

X

इंटरनेट

## Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार" Mazdoor Kisan Shakti Sangathan "The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ" Jawaharlal Nehru "Step Out From the Old to the New"

मानक

IS 14469 (1997): Mobile cranes - Determination of stability [MED 14: Cranes, Lifting Chains and Related Equipment]



511111111

Made Available By Public.Resource.Org

 $\star \star \star \star \star \star \star$ 



 $\star \star \star \star \star \star \star \star$ 

"ज्ञान से एक नये भारत का निर्माण″ Satyanarayan Gangaram Pitroda "Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता Bhartrhari-Nītiśatakam "Knowledge is such a treasure which cannot be stolen"



# BLANK PAGE



PROTECTED BY COPYRIGHT

भारतीय मानक गतिशील क्रेन – स्थिरता की अवधारणा

## Indian Standard MOBILE CRANES — DETERMINATION OF STABILITY

ICS 53.020.20

© BIS 1997

BUREAU OF INDIAN STANDARDS MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG NEW DELHI 110002

May 1997

**Price Group 3** 

#### NATIONAL FOREWORD

This Indian Standard which is identical with ISO 4305 : 1991 'Mobile cranes --- Determination of stability', issued by International Organization for Standardization (ISO), was adopted by the Bureau of Indian Standards on the recommendations of the Cranes, Lifting Chains and Its Related Equipment Sectional Committee, and approval of the Heavy Mechanical Engineering Division Council.

The text of ISO standard has been approved for publication as Indian Standard without deviations. Certain terminology and conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (, ) has been used as a decimal marker while in Indian Standards, the current practice is to use a full stop (.) as a decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	Corresponding Indian Standard	Degree of Equivalence
ISO 4306-1 : 1990	IS 13473 ( Part 1 ) : 1992 Cranes — Vocabulary: Part 1 General	Identical
ISO 4306-2 : 1985	IS 13473 ( Part 2 ) : 1992 Cranes — Vocabulary: Part 2 Mobile cranes	Identical
ISO 4302 : 1981	IS 14467:1997 Cranes — Wind load assessment	Identical
ISO 4310:1981	IS 14470 : 1997 Cranes — Test	Identical

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'.

## Indian Standard MOBILE CRANES — DETERMINATION OF STABILITY

#### 1 Scope

This International Standard specifies the conditions to be taken into consideration when verifying the stability of a mobile crane by calculation, assuming that the crane is operating on a firm and level surface (up to 1 % gradient).

It applies to mobile cranes as defined in ISO 4306-2, i.e. appliances mounted on wheels (tyres) or crawlers, with or without outriggers.

#### **2** Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards,

ISO 4302:1981, Cranes – Wind load assessment.

ISO 4306-1:1990, Cranes — Vocabulary — Part 1: General.

ISO 4306-2:1985, Lifting appliances — Vocabulary — Part 2: Mobile cranes.

ISO 4310:1981, Cranes – Test code and procedures.

#### **3** Calculations of stability

#### 3.1 General

The calculation shall verify that the crane is stable under the following conditions:

a) the criteria specified in table 1;

b) the criteria specified in table 2;

c) backward stability (see 3.3);

d) stability with out-of-service wind (see 3.4).

#### 3.2 Criteria for stability

3.2.1 See table 1 and table 2.

**3.2.2** Based on the criteria specified in table 1 and table 2, it is intended that the stability-limited crane ratings shall be usable in a minimum wind speed of 8,3 m/s. Under special conditions where this requirement imposes a restriction on rated capacity, the manufacturer shall clearly specify the maximum wind speed included in the stability calculation.

#### Table 1

Machine configuration/condition	Loading	Value to be taken into consideration 1)
On outriggers/crawlers <sup>2)</sup>	Applied load	1,25P + 0,1F
On wheels (tyres) <sup>2)</sup>	Applied load	1,33P + 0,1F
On crawlers/wheels (tyres) when travel speed up to 0,4 m/s is permissible	Applied load	1,33P + 0,1F
On crawlers/wheels (tyres) when travel speed greater than 0,4 m/s is permissible	Applied load	1,5P + 0,1F

#### 1) In these formulae

*P* is the rated capacity (hoist medium load) as specified by the crane manufacturer for the various configurations of the crane. It shall be for the hoist medium load of the crane as defined by ISO 4306-1 (see 3.5.1).

F is the load from the mass of the jib and fly jib referred to the jib head or fly jib head. (See ISO 4310 for the determination of F.)

The value to be taken into consideration is intended to simulate the dynamic forces arising during normal controlled operation.

2) For these configurations, the crane condition is stationary and relates to the travel of the crane as a whole but is not related to hoisting, luffing, telescoping and slewing.

Machine configuration/condition	Loading	Value to be taken into consideration <sup>1)</sup>		
On outriggers/crawlers <sup>2)</sup>	Applied load	1,1 <i>P</i>		
	Wind load	W		
	Inertia forces	D		
On wheels (tyres) <sup>2)</sup>	Applied load	1,17 <i>P</i>		
	Wind load	W		
	Inertia forces	D		
On crawiers/wheels (tyres) when travel speed up to 0,4 m/s is per-	Applied load	1,17 <i>P</i>		
missible	Wind load	W		
	Inertia forces	D		
On crawlers/wheels (tyres) when travel speed greater than 0,4 m/s is	Applied load	1,33 <i>P</i>		
permissible	Wind load	W		
	Inertia forces	D		

Table 2

#### 1) In this column

*D* are the inertia forces due to hoisting, telescoping, slewing, luffing or travel. For cranes having stepped controls, the actual values from inertia forces shall be used. For cranes having infinitely variable controls, the value of *D* shall be taken as 0.

P is as defined in table 1.

W is the effect of the in-service wind and shall be calculated in accordance with ISO 4302.

2) For these configurations, the crane condition is stationary and relates to the travel of the crane as a whole but is not related to hoisting, luffing, telescoping and slewing.

#### 3.3 Backward stability

To retain a reasonable margin, counterweighting shall be limited by the mass distribution given below, the appliance being in the following conditions:

- placed on a firm, level supporting surface (up to 1 % gradient);
- equipped with the shortest specified jib, set at its maximum recommended jib angle for that jib length;
- with hook, hook-block or other load-handling equipment resting on the ground;
- with outriggers free of the bearing surface for on-wheels (tyres) calculations;
- equipped with the longest specified jib, or jib and fly-jib combination set at its maximum recommended jib angle for that combination, and subjected to an in-service wind acting from the least favourable direction.

The specified mass distribution criteria shall be satisfied for each counterweight condition with the crane rotated to the least stable positions permitted by the manufacturer.

#### 3.3.1 Crawler-mounted cranes

The total load on the tipping line on the side or end of the undercarriage supporting the least load shall not be less than 15 % of the total weight of the crane.

When applied to crawler cranes equipped with retractable crawler assemblies, the manufacturer shall provide on the crane cautionary information visible to the operator if the above criterion is not met when crawlers are retracted.

#### 3.3.2 Wheel-mounted cranes

With the longitudinal axis of the rotating superstructure of the crane at  $90^{\circ}$  to the longitudinal axis of the carrier, the total load on the wheels (tyres) or outriggers on the side of the carrier under the jib shall be not less than 15 % of the total weight of the crane.

With the longitudinal axis of the rotating superstructure of the crane in line with the longitudinal axis of the carrier, in either direction, the total load on the wheels (tyres) or outriggers under the lighter loaded end of the carrier shall be not less than 15 % of the total weight of the crane in the work area specified by the manufacturer, and not less than 10 % of the total weight of the crane in the area not specified as a work area.

The on-wheels (tyres) limitations must be met unless cautionary information visible to the operator is placed on the crane. This information shall state the operating conditions that require the outriggers to be set to maintain sufficient backward stability.

## **3.4 Stability with out-of-service wind** (see ISO 4302)

The manufacturer shall stipulate the special precautions to be taken by the user when the crane is out of service and the working limits when subjected to wind.

#### 3.5 Determination of stability

**3.5.1** The value of P shall be such that, with loading conditions as given in table 1 and table 2, in neither case shall the overturning moment of the crane be greater than the stabilizing moment.

**3.5.2** The calculations shall be made with the crane in the least favourable position. Moreover, all the loads, dead loads, counterweights, accessories, etc. which have an influence on the stability shall be taken into consideration as being in the least favourable condition as regards their value and their position.

**3.5.3** Lines about which cranes on various mountings may tip and which are used to calculate the stabilizing moment are shown in annex A. These are indicative only and in practice are dependent on particular details of individual designs.

## Annex A

## (informative)

## **Tipping line of mobile cranes**

**NOTE 1** Figure A.1 to figure A.5 are illustrative only. In practice, tipping lines are dependent on individual designs.

### A.1 Cranes on wheels (tyres)

**A.1.1** Crane on wheels (tyres) without suspension or with the suspension locked (see figure A.1 and figure A.2)

The tipping line is the line joining the points of con-

tact of the wheels. For axles mounted on twin tyres, the following two cases should be considered:

- a) in the case where the axle is fixed or blocked, the point of contact of the outer wheel;
- b) in the case where the wheel is on a rocking axle, the pivot axis of this rocking axle.



Figure A.1



Figure A.2

## A.1.2 Crane on wheels with the suspension unlocked (see figure A.3)

The tipping line is the line joining the points of application of the suspension.

### **A.2** Cranes on outriggers (see figure A.4)

The tipping line is the line joining the centres of the support but, if flexible supporting surfaces exist besides the outriggers (such as wheels with pneumatic tyres), then these may be taken into account.



Figure A.3





### A.3 Cranes on crawlers (see figure A.5)

The tipping line is the line joining the axis of the sprocket wheels and the axis of the idler wheel.



Figure A.5

#### **Bureau of Indian Standards**

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 1986 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

#### **Review of Indian Standards**

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. HMD 14 (0408).

#### **Amendments Issued Since Publication**

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002 Telephones : 323 01 31, 323 94 02, 323 33 75	Telegrams: Manaksanstha ( Common to all offices )	
Regional Offices:	Telephone	
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	Solution 12: Solution 11: Solution 1	
Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola CALCUTTA 700054	337 84 99, 337 85 61   337 86 26, 337 86 62	
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43   60 20 25	
Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600113	<pre>{ 235 02 16, 235 04 42 235 15 19, 235 23 15</pre>	
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	832 92 95, 832 78 58   832 78 91, 832 78 92	

#### Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India