting points inside the tunnel shall comply with the following requirements

(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 fire fighting point shall offer a sufficient standing surface relatively 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 fire fighting 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.

A final place of safety is the termination of an escape route from the tunnel giving access to an open space outside the tunnel, and sited to ensure that people can disperse safely from the vicinity of the tunnel and the effects of the fire.

The TSI does not specify a minimum surface area per person ratio in the safe area which is coupled with the internal fire fighting point. This is because this ratio depends on many factors, such as the layout of the tunnel, the response time of the emergency response services, etc., and therefore a suitable value may be determined on a case by case basis.

For example, a particular tunnel project adopted a safe area with a standing surface of 0.33 m² per person. This safe area is expected to be self-evacuated in less than 20 minutes. For another tunnel project, the standing surface of the safe area was set at a higher value of 3 m² per person as the tunnel situation and the expected response time of the emergency response services require a waiting time of more than 60 minutes.

Facilities such as toilets, water, seats, etc. may be provided according to the waiting time derived from the evacuation scenarios and reported in the Emergency Plan.

For a particular tunnel project, where ‘alternative technical solutions’ are adopted for provision of access to the safe area, the adequacy of standing surface area may be demonstrated through application of the Common Safety Methods on risk assessment.

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2.3.12.1. Emergency communication (clause 4.2.1.8)

[...](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.

Radio continuity should be provided in stations, tunnels and safe areas.

Where there is agreement between the IM and the emergency response services, the emergency communication equipment could be GSM-R.

2.3.13. Emergency rule (clause 4.4.1)

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 take appropriate action.

[...]

The monitoring of the train before entering the tunnel may be achieved by:

- trackside monitoring and/or
- On-board monitoring

The monitoring of a train from the trackside may include at least one of the following equipment:

- hot axle box and locked axle brake detection
- axle load check points
- profile and antenna checkpoints
- fire- and chemical detection
- pantograph uplift checkpoints or through on-board equipment

On board monitoring may include at least one of the following equipment:

- hot axle box and locked axle brake detection
- fire detection
- pantograph uplift checkpoints or by means of on-board equipment
- traction and/or brake systems.

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The above lists for both trackside and on board monitoring are not exhaustive or mandatory. The definition of the appropriate equipment and operational measures is the responsibility of the IM and RUs through their respective Safety Management Systems.

2.3.14. Tunnel emergency plan (clause 4.4.2)

These rules apply to tunnels of > 1km.

(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. Railway Undertakings intending to use the tunnel shall be involved in the development or adaptation of the Emergency Plan. Station managers shall be equally involved if one or more stations in tunnel are used as safe areas or fire fighting points.

(b) The emergency plan shall be consistent with the self-rescue, evacuation, fire-fighting and rescue facilities available.

(c) Detailed scenarios adapted to local conditions shall be developed for the emergency plans.

According to the TSI, an emergency plan is required to contain at least the following:

- Description of the foreseen emergency scenarios (clauses 2.2 and 4.4.2 (c) of the TSI)
- Period of time for which the integrity of the tunnel lining is maintained in case of fire (clause 4.2.1.2)
- The way the emergency response services access the safe area (clause 4.2.1.5.2 (e))
- Period of time of availability of the alternative power supply for emergency lighting on escape routes after failure of the main power supply. (clause 4.2.1.5.4 (c))
- The method of supplying the water to the Fire Fighting Points (Clause 4.2.1.7. (b) (1)).
- The way the emergency response services access the Fire Fighting Point and deploy equipment (clause 4.2.1.7. (b) (3)).
- Power supply facilities provided for the emergency response services (clause 4.2.2.3 (a))
- Period of time of availability of an alternative power supply after failure of the main power supply (clause 4.2.2.3 (c))
- Procedures to improve the familiarity of all organisations with the infrastructure and the frequency of visits to the tunnel and table top or other exercises (clause 4.4.3 (b))
- The responsibility and procedure for earthing (clause 4.4.4. (c))

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An emergency plan may also contain:

- The responsibilities, names, addresses and telephone numbers, of all relevant organisations; any changes in this respect should be reported immediately and the emergency plan updated accordingly by the IM.
- The identification of the tunnel (which must be unique), and a precise description and plan of the access routes for the emergency response services
- The measures provided and the strategy for ensuring the safety of passengers in the tunnel and for their evacuation, in the event of occurrence of the foreseen emergency scenarios.
- The available evacuation time for the complete evacuation of people to a safe place.
- Information about the facilities provided in the safe area paired with the internal fire fighting point.

The list above is not exhaustive.

2.3.15. Provision of on-train safety and emergency information to passengers (clause 4.4.5)

(a) Railway undertaking 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.

The core content of the information may include:

- In case of fire, and if you are able to do so, try to extinguish the fire by using the on-board extinguishers
- Alerting the train crew
- If there is no immediate danger, await instructions from the train crew
- If necessary, or if instructed, passengers to 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

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The list above is neither exhaustive nor mandatory.

The information may be supplied in spoken form (train staff, recorded messages in the PA system) or in written form (leaflets, pictograms, etc...)

2.3.16. Fire resistance of tunnel structures (clause 6.2.7.2)

[...]

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

In the event of a fire, a rock tunnel that has been constructed without additional support is not likely to collapse and because of this no verification is needed.

Additional support for rock tunnels can be considered to be purpose-designed supporting structures such as sprayed concrete arches, steel frames, or cast in place concrete structures. Conventional rock support using sprayed concrete in combination with rock bolts to provide local support to rock blocks or wedges, is not considered to provide additional support as a supporting structure.

2.3.17. Implementation (chapter 7)

The table below provides some guidance regarding the compatibility between new rolling stock and both new and existing tunnels

	New Rolling Stock category	
Characteristics of tunnel	**Cat A**	**Cat B**
New Tunnels		
Length < 5 km without FFP	OK	OK
Length from 5 km to 20 km without FFP	NOK	OK
Length from 5 km to 20 km with FFP every 5 km	OK	OK
Length > 20 km without FFP	NOK	NOK
Length > 20 km with FFP every 20 km	NOK	OK
Length > 20 km with FFP every 5 km	OK	OK
Existing tunnels		
Length < 5 km	OK	OK
Length from 5 km to 20 km	OK under conditions described in clause 7.2.4	OK except specific cases
Length > 20 km		

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3. APPLICABLE SPECIFICATIONS AND STANDARDS

3.1. Explanation of the use of the specifications and standards

Standards of voluntary use which have been identified during the drafting process of the TSI are listed in the Annex 1; as far as possible, the clause of the standard which is relevant for the conformity assessment of the TSI requirement should be identified.

The Annex 1 is to be completed after review by the National Standards Bodies (NSBs), and updated on a regular basis, in order to take account of new or revised harmonised standards.

For consistency, the Annex 1 should be read with consideration of the Appendix A of the TSI, titled “Standards or normative documents referred to in this TSI”, which lists “Mandatory ref to clause(s) of Standard”; both annexes have the same structure. Standards listed in the Appendix A of the TSI are not always repeated in the Annex 1 of this application guide, even if additional clauses to those identified as mandatory may be used on a voluntary basis.

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Annex 1

Index No.	Reference	Clauses	Document name	Version	BP(s) concerned
1	EN 1125:2008	Relevant clauses. Doors Grade A or B to be selected	Building hardware. Panic exit devices operated by a horizontal bar, for use on escape routes. Requirements and test methods	March 2008	4.2.1.1. (b)
2	EN 13501-1:2007+A1	Relevant clauses	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests	September 2009	4.2.1.3
7	EN 12665:2011	Relevant clauses	Light and lighting — Basic terms and criteria for specifying lighting requirements	October 2011	4.2.1.5.4
8	EN 50172:2004	Chapters 1 to 5	Emergency escape lighting systems	March 2004	4.2.1.5.4

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