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MODERN TRENDS OF FIRE PROTECTION IN ROLLING STOCK
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**New challenges for manufacturers of rail vehicles,
its components and materials
as well as for laboratories in the field of fire safety**

Jolanta Maria Radziszewska-Wolińska



Challenge No 1

End of the LOC & PAS transition period for fire safety requirement

- March 2013 - series of standards **EN 45545 Railway applications - Fire protection on railway vehicles** published, with 3 years transition period (to the end of March 2016),
- January 2015 – implementation to application TSI LOC&PAS with 3 years transition period for fire safety requirement
 - ✓ At the end of 2017, the period finished allowing confirmation of meeting the fire performance requirements of the materials used, which was based on the test results according to specified German, British, French, Italian, Spanish and Polish standards. The above means that now non-metallic materials intended for the construction and equipment of all new rail vehicles must meet the requirements of European Standard EN 45545-2.
 - ✓ The above provisions may be a challenge for producers of materials who have not yet tested their products for compliance with European requirements, or have not yet managed to meet the new requirements.



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Challenge No 1

End of the LOC & PAS transition period for fire safety requirement

Research carried out at the IK Laboratory shows that not all materials meeting the PN requirements meet the requirements of EN.

These include, for example:

- ✓ paint coatings with a putty (according to the final application) intended for body of railway vehicles,
- ✓ rubber products (e.g. for old-style gangways),
- ✓ some painted polyester-glass laminates,
- ✓ transparent polycarbonates.



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Challenge No 1

End of the LOC & PAS transition period for fire safety requirement

Exceptions (TSI LOC&PAS)

Clause 7.1.1.

- Any rolling stock which is produced according to a design developed after the date of application of this TSI shall be compliant with this TSI.
- However,
 - ✓ The application of this TSI to mobile railway infrastructure construction and maintenance equipment (as defined in Sections 2.2 and 2.3) is not mandatory.
 - ✓ The application of this TSI to vehicles designed to be operated solely on the 1520 mm system is not mandatory during a transition period ending six years after the date of application of this TSI.
 - ✓ This TSI does not apply to units of existing rolling stock which are already placed in service on the network (or part of the network) of one Member State at the time when the TSI becomes applicable, as long as they are not upgraded or renewed (see clause 7.1.2).
 - ✓ This TSI does not apply to vehicles in the transitional period (according to 7.1.1.2).



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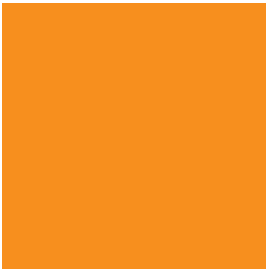
Challenge No 1

End of the LOC & PAS transition period for fire safety requirement

Exceptions (TSI LOC&PAS)

- This transition phase applies to:
 - ✓ Projects at advanced stage of development (as defined in the clause 7.1.1.2.2),
 - ✓ Contracts in course of performance (as defined in the clause 7.1.1.2.3),
 - ✓ Rolling stock of an existing design (as defined in clause 7.1.1.2.4).
- The application of this TSI to rolling stock which falls under one of the three cases above is not mandatory if one of the following conditions is met:
 - ✓ In case the rolling stock is in the scope of the HS RST TSI 2008 or of the CR LOC&PAS TSI 2011, the relevant TSI(s), including implementation rules and period of validity of the 'type or design examination certificate' (7 years) are applied.
 - ✓ In case the rolling stock is in the scope of neither the HS RST TSI 2008 nor the CR LOC&PAS TSI 2011: the authorisation for placing in service is delivered during a transition period ending 6 years after the date of application of this TSI.



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Challenge No 1

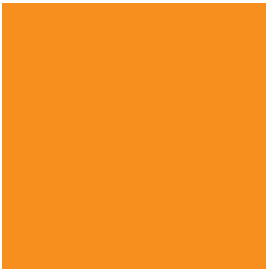
End of the LOC & PAS transition period for fire safety requirement

Exceptions (EN 45545-2)

Clause 4.6.1- in the case of vehicles built and already authorized in accordance with the requirements of previous standards and regulations, e.g. national standards or UIC leaflets, the following provisions shall apply:

- ✓ minor adjustments during maintenance as a consequence of product and market development on components may be performed to the already approved set of standards and regulations for the relevant train at the time of its approval;
- ✓ refurbishment projects shall take into account the guidelines of this standard and new components introduced shall be documented against any relevant acceptance criteria given in 4.2 EN 45545-2.



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Challenge No 1

End of the LOC & PAS transition period for fire safety requirement

Exceptions (EN 45545-2)

Clause 4.7 Products to be approved on functional necessity

If it can be shown that any of the requirements specified above are not technically achievable with functionally suitable products, then existing commercially available products can be used until and unless a suitable product is developed. There shall be no requirement to consider products made available after the date of the contract.

The use of this paragraph has the following conditions:

- ✓ essential requirements in 4.1 shall not be compromised;
- ✓ this shall be verified by assessment; taking the proposed design into consideration; including the functional reason and limitation for using the material in question (e. g. climate and/or infrastructure).

NOTE:

It can be necessary to use this process in respect of products such as:
rubber tyres; rubber suspension components; intercommunication gangways, electronics devices on printed board, flexible metal/rubber units; window seals; seals for doors; brake hoses; pneumatic hoses; flexible fuel hoses; high voltage cables; data bus cables, the anti-spall layer for windscreens on the driver's cab, windscreen washer water containers.





Challenge No 2

Fire safety requirements for electrotechnical equipment



Second challenge before the manufacturers of passenger rolling stock and its equipment elements is the necessity to meet fire safety requirements by electrotechnical equipment (including monitoring and information systems for passengers, heating devices).

It was posed by **EN 45545-2** standard and **TSI CCS**.





Challenge No 2

Fire safety requirements for electrotechnical equipment (EN 45545-2)



According to EN 45545-2 electrotechnical products should be tested / evaluated in accordance with:

- ✓ requirements according to Table 5 (listed products products mentioned in Table 2)
- ✓ Table 3 and grouping rules according to clause 4.3.



Challenge No 2

Fire safety requirements for electrotechnical equipment (EN 45545-2 -1 phase)



The following provisions of p.4.2 also apply:

Mechanical or electrical products contained in a technical cabinet **do not need to be assessed** if:

- ✓ the technical cabinet satisfies the requirements of integrity criterion E10, based on the definitions described in EN 45545-1 and EN 45545-3 and the enclosed volume is $\leq 2 \text{ m}^3$;
- ✓ or the technical cabinet satisfies the requirements of integrity criterion E15 and insulation criterion I15 to surfaces adjacent to passenger area and staff area and integrity criterion E15 to other surfaces, based on the definitions described in EN 45545-1 with no volume limitations;
- ✓ or the technical cabinet is protected by an automatic fire detection and fire extinguishing system;
- ✓ the technical cabinet contains only mechanical or low power electrical equipment. The cabinet sheets are closed and made of aluminium, steel or glass. The enclosed volume is $\leq 0,1 \text{ m}^3$. Covered openings (e.g. by connectors or switches) are acceptable;
- ✓ the technical cabinet sheet material is made of aluminium or steel and the enclosed volume is $\leq 0,5 \text{ m}^3$. For any individual surface of the cabinet, the total area of all openings in that surface shall be less than 1/1000 of the nominal surface area;

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Challenge No 2

requirements for fire safety by electrotechnical equipment (TSI CCS)

Clause 4.2.16. Construction of equipment used in CCS subsystems

The environmental conditions specified in the documents listed in Annex A, Table A2 of this TSI shall be respected.

Requirements for materials referred to in Regulation (EU) No 1302/2014 (LOC&PAS TSI) (e.g. related to fire protection) shall be respected by Control-command and signalling On-board Subsystems.



Challenge No 3

Verification of the EN 45545 series of standards



The next challenge will be the implementation of the results of ongoing verification of the EN45545 series of standards.

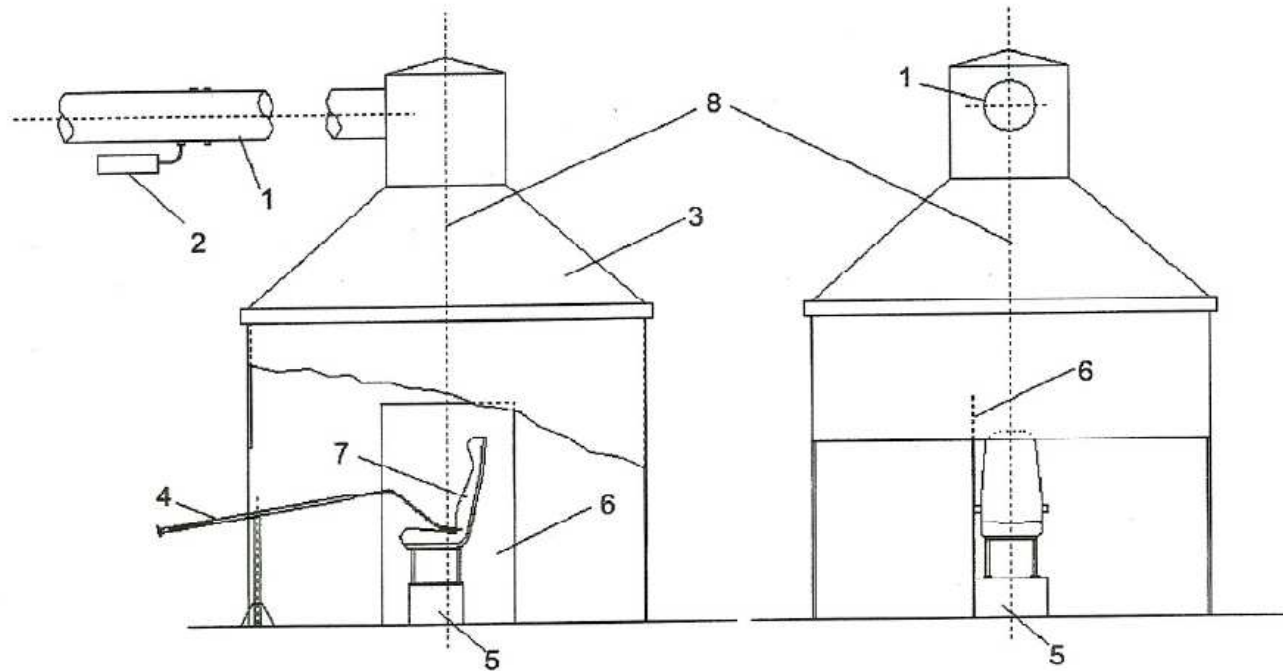
It will be the challenge for research laboratories in the implementation of changes in test methodologies and the challenge for manufacturers on the railway market in meeting new requirements for materials and elements that will introduce.

Changes in:

- test procedure of toxicity according to prEN 17084
 - ✓ modification of sampling,
 - ✓ additional calculation of FED and FEC,
- test procedure of complete seats according to prEN 16989
 - ✓ modification of stand housing, burner and vandalism test machine,
 - ✓ new requirements
- EN 45545-2 (1 phase)
 - ✓ modification requirements in Table 2,
 - ✓ adding Table B.1 “Multiple product classification” in annex B gives an overview of requirement sets which are also compliant even if tested to another requirement set.
- in the assessment by FCCS according to prEN FCCS – not yet



Complete seat test method schematic (according to prEN 16989)



- 1. exhaust duct
- 2. exhaust duct instrumentation
- 3. hood and side sheets
- 4. burner

- 5. seat support
- 6. side panel
- 7. seat
- 8. vertical axis of the hood

General view of test stand



Challenge No 3



Verification of the EN45545 series of standards

Results of the fire test of different passenger seats using gas burner 15kW/3 min

No of seat	MARHE	TSP ₆₀₀	Flame height above seat base
	kW	m ²	mm
Standard seats			
A46/13	23,60	33,6	750
A381/13	24,89	40,3	800
A227/15	23,73	86,6	600
A117/15	25,97	67,0	825
A366/13	21,18	29,0	800
Antivandal seats			
A87/16	22,20	69,8	750
A228/15	17,51	171,7	700
A118/15	19,88	71,7	700
Requirements (max): HL1/HL2/HL3	80 / 55 / 25	- / - b / 45	- / 1180 / 1180

b - TSP shall be measured to allow comparative data to be accumulated in anticipation of a possible future threshold value for HL2

Summary



New challenges result from the necessity of:

- the use of materials and components, including electronic equipment, meeting European requirements in the field of fire safety (EN 45545-2 ,TSI LOC&PAS, TSI CCS);
- implementation of modified toxicity testing methods and complete seats in laboratory practice as well as meeting their requirements by tested materials and objects (prEN 16989, prEN 17084, EN 45545-2- 1 phase);
- meeting the slightly changed requirements in EN 45545-2 - 1 phase.





Thank you for your attention!

