



**NSAI**  
Standards

Irish Standard  
I.S. EN 50119:2020

# Railway applications - Fixed installations - Electric traction overhead contact lines

**I.S. EN 50119:2020**

*Incorporating amendments/corrigenda/National Annexes issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

*This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):*

*NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.*

*This document is based on:*

EN 50119:2020

*Published:*

2020-04-03

*This document was published under the authority of the NSAI and comes into effect on:*

2020-04-29

ICS number:

29.280

NOTE: If blank see CEN/CENELEC cover page

NSAI  
1 Swift Square,  
Northwood, Santry  
Dublin 9

T +353 1 807 3800  
F +353 1 807 3838  
E standards@nsai.ie  
W NSAI.ie

Sales:  
T +353 1 857 6730  
F +353 1 857 6729  
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

## National Foreword

I.S. EN 50119:2020 is the adopted Irish version of the European Document EN 50119:2020, Railway applications - Fixed installations - Electric traction overhead contact lines

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

For relationships with other publications refer to the NSAI web store.

**Compliance with this document does not of itself confer immunity from legal obligations.**

*In line with international standards practice the decimal point is shown as a comma (,) throughout this document.*

This page is intentionally left blank

EUROPEAN STANDARD

**EN 50119**

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2020

ICS 29.280

Supersedes EN 50119:2009 and all of its amendments  
and corrigenda (if any)

English Version

## Railway applications - Fixed installations - Electric traction overhead contact lines

Applications ferroviaires - Installations fixes - Lignes  
aériennes de contact pour la traction électrique

Bahnanwendungen - Ortsfeste Anlagen - Oberleitungen für  
die elektrische Zugförderung

This European Standard was approved by CENELEC on 2020-01-13. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

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

<b>Contents</b>	<b>Page</b>
European foreword .....	6
<b>1 Scope .....</b>	<b>7</b>
<b>2 Normative references .....</b>	<b>7</b>
<b>3 Terms, definitions, symbols and abbreviations .....</b>	<b>11</b>
<b>4 Fundamental design data .....</b>	<b>24</b>
4.1 General.....	24
4.2 Line characteristics .....	25
4.3 Electrical power system design .....	25
4.4 Vehicle characteristics .....	26
4.5 Current collectors .....	26
4.6 Environmental conditions.....	26
4.7 Design life.....	26
<b>5 System requirements .....</b>	<b>27</b>
5.1 Design of electrical system .....	27
5.1.1 General.....	27
5.1.2 Temperature rise in conductors.....	27
5.1.3 Clearances between live equipment and earth.....	28
5.1.4 Clearances between adjacent live AC contact lines of differing voltage phases .....	30
5.2 Design of current collection systems.....	31
5.2.1 General.....	31
5.2.2 Elasticity and its variation .....	31
5.2.3 Vertical movement of contact point.....	32
5.2.4 Wave propagation velocity .....	32
5.2.5 Quality of current collection .....	32
5.3 Mechanical design of tensioned contact wire loads.....	34
5.3.1 Permissible tensile stress $\sigma_w$ .....	34
5.3.2 Maximum temperature $K_{temp}$ .....	34
5.3.3 Allowable wear $K_{wear}$ .....	35
5.3.4 Wind loads $K_{wind}$ .....	35
5.3.5 Ice loads $K_{ice}$ .....	35
5.3.6 Efficiency and accuracy of tensioning devices $K_{eff}$ .....	36
5.3.7 Termination fittings $K_{clamp}$ .....	36
5.3.8 Joints $K_{joint}$ .....	36
5.4 Mechanical design of catenary wire loads .....	36
5.4.1 Permissible tensile loading $F_w$ .....	36
5.4.2 Maximum temperature $K_{temp}$ .....	36
5.4.3 Wind loads $K_{wind}$ .....	37
5.4.4 Ice loads $K_{ice}$ .....	37
5.4.5 Efficiency and accuracy of tensioning device $K_{eff}$ .....	37
5.4.6 Termination fittings $K_{clamp}$ .....	38
5.4.7 Additional vertical load $K_{load}$ .....	38
5.5 Mechanical design of other stranded conductors .....	38
5.6 Mechanical design of solid wires.....	38
5.7 Mechanical design of ropes of non-conducting materials .....	38
5.7.1 General.....	38
5.7.2 Permissible tensile loading $F_w$ .....	38
5.7.3 Wind loads $K_{wind}$ .....	38

5.7.4	Ice loads $K_{ice}$ .....	38
5.7.5	Termination clamps $K_{clamp}$ .....	38
5.7.6	Vertical loads $K_{load}$ .....	39
5.7.7	Minimum bending radius $K_{radius}$ .....	39
5.8	Suspension systems .....	39
5.9	Tensioning systems for flexible overhead contact lines .....	39
5.10	Geometry of flexible overhead contact line equipment .....	39
5.10.1	Lateral deviation of contact wire .....	39
5.10.2	Uplift.....	40
5.10.3	Variation in contact wire height .....	40
5.10.4	Contact wire height .....	41
5.10.5	Tolerances of lateral contact wire position .....	43
5.10.6	Span length .....	44
5.11	Contact line arrangement above turnouts and crossings .....	44
5.12	Overlap arrangements .....	44
5.13	Specific requirements for overhead contact lines for trolleybus systems .....	45
5.13.1	General .....	45
5.13.2	Line characteristics .....	45
5.13.3	Vehicle characteristics.....	46
5.13.4	Current collector system .....	47
5.13.5	Static contact forces .....	47
5.13.6	Trolleybus in the vicinity of tramways .....	47
5.14	Tolerances and limits.....	47
6	Structures and Foundations .....	48
6.1	Basis of design .....	48
6.1.1	General .....	48
6.1.2	Basic requirements .....	48
6.1.3	Design with regard to structural limit states .....	49
6.1.4	Classification of actions .....	49
6.1.5	Reliability levels.....	50
6.1.6	Models for structural analysis and resistance .....	50
6.1.7	Design values and verification methods.....	50
6.1.8	Wall anchors .....	51
6.2	Actions on overhead contact line systems .....	52
6.2.1	Introduction.....	52
6.2.2	Permanent loads.....	52
6.2.3	Variable loads .....	52
6.2.4	Wind loads .....	52
6.2.5	Ice loads .....	55
6.2.6	Combined wind and ice loads.....	55
6.2.7	Temperature effects .....	56
6.2.8	Construction and maintenance loads .....	56
6.2.9	Accidental loads .....	56
6.2.10	Special actions .....	57
6.3	Types of structures and related load cases .....	57
6.3.1	Load cases and load combinations.....	57
6.3.2	Type of structures and application of load cases.....	58
6.3.3	Partial factors for actions .....	61
6.4	Design of structures and cross span supports .....	63
6.4.1	Analysis of internal forces and moments .....	63
6.4.2	Analysis of resistance.....	63
6.4.3	Material partial factors .....	63
6.4.4	Verification of resistance.....	63
6.4.5	Verification of serviceability.....	64
6.4.6	Material for structures.....	64
6.4.7	Corrosion protection and finishes.....	64

## EN 50119:2020 (E)

6.5	Foundations .....	65
6.5.1	General.....	65
6.5.2	Design of foundations .....	65
6.5.3	Calculation of actions .....	65
6.5.4	Geotechnical design.....	66
6.5.5	Structural design .....	68
6.5.6	Partial factors for foundations .....	68
6.5.7	Verification of stability .....	69
6.5.8	Calculation of displacements .....	69
6.5.9	Materials for foundations.....	69
6.5.10	Structural details.....	70
6.5.11	Protection against corrosion and weathering .....	70
6.5.12	Electrical design .....	70
6.5.13	Installation of foundations .....	71
7	Assembly and Component requirements .....	71
7.1	General.....	71
7.1.1	Design life.....	71
7.1.2	Component identification .....	71
7.1.3	Corrosion and erosion .....	71
7.2	Supporting assemblies .....	72
7.3	Contact wire .....	72
7.4	Other conductors and ropes .....	72
7.5	Tensioning devices.....	72
7.6	Mechanical midpoints .....	73
7.6.1	General.....	73
7.6.2	Catenary wire fixed points .....	73
7.6.3	Contact wire fixed points .....	73
7.7	Droppers .....	73
7.7.1	Mechanical requirements.....	73
7.7.2	Electrical requirements .....	74
7.8	Clamps and fittings.....	74
7.8.1	Mechanical requirements.....	74
7.8.2	Electrical requirements .....	74
7.9	Electrical connectors .....	74
7.10	Insulators.....	75
7.10.1	General requirements.....	75
7.10.2	Mechanical requirements.....	75
7.10.3	Insulator surface.....	75
7.11	Sectioning devices .....	76
7.11.1	General.....	76
7.11.2	Mechanical requirements.....	76
7.11.3	Electrical requirements .....	76
7.12	Disconnectors and drives .....	76
7.13	Protection devices .....	77
7.13.1	Covers and obstacles.....	77
7.13.2	Surge protection and voltage limiting devices.....	77
7.14	Specific components for trolleybus systems .....	77
7.14.1	General.....	77
7.14.2	Turnouts and crossings .....	77
7.15	Automatic earthing and short-circuiting equipment.....	78
7.16	Monitoring devices .....	78
8	Testing .....	78
8.1	Testing of components and assemblies - general .....	78
8.2	Supporting assemblies .....	79
8.2.1	Type test .....	79
8.2.2	Sample test.....	88



8.2.3	Routine test.....	90
8.3	Contact wires .....	90
8.4	Other conductors .....	90
8.5	Tensioning devices .....	90
8.5.1	Tests required.....	90
8.5.2	Type tests for tensioning devices with balance weights .....	90
8.5.3	Type tests for tensioning device without balance weight.....	92
8.6	Mechanical midpoints .....	92
8.7	Droppers.....	92
8.7.1	Tests required.....	92
8.7.2	Mechanical fatigue test.....	92
8.7.3	Mechanical tests.....	94
8.8	Clamps, splices and other fittings.....	94
8.9	Electrical connectors .....	94
8.9.1	General .....	94
8.9.2	Mechanical fatigue tests .....	94
8.10	Insulators .....	95
8.11	Sectioning devices .....	96
8.11.1	Type test.....	96
8.11.2	Field test.....	96
8.11.3	Sample verification.....	97
8.11.4	Routine tests .....	97
8.12	Disconnectors and drives .....	97
8.13	Surge arresters and voltage limiting devices.....	97
8.14	Specific components for trolleybus systems.....	97
8.15	System test .....	97
8.15.1	Demonstration of conformity .....	97
8.15.2	Acceptance tests and verification .....	98
8.15.3	Commissioning tests .....	98
9	Minimum documentation .....	99
9.1	General .....	99
9.2	System specification.....	99
9.3	Basic design .....	99
9.4	Installation design .....	99
9.5	Installation and maintenance .....	99
Annex A (informative) Structural details.....		100
Annex B (informative) Information on geotechnical soil investigation and soil characteristics.....		101
Annex C (informative) Overhead contact line for electric trucks .....		102
C.1	General .....	102
C.2	Line characteristics.....	102
C.3	System characteristics .....	102
C.4	Electric polarity of contact wires .....	103
C.5	Power supply voltage.....	103
C.6	Vehicle characteristics.....	103
C.7	Current collector characteristics .....	103
C.8	Contact forces .....	104
Annex ZZ (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2016/797/EU aimed to be covered.....		105
Bibliography.....		107

**EN 50119:2020 (E)****European foreword**

This document (EN 50119:2020) has been prepared by CLC/SC 9XC, "Electric supply and earthing systems for public transport equipment and ancillary apparatus (Fixed installations)" of CLC/TC 9X "Electrical and electronic applications for railways".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2021-01-13
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2023-01-13

This document supersedes EN 50119:2009, as impacted by EN 50119:2009/A1:2013.

EN 50119:2020 includes the following significant technical changes with respect to EN 50119:2009, as impacted by EN 50119:2009/A1:2013:

- requirements for urban mass transportation system are included;
- requirement for rigid overhead contact line (ROCL) are included;
- additional definitions for new terms are included (Clause 3);
- clearances and geometry of overhead contact line are improved (Clause 5);
- urban aspects are added, e.g. wall anchors (Clause 6);
- monitoring devices and automatic earthing and short-circuiting equipment are included (Clause 7);
- overhead contact line for electric trucks is added (Annex C).

Other improvements of this document came from the publication of IEC 60913.

In relation to Subclause 5.1.3, electrical coordination activities are on-going in CLC/SC 9XC (FprEN 50119, the EN 50124 series, prEN 50488 and the EN 50122 series). A Technical Report will be proposed.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive 2016/797/EU, see informative Annex ZZ, which is an integral part of this document.

## 1 Scope

This document applies to overhead contact line systems in heavy railways, light railways, trolley buses and industrial railways of public and private operators.

This document applies to new installations of overhead contact line systems and for the complete renewal of existing overhead contact line systems.

This document contains the requirements and tests for the design of overhead contact lines, requirements for structures and their structural calculations and verifications as well as the requirements and tests for the design of assemblies and individual parts.

This document does not provide requirements for ground level conductor rail systems (see Figure 1).

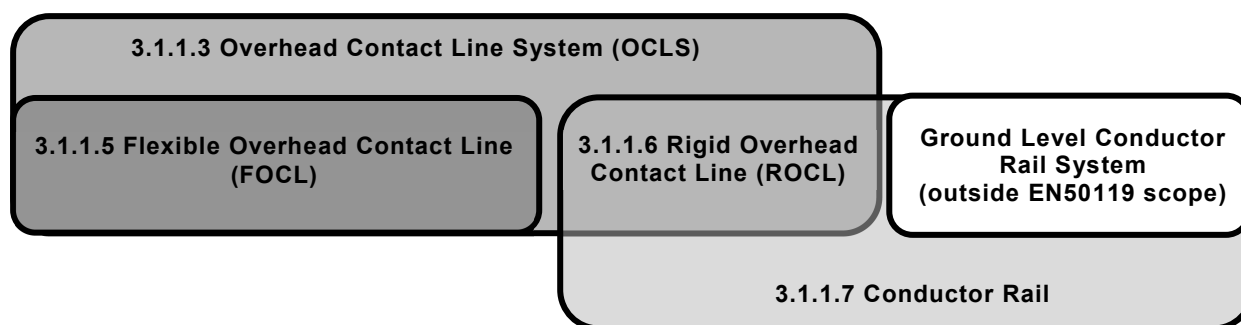


Figure 1 — Scope of contact line systems

## 2 Normative references

The following referenced documents are indispensable for the application 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 206, *Concrete - Specification, performance, production and conformity*

EN 485 (all parts), *Aluminium and aluminium alloys – Sheet, strip and plate*

EN 755 (all parts), *Aluminium and aluminium alloys – Extruded rod/bar, tube and profiles*

EN 1536, *Execution of special geotechnical work – Bored piles*

EN 1537, *Execution of special geotechnical works - Ground anchors*

EN 1990:2002, *Eurocode - Basis of structural design*

EN 1090-2:2018, *Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures*

EN 1991-1-4:2005, *Eurocode 1: Actions on structures - Part 1-4: General actions - Wind actions*

EN 1991-2, *Eurocode 1: Actions on structures - Part 2: Traffic loads on bridges*

EN 1992 (all parts), *Eurocode 2: Design of concrete structures*

EN 1993 (all parts), *Eurocode 3: Design of steel structures*

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-