BRITISH STANDARD

BS 7333:1990

Specification for

Slewing jib cranes

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Mechanical Handling Standards Policy Committee (MHE/-) to Technical Committee MHE/3, upon which the following bodies were represented:

Associated British Ports
Associated Offices Technical Committee
Association of Consulting Engineers
BP Trading Limited
British Ports Federation and the National Association of Ports Employers
British Railways Board
British Steel pic
Construction Plant Hire Association
Department of the Environment (Building Research Establishment)
Department of Trade and Industry [Mechanical Engineering and Manufacturing Technology Division (MMT)]
Electricity Supply Industry in England and Wales
Engineering Equipment and Materials Users' Association
Federation of Civil Engineering Contractors
Federation of Manufacturers of Construction Equipment and Cranes
Federation of Wire Rope Manufacturers of Great Britain
Health and Safety Executive
Independent Engineering Insurers Committee
Institute of Materials Management
Institution of Mechanical Engineers
Institution of Plant Engineers
Institution of Production Engineers
Institution of Structural Engineers
Lloyds Register of Shipping
Welding Institute

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Constructional Steelwork Association Ltd.
Department of the Environment (Property Services Agency)
GAMBICA (BEAMA Ltd.)
High Commission of India
Institution of Engineering Designers
Iron and Steel Trades Confederation
Manufacturing Science Finance

This British Standard, having been prepared under the direction of the Mechanical Handling Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on
31 July 1990

The following BSI references relate to the work on this standard:
Committee reference MHE/3
Draft for comment 87/72251 DC

ISBN 0 580 18639 3

Amendments issued since publication

Amd. No.	Date	Comments

Contents

Foreword

This British Standard has been prepared under the direction of the Mechanical Handling Standards Policy Committee. It forms one of a series of standards relating to cranes and excavators. As with all British Standards for cranes, the primary object of the specification is to ensure reliability and safety without placing restrictions on the general design of cranes or the methods employed in their construction.

Other standards in the series are as follows.

BS 327, *Specification for power-driven derrick cranes* [1].

BS 357, *Specification for power-driven travelling jib cranes (rail-mounted low carriage type)*[1]

BS 466, *Specification for power driven overhead travelling cranes, semi-goliath and goliath cranes for general use.*

BS 1757, *Specification for power-driven mobile cranes.*

BS 1761, *Specification for single bucket excavators of the crawler-mounted friction-driven type*[1]

BS 2452, *Specification for electrically driven jib cranes mounted on a high pedestal or portal carriage (high pedestal or portal jib cranes).*

BS 2573, *Rules for the design of cranes.*

BS 2573-1, *Specification for classification, stress calculations and design criteria for structures.*

BS 2573-2, *Specification for classification, stress calculations and design of mechanisms.*

BS 2799, *Specification for power-driven tower cranes for building and engineering construction*[1]

The method of classification used in this British Standard is that adopted by the International Organization for Standardization (ISO), published as ISO 4301/1 and incorporated in BS 2573. This provides a means of defining the anticipated duty of the crane which serves as the basis of agreement between the purchaser and the manufacturer, and supplies information on which much of the design analysis can be based. The classification of the crane is defined from the number of operating cycles and from the anticipated loading it will experience during its life and therefore provides a sound basis for rational design along with economic production.

Appendix A lists information that should be supplied by the purchaser at the time of enquiry and/or order.

Appendix B lists information to be supplied by the manufacturer upon delivery of the crane.

Appendix C comprises a list of British Standards for materials and equipment suitable for use in the manufacture of cranes.

Attention is drawn to BS 5744 and BS 7121-1 which cover the safe use of cranes and provide details of legislation relating to cranes.

This British Standard has been written on the basis that the inspection and testing after installation and the provision of the test certificate, before putting the crane into service, is the responsibility of the crane manufacturer.

[1] Obsolescent

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

blank

Section 1. General

1.1 Scope

This British Standard specifies the design, construction and testing of slewing, but not derricking (luffing), jib cranes for use with either hand, electric or pneumatic hoists. Cranes used on offshore installations to unload vessels are not covered by this standard.

NOTE 1 Typical slewing jib cranes are shown in Figure 1.
NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

1.2 Definitions

For the purposes of this British Standard the following definitions apply.

1.2.1
effective radius

the horizontal distance between the centre line of rotation and the vertical centre line through the load lifting attachment at the extreme point of travel (See Figure 2.)

1.2.2
deformable length

the effective radius added to the height from finished floor level to underside of jib arm

1.2.3
calculated deflection

the calculated vertical displacement at the effective radius, resulting from the mass of the lifting appliance plus the safe working load applied at that radius

1.2.4
vertical deflection

the actual vertical displacement at the effective radius, resulting from the safe working load applied at that radius

1.2.5
allowable deflection

the maximum allowable vertical displacement at the effective radius, resulting from the safe working load applied at that radius

1.2.6
overturning moment

the unbalanced moment produced by the total load (excluding impact) applied at the effective radius together with the deadweight moment of the jib crane

1.2.7
vertical load on base

the axial load imposed by the jib crane plus the total load applied on to the foundations or base plate

1.2.8
loads on bearings

loads resulting from the maximum overturning moment and the vertical forces due to the imposed loadings

1.2.9
slewing

rotary motion of a crane jib and superstructure about a vertical axis

1.2.10
competent person

a person who has such practical and theoretical knowledge and such experience of the crane and the equipment used in the lifting operation as is necessary to carry out the function to which the term relates in each particular context

1.3 Information to be provided

The manufacturer shall provide information to the purchaser of the crane in accordance with Appendix B and as shown in Figure 2.

NOTE The purchaser should provide information in accordance with Appendix A to enable the crane manufacturer to offer the most suitable crane to satisfy the duty requirements and service conditions.

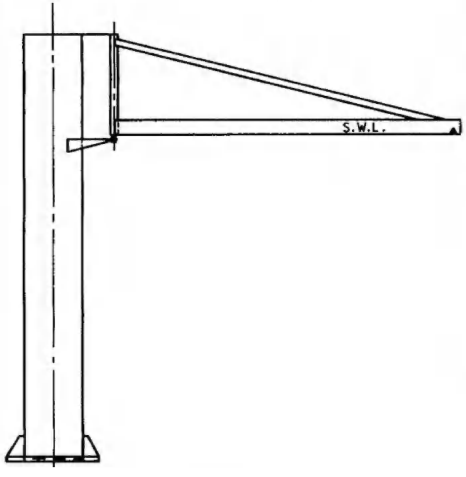
1.4 Classification

The classification of the crane shall be based on information provided in accordance with Appendix A and shall be determined in accordance with Table 1 and Table 2.

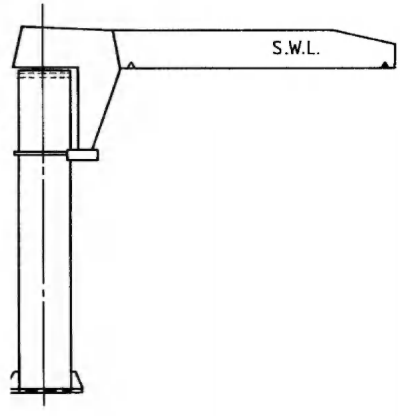
NOTE 1 The classification of powered mechanisms can be determined using the requirements for mechanisms given in BS 466. For hand-operated hoists, refer to BS 3243.
NOTE 2 No change in the group classification of a crane, or in its combination of state of loading and class of utilization within the same group classification, should be made without reference to the manufacturer or without having a thorough design check carried out by a competent person.

1.5 Protection and painting of crane structure

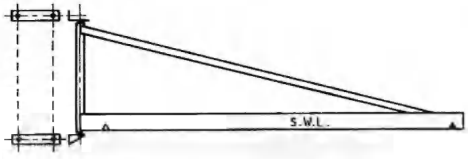
Protection and painting of the crane structure shall be in accordance with section 5 of BS 466.



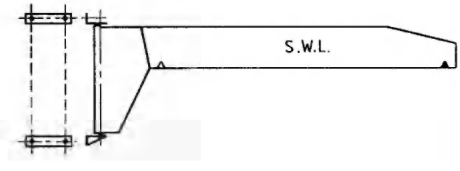
(a) Free Standing 180°/270° overbraced



(b) Free Standing 360° underbraced

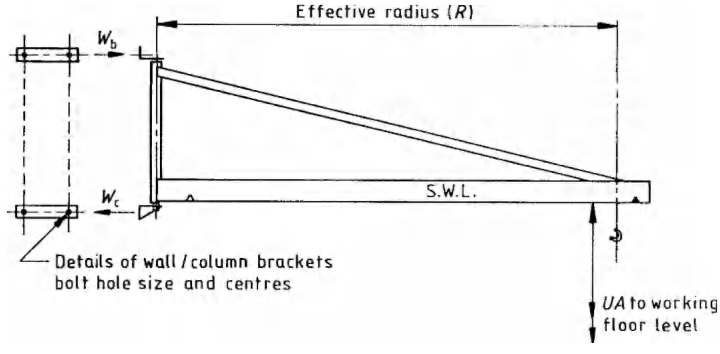


(c) Wall or column-mounted 180°/270° slew overbraced



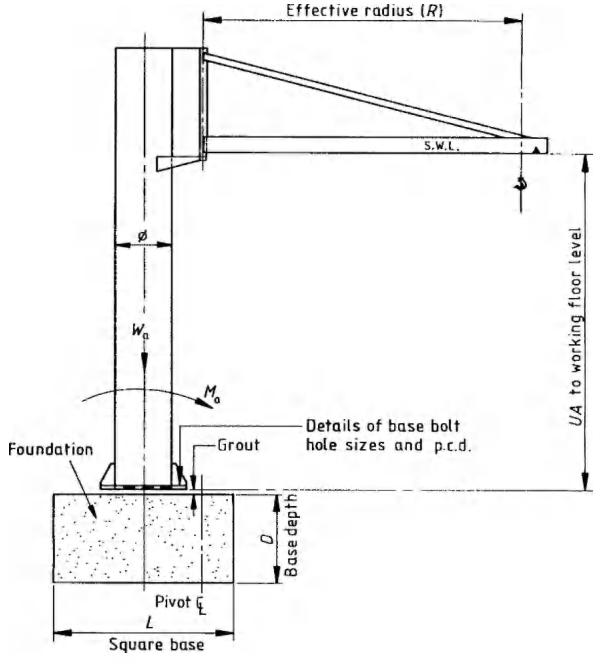
(d) Wall or column-mounted 180°/270° slew underbraced

Figure 1— Typical Slewing Jib cranes

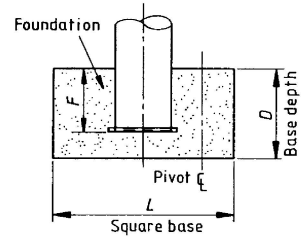


(a) Wall-mounted or column-mounted jib arms

Figure 2 — Typical information to be supplied by the manufacturer



(b) Surface-mounted post



(c) Cast-in floor post

NOTE The manufacturer is to provide details of all loads (in N), moments (in N mm) and dimensions (in mm) typically as indicated. (See Appendix B.)

Figure 2 — Typical information to be supplied by the manufacturer

Table 1 — Group classification of the crane

State of loading	Nominal load spectrum factor, K_p	Class of utilization and maximum number of operating cycles of the crane								
		U1	U2	U3	U4	U5	U6	U7	U8	U9
		3.2×10^4	6.3×10^4	1.25×10^5	2.5×10^5	5×10^5	1×10^6	2×10^6	4×10^6	$> 4 \times 10^6$
Q1 Light	0.5	A1	A1	A2	A3	A4	A5	A6	A7	A8
Q2 Moderate	0.63	A1	A2	A3	A4	A5	A6	A7	A8	A8
Q3 Heavy	0.8	A2	A3	A4	A5	A6	A7	A8	A8	A8
Q4 Very heavy	1.0	A3	A4	A5	A6	A7	A8	A8	A8	A8

NOTE The typical classifications resulting from the classes of utilization and the states of loading normally associated with particular types of jib crane applications are given in Table 3.
The lists of crane types and applications are not comprehensive. Full account should be taken of any particular requirements when determining the appropriate group classifications.

Table 2 — State of loading for the crane

State of loading	Nominal load spectrum factor, K_p	Descriptive definition
Q1 Light	0.5	Normally light loads: cranes that hoist the safe working load very rarely.
Q2 Moderate	0.63	Normally moderate loads: cranes that hoist the safe working load fairly frequently.
Q3 Heavy	0.8	Normally heavy loads: cranes that hoist the safe working load frequently.
Q4 Very heavy	1.0	Normally near safe working loads: cranes that are normally loaded close to safe working load.

Table 3 — Typical classifications for jib cranes

Type and/or application	Class of utilization	State of loading	Group classification
Standby duty: pumping stations, maintenance, breakdowns, etc.	U2 to U4	Q1	A1 to A3
Very light duty: general machine shop, etc.	U2 to U4	Q1 to Q2	A1 to A4
Light duty: vehicle offloading, stores, etc.	U2 to U4	Q1 to Q2	A2 to A4
Medium duty: production machine loading, assembly, etc.	U4 to U6	Q1 to Q3	A4 to A6
Heavy duty: process, magnet grabbing, shipyard, molten metal, hazardous or similar situations	U5 to U8	Q4	A6 to A8

Section 2. Structural

2.1 Permissible stresses

The permissible stresses and design of the crane structure shall comply with BS 2573-1.

2.2 Allowable deflection

The vertical deflection shall be such as to ensure that:

a) the trolley on the jib arm will not run out of control during normal operation; and

b) the jib arm cannot slew on its own.

In addition the crane shall be designed so that the vertical deflection at the effective radius caused by the safe working load shall not exceed that given in Table 4, where R is the effective radius, UA is the height to underside of jib arm and $(R + UA)$ is the deformable length.

Table 4 — Allowable deflection

Classification	Deflection
A1, A2 and A3	$(R + UA)^a$ /250
A4, A5 and A6	.R/250
A7 and A8	*R!* 400

[a] $(R + UA)$ is only applicable to post-mounted jib cranes.

NOTE 1 The deflection figures given in Table 4 apply to the crane structure and do not include deflections arising from the supporting structure, foundations or slackness in the bearings or pins.

NOTE 2 It should be noted that deflections in most instances are not the governing criteria for the design and safe operation of a wall- or pillar-mounted jib crane.

Accurate placement of loads handled by the crane is of importance. For lighter loads the operator may dampen amplitudes of oscillation by guiding the load with the hand. For heavier loads it is not possible for the operator to do this and more stringent restrictions for deflection and for maximum allowable amplitudes of oscillation may be required. The same applies to lifting speeds which may cause undesirable bouncing. (A guide to lifting speeds and related classification is given in Table 5.) Special requirements for these factors should be the subject of agreement between the purchaser and manufacturer or supplier (see Appendix **A** and Appendix **B**).

Table 5 — Recommended maximum lifting speeds

Classification	Lifting speed
	m/min
A1, A2 and A3	< 8
A4, A5 and A6	< 12
A7 and A8	<20

2.3 Joints

2.3.1 Welded joints

Welded joints shall comply with BS 2573-1.

2.3.2 Bolted joints

2.3.2.1 *General*

Bolts used in the manufacture of the crane shall be of the high-tensile or friction grip type. (See **2.3.2.2** and **2.3.2.3.)**

Bolts passing through taper flanges shall be fitted with washers, complying with BS 3410.

NOTE Bolts used for holding down, e.g. foundation bolts, may be black bolts complying with BS 4190.

Tie bolts used for fixing wall-mounted or column-mounted slewing jib cranes back to a supporting structure may be black bolts providing that they are not subject to shear stress and that they comply with BS 4190.

2.3.2.2 *High-tensile steel bolts*

High-tensile steel bolts shall comply with BS 3692.

2.3.2.3 *Friction grip bolts*

Friction grip bolts shall comply with BS 4395-1 and shall be fitted in accordance with BS 4604-1.

2.3.2.4 *Bolted joints in shear*

Bolted joints in shear shall use precision bolts in reamed holes, or friction grip bolts. With precision bolts, the shear plane shall be on the plain shank.

2.3.2.5 *Bolts in tension*

All bolts in tension shall be fitted with a locking device.

Section 3. Mechanical

3.1 Guarding

3.1.1 All gear wheels, pinions and chain drives shall be completely encased unless such parts are so situated in relation to the structure of the crane as to be as safe as if complete encasement were provided.

3.**1**.2 Guards shall be provided for revolving shafts and couplings unless every set screw, bolt or key on any revolving shaft is sunk, shrouded, or otherwise effectively guarded.

3.1.3 All other dangerous parts of the machine shall be guarded in accordance with BS 5304.

3.2 Rotating and fixed shafts and axles

Rotating and fixed shafts and axles shall comply with **8.2** of BS 2573-2:1980.

3.3 Bearings

Slewing bearings shall be designed to withstand the loads imposed. The parts involved shall be accurately aligned. The main bearings shall provide complete stability for the jib arm and shall not allow horizontal or vertical displacement. Separation or displacement between the jib members and column shall be prevented.

NOTE Types of bearings that are suitable for use in jib cranes include:

a) plain bearings with external means of lubrication;
b) anti-friction bearings with either external means of lubrication or grease pre-packed and sealed for life;
c) bearings of synthetic or composite materials, that do not need further lubrication.

3.4 End stops

Where a hoist or trolley is fitted, end stops shall be provided to prevent it:

a) running off the ends of its tracks;

b) colliding with the jib underbrace or slewing bearing;

c) colliding with the post when slewed.

Section 4. Electrical

NOTE 1 The electrical installation for slewing jib cranes should be in accordance with BS 2771-1.
NOTE 2 Attention is drawn to the Institute of Electrical Engineers (IEE) Wiring Regulations for Electrical Installations[2)] which form the basis for the design of the overall electrical installation of the crane. Terminology from these regulations has been used throughout the electrical clauses in this standard.
NOTE 3 Attention is drawn to the legal requirements of the Electricity (Factories Act) Special Regulations 1908 and 1944.
NOTE 4 Attention is drawn to the recommendations given in BS 5304.
NOTE 5 This section does not apply to d.c. power supplies.

4.1 Power supply

The crane shall be designed to operate on the power supply specified by the purchaser (see item 10 of Appendix A).

4.2 Isolation

A means shall be provided on the crane, or in close proximity to the crane, for isolating the crane from the power supply.

4.3 Control equipment

4.3.1 Control supply

Control circuits shall be supplied at a nominal voltage not exceeding 115 V.

NOTE It is, however, recommended that the control circuit voltage should be as low as practicable.

4.3.2 Contactors

Contactors shall comply with BS 5424-1. Reversing contactors shall be interlocked so that only one directional contactor can be energized.

4.3.3 Control circuit transformers

Control circuit transformers shall comply with BS 3535. An earth screen shall be provided between the primary and secondary winding. The transformer frame shall be earthed.

4.4 Electric current pick-up

4.4.1 Continuous jib rotation

Where the design of the crane provides for continuous rotation of the jib, slip ring units shall be provided so that there is no limitation in rotation from the power pick-up.

4.4.2 Limited jib rotation

Where the design permits only limited rotation of the jib, slip rings are not required but stops shall be fitted to prevent rotation beyond which provision has been made.

4.5 Enclosures

Protective enclosures shall be provided for all electrical equipment. The minimum degree of protection for enclosures shall be IP **44** of BS **5490** with the exception of motors which shall have a minimum degree of protection of IP **23**.

4.6 Cables and conductors

4.6.1 Protection of cable

Cables shall be protected from mechanical damage by any of the following means:

a) enclosed by running in conduits, trunking or on trays;

b) positioned so as to be protected by the crane structure;

c) use of armoured construction.

4.6.2 Conductors

Conductors shall be stranded or flexible. Single strand cables shall not be used.

4.6.3 Minimum size

Conductors for power wiring to the hoist motors shall have a minimum cross-sectional area of not less than **1.5** mm^2. For control circuits and auxiliary wiring, cables shall have a minimum cross-sectional area of not less than 1.0 mm^2.

4.6.4 Cable rating

The current carried by cables in circuits related to mechanism group M8 (see Table 6) shall not be greater than the appropriate values given in the IEE Wiring Regulations with respect to ambient temperature, type of excess current protection and volt drop.

NOTE Cables in circuits related to mechanism groups below M8 may be uprated in accordance with Table 6, in which case the voltage drop should be considered in accordance with the IEE Wiring Regulations.

Table 6 — Uprating of cables to hoist unit

Mechanism group	IEE Rating multiplied by:
M3	1.7
M4	1.7
M5	1.7
M6	1.4
M7	1.4
M8	1.0

[2)] Available from the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London WC2 0BL.

Section 5. Technical information, inspection, testing, certification and marking

5.1 Technical information

The following technical information shall be provided prior to commissioning of the crane to ensure safe usage:

a) general arrangement drawings showing all leading dimensions and installation details;

b) circuit wiring diagrams;

c) operating and maintenance instructions;

d) erection and dismantling procedures.

5.2 Testing at manufacturer's works

Electrical and mechanical equipment shall be tested in accordance with the appropriate British Standard (see **Appendix C**) at the crane or equipment manufacturer's works.

5.3 Inspection and testing after installation and before putting crane into service

5.3.1 General

The inspection and testing shall be carried out by a competent person who shall ensure that testing is carried out in a safe manner.

NOTE 1 The aim of testing is to determine whether the crane is in accordance with this British Standard and any statutory requirements.

NOTE 2 The scope of this standard does not cover the structure to which the crane is attached and/or foundations for the crane, but attention is drawn to the need to check the adequacy of those before installation.

5.3.2 Visual inspection

5.3.2.1 The visual inspection shall include a check for compliance with specifications and/or a check of the condition of all vital components such as:

a) mechanisms, electrical equipment, safety devices, brakes and controls;

b) crane metal structures and their connections;

c) all guarding;

d) hook or other load-handling attachments and their connections;

e) ropes, chains and their fastenings;

f) sheave blocks, their pivots and fastening details;

g) fluid levels.

5.3.2.2 It shall not be inferred that dismantling of any parts is necessary during this inspection, but opening of covers which would be required for normal services and inspection purposes shall be included, e.g. limit switch covers.

5.3.2.3 The inspection procedures shall include verification that all certificates required have been submitted and checked.

5.3.3 Load lifting tests

Load lifting competence testing shall consists of;

a) deflection tests (see **5.3.4);**

b) dynamic tests (see **5.3.5);**

c) overload tests (see **5.3.6).**

5.3.4 Deflection tests

5.3.4.1 ***Procedure***

On completion of installation, the safe working load shall be applied at the effective radius and the deflection measured.

5.3.4.2 ***Acceptance criteria***

There shall be no spontaneous rotation of the jib or uncontrolled movement of the trolley at any time and the measured deflection shall not exceed the allowable deflection shown in Table 4 for the particular crane classification.

5.3.5 Dynamic tests

5.3.5.1 ***Procedure***

Dynamic tests shall be conducted with the safe working load suspended from the crane. They are primarily for the purpose of verifying:

a) the functioning of crane mechanisms and brakes;

b) that speeds of operation are within ± 10 % of that specified at the design supply voltage and frequency.

During performance of the test, the crane shall be controlled according to the rules specified in the operating manual, and care shall be taken to limit accelerations, decelerations and speeds to those appropriate to normal crane operation.

Dynamic tests shall be performed separately for each crane motion or, if stated in the specifications of the cranes, for concurrent crane motions in such positions and configurations as will impose maximum loading on the mechanisms. Tests shall include starting and stopping for each motion throughout the range of the motion.

5.3.5.2 ***Acceptance criteria***

The components concerned shall perform their functions and there shall be no damage to the mechanisms or structural components and no connections shall be damaged or loosened.

5.3.6 Overload tests

5.3.6.1 ***Procedure***

Overload tests shall be conducted with a load of 1.25 x safe working load for the purpose of demonstrating the structural competence of the crane and its components.

Overload tests shall be performed at the effective radius to impose maximum loads, maximum bending moments and/or maximum axial forces, as applicable, in the major crane components.

The test load shall be lifted and all motions operated to ensure all gear teeth are tested under overload conditions.

5.3.6.2 ***Acceptance criteria***

There shall be no crack, permanent deformation, paint flaking or visible damage which affects the function and safety of the crane and no connection shall be loosened or damaged.

5.4 Test certificates

A certificate of test shall be supplied with the crane. The test certificate shall contain the following minimum information:

a) crane certification;

b) the test load(s) applied;

c) the safe working load(s);

d) the radii of the jib, trolley or crab appropriate to any multiple safe working loads.

5.5 Marking of the crane

5.5.1 Identification

For the purpose of identification the slewing jib crane shall bear the manufacturer's name and serial number, the number and date of this British Standard, i.e. BS 7333:1990 [3)], the classification designation (see **1.4**) and the year of manufacture.

5.5.2 Safe working load

The crane jib shall bear a permanent inscription on each side, readily legible from operating level, stating the safe working load of the crane in tonnes (or in kilograms if it is less than 1t).

[3)] Marking BS 7333:1990 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendix A Information to be supplied by the purchaser with enquiry and/or order

The purchaser should supply the following information with the enquiry and/or order.

1 Type of crane

2 Type of hoist

3 Safe working load (kilograms or tonnes)

4 Effective radius (R) required

5 Height to underside of jib arm or height of lift required

(i Total headroom available

7 Slewing angle required

8 Classification of the crane

(a) Where detailed information is available of the operations that the crane is expected to perform and of the individual loads to be carried, it should be provided as follows:

Utilization

Number of lifts per hour

Operating hours per day

Operating hours per month

Loads (including weight of hoist)

Actual loads if known

or

% of lifts with approximately safe working load

% of lifts with approximately 75 % safe working load

% of lifts with approximately 50 % safe working load

% of lifts with approximately 25 % safe working load

Weight of hoist

Intended design life ..... (years)

(b) Where insufficient information is available of the operations the crane is expected to perform, the purchaser should request the manufacturer to recommend the most suitable crane for the anticipated duty.

9 Location: indoor or outdoor

10 The extent to which electrical equipment is to be provided.

Where necessary the following information should be included:

(a) Power supply available

(b) Voltage ..... (nominal)

Phase ..... Hz .....

(c) Conductors .....

Is there a neutral? .....

If so, is it earthed? .....

11 General state of atmosphere or climate .....

12 Is any special painting or protective finish required? .....

13 Any special requirements, statutory or technical .....

(e.g. hazardous areas)

Appendix B Information to be supplied by the manufacturer

The following information shall be provided by the manufacturer (see Figure **2**).

1 Type of crane .....

2 TVpe of hoist .....

3 Classification of crane .....

4 Safe working load .....

5 Effective radius (***R***) .....

6 Height to underside of jib arm *(**UA**)* .....

7 Slewing angle (degrees) .....

8 Diameter of post (ϕ) .....

9 Fixing details (details of base bolt size and pitch circle diameter (p.c.d.), details of wall brackets bolt size and centres or dimension ***F***)

10 Foundation size (L x *D)* .....

11 Reactions, W_a, W_b, W_c, ...

12 Foundation moment, M_a .....

13 Electrical supply required ..... (kW)

Appendix C List of British Standards for materials and equipment suitable for use in the manufacture of cranes

A list of British Standards for materials and equipment suitable for use in the manufacture of cranes is given in Table 7.

Table 7 — British Standards for materials and equipment suitable for use in the manufacture of cranes

Crane detail	BS No.	Title
Permissible stresses	2573[a]	Rules for the design of cranes Part 1 Specification for classification, stress calculations and design criteria for structures Part 2 Specification for classification, stress calculations and design of mechanisms
Materials		
Castings, iron	2789	Specification for spheroidal graphite or nodular graphite cast iron
grey	1452	Specification for grey iron castings
malleable	6681	Specification for malleable cast iron
casting, steel	3100	Specification for steel castings for general engineering purposes
Castings, copper and alloys	1400	Specification for copper alloy ingots and copper alloy and high conductivity copper castings
Steel, structural	4360	Specification for weldable structural steels
Rivet materials	4620	Specification for rivets for general engineering purposes
Steel bars for machined parts, shafts and axles	970	Specification for wrought steels for mechanical and allied engineering purposes Part 1 General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels
Springs, coil and spiral	24	Railway rolling stock material Part 3B Specification for helical and volute springs and spring steels
	5216	Specification for patented cold drawn carbon steel wire for mechanical springs
	1429	Specification for annealed round steel wire for general engineering springs
Structural details, etc.		
Bolts and nuts	916[b]	Specification for black bolts, screws and nuts, hexagon and square, with B.S.W. threads, and partly machined bolts, screws and nuts, hexagon and square, with B.S.W. or B.S.F threads

[a] Referred to in the text.
[b] Obsolescent.

Table 7 — British Standards for materials and equipment suitable for use in the manufacture of cranes

Crane detail	BS No.	Title
	1083[b]	Specification for precision hexagon bolts, screws and nuts (B.S.W. and B.S.F. threads)
	1768[b]	Specification for Unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series
	3139	Specification for high strength friction grip bolts for structural engineering Part 1[b] General grade bolts
	3294	Specification for the use of high strength friction grip bolts in structural steelwork Part 1 General grade bolts
	3410[ab]	Specification for metal washers for general engineering purposes
	3692[a]	Specification for ISO metric precision hexagon bolts, screws and nuts. Metric units
	4190[a]	Specification for ISO metric black hexagon bolts, screws and nuts
	4395[a]	Specification for high strength friction grip bolts and associated nuts and washers for structural engineering Part 1 General grade
	4604[a]	Specification for the use of high strength friction grip bolts in structural steelwork. Metric series Part 1 General grade
Rivets (dimensions)	275[b]	Specification for dimensions of rivets *(V2* inch to 1% inch diameter)
	4620	Specification for rivets for general engineering purposes
Tyres	3037	Specification for tyres for crane rail wheels Part 1 Double-flanged parallel-tread tyres Part 2 Forged or rolled steel double flanged rail wheels and tyres (metric units)
Welding	5135	Specification for arc welding of carbon and carbon manganese steels
Machinery and machinery details		
Bearings, ball and roller	292	Rolling bearings: ball bearings, cylindrical and spherical roller bearings Part 1 Specification for dimensions of ball bearings cylindrical and spherical roller bearings (metric series) Part 2 Specification for dimensions of ball bearings and cylindrical roller bearings (inch series)

[a] Referred to in the text.
[b] Obsolescent.

Table 7 — British Standards for materials and equipment suitable for use in the manufacture of cranes

Crane detail	BS No.	Title
	3134	Metric tapered roller bearings Part 1 Specification for dimensions and tolerances of single row bearings Part 2 Specification for dimensions of double row bearings Part 3 Specification for dimensions of flanged cups
Oil retaining	4480	Plain bearings: metric series Part 1 Sintered bronze bushes
Chains and chain wheels	228	Specification for short pitch transmission precision roller chains and chainwheels
Gearing, spur	436	Spur and helical gears Part 1 Basic rack form, pitches and accuracy (diametral pitch series) Part 2 Basic rack form, modules and accuracy (1 to 50 metric module)
bevel	545	Specification for bevel gears (machine cut)
worm	721	Specification for worm gearing Part 1 Imperial units Part 2 Metric units
Keys and keyways	46	Keys and keyways and taper pins Part 1 Specification. Keys and keyways
	4235	Specification for metric keys and keyways Part 1 Parallel and taper keys
Limits and fits	1916	Limits and fits for engineering Part 1 Limits and tolerances Part 2 Guide to the selection of fits in BS 1916-1 Part 3 Recommendations for tolerances, limits and fits for large diameters
	4500	ISO limits and fits Part 1 General tolerances and deviations Part 3 Working limits on untoleranced dimensions Part 4 Specification for system of cone (taper) fits for cones from C = 1 : 3 to 1 : 500, lengths from 6 mm to 630 mm and diameter up to 500 mm Part 5 Specification for system of cone tolerances for conical workpieces from C = 1 : 3 to 1 : 500 and lengths from 6 mm to 630 mm
Lubricating nipples	1486	Lubricating nipples Part 1 Lubricating nipples and adaptors for use on machinery and vehicles Part 2 Heavy duty lubricating nipples

Table 7 — British Standards for materials and equipment suitable for use in the manufacture of cranes

Crane detail	BS No.	Title
Screw threads	1580	Specification for Unified screw threads Parts 1 & 2 Diameters ^{l}A in and larger Part 3 Diameters below V*in
	3643	ISO metric screw threads Part 1 Principles and basic data Part 2 Specification for selected limits of size
Splines and serrations	2059	Specification for straight-sided splines and serrations
	3550[a]	Specification for involute splines
Taper pins solid and split	46[a]	Keys and keyways and taper pins Part 3 Specification for solid and split taper pins for general engineering purposes
Electrical machinery and equipment		
Cables	6004	Specification for PVC-insulated cables (non-armoured) for electric power and lighting
	6007	Specification for rubber-insulated cables for electric power and lighting
	6231	Specification for PVC-insulated cables for switchgear controlgear wiring
	6346	Specification for PVC-insulated cables for electricity supply
	23	Specification for copper and copper-cadmium trolley and contact wire for electric traction
Circuit breakers	4752	Specification for switchgear and controlgear for voltages up to and including 1 000 V a.c. and 1 200 V d.c. Part 1 Circuit-breakers
Conduit	31	Specification. Steel conduit and fittings for electrical wiring
	4568	Specification for steel conduit and fittings with metric threads of ISO form for electrical installations Part 1 Steel conduit, bends and couplers Part 2 Fittings and components
Controllers and resistors	587[a]	Specification. Motor starters and controllers
Hand lamps	4533	Luminaires Part 102 Particular requirements Section 102.8 Specification for handlamps
Isolating devices	5419	Specification for air-break switches, air-break disconnectors, air-break switch disconnectors and fuse-combination units for voltages up to and including 1 000 V a.c. and 1 200 V d.c.
Motors	5000	Rotating electrical machines of particular types or for particular applications Part 99 Machines for miscellaneous applications

[a] Obsolescent.

Table 7 — British Standards for materials and equipment suitable for use in the manufacture of cranes

Crane detail	BS No.	Title
Transformers	3535	Specification for safety isolating transformers for industrial and domestic purposes
Trunking	4678	Cable trunking Part 1 Steel surface trunking
Contactors	5424[a]	Specification for controlgear for voltages up to and including 1 000 V a.c. and 1 200 V d.c. Part 1 Contactors
Lifting equipment		
Hooks	2903	Specification for higher tensile steel hooks for chains, slings, blocks and general engineering purposes
Shackles	3032	Specification for higher tensile steel shackles
	3551	Specification for alloy steel shackles
Wire ropes	302	Stranded steel wire ropes Part 1 Specification for general requirements Part 2 Specification for ropes for general purposes Part 3 Specification for zinc coated ropes for ships Part 4 Specification for ropes for lifts Part 5 Specification for ropes for hauling purposes Part 6 Specification for ropes for mine hoisting Part 7 Specification for large diameter ropes for general purposes Part 8 Specification for higher breaking load ropes
Wire rope fittings	461	Specification for Bordeaux connections
	462	Specification for wire rope grips
	463	Specification for sockets for wire ropes Part 1 Inch units Part 2 Metric units
	464	Specification for thimbles for wire ropes
Protection		
Paint	2523	Specification for lead-based priming paints
	3698	Specification for calcium plumbate priming paints
	4652	Specification for metallic zinc-rich priming paint (organic media)
Surface preparation	4232	Specification for surface finish of blast-cleaned steel for painting
	CP 3012	Code of practice for cleaning and preparation of metal surfaces

[a] Referred to in the text.

blank

Publications referred to

See also Appendix C.

BS 327, *Specification for power-driven derrick cranes* [4) 5)].

BS 357, *Specification for power-driven travelling jib cranes (rail-mounted low carriage type)* [4) 5)].

BS 466, *Specification for power-driven overhead travelling cranes, semi-goliath and goliath cranes for general use.*

BS 1757, *Specification for power-driven mobile cranes* [4)].

BS 1761, *Specification for single bucket excavators of the crawler-mounted friction-driven type* [4) 5)]

BS 2452, *Specification for electrically driven jib cranes mounted on a high pedestal or portal carriage (high pedestal or portal jib cranes)* [4)]

BS 2573, *Rules for the design of cranes.*

BS 2573-1, *Specification for classification, stress calculations and design criteria for structures.*

BS 2573-2, *Specification for classification, stress calculations and design of mechanisms.*

BS 2771, *Electrical equipment of industrial machines.*

BS 2771-1, *Specification for general requirements.*

BS 2799, *Specification for power-driven tower cranes for building and engineering construction* [4) 5)].

BS 3243, *Specification for hand-operated chain pulley blocks.*

BS 3410, *Specification for metal washers for general engineering purposes* [5)].

BS 3535, *Specification for safety isolating transformers for industrial and domestic purposes.*

BS 3692, *Specification for ISO metric precision hexagon bolts, screws and nuts. Metric units.*

BS 4190, *Specification for ISO metric black hexagon bolts, screws and nuts.*

BS 4395, *Specification for high strength friction grip bolts and associated nuts and washers for structural engineering.*

BS 4395-1, *General grade.*

BS 4604, *Specification for the use of high strength friction grip bolts in structural steelwork. Metric series.*

BS 4604-1, *General grade.*

BS 5304, *Code of practice for safety of machinery.*

BS 5424, *Specification for controlgear for voltages up to and including 1 000 V a.c. and 1 200 V d.c.*

BS 5424-1, *Contactors.*

BS 5490, *Specification for classification of degrees of protection provided by enclosures.*

BS 5744, *Code of practice for safe use of cranes(overheadlunderhung travelling and goliath cranes, high pedestal and portal jib dockside cranes, manually-operated and light cranes, container handling cranes and rail-mounted low carriage cranes)*[4)].

BS 7121, *Code of practice for safe use of cranes*[4)].

BS 7121-1, *General.*

ISO 4301, *Cranes and lifting appliances — Classification* [4)].

ISO 4301-1, *General.*

IEE Wiring Regulations for Electrical Installations

[4)] Referred to in the foreword only.
[5)] Obsolescent.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL