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Interested committees:

Title: Draft BS EN 16851 Cranes - Light crane systems.

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Full document details: 25/30512738 DC

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Cranes - Light crane systems

Appareils de levage à charge suspendue - Systèmes de
grue légère

Krane - Leichtkransysteme

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 147.

If this draft becomes a European Standard, 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.

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

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



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European foreword

This document (prEN 16851:2025) has been prepared by Technical Committee CEN/TC 147 “Cranes - Safety”, the secretariat of which is held by SFS.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 16851:2017+A1:2020.

prEN 16851:2025 includes the following significant technical changes with respect to EN 16851:2017+A1:2020:

- update of reference documents and cross-references;
- revision of Clauses 2 and 3;
- revision and update of subclauses 4.1.1, 4.4.9, 4.4.10, 4.7.1, 4.9;
- removal of subclause on lighting (4.7.4);
- addition of new subclauses 6.3.1 and 6.3.3;
- restructuring of Clause 6;
- revision of the list of significant hazards and move to Annex A;
- revision of Annex ZA;
- addition of new Annex F.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

For relationship with other European Standards for cranes, see Annex E.

Introduction

This document has been prepared to provide one means for equipment of cranes to conform to the essential health and safety requirements of the Machinery Regulation, as mentioned in Annex ZA.

This document is a type C standard as stated in EN ISO 12100:2010.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- service providers, e.g. for maintenance (small, medium and large enterprises).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards are covered are indicated in the Scope of this document.

When requirements of this type C standard are different from those which are stated in type A or B standards, the requirements of this type C standard take precedence over the requirements of the other standards, for machines that have been designed and built according to the requirements of this type C standard.

1 Scope

This document applies to:

- light crane systems, either suspended or free-standing systems, where the rated capacity of any single hoist mechanism is 4 t or less;
- pillar- and wall-mounted jib cranes, without an operator's cabin, whose rated capacity is 10 t or less and whose overturning load moment is 500 kNm or less.

NOTE 1 For illustration of crane types, see Annex C.

This document is not applicable to cranes covered by another product specific crane standard, e.g. EN 15011:2020 or EN 14985:2012, see Annex E.

This document is applicable to cranes and crane systems, whose structures are made of steel or aluminium, excluding aluminium structures containing welded joints.

This document gives requirements for all significant hazards, hazardous situations and events relevant to cranes, when used as intended, foreseeable misuse and under foreseen conditions (see Annex A).

NOTE 2 Automated operation can be subject to additional requirements. Guidance is given in Annex F.

The specific hazards due to potentially explosive atmospheres, ionizing radiation, operation in electromagnetic fields beyond the range of EN IEC 61000-6-2:2019 and operation in pharmacy or food industry are not covered by this document.

This document does not cover hazards related to the lifting of persons.

This document is not applicable to cranes manufactured before the date of its publication.

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 515:2017, *Aluminium and aluminium alloys - Wrought products - Temper designations*

EN 755-1:2016, *Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 1: Technical conditions for inspection and delivery*

EN 755-2:2025, *Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties*

EN 755-9:2016, *Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 9: Profiles, tolerances on dimensions and form*

EN 795:2012, *Personal fall protection equipment - Anchor devices*

EN 894-1:1997+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators*

EN 894-2:1997+A1:2008, *Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays*

EN 12077-2:2024, *Cranes safety - Requirements for health and safety - Part 2: Limiting and indicating devices*

- EN 13001-1:2015, *Cranes - General design - Part 1: General principles and requirements*
- EN 13001-2:2021, *Crane safety - General design - Part 2: Load actions*
- EN 13001-3-1:2025, *Cranes - General design - Part 3-1: Limit states and proof of competence of steel structure*
- EN 13001-3-2:2014, *Cranes - General design - Part 3-2: Limit states and proof of competence of wire ropes in reeving systems*
- EN 13001-3-3:2014, *Cranes - General design - Part 3-3: Limit states and proof of competence of wheel/rail contacts*
- EN 13001-3-4:2018, *Cranes - General design - Part 3-4: Limit states and proof of competence of machinery - Bearings*
- EN 13001-3-5:2016+A1:2021, *Cranes - General design - Part 3-5: Limit states and proof of competence of forged and cast hooks*
- EN 13001-3-6:2018+A1:2021, *Cranes - General design - Part 3-6: Limit states and proof of competence of machinery - Hydraulic cylinders*
- EN 13135:2013+A1:2018, *Cranes - Safety - Design - Requirements for equipment*
- EN 13157:2004+A1:2009, *Cranes - Safety - Hand powered cranes*
- EN 13557:2024, *Cranes - Control devices and control stations*
- EN 13586:2020, *Cranes - Access*
- EN 14238:2004+A1:2009, *Cranes - Manually controlled load manipulating devices*
- EN 14492-2:2019, *Cranes - Power driven winches and hoists - Part 2: Power driven hoists*
- EN 15011:2020, *Cranes - Bridge and gantry cranes*
- EN 60204-32:2008, *Safety of machinery - Electrical equipment of machines - Part 32: Requirements for hoisting machines (IEC 60204-32:2008)*
- EN 62745:2017,¹ *Safety of machinery - Requirements for cableless control systems of machinery (IEC 62745:2017)*
- prEN 50742:—,² *Safety of machinery – Protection against corruption*
- EN ISO 3744:2010, *Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane (ISO 3744:2010)*
- EN ISO 4871:2009, *Acoustics - Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

¹ As impacted by EN 62745:2017/A11:2020.

² Under preparation on CLC/TC 44X/WG 2. Stage 10.99 realized on 2023-12-13.

EN ISO 11201:2010, *Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions in an essentially free field over a reflecting plane with negligible environmental corrections (ISO 11201:2010)*

EN ISO 11688-1:2009, *Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning (ISO/TR 11688-1:1995)*

EN ISO 12100:2010, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2023, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2023)*

EN ISO 13854:2019, *Safety of machinery - Minimum gaps to avoid crushing of parts of the human body (ISO 13854:2017)*

EN ISO 13857:2019, *Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2019)*

EN ISO 14120:2015, *Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards (ISO 14120:2015)*

EN ISO 20607:2019, *Safety of machinery - Instruction handbook - General drafting principles (ISO 20607:2019)*

ISO 3864-1:2011, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

ISO 3864-2:2016, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 3864-3:2024, *Graphical symbols — Safety colours and safety signs — Part 3: Design principles for graphical symbols for use in safety signs*

ISO 3864-4:2011, *Graphical symbols — Safety colours and safety signs — Part 4: Colorimetric and photometric properties of safety sign materials*

ISO 4306-1:2007, *Cranes — Vocabulary — Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4306-1:2007, EN ISO 3744:2010 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

light crane system

assembly of hoist mechanisms, bridges, trolleys and tracks with their suspensions for lifting operations

3.2**bridge**

beam carrying hoist mechanism(s) and supported on trolleys running on tracks

Note 1 to entry: Wording of the definition differs from that given in ISO 4306-1:2007.

3.3**track**

stationary beam on which a bridge or hoist mechanism(s) are running

Note 1 to entry: Characteristic for tracks in light crane systems is that a track can be removed from the supporting building structures without influence on strength of the supporting structures.

3.4**suspension**

necessary clamps, hanger rods and other fittings from which a track is suspended from a building or other supporting structure

3.5**monorail**

single track consisting of one or several sections, on which hoist mechanisms or trolleys are running

Note 1 to entry: Monorail together with hoist mechanisms is a particular type of a light crane system.

3.6**pillar-mounted jib crane**

crane with a vertical pillar installed on a stationary construction or on a relocatable base, equipped with a slewing jib and hoist mechanism(s)

3.7**wall-mounted jib crane**

crane fixed to a vertical structure (e.g. wall or column), equipped with a slewing jib and hoist mechanism(s)

3.8**jib crane**

generic term for both pillar-mounted and wall-mounted jib cranes

Note 1 to entry: This definition is different from that in ISO 4306-1:2007.

3.9**free-standing light crane system**

floor-mounted light crane system

system installed on the floor or relocatable between its working positions

Note 1 to entry: A free-standing light crane system can be supported by the surrounding structures using bracings.

Note 2 to entry: Characteristic for a free-standing light crane system is that it can be removed from the supporting building structures without influence on strength of the supporting structures.

Note 3 to entry: For an example of free-standing light crane system see Figure C.4.

3.10

trolley

wheel assembly running on a track or on a bridge and supporting a bridge or hoist mechanism

Note 1 to entry: Definition differs from that specified in ISO 4306-1.

3.11

loading/unloading station

arrangement enabling a piece of track to be lowered down and lifted up together with the hoist mechanism or trolley

3.12

turntable

component able to rotate in a horizontal plane and containing a piece of track, enabling the hoist mechanism or trolley to change from one track to another

3.13

switch

component enabling the hoist mechanism or trolley to change from one track to another

3.14

interlock

mechanism aligning a moving bridge with a stationary track or aligning two bridges and keeping this aligned connection steady for hoist mechanism or trolley to move through the connection

3.15

engineering assessment

evaluation of the characteristics of a part, component, or system by comparing their given properties with known specifications (e.g. standards and/or regulations)

3.16

hoist mechanism

equipment for moving the load vertically

4 Safety requirements and/or protective measures

4.1 General – Safety related standards

Light crane systems and jib cranes shall comply with the safety requirements and/or protective measures of Clause 4. In addition, these cranes shall be designed in accordance with the principles of EN ISO 12100:2010 for relevant but not significant hazards, which are not dealt with by this document.

The service conditions that are selected and used as the basis of design, in accordance with EN 13001-1:2015, 4.3 and EN 13001-2:2021, Clause 4 shall be specified in the technical file of the crane. The design duty (classification) shall be specified in terms of classes U and Q with the average distances of movements in line with EN 13001-1:2015, 4.3. See Annex B for guidance and examples of classification of typical applications.

Light crane systems shall be designed and constructed in such a way as to prevent failure from fatigue and wear, taking due account of their intended use and any foreseeable misuse.

Machinery included in light crane systems and jib cranes shall be in accordance with the following European Standards as applicable:

— EN 14492-2:2019, *Cranes — Power driven winches and hoists — Part 2: Power driven hoists*;

- EN 14238:2004+A1:2009, *Cranes — Manually controlled load manipulating devices*;
- EN 13157:2004+A1:2009, *Cranes — Safety — Hand powered cranes*.

Components and parts of a light crane systems and jib cranes shall be in accordance with the following European Standards as applicable:

- EN 13135:2013+A1:2018, *Cranes - Safety - Design - Requirements for equipment*;
- EN 13557:2024, *Cranes - Control devices and control stations*;
- EN 12077-2:2024, *Cranes safety — Requirements for health and safety — Part 2: Limiting and indicating devices*;
- EN 13586:2020, *Cranes — Access*;
- EN 60204-32:2008, *Safety of machinery - Electrical equipment of machines - Part 32: Requirements for hoisting machines (IEC 60204-32)*.
- EN 62745:2017, *Safety of machinery - Requirements for cableless control systems of machinery (IEC 62745:2017)*.

Proof of competence calculations shall be in accordance with EN 13001 series as applicable, i.e.

- EN 13001-1:2015, *Cranes — General design — Part 1: General principles and requirements*;
- EN 13001-2:2021, *Crane safety – General design – Part 2: Load actions*;
- EN 13001-3-1:2025, *Cranes — General Design — Part 3-1: Limit States and proof competence of steel structure*;
- EN 13001-3-2:2014, *Cranes – General design – Part 3-2: Limit states and proof of competence of wire ropes in reeving systems*;
- EN 13001-3-3:2014, *Cranes – General design – Part 3-3: Limit states and proof of competence of wheel/rail contacts*;
- EN 13001-3-4:2018, *Cranes — General design — Part 3-4: Limit states and proof of competence of machinery — Bearings*;
- EN 13001-3-5:2016+A1:2021, *Cranes - General design - Part 3-5: Limit states and proof of competence of forged and cast hooks*;
- EN 13001-3-6:2018+A1:2021, *Cranes — General design — Part 3-6: Limit states and proof of competence of machinery — Hydraulic cylinders*.

Light crane systems and jib cranes, not fixed to their foundation, shall be designed against loss of rigid body stability in accordance with EN 13001-2:2021, 4.3.8.

Local stresses in wheel supporting flanges shall be calculated in accordance with EN 15011:2020, 4.2.2.3.

For aluminium structures, see additional requirements in 4.2.

Sharp edges shall be deburred in order to avoid injury during erection.

All connections shall be secured, so that they cannot get loose and wear of parts shall not lead to any risk of load drop or other dangerous situation.

The design and the installation shall be such as to ensure that uncontrolled movements are avoided. The crane shall be designed so that the operator is able to control all movements at all times.

Where hand powered trolleys or bridges are used, the force needed to move the trolley or bridge shall not exceed 200 N.

4.2 Aluminium structures

4.2.1 General

The proof of competence shall follow the methodology given in EN 13001-3-1:2025 with the changes and setting of design parameters as specified in 4.2. The yield stress f_y shall be taken as the 0,2 % proportional limit f_0 specified for aluminium.

4.2.2 Products and materials

European Standards specify materials and their specific values. For structural members made of aluminium, materials in accordance with the following European Standards shall be used:

- extruded products: EN 755-1:2016 and EN 755-2:2025.

Table 1 shows a selection of materials for extruded products in accordance with the EN 755-2:2025. Where those materials are used, the design values for strength (f_y , f_u) shall be those listed in Table 1. The values are applicable for temperatures up to 80 °C. For more information, see the specific European Standard.

Grades and qualities other than those mentioned in EN 755-1:2016 and EN 755-2:2025 and in Table 1 may be used when the mechanical properties and the chemical composition are specified in a manner corresponding to EN 755-1:2016 and EN 755-2:2025, and when the following conditions are fulfilled:

- the design value of f_y is limited to $f_u/1,1$ for materials with $f_u/f_y < 1,1$;
- the percentage elongation at fracture $A \geq 7\%$ on a gauge length $L_0 = 5,65 \times \sqrt{S_0}$ (where S_0 is the original cross-sectional area);
- temper conditions shall be specified and defined in accordance with EN 515:2017.

Table 1 — Design values of material strength in accordance with EN 755-2:2024

Alloy	Temper	Thickness t mm	Design strength	
			f_y yield N/mm ²	f_u ultimate N/mm ²
EN AW-6060	T5	$t \leq 25$	100	140
	T6	$t \leq 15$	140	170
	T64	$t \leq 15$	120	180
	T66	$t \leq 25$	150	195
EN AW-6061	T4	$t \leq 25$	110	180
	T6	$t \leq 25$	240	260
EN AW-6063	T5	$t \leq 25$	110	160
	T6	$t \leq 25$	160	195
	T66	$t \leq 10$	200	245
	T66	$10 < t \leq 25$	180	225
EN AW-6005A	T6	$10 < t \leq 25$	200	250
EN AW-6106	T6	$t \leq 10$	200	250
EN AW-7020	T6	$t \leq 15$	290	350
		$15 < t \leq 40$	275	350
Temper designations: refer to EN 515:2017.				

4.2.3 Proof of static strength

For calculation of the limit design stress in structural members (i.e. excluding bolted and pin connections), the general resistance factor shall be set to $\gamma_m = 1,1$, and the specific resistance factor for all types of materials and directions of stresses shall be set to $\gamma_{sm} = 1$.

4.2.4 Proof of fatigue strength

Characteristic fatigue strength $\Delta\sigma_c$ shall be taken in accordance with Table 2. The slope constant shall be set to $m = 7$.

Where a member has a detail with geometric form to cause local stress concentration, the nominal stress in the member shall be increased with the relevant stress concentration factor, when applied to the proof of fatigue strength. Such details are e.g. holes in a member or stepped discontinuities with edges perpendicular to the direction of normal stress.

Table 2 — Characteristic fatigue strength of aluminium structures

Description	Yield stress f_y N/mm ²	Characteristic fatigue strength $\Delta\sigma_c$ N/mm ²
Non-welded structural member under normal stresses		
— all tempers	$100 \leq f_y \leq 200$	63
— without geometric notch effects	$200 < f_y \leq 290$	71

4.2.5 Proof of elastic stability

The material parameter values shall be set as follows:

- modulus of elasticity $E = 70\,000\text{ N/mm}^2$;
- Poisson's ratio $\nu = 0,3$.

Dimensional tolerances of extruded structural members shall conform to EN 755-9:2016.

4.3 Actions on supporting structures

Actions on supporting structures shall be given in technical documentation in accordance with Annex C.

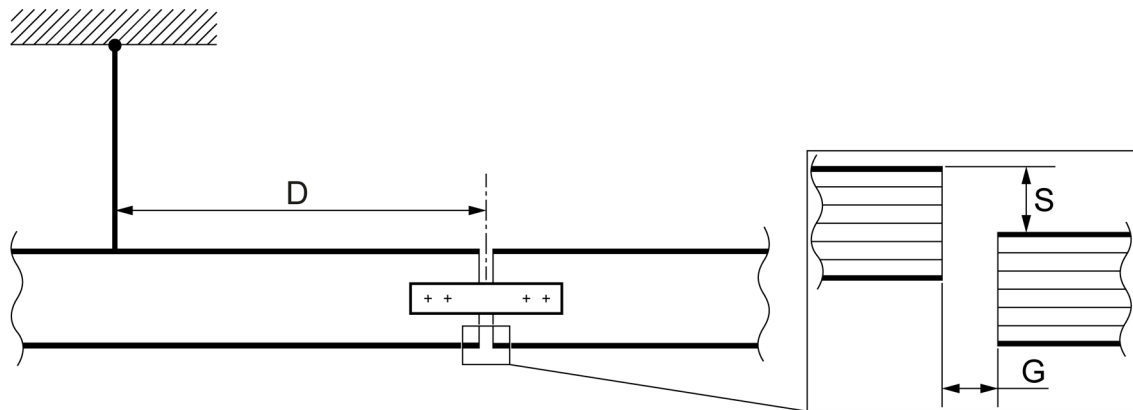
4.4 General components

4.4.1 Joints in crane tracks, crane bridges and monorails

Joints shall ensure specified alignment of the connected parts and the continuity of the rolling surface of trolleys.

Joints shall be designed for the maximum forces induced on the joint. The shocks against the end stops, the buffers or any other dynamic loading shall be taken into account. If other means are not provided to prevent the joint from opening during operation, then the joint shall be designed such it cannot open, e.g. by means of positive locking.

The allowable distance between a joint and the nearest support (D) as well as the allowable gap (G) and step (S) of the running surface shall be specified and documented in the installation and maintenance instructions, see Figure 1.

**Key**

- D distance from the joint to the nearest support
- G gap at the joint
- S step at the joint

Figure 1 — Joint**4.4.2 Suspensions**

Means shall be provided in order to limit excessive horizontal displacement of the light crane system. Suspensions shall have means for height and position adjustment.

4.4.3 Bridge skewing

The bridge attachment to a trolley running on the track shall be built in such a way that it allows necessary degrees of freedom around the horizontal and vertical axis without damaging the light crane system, e.g. the vertical axis shall have sufficient freedom so that the crane bridge movement does not become obstructed on the track during operation.

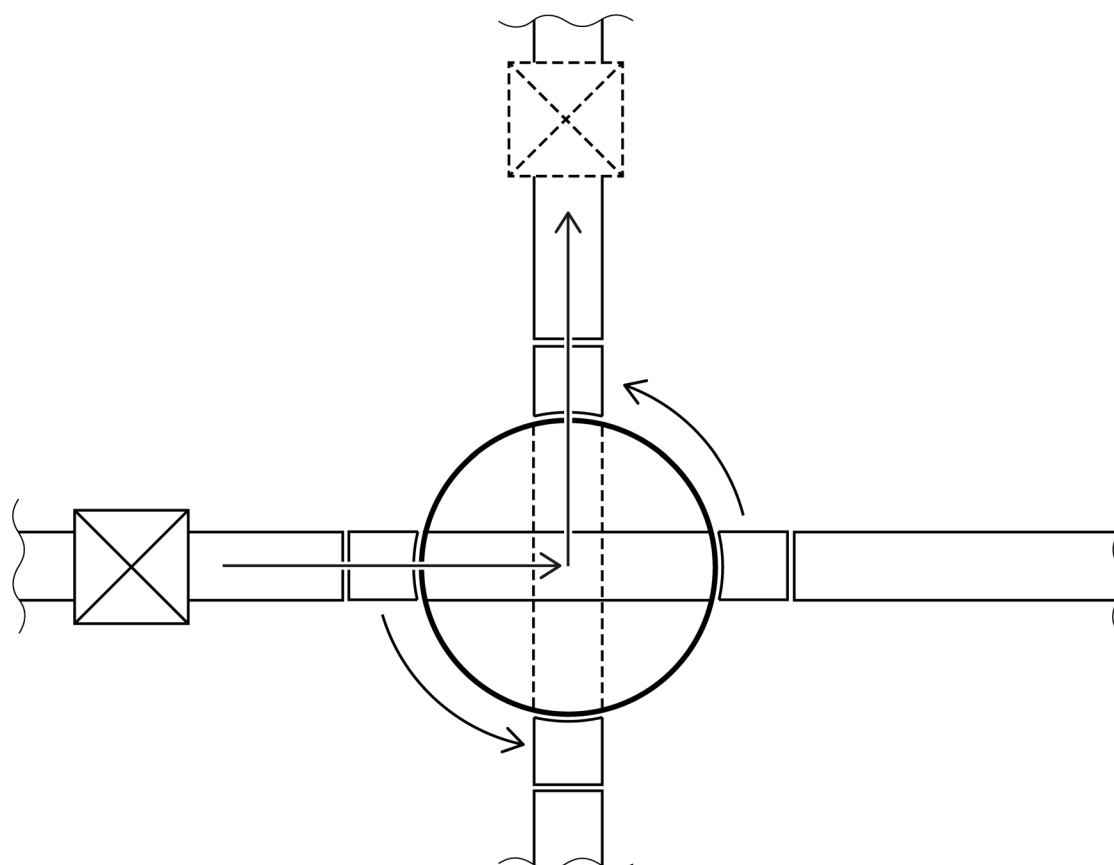
4.4.4 Backup devices for trolleys and suspensions

Where a trolley or a suspension of a track is equipped with a backup device as a safe guard against a failure of the primary component, the backup device shall be designed taking into account the dynamic effects due to the failure of the primary component.

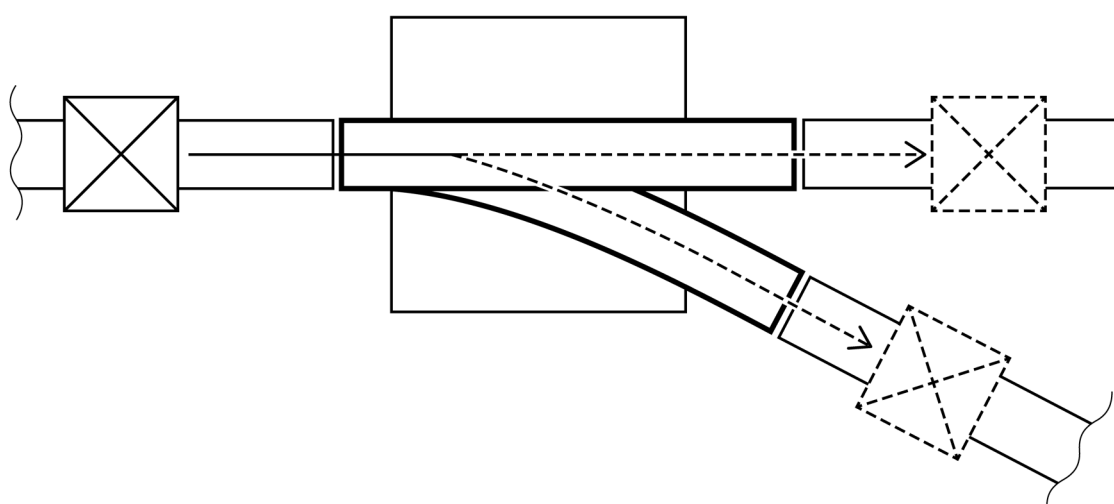
Instructions shall be provided for actions after the failure, e.g. inspection of the structure, repair and putting light crane system back to service, see 6.2.4.

4.4.5 Turntables and switches

Mechanism shall be such as to prevent a trolley from falling or from becoming obstructed by the mobile part during operation. If an obstruction occurs, it shall not lead to a hazardous situation. Figure 2 shows examples of turntable (Figure 2 a)) and switch (Figure 2 b)).



a) Turntable



b) Switch

Key

- 1 running component
- 2 turntable
- 3 switch

Figure 2 — Turntable and switch