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Introduction of the european fire safety standard CEN TS 45545

Status

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Today we have in:

- Great Britain: BS 6853 “Fire precautions in the design and construction of railway passengers rolling stock”
- France: AFNOR NF F 16101 “Railway rolling stock fire behaviour - Choice of materials, application to electrical equipment”
  NF F 16103 “Fire protection and fire-fighting - design arrangements”
- Germany: DIN 5510 “Preventive fire protection in railway vehicles

Status

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Today we have in:

- Italy: ST 306574 and 304142, which give advice on the choice and testing of materials, provision of fire barriers and means of safely evacuating a burning train
- UIC –Codex: (Union International des Chemins de Fer) UIC 564-2 is also relevant in some countries

Intermediate State

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CEN TS 45545

Fire protection of railway vehicles

Future

EUROPEAN STANDARD

EN 45545

“Fire protection of railway vehicles”

Start-up stage
Founding of JWG

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The Joint Working Group was founded from

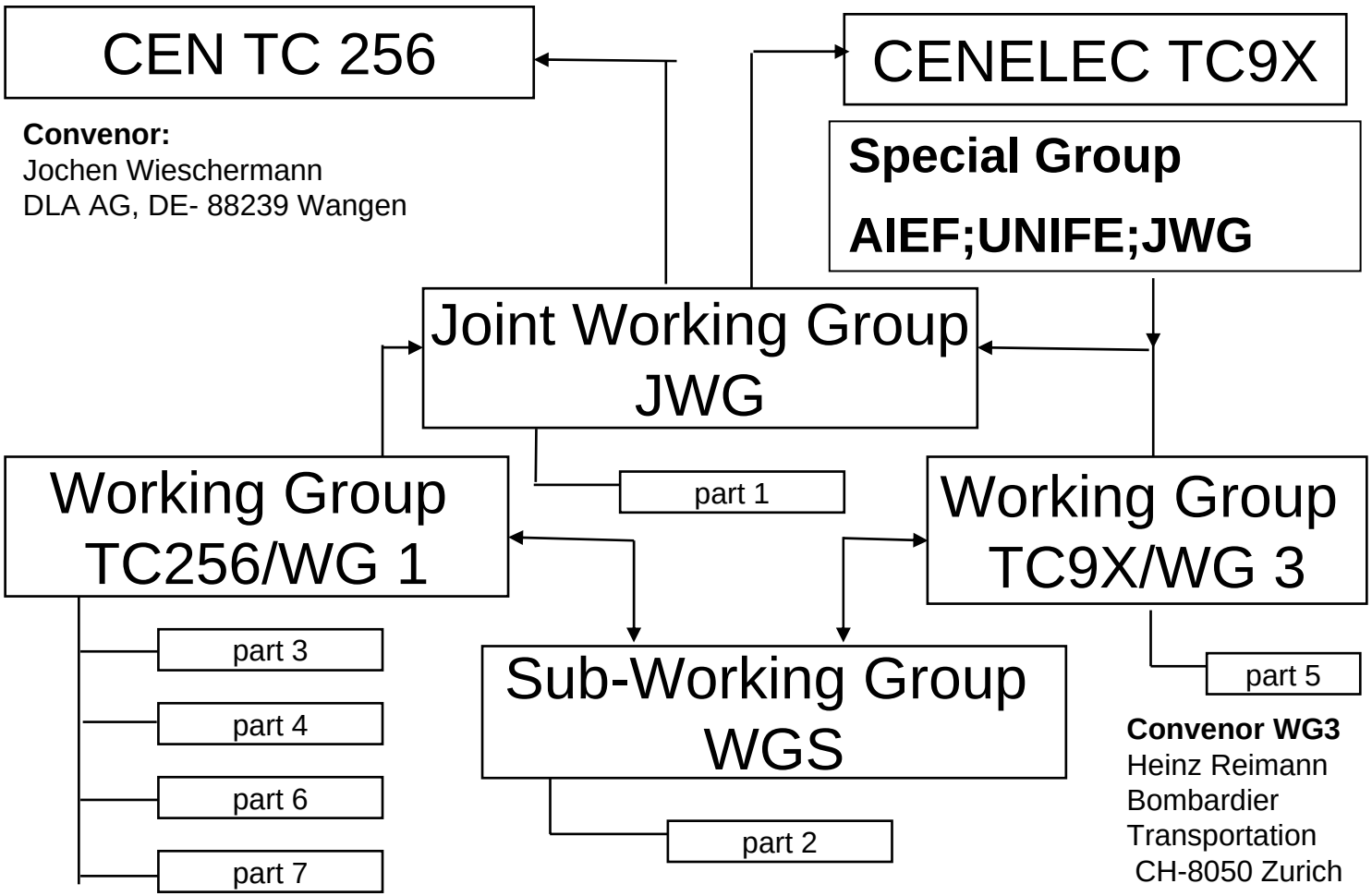
- CEN TC 256 Working Group 1

- CENELEC TC 9X Working Group 3

The result will be:

EN 45545 "Fire Protection of railway vehicles”

Diagram of working process



Support from FIRESTARR PROJECT

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Support to the development of the European Standard ‘Fire protection of railway vehicles’

FIRESTARR PROJECT

FIRESTARR PROJECT

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The FIRESTARR project was a European Commission funded research program

- established 1997

- assist: Joint Working Group in drafting part 2

Output from FIRESTARR

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FIRESTARR

Describes the fire scenarios that are statistically important in European trains

- identifies test methods for characterizing their action -to-fire performance of railway products
- explains the database that was built up from results of small-scale, large-scale and real-scale

FIRESTARR objectives

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- identity the fire risks in European trains and to define the most relevant fire scenarios which frequently occur
- to select the most suitable test methods for the assessment of reaction –to –fire behaviour as defined by key fire effects
  - Fire initiation
  - Time to an uncontrolled state (flashover)
  - Time to loss of visibility
  - Time to lethal conditions for passenger

Basis of CEN TS 45545

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EC – Directives

- Council Directive 9648EC of 23 July 1996 on the interoperability of the Trans-European high-speed rail system
- Directive 200116EC of the European Parliament and of the Council of 19 March 2001 on the interoperability of the Trans-European conventional rail system

Basis of CEN TS 45545

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Interoperability means…

- The ability of the Trans-European high-speed rail system to allow the safe and uninterrupted movement of high-speed trains which accomplish the specified levels of performance.
- This ability rests on all the regulatory, technical and operational conditions which must be met in order to satisfy essential requirements.

Technical Specifications for Interoperability

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Essential Requirements

- Safety
- Reliability and availability
- Health
- Environmental protection
- Technical compatibility

Relationship between EN 45545 and TSI

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Annex ZA

(informative)

Relationship between this European Standard and the Essential Requirements of EC Directives on the interoperability of the European high-speed and conventional train network.

CEN TS 256 support after negative vote for part 1 and 3

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- Change from CEN-Standard procedure to a CEN TS
- Implementation of a special group (JWG/AEIF) for discussion of the standard text.
- Restart of CEN-standard after carry out of CEN TS

Scope of the EN 45545

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This European Standard specifies:

- measures on railway vehicles for fire protection
- verification of these measures

The objective of the measures and requirements specified in this European Standard is to protect passengers and staff in railway vehicles in the event of a fire on board.

It is not within the scope of this standard to describe measures which ensure the preservation of the vehicles in the event of a fire.

CEN TS 45545: Scope of the parts

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- part 1: General
- part 2: Requirements for fire behaviour of materials and components
- part 3: Fire resistance requirements for fire barriers
- part 4: Fire safety requirements for railway rolling stock design
- part 5: Fire safety requirements for electrical equipment
- part 6: Fire control and management systems
- part 7: Fire safety requirements for flammable liquid and flammable gas installations

CEN TS 45545 Part 1, General

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This Part of CEN TS 45545 covers

- Principal definitions
- Operation categories
- Design categories
- Fire safety objectives
- General requirements for fire protection measures and their evaluation of conformity

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Operation Categories for Railway vehicles

Operation category 1:

Vehicles that are not designed or equipped to run on underground sections, tunnels and/or elevated structures and which may be stopped with minimum delay, after which immediate side evacuation to a place of ultimate safety is possible.

Annex B (Informative):

Annex B defines the infrastructure

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Operation Categories for Railway vehicles

Operation category 2:

Vehicles that are designed or equipped to run on underground sections, tunnels and/or elevated structures with side evacuation available and where there are stations or emergency stations that offer a place of ultimate safety to passengers, reachable within a short running time.

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Operation Categories for Railway vehicles

Operation category 3:

Vehicles that are designed or equipped to run on underground sections, tunnels and/or elevated structures, with side evacuation available and where there are stations or emergency stations that offer a place of ultimate safety to passengers, reachable within a long running time.

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Operation Categories for Railway vehicles

Operation category 4:

Vehicles that are designed or equipped to run on underground sections, tunnels and/or elevated structures, without side evacuation available and where there are stations or emergency stations that offer a place of ultimate safety to passengers, reachable within a short running time.

Remark : Annex B defines the infrastructure

CEN TS 45545 Part 1

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Design categories

All vehicles are classified due to their design as follows:

- A: Vehicles forming part of an automatic train having no emergency trained staff on board
- D: Double decked vehicles
- S: Sleeping and couchette vehicles
- N: All other vehicles (standard vehicles)

CEN TS 45545 Part 1

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Ignition models within the scope of the standard (Annex A)

- Flaming source is 3 minutes duration and average power output of 7 kW generating an flux of 25 to 30 kW/m^2.
- A radiant flux of nominal value 25 kWm^{-2} applied to an area of 0,1 m^2.
- A radiant flux of nominal value 50 kWm^{-2} applied to an area of 0,1 m^2.
- Flaming source of power 1 kW and 30 sec. duration.
- A flaming source generating a radiant flux of nominal value in the range 20 – 25 kWm^{-2} applied to an area of 0.7 m^2 with an average heat of 75 kW for a period of 2 minutes followed immediately by a flux of nominal value in the range 40 – 50 kWm^{-2} applied to the same 0,7 m^2 area with an average heat of 150 kW for a period of 8 minutes.

CEN TS 45545 Part 2

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Requirements for fire behaviour of materials and components

The content of part 2 is:

- Functional description of the fire safety objectives
- The generic material classes and the requirement classes
- Test methods according to the generic material classes
- Characteristic requirement of the System test
- Requirements in principle for selection of testing and test samples
- Interior material construction

CEN TS 45545 Part 2

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Relation between operation categories and design categories (Fire Hazard levels values)

Fire hazard levels values (HL 1 to HL 3) as a result from operation and design categories defined in part 1 shall take into account the different dwell times defined in part1.

Relations between operation categories and fire hazard levels (=HL)

Table

Design Category / Operation Category	N: Standard vehicles	A: Automatic vehicles having no emergency	D: Double decked vehicle	S: Sleeping and couchtette cars Double decked or single deck
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

CEN TS 45545 Part 2

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“Requirements for fire behavior of materials and components”

Test Methods:

Material classes	Spread of flame	Ignitability	Rate of heat release	Smoke	Toxicity
Structural surface related products	ISO 5658-2 Radial panel	ISO 5660-1 Cone calorimeter		ISO 5659-2 NBS chamber	
Furniture products	For product testing ISO 9705 Furniture calorimeter			ISO 5659-2 NBS chamber	
	---	For sample testing ISO 5660-1 Cone calorimeter		ISO 5659-2 NBS chamber	
Electro technical products	ISO 4589-2 LOI		---	ISO 5659-2 NBS chamber	
Mechanical products	ISO 4589-2 LOI		---	ISO 5659-2 NBS chamber	

CEN TS 45545 Part 3

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Fire resistance requirements for fire barriers

- Requirements and testing methods for fire barriers in railway vehicles
- The objective of this part is to protect passengers and staff in railway vehicles in the event of a fire on board by containing fire

CEN TS 45545 Part 3

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Classification of fire barriers

For the purposes of this European Standard, the terms and definitions given in ISO 13943 and the following apply.

Fire barriers

Separating elements which resist the passage of flame and/or heat and/or effluents for a period of time under specified conditions.

CEN TS 45545 Part 3

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Classification of fire barriers

Fire barriers may have performance in one of the three parameters:

1. The lowest performing barrier is E = Integrity
2. The next level of performance would be requested EW = Integrity and Radiation Transfer.
3. The top level is E I = Integration and insulation requirement

CEN TS 45545 Part 3

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The following points shall be taken into consideration for the verification of functionality:

1. Origin of fire
2. Size of fire
3. Material involved in fire
4. Nature of detector
5. Air blow

CEN TS 45545 Part 3

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e. g. extract from table – Fire barrier requirements

No.	Fire Origin	Protected Location	Remarks	Operation category	Requirements
1	Under floor high power electrical cabinet containing supply or traction circuits expect brake resistor	Passenger and staff area including driver's cab	Tested in accordance with EN 1364-2 The requirement applies from the inside to the outside surface of the top of the box Where there is a requirement between the cabinet and the passenger or staff area there shall be a type A arc barrier CEN TS 45545-5 require a type A arc barrier to be fitted if an electric arc is possible during normal operation	1 – 4	E15
2	Under floor placed traction transformers or reactors filled with insulation fluid	Passenger and staff area including driver's cab	Tested in accordance with EN 1364-2 Whole cross section and 1 m longer than the object on each longitude direction Requirements are defined from underfloor to the top of the floor covering	1 and 2 3 and 4	E15 E15; I15
3	Underfloor combustion engine equipment (including heating equipment, fuel tank and pipe work)	Passenger and staff area including driver's cab	Tested in accordance with EN 1364-2 Whole cross section and 1 m longer than the objection each longitude direction Requirements are defined from underfloor to the top of the floor covering	1 and 2 3 and 4	E15 E15; I15
4	Underfloor	Passenger and staff area including driver's cab	Tested in accordance with EN 1364-2 Requirements are defined from underfloor to the top of the floor covering	1 and 2 3 and 4	No requirement E15

CEN TS 45545 Part 4

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Fire safety requirements for railway rolling stock design

This part specified aims to protect passengers and staff in railway vehicles in the event of a fire on board by minimising the risk of a fire starting, delaying the fire development and aiding evacuation.

CEN TS 45545 Part 4

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Systems for running

For ignition models there is no significant risk for the strength of the body structure to enable the running capability.

For relevant ignition models, the following shall be demonstrated for vehicles for operation categories 2,3 & 4:

> Vehicles shall be designed such that, in the event of a fire on board they will remain capable of running for a time or a distance to an evacuation point in accordance with CEN TS 45545-1 clause 6.

CEN TS 45545 Part 5

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Fire safety requirements for electrical equipment

This part specified the objective of protecting passengers and staff in railway vehicles in the event of a fire on board by:

- Minimising the risk of starting a fire during operation and as a result of technical defect of the electrical equipment and wiring.

General requirements

- The normal electrical design requirements used for railway vehicles are supplemented by the design requirements of this standard.
- In addition to the design requirements of this standard, electrical equipment shall be designed to withstand the mechanical, electrical and thermal stresses which are likely to be encountered in operation. (see EN 50125-1).

CEN TS 45545 Part 6

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Fire control and management systems

Requirements for:

- fire detection
- alarm systems
- equipment shutdown
- fire fighting systems

The requirements specify aims to protect passengers and staff in railway vehicles in the event of a fire on board by:

- alerting staff and passengers to a fire
- delaying the fire development
- control the movement of smoke

Example

Fire detection systems shall be reliable and shall activate consistently in all modes of service. They shall monitor the areas or equipment defined in Table 1. Fire detection systems shall be functionally suitable for the expected fire products, e.g. flames, smoke, heat.

The following points shal be taken into consideration (s. part 3)

1. Origin of fire
2. Size of fire
3. Material involved in fire
4. Nature of detector
5. Air flow

Example

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	Passenger Area	Sleeper compartment	Toilets	Staff area	Cooking or catering area	Technical cabinets	HVAC Unit	Combustion engines under the car	Electric traction equipment under car	Combustion engines inside	Electric traction equipment inside	Engine compartment on locomotives	Luggage Compartment
Design categories N&D								1		1	1	1	1
			2					2	2	2	2	2	2
	3		3				3	3	3	3	3	3	3
	4		4	4	4		4	4	4	4	4	4	4
Design categories S&DS	1	1	1	1	1	1	1	1	1	1	1	1	1
	2	2	2	2	2	2	2	2	2	2	2	2	2
	3	3	3	3	3	3	3	3	3	3	3	3	3
	4	4	4	4	4	4	4	4	4	4	4	4	4
Design categorie A								1	1	1	1	1	1
			2					2	2	2	2	2	2
	3		3			3	3	3	3	3	3	3	3
	4		4	4	4	4	4	4	4	4	4	4	4

Excluding remarks

CEN TS 45545 Part 7

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Fire safety requirements for flammable liquid and flammable gas installation

This part specifies the objective of protecting passengers and staff in railway vehicles in the event of fire on board, by:

- Minimising the risk of fire during operation and as a result of technical defect.

This minimising of risk is valid for the installation of

- flammable liquid parts and
- flammable gas parts.

CEN TS 45545 Part 7

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General requirements

- In each area where flammable fluids, vapours, gases might escape by leakage, appropriate means must be available to minimize the probability.
- of ignition as well as the resultant hazards if ignition does occur.
- Compliance shall be shown by analysis or tests.

Progress parameters

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European Fire safety Standards CEN TS 45545

After the negative vote of the majority of the European member states of part 1 and part 3, the analysis shows, that the following arguments shall be taken in account

- Ask for an advisory team containing CEN/CENELEC and AEIF responsibilities
- Word description of the operation categories in addition with the description of the interfaces to the infrastructure
- Eliminate the hazard levels
- Revise the part 3 completely
- Technical specification
- The whole technical specification shall be voted completely

Progress parameters

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Guidance from Chairman and secretariat of CEN/TC 256 on new procedure with the JWG – documents:

- work only on the English version until November ‘06
- final versions have to be agreed by the JWG
- Part 5 is closed as a TS
- all parts will have a final check
- Editing Group will work in February 2007
- results go to vote as a TS

Open Points

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After a resolution 17/04 the standstill is kept as the publication as TC is only an interim step before transformation of the whole series of TC into EN´s. Therefore all 7 parts are changed into EN.
During this interim stage JWG will fulfill the following task:

- Support and guidance for toxicity testing methods.

Open points

- Checking both the individual and overall parts to achieve optimum security for persons in accordance with technical aspects.
- Consideration for system approaches for assessments according to Fire safety in Passenger vehicles.
- Assess the comments of pr TS
- Produce a transcript giving aid for a proposed end version for CEN TC 256

Timeframe

- Editing group meeting August 2007
- Result of the editing group meeting sent to CEN TC 256 on 15. September 2007
- Vote about the CEN TS 45545
- Restart of EN (base TS) approximately one year later
- EN 45545 approximately 2010

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Thank you for your attention

Jochen Wieschermann