



# SLOVENSKI STANDARD

## SIST EN 13107:2015

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Nadomešča:  
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### Varnostne zahteve za žičniške naprave za prevoz oseb - Gradbena dela in objekti

Safety requirements for cableway installations designed to carry persons - Civil engineering works

Sicherheitsanforderungen an Seilbahnen für den Personenverkehr - Bauwerke

Prescriptions de sécurité pour les installations à câbles transportant des personnes - Ouvrages de génie civil

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Oprema za žičnice

Cableway equipment

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EUROPEAN STANDARD  
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**EN 13107**

June 2015

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**Safety requirements for cableway installations designed to carry  
persons - Civil engineering works**

Prescriptions de sécurité pour les installations à câbles  
transportant des personnes - Ouvrages de génie civil

Sicherheitsanforderungen an Seilbahnen für den  
Personenverkehr - Bauwerke

This European Standard was approved by CEN on 3 December 2014.

CEN 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 CEN member.

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## Contents

	Page
Foreword.....	5
1 Scope .....	8
2 Normative references .....	8
3 Terms and definitions .....	9
4 Units and symbols .....	9
5 General requirements.....	10
5.1 Application of this standard .....	10
5.2 Safety principles .....	10
5.3 Safety analysis .....	10
5.3.1 Reliability differentiation .....	10
5.3.2 Design situations .....	10
5.3.3 Design working life .....	10
5.3.4 Durability .....	10
6 Combinations of actions and safety measures .....	11
6.1 Combinations of actions .....	11
6.2 Safety measures .....	11
7 Actions and environmental influences .....	11
7.1 General.....	11
7.1.1 Principal classifications.....	11
7.1.2 Characteristic and representative values of actions .....	12
7.1.3 Environmental influences .....	12
7.2 Actions for aerial ropeways.....	12
7.2.1 General.....	12
7.2.2 Permanent actions.....	13
7.2.3 Variable actions .....	13
7.2.4 Accidental actions .....	17
7.2.5 Other actions and effects.....	19
7.3 Actions for funicular railways .....	19
7.3.1 General.....	19
7.3.2 Permanent actions.....	19
7.3.3 Variable actions .....	20
7.3.4 Accidental actions .....	22
7.3.5 Other actions and effects.....	24
7.4 Actions for ski-tows.....	24
7.4.1 General.....	24
7.4.2 Permanent actions.....	24
7.4.3 Variable actions .....	25
7.4.4 Accidental actions .....	27
7.4.5 Other actions and effects.....	29
8 Limit states .....	29
8.1 General.....	29
8.2 Limit state design .....	30
9 Verifications .....	30
9.1 General.....	30
9.2 Design values of actions.....	30
9.3 Verification of ultimate limit state .....	31
9.3.1 General.....	31

9.3.2	Verification of static equilibrium and strength (ground, components).....	31
9.3.3	Combination of actions .....	32
9.3.4	Partial factors .....	33
9.4	Verification of serviceability limit state .....	34
9.4.1	General .....	34
9.4.2	Verification of serviceability limit states .....	34
9.4.3	Combination of actions .....	34
9.4.4	Deformations .....	35
9.4.5	Rotations.....	35
9.4.6	Vibrations of work platforms .....	36
9.5	Verification of fatigue .....	37
9.5.1	General .....	37
9.5.2	Fatigue loading.....	38
9.5.3	Fatigue loads for continuous circulation .....	38
9.5.4	Fatigue loads for monocable group ropeways and group aerial ropeways .....	39
9.5.5	Fatigue loads for double cableway installations .....	39
9.5.6	Fatigue loads for funicular railways.....	40
9.5.7	Fatigue resistance.....	40
9.5.8	Verification.....	40
9.6	Fire design verifications.....	41
10	Type of construction.....	42
10.1	Concrete structures .....	42
10.1.1	General .....	42
10.1.2	Foundations.....	42
10.1.3	Bridges of funicular railways and ski-tows.....	42
10.1.4	Structures subjected to fatigue .....	42
10.2	Steel structures .....	42
10.2.1	General .....	42
10.2.2	Steel grade and quality .....	43
10.2.3	Bridges of funicular railways and ski-tows.....	43
10.2.4	Structures subjected to fatigue .....	43
10.3	Composite steel and concrete structures .....	43
10.4	Timber structures.....	43
10.5	Geotechnical construction works .....	44
10.6	Seismic design .....	44
10.7	Aluminium structures .....	44
10.7.1	Buildings.....	44
10.7.2	Structures subjected to fatigue .....	44
11	Components .....	44
11.1	Foundations – General .....	44
11.2	Spread foundations .....	44
11.2.1	Verification of ultimate limit state for spread foundations .....	44
11.2.2	Verification of the serviceability limit state for spread foundations .....	46
11.3	Deep foundations – anchors and piling.....	46
11.4	Railings, balustrades, and barriers .....	47
11.4.1	General .....	47
11.4.2	Railings in public areas.....	47
11.4.3	Railings in work areas .....	47
11.5	Connection between steel line support structure and foundation .....	48
11.6	Line structures of funicular railways .....	48
11.6.1	Track.....	48
11.6.2	Track infrastructure .....	48
11.6.3	Track superstructure .....	48
11.6.4	Bridges .....	49
11.6.5	Tunnels and galleries .....	49
11.7	Bridges for ski-tows.....	49
12	Protection of workers .....	49
12.1	General .....	49

## EN 13107:2015 (E)

12.2	Work platforms.....	49
12.3	Access to work platforms .....	50
12.4	Gangways for return stations.....	50
12.5	Rope lifting devices and roller batteries .....	50
12.6	Running rails for carriers.....	51
12.7	Provisions for load handling devices.....	51
12.8	Handling devices for drive elements .....	51
12.9	Anchor points for tensioning ropes.....	51
Annex A	(normative) Documentation .....	52
A.1	General.....	52
A.2	General data .....	52
A.3	Technical documents .....	52
A.3.1	General.....	52
A.3.2	Utilization plan (requirements specification).....	52
A.3.3	Project principles / Specifications / Technical Report.....	53
A.4	Verifications and calculations .....	53
A.4.1	Verifications .....	53
A.4.2	Calculations.....	53
A.4.3	Plans .....	54
A.5	Records.....	54
Annex B	(informative) Extracts from the EN 1990:2002 .....	55
B.1	General.....	55
B.2	Terms and definitions .....	55
B.3	Safety principles (essential requirements) .....	57
B.4	Safety analysis.....	57
B.4.1	Reliability differentiation [EN 1990:2002, 2.2].....	57
B.4.2	Durability [EN 1990:2002, 2.4].....	58
B.4.3	Design situations [EN 1990:2002, 3.2] .....	59
B.5	Safety measures .....	59
B.5.1	Assumptions [EN 1990:2002, 1.3] .....	59
B.5.2	Further safety measures .....	59
B.5.3	Quality management [EN 1990:2002, 2.5].....	60
B.6	Fundamentals for limit state design .....	60
B.6.1	General [EN 1990:2002, 3.1].....	60
B.6.2	Ultimate limit states [EN 1990:2002, 3.3] .....	60
B.6.3	Serviceability limit states [EN 1990:2002, 3.4] .....	61
Annex ZA	(informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2000/9/EC relative to cableway installations designed to carry persons .....	62
Bibliography	.....	65

## Foreword

This document (EN 13107:2015) has been prepared by Technical Committee CEN/TC 242 "Safety requirements for passenger transportation by rope", the secretariat of which is held by AFNOR.

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 December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

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

This document supersedes EN 13107:2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 2000/9/EC.

For the relationship with the EU Directive 2000/9/EC, see informative Annex ZA, which is an integral part of this document.

With respect to EN 13107:2004, the following significant amendments have been made:

- Since the present standard was enacted, the Eurocodes 0 to 9 have come into force, which is why they have lost the status of a pre-standard "ENV". The Eurocodes are binding in regard to the design and sizing for the entire construction, but also for the area of cableway installations. Many adjustments in this revision phase justify themselves because the updates in relation to these standards resulted in numerous editorial, conceptual, as well as substantive changes.
- Due to various inaccuracies in the translation from English (2004: Original document), some textual changes had to be made in the German and French versions.
- In the German version, a "muss-Formulierung" ["must formulation"] was used consistently at Germany's request for the requirements with mandatory character. In the French version, "doit" is used for this.
- The German spelling rules were taken into account where necessary with "ß" instead of "ss".
- In 5.3.3, the working life of some structural parts has been adjusted to current knowledge.
- In 7.2.3.2, the variable actions of the rope forces in determining the amount of hydraulic braced systems may relate to the nominal base clamping force and not to the upper limit.
- Clause 7 defines, under the payloads, the horizontal action on railing in public areas and in the working platforms, the snow load that is to be considered, as well as the accidental action on attachment points.
- In Clause 7, it has been pointed out that environmental influences are to be established through expert opinion or – if available – national regulations may / shall be used. The environmental impacts have been added to the parameters; in particular the relevant return period has been determined according to whether the action represents a variable or accidental action.
- In Clause 7 "Actions and environmental influences," there were some reallocations of accidental to variable actions (e.g. simultaneous incursion of the operational and safety brake, frequently occurring avalanche impacts, etc.).

## EN 13107:2015 (E)

- In 7.2 the size of the nosing force has been defined, instead of referring to the carrier standard EN 13796-1. The nosing force is caused by irregularities in the track and shall therefore be determined by EN 13107. Moreover, it has primary effects on the concept and the execution of the track as well as the engineering structures.
- In 9.4.4.2, the permitted value of the support deformation was increased for combined support / compression towers. Moreover, it no longer deals with the threshold values, but with the indicative values for the specified support deformations.
- Subclause 9.5 “Verification of fatigue” has been completely rewritten and updated in accordance with the state of the art.
- In 10.2, some specific rules for manufacturing processes as well as steel grades and quality were adjusted or deleted to comply with Eurocode 3 which was enacted, since the relevant standard is precise and detailed in this regard.
- Subclauses 11.1 to 11.3, were revised based on the current EN 1997-1 and adapted to the needs of the area of cableway installations.
- 11.4 has been re-added to the standard for the public sector because it provides relevant reference to EN 13107 in EN 12929-1.
- 11.6 has been restructured and redrafted. Reference is made to the standard CEN/TC 256/DC 1 for the concept and execution of the track superstructure.
- Subclause 11.8 “Miscellaneous” has been removed altogether. It mainly dealt with the requirements for fire protection, which have been newly recorded in Section 7 (“Fire” with respect to the three aforementioned cableway installation systems).
- In Clause 7, and in Subclause 9.6, references to fire risks that are typical for cableway installations as well as to CEN/TR 14819-1 and CEN/TR 14819-2 have been made. Reference is also made to the national regulations.
- In Clause 12, 12.1 as well as Figure 2 “Safety distances with vehicles” has been deleted. Similar requirements are contained in EN 12929-1. At this point, a “General” subclause with general principles for employee protection has been added.
- Annex A has been editorially revised and adapted to the new terms and definitions.
- Annex B has been adapted to the new terminology in EN 1990 and three new terms and definitions have been added (rope shoe, track rope saddle, friction coefficient). For texts that are quoted from EN 1990 almost word for word, DE applications concerning a “must formulation” had not been implemented.
- Annex C (Deviation A) has been deleted.
- Annex ZA has been updated.

This European Standard is part of a series of standards concerning safety requirements for cableway installations designed for passenger transport. This series consists of the following standards:

- EN 1907, relating to *Terminology*
- EN 12929 (all parts), relating to *General requirements*
- EN 12930, relating to *Calculations*
- EN 12927 (all parts), relating to *Cables*



- EN 1908, relating to *Tensioning devices*
- EN 13223, relating to *Drive systems and other mechanical equipment*
- EN 13796 (all parts), relating to *Carriers*
- EN 13243, relating to *Electrical equipment other than for drive systems*
- EN 13107, relating to *Civil engineering works*
- EN 1709, relating to *Pre-commissioning inspection, maintenance, operational inspection and checks*
- EN 1909, relating to *Recovery and evacuation*
- EN 12397, relating to *Operation*
- EN 12408, relating to *Quality control*

Together these form a series of standards applicable to the design, manufacturer, installation, maintenance and operation of cableway installations designed for passenger transport.

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

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## 1 Scope

This European Standard specifies the safety requirements applicable to civil engineering works for cableway installations designed to carry persons. In doing so, the various types of cableway installations and their environment are taken into consideration.

It includes requirements relating to the prevention of accidents and the protection of workers, notwithstanding the application of national regulations.

National regulations regarding building or construction or that are designed to protect particular groups of people remain unaffected.

It does not apply to cableway installations for transportation of goods or to lifts.

This European Standard is applicable to:

- new cableway installations designed to carry persons;
- alterations to existing cableway installations, as far as the safety of civil engineering works or parts of them is involved and no contrary specifications apply.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 795, *Personal fall protection equipment – Anchor devices*

<https://standards.iteh.ai/catalog/standards/sist/866afcc7-9559-4ec9-ad28-214959be43/sist-en-13107-2015>

EN 1090-1, *Execution of steel structures and aluminium structures – Part 1: Requirements for conformity assessment of structural components*

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

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

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

EN 1709, *Safety requirements for cableway installations designed to carry persons — Pre-commissioning inspection, maintenance, operational inspection and checks*

EN 1907, *Safety requirements for cableway installations designed to carry persons — Terminology*

EN 1908, *Safety requirements for cableway installations designed to carry persons — Tensioning devices*

EN 1909, *Safety requirements for cableway installations designed to carry persons — Recovery and evacuation*

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

EN 1991 (all parts) *Eurocode 1 - Actions on structures*

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

EN 1993 (all parts), *Eurocode 3 - Design and Construction of reinforced concrete structures*

- EN 1993-1-9:2005, *Eurocode 3: Design and Construction of reinforced concrete structures - Part 1-9: Fatigue*
- EN 1994 (all parts), *Eurocode 4: Design of composite steel and concrete structures*
- EN 1995 (all parts), *Eurocode 5: Design of timber structures*
- EN 1996 (all parts), *Eurocode 6 - Design of masonry structures*
- EN 1997 (all parts), *Eurocode 7 - Geotechnical design*
- EN 1998 (all parts), *Eurocode 8 - Design of structures for earthquake resistance*
- EN 1999 (all parts), *Eurocode 9 - Design of aluminium structures*
- EN 12397, *Safety requirements for cableway installations designed to carry persons — Operation*
- EN 12408, *Safety requirements for cableway installations designed to carry persons — Quality control*
- EN 12699, *Execution of special geotechnical work (special geotechnical work): Displacement piles*
- EN 12927 (all parts), *Safety requirements for cableways installation designed to carry persons — Ropes*
- EN 12929 (all parts), *Safety requirements for cableways installation designed to carry persons — General requirements*
- EN 12930, *Safety requirements for cableway installations designed to carry persons — Calculations*
- EN 13223, *Safety requirements for cableways installations designed to carry persons — Drive systems and other mechanical equipment*
- EN 13243, *Safety requirements for cableways installation designed to carry persons — Electrical equipment other than for drive systems*
- EN 13670, *Execution of concrete structures*
- EN 13796 (all parts), *Safety requirements for cableway installations designed to carry persons — Carriers*
- EN 14199, *Execution of special geotechnical labour (special geotechnical work) — Micropiles*
- CEN/TR 14819 (all parts), *Safety recommendations for cableway installations designed to carry persons - Prevention and fight against fire*
- EN ISO 80000-1, *Quantities and units — Part 1: General (ISO 80000-1)*

### 3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN 1907, EN 1990 and EN 1991 (all parts) apply.

NOTE Other terms and definitions relating to this standard are listed in B.2.

### 4 Units and symbols

SI units shall be used in accordance with EN ISO 80000-1.

Symbols used in this standard conform to the Structural Eurocodes EN 1991 (all parts) to EN 1999 (all parts) and are defined where they appear for the first time in the text.

## EN 13107:2015 (E)

## 5 General requirements

### 5.1 Application of this standard

The requirements of this European Standard apply to all cableway installations along with EN 1709, EN 1908, EN 1909, EN 12397, EN 12408, EN 12927 (all parts), EN 12929 (all parts), EN 12930, EN 13223, EN 13243 and EN 13796 (all parts).

### 5.2 Safety principles

The safety principles set out in EN 12929-1 apply. The design and execution of all cableway installations shall meet the essential requirements as specified in the EU Cableways Directive 2000/9/EC and the EN 1990.

NOTE More information is given in B.3.

### 5.3 Safety analysis

#### 5.3.1 Reliability differentiation

The reliability required for the civil engineering works of cableways shall be obtained by design and execution according to EN 1990 to EN 1999 (all parts) and this European Standard.

NOTE More information is given in B.4.

#### 5.3.2 Design situations

Design situations are classified as follows:

- persistent situations which refer of the conditions of normal use;
- transient situations which refer to temporary conditions applicable to the structure, e.g. during construction or repair;
- accidental situations which refer to exceptional conditions applicable to the structure or to its environment, e.g. to fire, derailment, impact, avalanches, local failure;
- seismic situations, which refer to conditions applicable to the structure when subjected to seismic events.

#### 5.3.3 Design working life

**5.3.3.1** The design working life is the assumed period for which a structure is to be used for its intended purpose with anticipated maintenance but without major repair being necessary.

When specifying the working life, the current “state of the art” shall be taken into consideration. As a minimum the expected fatigue loads shall be taken as a basis for the verification of fatigue in the considered period.

**5.3.3.2** It is recommended to adopt the following periods for the civil engineering works of cableways and to define them in the utilization plan (requirements specification):

- 20 years for interchangeable / renewable components (e.g. seals, joints, drainage systems, bearings etc.);
- 30 years in general and for all structures or parts of structures which absorb actions induced by ropes;
- 50 years for buildings as well as for support structures of bicable, double monocable and funicular railways.

#### 5.3.4 Durability

**5.3.4.1** The durability of structures shall be determined in accordance with EN 1990.

**5.3.4.2** EN 1990 to EN 1999 (all parts) as well as the present European Standard set appropriate measures.

NOTE More information is given in B.4.

## 6 Combinations of actions and safety measures

### 6.1 Combinations of actions

For the purpose of this European Standard, the actions and combinations of actions are specified in Clauses 7 and 9. Each combination of actions is made up of the permanent actions, one dominating, variable action (main action) or one accidental action, possibly combined with accompanying variable actions (accompanying actions). Each combination of actions leads to a design situation, which shall be verified.

### 6.2 Safety measures

Safety measures shall be taken into account in order to avoid or to limit the consequences of hazards and hazard scenarios. Particular regard shall be paid to the maintenance of civil engineering works.

NOTE More information is given in B.5.

## 7 Actions and environmental influences

### 7.1 General

#### 7.1.1 Principal classifications

**7.1.1.1** An action ( $F$ ) is:

- a) a direct action, e.g. a force or load applied to the structure; or
- b) an indirect action, e.g. an imposed or constrained deformation, or an imposed acceleration caused, for example, by temperature changes, moisture variation, uneven settlement or earthquakes.

**7.1.1.2** Actions are classified by:

- a) their variation in time
  - 1) permanent actions ( $G$ ), e.g. self-weight of the structure as a result of immovable fittings, ancillary and fixed equipment or ground actions;
  - 2) variable actions ( $Q$ ), e.g. imposed loads, actions induced by ropes, traffic loads, wind actions or snow actions; where a distinction has to be made as to whether these actions take place “in operation” or “out of operation”;
  - 3) accidental actions ( $A$ ), e.g. due to onboard brakes as well as jammed grips, derailment, avalanches, explosions or impact from vehicles.
- b) their spatial variation
  - 1) fixed actions, e.g. self-weight;
  - 2) free actions, e.g. imposed loads, wind actions and snow actions;
- c) their nature and/or the structural response
  - 1) static actions, which do not cause significant acceleration of the structure or structural member;

## EN 13107:2015 (E)

2) dynamic actions, which cause significant acceleration of the structure or the structural member.

### 7.1.2 Characteristic and representative values of actions

**7.1.2.1** The characteristic value of an action is its main representative value.

**7.1.2.2** Characteristic values of actions ( $F_k$ ) are specified:

- in EN 12930;
- in EN 1991-1 (all parts) as well as EN 1991-2 and EN 1991-3 as a mean value, a higher or a lower value, or a nominal value (which does not refer to a known statistical distribution);
- in the design, provided that the provisions specified in EN 1990 are observed by competent persons.

**7.1.2.3** For permanent actions the characteristic value ( $G_k$ ) shall be determined as follows:

- a) if the variability of  $G$  is small, one single value  $G_k$  (nominal value) may be used;
- b) if the variability of  $G$  is not small, two values shall be used; an upper value  $G_{k,sup}$  and a lower value  $G_{k,inf}$ .

**7.1.2.4** For variable actions, the characteristic value  $Q_k$  corresponds to:

- a) either an upper value, with an intended probability of not being exceeded, or a lower value with an intended probability of not falling below during some reference period;
- b) or a nominal value, which may be specified in cases where a probability distribution is not known.

**7.1.2.5** For accidental actions, the representative value is generally a characteristic value ( $A_k$ ), which corresponds to a specified value (nominal value).

**7.1.2.6** For variable multi-component actions, the characteristic action is represented by a group of values, to be considered alternatively in the design calculation. Actions, which are directly dependent of each other in the considered load state, form a group of values which shall be treated as a single, variable action.

**7.1.2.7** In most common cases the other representative values of a variable action are:

- the combination value, generally represented as a product  $\psi_0 Q_k$ ;
- the frequent value, generally represented as a product  $\psi_1 Q_k$ ;
- the quasi-permanent value, generally represented as a product  $\psi_2 Q_k$ .

### 7.1.3 Environmental influences

The environmental influences which can affect the durability of the structure shall be considered in the choice of structural materials, their specification, the structural concept and detailed design. EN 1992 (all parts) to EN 1999 (all parts) specify the relevant measures.

NOTE Full information on the subjects mentioned in 7.1 is given in EN 1990 and its annexes.

## 7.2 Actions for aerial ropeways

### 7.2.1 General

Actions for aerial ropeways are classified according to 7.1.1.2 a):

- a) permanent actions;
- b) variable actions;
- c) accidental actions.

## 7.2.2 Permanent actions

### 7.2.2.1 General

Permanent actions act throughout a given design situation; their variation in magnitude with time is negligible in relation to the mean value, or their variation is always in the same direction (monotonic) until the action attains a certain limit value.

As a general rule, the following actions are considered to be permanent actions:

### 7.2.2.2 Self-weight

The self-weight of a structure includes the loads arising exclusively from the mass of the structural elements and can be represented in most cases by a single characteristic value, calculated on the basis of the nominal dimensions and the densities (weights) given in EN 1991-1-1.

The self-weight of non-structural elements as far as their position is fixed shall be considered as characteristic values. This refers, for example, to partition walls and panelling, railings, safety barriers, lifts and moving staircases, fittings as well as ancillary and fixed equipment. Whenever one of the elements listed above is movable, the corresponding actions shall be considered as variable actions (Imposed loads).

### 7.2.2.3 Ground actions

These actions include the pressure on basement walls and foundations induced by earth loads as well as pore water pressure and other ground actions.

As a general rule, the characteristic values of ground actions shall be taken in accordance with EN 1997-1.

## 7.2.3 Variable actions

### 7.2.3.1 General

Variable actions are those actions which are not likely to act throughout a given design situation; their variation in magnitude with time may not be negligible, or their variation may not always take place in the same direction.

As a general rule, the following actions are considered as variable actions:

### 7.2.3.2 Actions induced by ropes and carriers

Each rope action shall be considered as an individual case (see also 9.2.5). Dynamic actions as well as friction actions shall be considered where relevant (see 7.2.3.3 and 7.2.3.4). The most unfavourable load arrangement "*in operation*" or "*out of operation*" shall be taken into account for the design of structural elements.

- a) actions induced by the carrying-hauling rope(s) of continuous or pulsed movement aerial ropeways;
- b) actions induced by the track- and haulage rope(s) of pulsed movement or reversible aerial ropeways;
- c) actions induced by other ropes such as tension ropes, recovery ropes, evacuation ropes or signalling ropes;
- d) actions induced by carriers affecting the structure directly.