INTERNATIONAL STANDARD

ISO 8686-4

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Cranes — Design principles for loads and load combinations —

Part 4:
Jib cranes

Appareils de levage à charge suspendue — Principes de calcul des charges et des combinaisons de charges —

Partie 4: Grues à flèche

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Contents

Page

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.

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 8686-4 was prepared by Technical Committee ISO/TC 96, *Cranes*, Subcommittee SC 8, *Jib cranes*.

ISO 8686 consists of the following parts, under the general title *Cranes — Design principles for loads and load combinations*:

— *Part 1: General*

— *Part 2: Mobile cranes*

— *Part 3: Tower cranes*

— *Part 4: Jib cranes*

— *Part 5: Overhead travelling and portal bridge cranes*

Introduction

This part of ISO 8686 establishes requirements and gives guidance and design rules that reflect the present state of art in the field of crane machine design. The rules given represent good design practice that ensures fulfilment of essential safety requirements and adequate service life of components. Deviation from these rules normally could lead to increased risks or reduction of service life, but it is acknowledged that new technical innovations, materials, etc. can enable new solutions that result in equal or improved safety and durability.

Cranes — Design principles for loads and load combinations —

Part 4:
Jib cranes

1 Scope

This part of ISO 8686 applies the general design principles set forth in ISO 8686-1 to jib cranes, i.e. jib-type cranes other than those offshore, tower, mobile, railway, gantry and overhead cranes covered in other parts of ISO 8686, as defined in ISO 4306-1, and presents loads and load combinations appropriate for use in proof-of-competence calculations for the steel structures of jib cranes.

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.

ISO 4302:1981, *Cranes — Wind load assessment*

ISO 8686-1:1989, *Cranes — Design principles for loads and load combinations — Part 1: General*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this part of ISO 8686, the terms, definitions, symbols and abbreviated terms given in ISO 8686-1 apply.

4 Principles of choice: basic considerations for loads and load combinations

4.1 Basic considerations

Loads shall be combined with the intention of discovering maximum load effects on jib crane components or members during operation as simulated by an elastostatic calculation model. To achieve this, the following considerations govern preparation of proof-of-competence calculations:

a) the crane is taken in its most unfavourable attitude and configuration while the loads are assumed to act in magnitude, position and direction, causing unfavourable stresses at the critical points selected for evaluation on the basis of engineering considerations;

b) conservatively, loads can be combined as defined in this part of ISO 8686, or they may be combined with some loads adjusted by reduction factors to more closely reflect loading conditions of combined actions for the actual working regime.

4.2 Simultaneous accelerations

In general, the effects of two accelerating drives, e.g. travelling, traversing, slewing or luffing or telescoping, are assumed to act simultaneously with hoisting acceleration; only two drives are assumed to accelerate simultaneously in the absence of hoisting. Slewing inertia force with the accompanying centrifugal force shall be considered as one load effect in this context. However, no simultaneous accelerations shall be considered when specifically prevented by design features.

4.3 Side loading

Certain design features may have the effect of inducing side loading on jibs. When those features are present in a design, they shall be included with all applicable load combinations for which calculations are performed, combined so as to maximize side loading. In addition to slewing and wind effects, an example of a feature affecting side loading would be a reeving arrangement that causes the hoist line to deviate from the jib centreline.

4.4 Emergency actions

4.4.1 Manually initiated actions

For manual emergency stops, caused by engaging an emergency stop control, calculations shall be carried out under *emergency cut-out* on line 16 of Table 1 or Table 2.

4.4.2 Automatically initiated actions

When jib cranes are furnished with controls or devices that cut out drives and apply brakes under emergency conditions without an initiating action by the driver, or are furnished with brakes that automatically engage on loss of power or control function, calculations reflecting those effects shall be carried out under *emergency cut-out* on line 16 or *failure of mechanisms* on line 17 of Table 1 or Table 2.

5 Loads from acceleration of crane drives

5.1 Hoisting effects

Inertial effects due to hoisting, except for hoisting an unrestrained grounded load (see ISO 8686-1:1989, 6.1.2.2), depend on the change in hoist drive force ΔF. The change in force shall be calculated from hoist drive or brake characteristics using the highest drive/brake torque actually generated by the system.

5.2 Effects from other than hoist drives

In practice, acceleration and deceleration rates can vary depending on the attachment fitted, the operating radius, the control scheme employed, and the characteristics of the drive and braking mechanisms. For proof-of-competence calculations, the changes in drive forces ΔF causing acceleration or deceleration shall be calculated from the highest drive/brake torque actually generated by the system.

5.3 Application of changes in drive force, ΔF

The values of ΔF for hoisting are amplified by an appropriate value for ϕ_5 (see ISO 8686-1:1989, Table 1) taken from Table 3 to make up the load for use on line 5 of Table 1 or Table 2.

The values of ΔF for drives other than hoisting are amplified by an appropriate value for ϕ_5 taken from Table 3 to make up the load for use on line 4 of Table 1 or Table 2.

6 Proof-of-competence calculations for steel structures

6.1 General

Proof-of-competence calculations shall be carried out using either the allowable stress method or the limit state method, see ISO 8686-1.

6.2 Allowable stress method

Table 1 gives loads and load combinations for the allowable stress method together with applicable allowable stress coefficients γ_f and dynamic amplification factors ϕ_n. Table 3 gives values for the factors ϕ_n and other pertinent load information. Table 4 describes the motions that are to be combined, in consideration of Clause 4, and the conditions to be included within the load combinations listed in Table 1.

For members under axial compression, the allowable stress coefficients γ_f given in Table 1 are applicable only when used in conjunction with a column formula selected in accordance with Annex A.

6.3 Limit state method

Table 2 gives loads and load combinations for the limit state method together with applicable partial load factors γ_p and dynamic amplification factors ϕ_n. Table 3 gives values for the factors ϕ_n and other pertinent load information. The resistance coefficient γ_m shall be taken as 1,1 for all load combinations. The limit strength shall be divided by γ_m to reflect statistical variations in material strength and local imperfections. Table 4 describes the motions that are to be combined, in consideration of Clause 4, and the conditions to be included within the load combinations listed in Table 2.

For members under axial compression, the resistance coefficient γ_m and the partial load factors γ_p given in Table 2 are applicable only when used in conjunction with a column formula selected in accordance with Annex A.