ICS 45.060.01, 83.180 SLOVENSKÁ TECHNICKÁ NORMA November 2022

STN	**Železnice** **Lepenie koľajových vozidiel a ich častí**	**STN** **EN 17460** 28 0081

Railway applications - Adhesive bonding of rail vehicles and their components

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/22

Obsahuje: EN 17460:2022

135742

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 17460

July 2022

ICS 45.060.01; 83.180

English Version

Railway applications - Adhesive bonding of rail vehicles and their components

Applications ferroviaires - Collage par collage de véhicules et de pièces ferroviaires

Bahnanwendungen - Kleben von Eisenbahnfahrzeugen und deren Teilen

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN 17460:2022 E

Contents

Page

European foreword ... 6
Introduction ... 7
1 Scope ... 8
2 Normative references ... 8
3 Terms and definitions ... 9
4 Competences of adhesive bonding personnel ... 14
4.1 General ... 14
4.2 Competences of coordinators ... 15
4.3 Competences of the adhesive bonding operators ... 17
5 Design and verification of adhesively bonded joints on rail vehicles ... 17
5.1 General ... 17
5.2 Design process ... 17
5.2.1 Flow chart ... 17
5.2.2 List of requirements ... 18
5.2.3 Preliminary design and general design parameters ... 19
5.3 Design ... 19
5.3.1 General ... 19
5.3.2 Risk analysis and safety classification ... 19
5.3.3 Adhesive bonding joint list ... 20
5.3.4 Qualification of an adhesive ... 20
5.4 Validation of the design ... 24
5.4.1 General ... 24
5.4.2 Identifying of the influences/loads ... 24
5.4.3 Calculation ... 25
5.4.4 Proven design ... 28
5.4.5 Component test ... 28
5.4.6 Combination of calculation/component test/proven design ... 28
5.5 Proof of conformity ... 28
6 Workmanship ... 31
6.1 General ... 31
6.2 General process requirements ... 31
6.2.1 Transport and storage of adhesives, auxiliary materials and adherends ... 31
6.2.2 Manufacturing environment ... 31
6.2.3 Preparation of work stations and acclimatization of materials ... 31
6.2.4 Occupational health and safety, environmental protection ... 32
6.2.5 Checking for fitting accuracy concerning shape, position and dimension ... 32
6.2.6 Checks prior to start of production ... 32
6.2.7 Treatment of the adherend surfaces ... 32
6.2.8 Dosing, mixing and application ... 33
6.2.9 Joining the adherends ... 34
6.2.10 Fixing ... 34
6.2.11 Solidification ... 34
6.2.12 Packaging and transport of adhesively bonded components ... 35
6.3 Work instructions ... 35
6.4 Production-accompanying work-samples as a proof possibility of application quality ... 37

6.5 Rework **38**
6.6 Quality assurance **38**
6.6.1 General **38**
6.6.2 Quality planning **38**
6.6.3 Quality inspection **39**
6.6.4 Corrective action **40**
6.6.5 Imperfections in adhesive bonds **40**
7 Maintenance and repair **40**
7.1 General **40**
7.2 Documentation **41**
7.3 Execution rules **41**
7.4 Maintenance and repair instructions **41**
8 Subcontracting **41**
Annex A (informative) **Adhesive bonding personnel** **42**
A.1 Personnel **42**
A.1.1 Competencies of adhesive bonding operators **42**
A.1.2 (Responsible) Adhesive Bonding Coordinator (rABC/ABC) **42**
A.2 Organizational integration of adhesive bonding coordination - further details in addition to 4.2 ..... **45**
A.3 Monitoring and testing personnel **45**
Annex B (informative) **Explanation of comprehensive, specific and basic competencies, knowledge application, practical application, and experiences** **46**
B.1 Competence - subject **46**
B.2 General definitions of competencies, knowledge application, practical application, and experiences defined in Table 1 of this document **47**
B.2.1 Comprehensive **47**
B.2.2 Specific **47**
B.2.3 Basic **48**
B.3 Detailed definitions of competencies, knowledge application, practical application, and experiences with respect to the subject contents defined in Table B.1 of this annex **48**
B.3.1 Comprehensive: detailed definitions **48**
B.3.2 Specific: detailed definitions **55**
B.3.3 Basic: detailed definitions **61**
Annex C (informative) **List of requirements** **65**
Annex D (normative) **Determining the stress limit** **67**
D.1 General **67**
D.2 Characteristic values and the permissible stress limit **67**
D.3 Testing low-modulus (flexible) adhesives **69**
D.3.1 General **69**

D.3.2 Determining the modulus of elasticity, the Poisson's ratio and the stress/strain characteristic using adhesive test pieces ... 69
D.3.3 Testing the quasi-static adhesive bond strength for adhesive bonds formed with low-modulus adhesives ... 69
D.3.4 Testing the compression of adhesive bonds using low-modulus adhesives ... 70
D.3.5 Testing the elongation at break after relaxation of adhesive bonds using flexible adhesive ... 71
D.3.6 Testing the creep behaviour of adhesive bonds using low-modulus adhesives ... 71
D.3.7 Testing the fatigue strength of adhesive bonds using low-modulus adhesives ... 72
D.3.8 Measurement of pH value of cured adhesives exposure to moisture ... 72
D.4 Testing high-modulus (very stiff) adhesives ... 72
D.4.1 Determining the modulus of elasticity, the Poisson's ratio and the stress/strain characteristic using adhesive test pieces ... 72
D.4.2 Testing lap shear strength ... 72
D.4.3 Testing the creep behaviour of adhesive bonds using high-modulus adhesives ... 73
D.4.4 Testing the fatigue strength of adhesive bonds using high-modulus adhesives ... 73
D.4.5 Other tests: measurement of pH value of cured adhesives exposure to moisture ... 73
Annex E (informative) Criteria for choosing an adhesive bonding system ... 74
Annex F (informative) Description of non-destructive and destructive testing methods ... 78
F.1 General ... 78
F.2 Non-destructive testing ... 78
F.2.1 Preliminary remark ... 78
F.2.2 Visual inspection ... 78
F.2.3 Ultrasonic testing ... 78
F.2.4 Thermography ... 78
F.2.5 Shearography ... 79
F.2.6 Tap test ... 79
F.2.7 Water drop test ... 79
F.2.8 Ink test ... 79
F.2.9 Test for adhesion at edges or flanks ... 79
F.2.10 Suction cup test ... 79
F.2.11 Test using a feeler gauge ... 79
F.3 Destructive testing ... 79
F.3.1 Preliminary remark ... 79
F.3.2 Fracture patterns ... 79
F.3.3 Lap shear test (EN 1465) ... 80
F.3.4 Floating roller peel test (ISO 4578 [55]) ... 80
F.3.5 Bead peel test (ISO 21194) [54] ... 80

Annex G (informative) **Description of accelerated ageing tests** **81**
G.1 General **81**
G.2 Ageing factors and its effects **81**
G.3 Selection of accelerated ageing test **82**
G.4 Examples of accelerated ageing tests **82**
G.4.1 General **82**
G.4.2 Constant climatic conditions **82**
G.4.3 Alternating climate test **82**
G.4.4 Salt spray test **83**
G.4.5 Cataplasma test **83**
G.4.6 Exposure to light respectively UV radiation **83**
G.4.7 Exposure to contaminants and media **83**
G.4.8 Appropriate combined test **83**
G.4.9 Weathering **84**
Annex H (informative) **Examples of non-decorative and decorative imperfections of adhesive bonds** **85**
H.1 General **85**
H.2 Examples of non-decorative imperfections **85**
H.3 Criteria and different decorative areas **86**
Annex I (informative) Adhesive bonding symbols **87**
I.1 Assemblies information on drawings **87**
Annex J (informative) **Clarification of further vocabulary associated with adhesive bonding technology** **88**
J.1 General **88**
J.2 Vocabulary **88**
Bibliography **97**

European foreword

This document (EN 17460:2022) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2023, and conflicting national standards shall be withdrawn at the latest by January 2027.

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.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Historically, the production of railway vehicles and their components, for the main part, comprises such materials as steels and aluminium alloys. Their methods of construction and assembly include such processes as bolting, riveting, and welding.

Railway vehicles within the meaning of this document are defined in EN 15380-1 [47].

Technological developments have led to the availability of other materials, e.g. composites, and some of these traditional methods of construction as bolting, riveting, and welding and assembly are not necessarily appropriate or suitable for such materials.

For this reason, a process of adhesive bonding can be essential for the production of certain railway vehicles and their components, not only in the case of composites but for steels and aluminium alloys as well as glass and other materials.

The confirmation of the quality and integrity of the final adhesively bonded joints do not readily lend themselves to traditional inspection and testing techniques such as non-destructive testing.

Therefore, it is essential that the quality and control of the adhesively bonded joints of assemblies and components is managed to the best possible level by means of an appropriate process control procedure.

Whilst there are standards that deal with Quality Control and are taken into account, this document aims to give the correct framework and includes additional detail necessary for all adhesive bonding and sealing activities performed on railway vehicles and its components as a special process.

NOTE EN ISO 9001 [41] is such an example.

Against this background, this document refers to definitions as well as organisational, management, contractual and technical principles to be followed in production of adhesively bonded joints in analogy to welding technology. Thus, comparable focal points are also the focus here:

Focal point 1: Classification of each adhesively bonded joint according to safety requirements (see 5.3.2).

Focal point 2: Designation of supervisory personnel (Adhesive Bonding Coordinators - ABCs) and execution personnel (Adhesive Bonding Operators) who can objectively demonstrate that they have the necessary and required skills, knowledge, and experience in the field of adhesive bonding (see Clause 4).

Focal point 3: Verification that the actual loading (stress, strain, and strain energy) of an adhesively bonded joint during the use of an adhesively bonded product is in any case less than the maximum load capacity (see 5.4 and Annex D).

Another focus of this document are the principles of workmanship of adhesively bonded joints (see Clause 6).

1 Scope

This document defines terms and specifies requirements for adhesive bonding and sealing work in rail vehicles and their components independent of the material of the adherend and the solidification mechanism, strength, and deformation properties of the adhesives.

This document is applicable to adhesive bonding and sealing adherends in the:

— development (pre-production);

— production (in-production);

— maintenance including repair (post-production);

— quality assurance of production, inspection, maintenance including repair of rail vehicles and their components.

This document is not applicable to:

— screw retention by the usage of adhesives, if a screw assembly without further safeguard of identical joint design is sufficient for the purpose;

— hybrid joints, if the expected function is given exclusively by another joining technology e.g. welding, screwing, riveting;

— production of vulcanizates;

— production of plywood;

— production of fibre reinforced plastic composites (FRP-composites);

— production of laminated safety glass;

— pure encapsulating of electronic parts;

— application of single-sided adhesive decorative films.

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 1465, *Adhesives — Determination of tensile lap-shear strength of bonded assemblies*

EN 923, *Adhesives — Terms and definitions*

EN ISO 10365, *Adhesives — Designation of main failure patterns*

ISO 16269-6:2014, *Statistical interpretation of data — Part 6: Determination of statistical tolerance intervals*

EN 14869-2, *Structural adhesives — Determination of shear behaviour of structural bonds — Part 2: Thick adherends shear test (ISO 11003-2)*

ISO 12107, *Metallic materials — Fatigue testing — Statistical planning and analysis of data*