TECHNICAL REPORT

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Cranes — Tower cranes — International Standards for design, manufacture, use and maintenance requirements and recommendations

Appareils de levage à charge suspendue — Grues à tour — Normes internationales sur les exigences et les recommandations de conception, de fabrication, d'utilisation et de maintenance

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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

ISO/TR 27245 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 7, *Tower cranes*.

Cranes — Tower cranes — International Standards for design, manufacture, use and maintenance requirements and recommendations

1 Scope

This Technical Report provides a list of International Standards that can be completely or partly applied in the design of tower cranes. A bibliography refers to other useful documents (FEM publications, European standards and national standards).

Annex A gives International Standards which are not applicable to tower cranes, even if the scope does not exclude them explicitly.

2 Requirements

2.1 Particular International Standards for tower cranes

The International Standards marked with an X are also applicable for cranes in use.

ISO 4301-1 *Cranes and lifting appliances — Classification — Part 1: General*

Abstract: Establishes a general classification of cranes based on the number of operating cycles to be carried out during the expected life of the crane and a load spectrum factor which represents a nominal state of loading. Classification considers only the operating conditions which are independent of the type of crane and the way it is driven.

ISO 4301-3 *Cranes — Classification — Part 3: Tower cranes*

Abstract: Establishes the classification of tower cranes based on the number of operating cycles to be carried out during the expected life of the appliance and its mechanisms, and a load spectrum factor which represents the nominal state of loading.

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

Abstract: Defines terms concerning the main types of cranes, parameters, general concepts and component parts in English, French and Russian.

ISO 4306-3 *Cranes — Vocabulary — Part 3: Tower cranes*

Abstract: Establishes a vocabulary and defines the terms relating to tower cranes.

ISO 4308-1 X *Cranes and lifting appliances — Selection of wire ropes — Part 1: General*

Abstract: Specifies two methods for the selection of wire rope to be used on lifting appliances as designated in ISO 4306-1, one based on the value of the rope selection factor C and the other based on the value of the coefficient of utilisation Z_p.

ISO 4308-1 establishes the minimum requirements for acceptable strength and performance levels of wire ropes with respect to the design, application and maintenance of the lifting appliance. ISO 4308-1 establishes the minimum requirements for the diameters of drums and sheaves that are to be associated with the selected wire rope.

ISO 4309 X *Cranes — Wire ropes — Care, maintenance, installation, examination and discard*

Abstract: Details the essential guidelines for examination of wire ropes in service on a lifting appliance, and enumerates discard criteria relating to wire breaks, wear, corrosion and deformation which are to be applied to ensure the efficient and safe usage of the equipment.

ISO 4310 *Cranes — Test code and procedures*

Abstract: Specifies the tests and procedures to be followed in order to verify that a crane conforms to its operational specifications and is capable of lifting rated loads. Defines test procedures such as conformity tests, visual inspection and lifting competence testing.

ISO 7296-1 *Cranes — Graphical symbols — Part 1: General (including amendment 1)*

Abstract: Gives 67 symbols and defines the various colours to be used with cranes. Contains the alphabetical indexes in English, French and Russian.

ISO 7296-3 *Cranes — Graphic symbols — Part 3: Tower cranes*

Abstract: Gives symbols and combination of symbols particular to tower cranes.

ISO 7363 *Cranes and lifting appliances — Technical characteristics and acceptance documents*

Abstract: Establishes the form of presentation and content of the documents which a manufacturer should provide with the equipment. Documents give technical information and include acceptance documents for the equipment to facilitate its installation, testing and use. Specimen acceptance documents are given in the annex. Applies to all types defined in ISO 4306-1.

ISO 7752-1 *Lifting appliances — Controls — Layout and characteristics — Part 1: General principles*

Abstract: Deals with the arrangement of those crane controls which are used in positioning loads and serves as a general basis for the elaboration of detailed International Standards for particular types. It defines basic requirements of these controls, safe crane operation conditions and criteria for the layout of control levers and pedals.

ISO 7752-3 *Cranes — Controls — Layout and characteristics — Part 3: Tower cranes*

Abstract: Establishes the arrangement, requirements and direction of movement of the basic crane controls for travelling, traversing, slewing, cab driving, lifting, hoisting and lowering operations for tower cranes as defined in ISO 4306-3.

ISO 8566-1 *Cranes — Cabins — Part 1: General*

Abstract: Establishes the general requirements for cabin construction, driver's seat, visibility, control elements, information, noise, vibration, heating and air-conditioning for cranes as defined in ISO 4306-1.

ISO 8566-3 *Cranes — Cabins — Part 3: Tower cranes*

Abstract: Establishes the requirements for cabin construction, driver's seat, control elements, heating and cooling for tower cranes as defined in ISO 4306-3.

ISO 8686-1 *Cranes — Design principles for loads and load combinations — Part 1: General*

Abstract: Establishes general methods for calculating loads and principles to be used to select load combinations for proof of competence for the structural and mechanical components for cranes as defined in ISO 4306-1. It is based on rigid-body kinetic analysis and elasto-static analysis. It provides the general form, content and range of parameter values for more specific standards and also a framework for agreement on loads and load combinations between manufacturer and purchaser.

ISO 8686-3 *Cranes — Design principles for loads and load combinations — Part 3: Tower cranes*

Abstract: Establishes the application of ISO 8686-1 to tower cranes as defined in ISO 4306-3 and gives specific values for the factors to be used.

ISO 9373 X *Cranes and related equipment — Accuracy requirements for measuring parameters during testing*

Abstract: Specifies the principal requirements for instruments and measurement systems of test loads, distances, time and other relevant parameters for cranes and related equipment. It gives recommended limit values of relative errors in measurement during testing.

ISO 9374-1 *Cranes — Information to be provided — Part 1: General*

Abstract: Specifies, in general, the information to be provided by the purchaser and the manufacturer so that the most suitable crane can be supplied for the duty requirements and service conditions. Refers to ISO 4301-1 and ISO 7363.

ISO 9374-3 *Cranes — Information to be provided for enquiries, orders, offers and supply — Part 3: Tower cranes*

Abstract: Specifies information to be provided by a purchaser in enquiring about or ordering a tower crane, and a manufacturer in tendering for supplying a tower crane.

ISO 9926-1 X *Cranes — Training of drivers — Part 1: General*

Abstract: Specifies the minimum training to be given to trainee drivers of cranes, to develop basic operational skills and to impart the requisite knowledge for the proper use of those skills. Does not specify any procedure for evaluating capabilities or qualifications of the trainees.

ISO 9926-3 X *Cranes — Training of drivers — Part 3: Tower cranes*

Abstract: Covers the specific subjects considered necessary for training tower crane drivers.

ISO 9927-1 X *Cranes — Inspections — Part 1: General*

Abstract: Specifies the regular inspections to be carried out on cranes as defined in ISO 4306-1, ISO 4306-2 and ISO 4306-3.

ISO 9927-3 X *Cranes — Inspections — Part 3: Tower cranes*

Abstract: Specifies the regular inspections to be carried out on tower cranes.

ISO 9928-1 *Cranes — Crane driving manual — Part 1: General*

Abstract: Gives guidance on the contents and the presentation of a crane driving manual which include: technical data, special safety advice, driver's aids and controls, driver's instructions, load diagrams and load tables, safety devices and environmental conditions.

ISO 9942-1 *Cranes — Information labels — Part 1: General*

Abstract: Specifies the minimum requirements for labels for the identification and operation of cranes.

ISO 9942-3 *Cranes — Information labels — Part 3: Tower cranes*

Abstract: Gives minimum requirements concerning information labels for tower cranes.

ISO 10245-1 *Cranes — Limiting and indicating devices — Part 1: General*

Abstract: Specifies general requirements for limiting and indicating devices for lifting appliances that are applicable to loads and motions, performance and environment. These devices restrict operation and/or provide the driver or other persons with operational information.

ISO 10245-3 *Cranes — Limiting and indicating devices — Part 3: Tower cranes*

Abstract: Specifies the requirements for limiting and indicating devices of tower cranes for loads, motions, performance and environment.

ISO 10972-1 *Cranes — Requirements for mechanisms — Part 1: General*

Abstract: Establishes requirements which apply generally to mechanisms and related components of cranes and lifting appliances as described in ISO 4306-1, ISO 4306-2 and ISO 4306-3.

ISO 10972-3 *Cranes — Requirements for mechanisms — Part 3: Tower cranes*

Abstract: Establishes requirements which apply generally to mechanisms and related components of tower cranes.

ISO 10973 *Cranes — Spare parts manual*

Abstract: Provides guidelines on the general requirements necessary for the preparation and presentation of spare-parts manuals for cranes.

ISO 11660-1 *Cranes — Access, guards and restraints — Part 1: General*

Abstract: Establishes the general requirements for access to control stations and other installations of cranes as defined in ISO 4306-1, during normal operation, maintenance inspection, erection and dismantling. Guards and restraints are also dealt with in general, regarding the protection of persons on or near the crane as related to moving parts, falling objects or live parts.

ISO 11660-3 *Cranes — Access, guards and restraints — Part 3: Tower cranes*

Abstract: Establishes the particular requirements relating to the access, guards and restraints for tower cranes as defined in ISO 4306-1 and gives criteria for the selection of the appropriate equipment under the conditions of use expected of the tower crane.

ISO 11994 *Cranes — Availability — Vocabulary*

Abstract: Establishes the generally accepted terms and definitions relating to availability of all types of cranes as defined in ISO 4306-1, with the aim of making contracts and mutual understanding easier. The terms and definitions are to be used by crane designers, manufacturers, inspecting authorities, users and others.

ISO 12478-1 *Cranes — Maintenance manual — Part 1: General*

Abstract: Establishes guidelines on the general requirements necessary for the preparation and presentation of maintenance manuals for cranes.

ISO 12480-1 X *Cranes — Safe use — Part 1: General*

Abstract: Establishes required practices for the safe use of cranes, including safe systems of work, management, planning, selection, erection and dismantling, operation and maintenance of cranes and the selection of drivers, slingers and signallers.

ISO 12480-3 X *Cranes — Safe use — Part 3: Tower cranes*

Abstract: Establishes required practices for the safe use of tower cranes. Subjects covered include safe systems of work, management, planning, selection, erection and dismantling, special base, operation and maintenance of tower cranes and the selection of drivers, slingers and signallers.

ISO 12482-1 X *Cranes — Condition monitoring — Part 1: General*

Abstract: Ensures that the design constraints of the intended use of a crane are clearly identified and defines actions to be taken when the crane has been used over a period of time and has approached these constraints, to ensure a new safe working period. A description is given of the special assessment required to monitor the condition of a crane.

ISO 12485 *Tower cranes — Stability requirements*

Abstract: Specifies the conditions to be met when verifying, by calculation, the stability of tower cranes that is subject to tipping and drifting.

ISO 13200 *Cranes — Safety signs and hazard pictorials — General principles*

Abstract: Establishes general principles for the design and application of safety signs and hazard pictorials permanently affixed to cranes. It describes the basic safety sign formats, specifies colours for safety signs and provides guidance on developing the various panels that together constitute a safety sign.

ISO 14518 X *Cranes — Requirements for test loads*

Abstract: Establishes methods for composition and measurements of test loads and gives procedures for the application of test loads during the testing of cranes.

ISO 15513 *Cranes — Competency requirements for crane drivers (operators), slingers, signallers and assessors*

Abstract: Gives competency requirements applicable for the selection, training, assessment and verification of crane drivers (operators), slingers, signallers and their assessors.

ISO/TS 15696 *Cranes — List of equivalent terms*

Abstract: Establishes a list of equivalent terms in English, French and Russian of the most commonly used terms in the field of cranes and defined or listed in International Standards developed by ISO Technical Committee ISO/TC 96. This Technical Specification contains terms concerning the main types of crane, parameters, general concepts and component parts.

ISO 23853 X *Cranes — Training of slingers and signallers*

Abstract: Specifies the minimum training to be given to trainee crane slingers and crane signallers to develop the basic slinging skills and to impart knowledge for competency required for slingers and signallers

2.2 Additional international standards useful for tower cranes

2.2.1 General

ISO 12100-1 *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

Abstract: Defines basic terminology and specifies general design methods, to assist designers and manufacturers in achieving safety in the design of machinery.

ISO 12100-2 *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

Abstract: Intended to be used with ISO 12100-1 when considering the solution to a specific problem. The two parts of ISO 12100 can be used independently of other documents.

2.2.2 IEC standards for electrical requirements

IEC 60204-32 *Safety of machinery — Electrical equipment of machines — Part 32: Requirements for hoisting machines*

Abstract: Applies to equipment or parts of equipment not exceeding 1 000 V a.c. or 1 500 V d.c. between lines, and with nominal frequencies not exceeding 200 Hz. Additional and special requirements can apply to the electrical equipment of hoisting machines that are used in potentially explosive and/or flammable atmospheres. It does not cover individual items of electrical equipment other than their selection for use and their erection.

2.2.3 ISO standards for acoustics

ISO 3744 *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*

Abstract: Specifies a method of measurement. Gives requirements for the test environment and instrumentation, as well as techniques for obtaining the surface sound pressure level from which the sound power level of the source is calculated, leading to results which have a grade 2 accuracy.

ISO 4871 *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

Abstract: Gives information on the declaration of noise emission values, describes acoustical information to be presented in technical documents and specifies a method for verifying the noise emission declaration.

ISO 11203 *Acoustics — Noise emitted by machinery and equipment — Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level*

Abstract: Specifies two methods for determining the emission sound pressure levels of machinery and equipment at a work station and at other specified positions nearby, by calculation from the sound power level. Permits the comparison of the sound power of different units of a given family of machinery.

ISO/TR 11688-1 *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

Abstract: Serves as an aid to understanding the basic concepts of noise control in machinery and equipment. The recommended practice presented is intended to assist the designer at any design stage to control the noise of the final product. Makes references to numerous technical publications dealing with acoustical problems.

2.2.4 Graphical symbols

ISO 3864-1 *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs in workplaces and public areas*

Abstract: Establishes the safety identification colours and design principles for safety signs to be used in workplaces and in public areas for the purpose of accident prevention, fire protection, health hazard information and emergency evacuation. It also establishes the basic principles to be applied when developing standards containing safety signs.

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

Abstract: Establishes additional principles to ISO 3864-1 for the design of safety labels for products, i.e. any items manufactured and offered for sale in the normal course of commerce, including but not limited to consumer products and industrial equipment. The purpose of a product safety label is to alert persons to a specific hazard and to identify how the hazard can be avoided.

Annex A
(informative)

Standards not applicable to tower cranes

This Annex mentions International Standards which are not applicable to tower cranes, even if the scope does not exclude them explicitly.

ISO 4302 *Cranes — Wind load assessment*

Abstract: Gives a simplified method of calculation and assumes that the wind blows horizontally from any direction, that the wind blows at a constant velocity and that there is a static reaction to the loadings applying to the crane structure. Includes built-in allowances for the effects of gusting (rapid changes in wind velocity) and for dynamic response.

ISO 4304 *Cranes other than mobile and floating cranes — General requirements for stability*

Abstract: Specifies the conditions to be met when verifying, by calculation, the stability of all crane types defined in ISO 4306-1 that are subject to tilting. It assumes that they are standing on a firm, level supporting surface or track. The sliding of cranes on their tracks is not covered.

Bibliography

[1] EN 14439, *Cranes — Safety — Tower cranes*

[2] FEM 1.001, *Rules for the design of hoisting appliances*

[3] FEM 1.004, *Recommendation for the calculation of tower crane structures in out-of service condition*

[4] AS 1418.4, *Cranes, hoists and winches — Tower cranes*

[5] AS 2550.4, *Cranes, hoists and winches — Safe use — Tower cranes*

[6] BS 7121:1, *Code of practice for safe use of cranes — Part 1: General*

[7] BS 7121:2, *Code of practice for safe use of cranes — Part 2: Inspection, testing and examination*

[8] BS 7121:5, *Code of practice for safe use of cranes — Part 5: Tower cranes*

[9] ASME B30.3-2004, *Construction Tower Cranes*

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