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

Appareils de levage autres que grues mobiles et grues flottantes — Exigences générales relatives à la stabilité

Reference number
ISO 4304 : 1987 (E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4304 was prepared by Technical Committee ISO/TC 96, *Cranes, lifting appliances and related equipment*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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

1 Scope and field of application

This International Standard 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 tipping (except mobile cranes and floating cranes); it assumes that they are standing on a firm, level supporting surface or track.

The sliding of cranes on their tracks is not covered by this International Standard.

2 References

ISO 4302, *Cranes — Wind load assessment.*

ISO 4306-1, *Lifting appliances — Vocabulary — Part 1: General.*

3 Stability

3.1 Calculations

3.1.1 A crane is said to be stable when the algebraic sum of the stabilizing moments is greater than the sum of the tipping moments.

3.1.2 Calculations shall be made to verify the stability of the crane by computing the sum of the tipping moments using the values given in the table.

In all calculations, the position of the crane and its components, and the effect of all loads and forces, shall be considered in their least favourable combination, direction and effect.

3.1.3 Where a crane is required to operate on an inclined surface, the manufacturer shall take the specified conditions into account in calculating stability.

3.1.4 For cranes designed to travel with load, the forces induced by the maximum allowable vertical track variation as specified by the manufacturer shall be taken into account, in addition to other loads specified in case II of the table.

3.1.5 For cranes that are to be permanently installed, earthquake effects appropriate to the particular site or zone shall be considered as an additional loading under cases I, II and III of the table.

3.1.6 In the calculations shown in the table, consideration shall be given to the loads induced by the weight of the crane and its components, including any lifting attachments which are a permanent part of the crane in its working condition.

3.2 Backwards stability in service conditions

When a crane is in an unladen state and with all operationally movable components retracted to positions closest to the backward tipping edge, backwards stability in service conditions shall be verified as indicated in either 3.2.1 or 3.2.2 (see also the table, case IV).

3.2.1 Moment method

The tipping moment caused by in-service wind W_1 and inertia forces D shall not be greater than 90 % of the stabilizing moment.

3.2.2 Gravity method

The projection of the centre of gravity of the static crane in calm air onto a horizontal plane shall be at a position not exceeding 80 % of the distance from the forward supporting point to the backward tipping edge. Typical examples are shown in the figure.

3.3 Application of wind loads

3.3.1 In-service wind forces shall always be applied in the least favourable direction.

3.3.2 Out-of-service wind forces shall be applied in the least favourable direction for those cranes which are not free to rotate with the wind. For those cranes which are designed to rotate with the wind, the wind force shall be applied on the superstructure in the direction contemplated, and in the least favourable direction on the lower structure.

Table

Condition (see 3.1)	Loading	Value to be considered [1]
Case I : Basic stability	Applied load	1,5 P
	Wind load	0
	Inertia forces	0
Case II : Dynamic stability	Applied load	1,3 P
	Wind load	W_1
	Inertia forces	D
Case III : Extreme wind loading	Applied load	0
	Wind load	1,2 W_2
	Inertia forces	0
Case IV : Sudden release of load	Applied load	$-0,2\ P'$
	Wind load	W_1
	Inertia forces	0

1) Where

D are the inertia forces or buffer forces determined by the manufacturer;

P is the rated capacity for equipment as specified by the manufacturer — lifting attachments which are a permanent part of the crane in its working condition shall be considered as part of the load for stability calculations whether or not such attachments are part of the published load ratings;

P' is the rated capacity for equipment as specified by the manufacturer, excluding lifting attachments which are a permanent part of the crane in its working condition;

W_1 is the in-service wind effect in accordance with ISO 4302;

W_2 is the out-of-service wind effect in accordance with ISO 4302 — gusting effects are included.

4 Crane base

The crane manufacturer shall specify the forces imposed by the crane on the ground or supporting structure. Where the foundation provides all or part of the stability of the crane, the manufacturer shall specify the requirements applicable to the foundation.

5 Stabilizers

When stabilizers are required, the manufacturer's operating instructions for the crane shall completely describe the type of stabilizers to be installed, the proper means of installing them, and whether they are required for in-service, out-of-service or backwards stability needs. The term "stabilizers" shall be taken to refer to any additions to the basic or normal crane configuration, supplied for the purpose of increasing stability.

Stabilizers shall be designed for ease and speed of bringing into use.

6 Deformation

For those cranes subject to significant elastic deformation on account of dead, live, wind or dynamic loads, the effects of such elastic deformation shall be taken into account in the stability and backwards stability calculations.

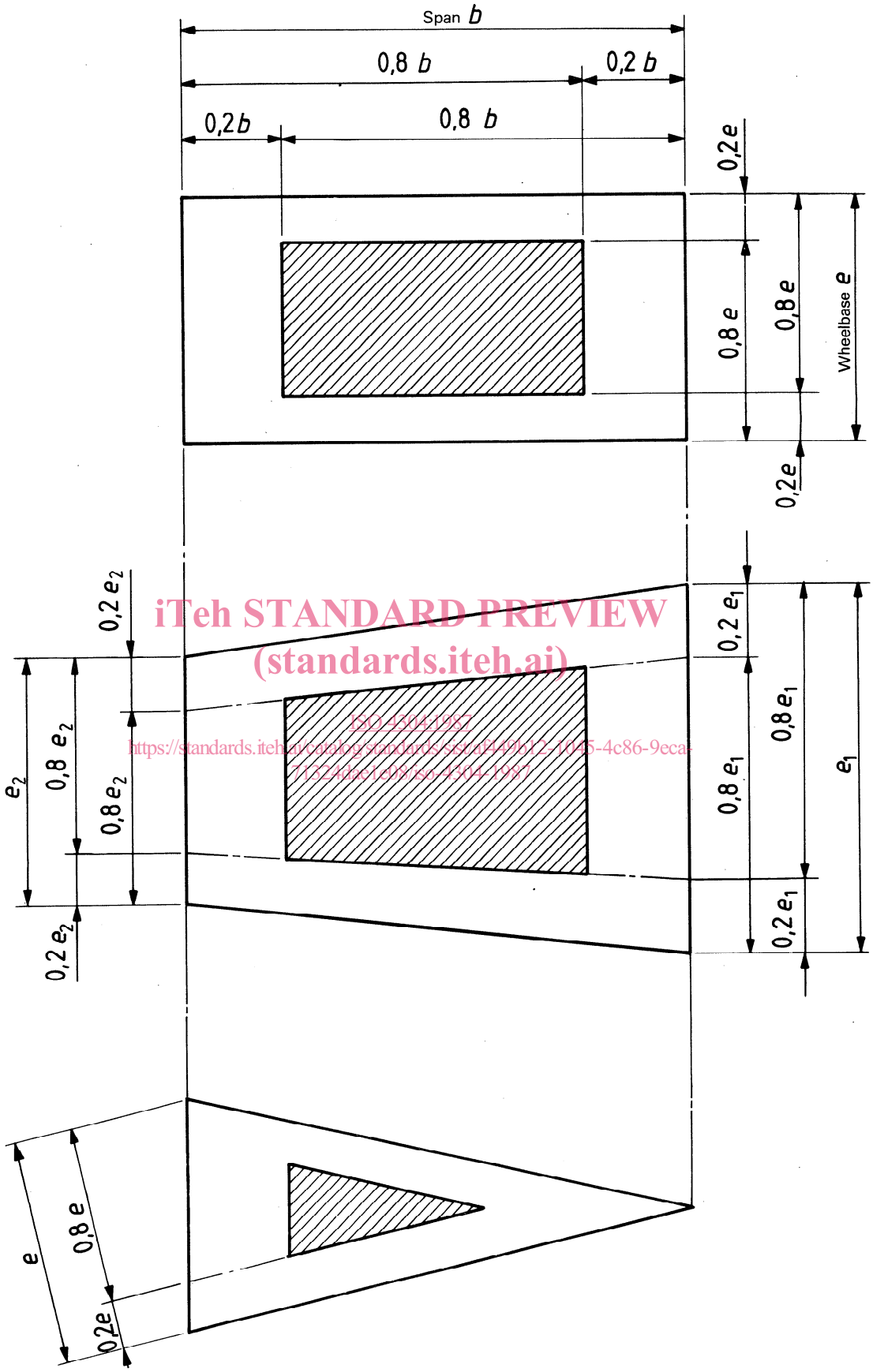

Figure — Crane base configurations

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Price based on 3 pages