SLOVENSKI STANDARD
SIST-TP CEN/TR 17532:2020

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Železniške naprave - Požarna zaščita v železniških vozilih - Ocena sistemov za obvladovanje in gašenje požara za železniška vozila

Railway applications - Fire protection on railway vehicles - Assessment of fire containment and control systems for railway vehicles

Bahnanwendungen - Brandschutz in Schienenfahrzeugen - Bewertung von Systemen zur Eindämmung und Bekämpfung von Bränden für Eisenbahnfahrzeuge

Applications ferroviaires - Protection contre les incendies dans les véhicules ferroviaires - Evaluation des systèmes de lutte et de contrôle des incendies pour les véhicules ferroviaires

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ICS:

13.220.20	Požarna zaščita	Fire protection
45.060.01	Železniška vozila na splošno	Railway rolling stock in general

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TECHNICAL REPORT

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English Version

Railway applications - Fire protection on railway vehicles - Assessment of fire containment and control systems for railway vehicles

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This Technical Report was approved by CEN on 3 August 2020. It has been drawn up by the Technical Committee CEN/TC 256.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (CEN/TR 17532:2020) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document has been developed in addition to EN 45545 series and EN 50553 to define an assessment method for Fire Containment and Control Systems (FCCS) that may be installed in rolling stock as an alternative to full cross-section partitions. The EN 45545-3 requirements are that full cross-section partitions are required at a maximum separation of 30 metres within a train and each barrier is required to achieve 15 minutes minimum Fire Resistance – Integrity and Insulation performance. This document describes an alternative protection system - FCCS - that also protects passengers and staff from the effects of fire until the train has been evacuated.

It is expected that the FCCS will be activated shortly after a fire that has ignited in a train has been detected. At the same time, passengers and staff in the affected area may move to a non-affected area of the train.

This document also defines requirements for the fire detection systems that activate FCCS systems on board trains.

This document gives the last version of WI947 and comments of NSBs where the compromise is not finalised.

This document provides information to ERA to close the open point.

This document contains information on research to be done to improve the state of the art. The cost of the research should be also evaluated.

This document proposes the next steps with the goal of creating a standard that resolves the issues at hand. This document does not give a cost-benefit-analysis, because such an analysis is not the task of CEN/TC 256/WG 01 experts.

1 Scope

This document specifies the assessment of Fire Containment and Control Systems (FCCS) and associated fire detection systems for railway vehicles as an alternative to the fire barriers specified in EN 45545-3.

This document describes:

— assessment of the installation and capability of fire detection systems;

— assessment of the interaction between fire detection systems and FCCS;

— application and limitations of the assessment process (mock-up or real scale test).

This document considers any additional assessment requirements when vehicle designs that have already been assessed as acceptable to this document are modified, or when new design variants, which have an impact on FCCS, are made which are based on an existing design.

This document is applicable to any railway vehicle where fire detection systems and/or Fire Control and Containment Systems are used.

This document defines performance requirements and verification and validation requirements for systems whose objective is to detect and control or contain the effect of fire in order to create a protected area within the railway vehicle until the railway vehicle can be cleared of passengers and staff by way of evacuation. It is additionally assumed that the new railway vehicles comply with EN 45545-2 (material properties) and EN 45545-4 (design rules) in order to achieve the safety requirements defined in the EN 45545 series.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 45545-1, *Railway applications - Fire protection on railway vehicles - Part 1: General*

EN 45545-2, *Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behaviour of materials and components*

EN 45545-3, *Railway applications - Fire protection on railway vehicles - Part 3: Fire resistance requirements for fire barriers*

EN 45545-4, *Railway applications - Fire protection on railway vehicles - Part 4: Fire safety requirements for rolling stock design*

EN 45545-6, *Railway applications - Fire protection on railway vehicles - Part 6: Fire control and management systems*

EN 50155, *Railway applications – Rolling stock – Electronic equipment*

EN 50553, *Railway applications - Requirements for running capability in case of fire on board of rolling stock*

EN ISO 13943, *Fire safety - Vocabulary (ISO 13943)*

ISO 8421-1, *Fire protection - Vocabulary - Part 1: General terms and phenomena of fire*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 45545-1, EN ISO 13943, ISO 8421-1, relevant Technical Specification for Interoperability (TSI) documents and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
fire containment
action of keeping the effects of fire in terms of heat, smoke and toxic gases within prescribed limits based on avoiding critical thresholds for temperature rise, smoke and toxic gas flow

3.2
fire control
reduction of the effects of a fire to defined levels

Note 1 to entry: It is intended to have no significant risk of serious injury or threat to life.

3.3
detection time
time interval between ignition of a fire and its detection by an automatic or manual system

3.4
affected area
area where the fire should be contained and controlled by FCCS in the context of a fire incident

3.5
non-affected area
area outside the affected area on board of the rolling stock where passengers and staff are protected by FCCS in the context of a fire incident

Note 1 to entry: This is also called protected area.

3.6
artificial smoke
artificial particulate matter to simulate smoke

3.7
basic module
part of the coach with one or several FCCS devices expected to contain and to control the fire source in its area

4 Fire detection

4.1 Fire detection in passenger areas

4.1.1 General

The fire detection system should be assessed based on vehicle parameters as defined in 4.1.2 and the fire detection system parameters defined in 4.1.3.

Fire detection systems should be tested with the equipment described in 4.1.4 at the test location defined in 4.1.4.2. The pass-fail criteria are in 4.1.6. The test is based on the time it takes for the system to detect smoke emission from a standard smoke generator that produces smoke at a fixed rate.

This subclause defines the verification requirements that are based on the detection system complying with the following parameters:

— power and type of fire source for verification;

— detection time (refer to 3.3);

— adequate location of detectors.

The application of this subclause for the proof of specified functions serves the final proof of the detector position and detector selection in terms of confirming compliance with the time limit for fire detection.

This verification can be carried out by test in a mock-up or in a real vehicle, or by simulations if input data were validated by real test in a mock-up or in a real vehicle.

NOTE 1 This subclause is suitable only for validation of detection systems which use smoke detectors to determine the presence of a fire.

NOTE 2 Validation of alternative fire detection technologies (such as cameras or thermal detection) is not yet described in this document.

4.1.2 Vehicle parameters

Where the train being assessed is a new design, the vehicle or vehicle sub-element to be tested should be fully defined prior to testing and documented in detail in the test report including the following details:

— definition and description of the individual rail vehicle or non-separable train set being tested, with regard to operational use and the related environmental conditions (e.g. tunnel operation) and the definition and location of any specific test objects;

— control and regulation concept for the air treatment units (for ventilation, heating, cooling) in the rail vehicle or the train set and air routing concept (layout of air ducts and air inlet and air outlet situations, dynamic or static exhaust air routes);

— information on door and window openings and their possible handling (e.g. open in normal service or open only if ventilation equipment fails);

— information on ventilation concepts of control cabinets and machine rooms (e.g. static or dynamic ventilation).

This situation should also be considered in terms of preconditions for system specification tests, e.g. at older types of rolling stock.

As part of vehicle evaluation, the location of the smoke source during the test should use the demanding case which is the situation which assumedly will create the longest detection time under normal

operating conditions. The justification for the demanding case should be fully explained in the technical documentation of the FCCS.

The demanding case should be defined, based on the individual vehicle layout and location of the fire detectors.

The validation tests of the fire detection sub-system should take place with the vehicle in standstill condition under operating conditions.

4.1.3 Fire detection system parameters

The fire detection system should be in accordance with EN 50155. Fire detection devices should be functionally suitable for the expected fire products.

For planning and performing the tests, the following information relating to the fire detector(s) connected within the system should be recorded and included in the test report:

— description of the fire detection system concerning the fire detectors' function within the system;

— description of the fire detector types and their positions (including variations, if available) in the vehicle or the monitored area;

— possible requirements deviating from standards should regarded (e.g. corresponding conditions concerning operating and storage temperature).

4.1.4 Test equipment parameters

4.1.4.1 Fire source for test

4.1.4.1.1 General

For the test, one of the following smoke generator sources should be selected. Details of the smoke generator source specification should be included in the test report:

— liquid tray;

— smoke generator;

— or equivalent source.

Definition of a repeatable and reliable fire source is the main topic. For choosing an equivalent source, it should be clearly defined with quantitative requirements.

NOTE There is no consensus on the suitability of liquid tray/ TF4 cushion (open fire) for testing in a new vehicle. There is no consensus on the possibility to test temperature detectors with the smoke generator. Infrared detection has not yet been proven conclusively and needs more investigation.

4.1.4.1.2 Test with liquid tray

A fire source equivalent to Ignition Model 1/Fire type A according to EN 45545-1/EN 50553 is placed underneath a tray of liquid.

EN 45545-1 Ignition model 1is defined as follows:

— flaming source of 3 minutes duration;

— average power output (7 ± 1) kW;

— 25 kW/m² – 30 kW/m² flux generation.

The liquid tray is made from galvanized or stainless steel with jointed sealed edges covered with a 10 mm thick calcium silicate, a square trunk section and the following exterior dimensions (see Figure 1a)):

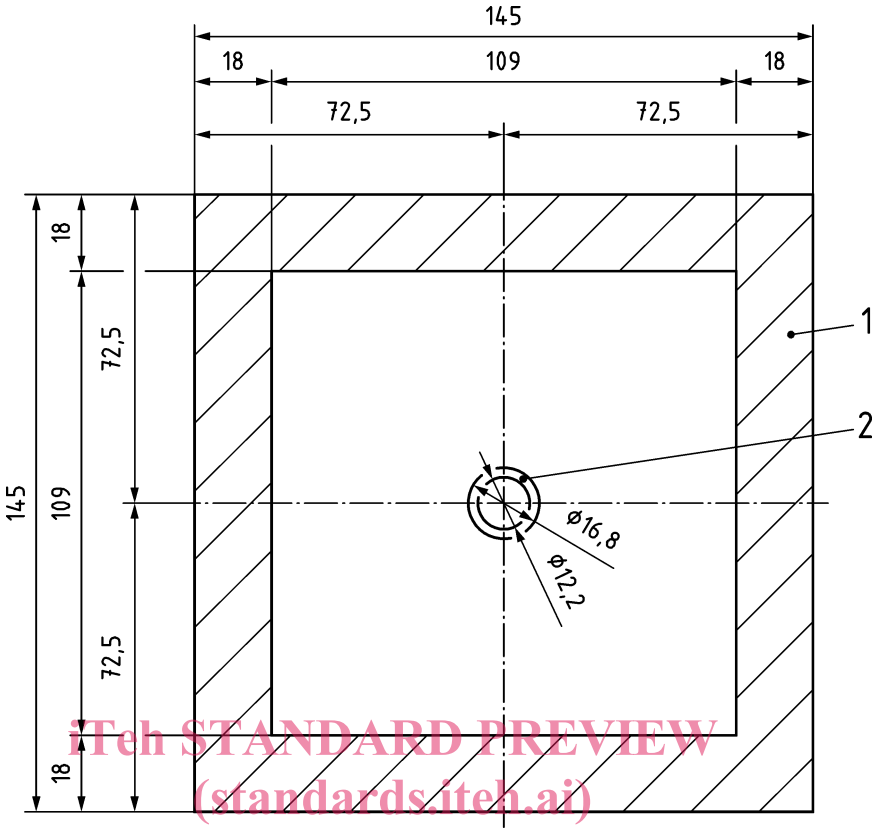
— bottom base: (160 ± 2) mm × (160 ± 2) mm;

— top base: (160 ± 2) mm × (160 ± 2) mm;

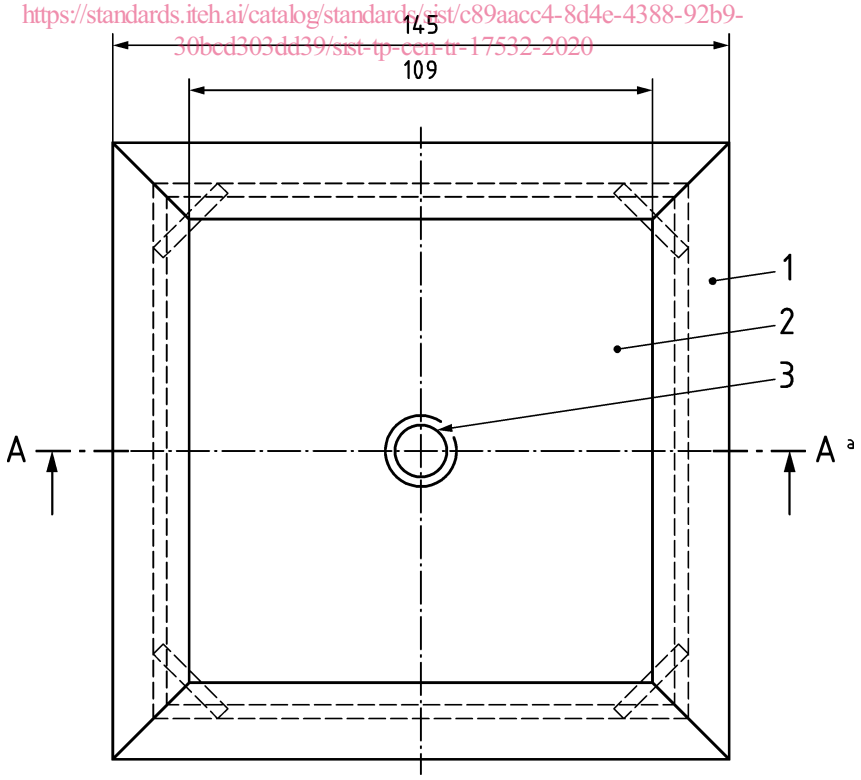
— height: (50 ± 2) mm;

— thickness of tray: (3,0 ± 0,1) mm.

Dimensions in millimetres



a) — Top view of the tray with dimensions in millimetres



b) — Metalwork and the calcium silicate

Figure 1b) shows the relative position of the metalwork and the calcium silicate.