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English Version

Guidelines for the use of EN 45545-2 for Ni-Cd batteries on board rolling stock

Lignes directrices pour l'utilisation de l'EN 45545-2 pour les batteries NiCd à bord matériel roulant

Leitfaden für die Verwendung von EN 45545-2 für Nickel-Cadmium-Batterien auf Bahnfahrzeugen

This Technical Report was approved by CENELEC on 2021-04-19.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Contents	Page
European Foreword	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Main aspects and requirements of EN 45545-2 addressed by this guide	5
4.1 General	5
4.2 Need of clarification and suggested methodological approach	5
4.2.1 General	5
4.2.2 Need of clarification	5
4.2.3 Specific approach	6
5 Guiding the assessment of the Ni-Cd batteries	6
6 Spare parts management	6
Bibliography	8

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[SIST-TP CLC/TR 50718:2021](https://standards.iteh.ai/catalog/standards/sist/8928b39e-bfc2-4abb-8e8f-a12baa6ead45/sist-tp-clc-tr-50718-2021)

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European Foreword

This document (CLC/TR 50718:2021) has been prepared by CLC/TC 9X “Electrical and electronic applications for railways”.

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

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Introduction

The design, verification and testing of Ni-Cd batteries on board rolling stock is standardized by EN 50547, which refers to the EN 45545 series and particularly to EN 45545-2:2013+A1:2015 in the clause “Fire behaviour requirements”.

However, the referred series deals with the Ni-Cd batteries in a generic and limited way:

- EN 45545-2:2013+A1:2015 deals with Ni-Cd batteries as a non-listed products.

As a consequence, the application of the EN 45545 series to the case of Ni-Cd batteries on board of trains opens the door to very different interpretations.

Designers, assessors, producers and customers have very different points of view which could result in problematic aspects which are difficult to be fixed and agreed upon.

In order to overcome such situations, TC9X decided to set up the Survey Group CLC TC9X WG31 with the task to prepare a new standard; the SG31 proposes in the meantime to issue guidelines for the application of the EN 45545 series in case of Ni-Cd batteries on board rolling stock.

This document has been prepared according to the decision 58/12 taken during the TC9X Plenary meeting and the following approved NWIP, see document BT166/DG11706/DL.

This document is a report of the available experience and best practice in applying the EN 45545 series to the case of Ni-Cd batteries on board rolling stock.

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1 Scope

The scope of this document is to guide users of the EN 45545 series, particularly EN 45545-2:2013+A1:2015 and EN 45545-5:2013+A1:2015, in the application of these standards in designing and assessing Ni-Cd batteries on board trains for their fire protection measures.

The scope of this document excludes any new requirements, considering only the requirements stated by the above listed standards.

However, EN 45545 being generic requirements and not specifically referring to Ni-Cd batteries, this guide helps the application for those batteries.

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 45545-1:2013, *Railway applications - Fire protection on railway vehicles - Part 1: General*

EN 45545-2:2013+A1:2015, *Railway applications - Fire protection on railway vehicles - Part 2: Requirements for fire behaviour of materials and components*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 45545-1:2013 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>”
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4 Main aspects and requirements of EN 45545-2 addressed by this guide

4.1 General

This clause reports the list of aspects and requirements which are stated by EN 45545-2:2013+A1:2015 and EN 45545-5:2013+A1:2015 and which need clarification and guiding in case of application to Ni-Cd cells and batteries.

4.2 Need of clarification and suggested methodological approach

4.2.1 General

There is a consensus between CEN and CENELEC experts that the application of the current EN 45545-2:2013+A1:2015 standard applied specifically to Ni-Cd batteries has resulted in an observed risk of battery fire departure initiated by the battery itself.

The use of EN 45545-2:2013+A1:2015 for such areas as vehicle interiors is generally considered clear; Ni-Cd batteries were not considered a problem, and therefore were not specifically addressed.

4.2.2 Need of clarification

In EN 45545-1:2013, listed product and non-listed product are defined respectively in 3.33 and 3.41 referring to EN 45545-2:2013+A1:2015, Table 2. This table does not mention Ni-Cd battery, so Ni-Cd battery is a non-listed product.

NOTE 1 A good definition of listed products could be: "A product which is listed in Table 2 of EN 45545-2:2013+A1:2015, 4.4"

CLC/TR 50718:2021 (E)

NOTE 2 A good definition of unlisted products could be: "A product which does not appear in Table 2 of EN 45545-2:2013+A1:2015, 4.4."

In EN 45545-2:2013+A1:2015, 4.2.l), some specific requirements for classified products are defined, with no mention of Ni-Cd battery.

NOTE 3 A good definition of classified products could be: "A product which is a listed product or is an unlisted product for which the requirement set (described in EN 45545-2:2013+A1:2015, Table 5) is identified and the relevant tests are passed."

Also, in EN 45545-2:2013+A1:2015, 4.2.h), a category for products that can be considered as non-classified (unclassified) and therefore do not have to respect any fire requirement from the EN 45545 series is defined. This could lead to introductions in the market of a product without any fire retardant properties, e.g. that would then not be protected against a fire event coming from an electrical defect inside the battery (e.g. loss of insulation).

NOTE 4 A good definition of unclassified products could be "A product having no identified requirement set".

The application of EN 45545-2:2013+A1:2015 to Ni-Cd battery, considering Ni-Cd battery as non-listed product, could lead to the reintroduction of previous generation plastics (with associated fire risks which are addressed by newer plastics). There are no issues reported with the latest generation plastics.

In theory, ageing of plastics can lead to increased fire risk; this phenomenon has also been observed in practice.

4.2.3 Specific approach

Therefore, the application of EN 45545-2:2013+A1:2015 is to be considered with 4.7 for Ni-Cd batteries.

5 Guiding the assessment of the Ni-Cd batteries

The application of the requirements of EN 45545-2:2013+A1:2015 is guided taking into consideration the phase of design and production and in the various configurations of Ni-Cd batteries as defined in EN 50547.

The 4.7 (approval on functional necessity) will be applied until the results of SG31 are available, provided that previously applicable standards (e.g. DIN 5510, UNI CEI 11170, NFF 16101-16102, etc.) do demonstrate the 4.1 compliance (essential fire safety objectives) as requested in 4.7 use conditions.

Current available products did demonstrate electrical and fire and smoke requirements over battery life duration.

New battery cells that might arrive later in the market will then be subjected to the resulting work of SG31.

6 Spare parts management

It is suggested that the approach to be used in case of managing spare parts considers the different levels of component and sub-systems with reference to the following cases:

- 1) substitution in the framework of preventive or corrective maintenance;
- 2) upgrading;
- 3) renewal.

Case 1 refers to replacement of components by parts of identical function and performance; in this case no new authorization or assessment is needed.

Case 2 and 3 refers respectively to:

- a) any major modification work on a subsystem or part of subsystems which improves the overall performance;
- b) any major substitution work on a subsystem or part of subsystem which does not change the overall performance.

In both cases the assessment for smoke and fire is necessary. A redesign according to EN 45545 series with the same functionality is requested unless it is possible to invoke EN 45545-2:2013+A1:2015, 4.7 because of functional necessity.

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EN 45545 (series), *Railway applications - Fire protection on railway vehicles*

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

EN 45545-5:2013+A1:2015, *Railway applications - Fire protection on railway vehicles - Part 5: Fire safety requirements for electrical equipment including that of trolley buses, track guided buses and magnetic levitation vehicles*

EN 50547:2013, *Railway applications - Batteries for auxiliary power supply systems*

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