



## RECOMMENDATION FOR USE

RFU-INS-035

**CO-ORDINATION BETWEEN NOTIFIED BODIES**  
DIRECTIVES 96/48/EC AND 2001/16/EC ON THE  
INTEROPERABILITY OF THE TRANS-EUROPEAN HIGH-SPEED  
AND CONVENTIONAL RAILWAY SYSTEMS

Issue 01  
Date: 30/04/2009  
Page 1 of 3

### TITLE

INTERPRETATION OF FIRE PROTECTION REQUIREMENTS FOR STRUCTURES

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#### SUBJECT RELATED TO

TSI SRT 4.2.2.3

### DESCRIPTION AND BACKGROUND EXPLANATION

In 4.2.2.3 the TSI SRT says:

The integrity of the structure shall be maintained, in the event of fire, for a period of time sufficiently long to permit self-rescue and evacuation of passengers and staff [part 1.1] and the intervention of rescue services without the risk of structural collapse [part 1.2].

The fire performance of the finished tunnel surface, whether in situ rock or concrete lining, has to be assessed [part 2]. It shall withstand the temperature of the fire for a particular duration of time [part 3]. The specified 'temperature-time curve' (EUREKA-curve) is given in the following figure [part 4]. It is to be used for the design of concrete structures only [part 5].

The interpretation of part 1.1 clearly states: the integrity of the structure must be maintained long enough to allow self rescue and evacuation of the passengers. It has to be stated, that the survival period at locations with gas temperatures above 120°C is extremely limited and in consequence self rescue or evacuation is extremely limited, too.

In part 1.2 of this sentence the requirement for structural integrity is exceeded for rescue services. The rescue services (fire brigades etc.) will have special protection equipment but assistance is only needed in areas with living persons. It is important to point out, that the main target of rescue services is intended to rescue living persons. and the intervention areas for rescue services is limited to locations, where still no structural damage has to be expected.

In part 2 it is stated, that the finished tunnel surface has to be assessed in any case (rock or concrete lining). Rock surfaces for tunnels on the high speed rail network are rarely used in Europe. Moreover limited experience about the behaviour of rock surfaces in case of fires is available.

Part 3 demands that the finished tunnel surface has to withstand the fire for a particular time. No assistance is given how long this "particular time" shall be. The load on the structure is precisely given with the temperature-time curve in the figure below, but the design time period is missing. In conclusion the basic aim of this requirement defined in part 1 has to be applied – a self rescue, evacuation and intervention of rescue services must be guaranteed.

In part 4 the temperature-time curve is specified. In part 5 it is stated that it shall be used only for concrete structures. So the requirements for the assessment of rock surfaces as mentioned in part 2 are missing.

**RECOMMENDATION FOR USE**

Due to the missing requirements for a rock surface it could be interpreted, that it is assumed fire will not cause any damages to stable excavations in unsupported rock. In conclusion concrete linings with no structural function will not change the behaviour of this rock excavation and in consequence no additional requirements will have to be fulfilled by the lining except the fact, that explosive spalling of the lining may not take place in areas where evacuation may take place.

**RFU PROPOSAL**

1) Definition of the time period

The necessity to allow self rescue and the intervention of rescue services is without doubt. However, it is also important to define a temperature limit and a period for a specific time, because any persons alive will not remain in areas with temperatures exceeding certain limits. Inspection works after the fire should be treated separately and all persons should be accompanied by experienced engineers to reduce the risks.

**The particular time period, which is given in the tunnel safety documentation, is defined as the time needed for self rescue or the time needed for assistance by rescue services in the tunnel. For this particular time the integrity of the structure must be maintained according to the temperature-time-curve (EUREKA-curve) given in the TSI SRT.**

2) Definition of the load requirements

Whereas the requirements for concrete structures are defined, the requirements for rock surfaces are missing. We have to distinguish 3 different cases for tunnel structures:

- a) unsupported rock excavation
- b) cosmetic layer of concrete (rock itself is load-carrying structure)
- c) concrete structure (with structural function)

No requirements from the TSI SRT can be interpreted for case a). Obviously, for unsupported, stable rock surfaces it is thought to fulfil all requirements automatically, which concludes that rock surfaces do not lose its function in case of a fire. However, in case national requirements exist these will have to be applied.

For case b) where the concrete surface has no structural function (the unsupported rock is stable) the concrete surface has only to fulfil the requirement of not endangering any persons including rescue services. Due to the lower temperatures in areas where self rescue takes place or rescue services operate no structural collapse has to be expected. Nevertheless it must be demonstrated that the concrete lining can withstand the likely temperature in such areas for a sufficient long time period to allow self rescue or the operation of rescue services without endangering persons. In case



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Page 3 of 3

national requirements exist these will have to be applied in addition.

For case c) the temperature-time curve from 4.2.2.3 has to be used. The time period is defined above. The concrete structure has to withstand this temperature-curve for a sufficient long time period to allow self rescue or the operation of rescue services. This time period does not have to be 170 minutes. It will be significantly shorter if self rescue or rescue services can help in a shorter time and self rescue and operation of rescue services will not take place in areas where such temperatures defined by the temperature time curve are to be expected.

### DATE OF AGREEMENT AT NB RAIL PLENARY MEETING

17 June 2009 (Issue 01)