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Level 2

Design and Installation of Cranes

Endorsement and Authorisation

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Issue record

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Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 1st March 2009.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

Reference documentation

BS 88-1	Fuses. Low Voltage fuses General Requirements
BS 466	Specification for power driven overhead travelling cranes, semi-goliath and goliath cranes for general use
BS EN 13001-1	Crane Safety. General Design. General Principles and Requirements
BS EN 13001-2	Crane Safety. General Designs. Load Actions
BS 3858	Specification for binding and identification sleeves for use on electric cables and wires
BS 4800	Schedule of paint Colours for Building Purposes
BS 5467	Electric Cables Thermosetting insulated Armoured Cables for Voltages of 600/1000V and 1900/3300V
BS 5499	Graphical Symbols and signs. Safety Signs including Fire Safety Signs. Specifications for Geometric shapes Colours and layout
BS 6004	Electric Cables PVC Insulated Non Armoured Cables for Voltages up to and including 450/750V for Electric Power Lighting and Internal Wiring
BS 6221-2	Printed wiring boards. Methods of test
BS 6221-6	Printed wiring boards. Specification for multilayer printed wiring boards
BS 6231	Electric Cables Single Core PVC Insulated. Flexible Cables of Rated Voltage 600/1000V for Switchgear and Control gear
BS 6346	Electric Cables PVC Insulated Armoured Cables for Voltages of 600/1000V and 1900/3300V

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BS 6724	Electric Cables Thermosetting Insulated. Armoured Cables for Voltages of 600/1000V and 1900/3300V having low emissions of smoke and corrosive gases when affected by fire
BS EN 13001-1:2004	Crane Safety. General Design. General Principles and Requirements.
BS 7211	Electric Cables PVC Insulated Non Armoured Cables for Voltages up to and including 450/750V for Electric Power Lighting and Internal Wiring having low emissions of smoke and corrosive gases when affected by fire
BS 7333	Specification for Slewing Jib Cranes
BS 7671	Requirements For Electrical Installations (IEE Wiring Regulations)
BS 7846	Electric Cables 600/1000V Armoured fire resistant cables having Thermosetting Insulation and low emissions of smoke and corrosive gases when affected by fire
BS 7889	Electric Cables Thermosetting Insulated Unarmoured Cables for a voltage of 600/1000V
BS 9000-1	General requirements for a system for electronic components of assessed quality. Specification of general procedures
BS EN 1677-5	Components for slings. Safety. Forged steel lifting hooks with latch. Grade 4
BS EN 13001-1	Crane safety. General design. General principles and requirements
BS EN 13001-2	Crane safety. General design. Load Actions
BS EN 13557	Cranes. Controls and control stations
BS ISO 4308-1	Cranes and lifting appliances. Selection of wire ropes. General
BS ISO 4309	Cranes. Wire ropes. Care, maintenance, installation, examination and discard
BS ISO 10245-4	Cranes. Limiting and indicating devices. Jib cranes
BS EN ISO 12100-1	Safety of Machinery. Basic concepts, General Principles for Design, Basic Terminology, Methodology.
BS EN ISO 12100-2	Safety of Machinery. Basic concepts, General Principles for Design, Technical Principles
BS EN 60073	Basic and Safety Principles For Man-Machine Interface Marking and identification coding principles for indicators and actuators

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BS EN 60439	Low Voltage Switchgear And Control Gear Assemblies Type Tested and Partially Type Tested
BS EN 60204-1	Safety of machinery. Electrical equipment of machines. General requirements
BS EN 60529	Specification for degrees of protection provided by enclosures (IP code)
BS EN 60947-5-1	Specification for low-voltage switchgear and control gear. Control circuit devices and switching elements. Electromechanical control circuit devices
BS EN 61000-6-3	Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light- industrial environments
BS EN 61386-1	Conduit systems for cable management. General requirements
BS EN ISO/IEC 17050	Conformity Assessment. Suppliers Declaration of Conformity. General requirements
SI 2005/0281	Electro-Magnetic Compatibility Regulations 2005
SI 1998/2306	The Provision and Use of Work Equipment Regulations 1998
SI 1998/2307	Lifting Operations and Lifting Equipment Regulations 1998
GI/RT7007	Low Voltage Electrical Installations
GI/GN7607	Guidance on Low Voltage Electrical Installations
GM/RT1040	Safe Working On or Near Electrical Equipment

The Railway Group Standards and other references included in the above table are given for guidance purposes, but are not intended to be exhaustive list of all relevant documents.

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1 Purpose

This specification defines the technical requirements for slewing/pillar jib cranes and Overhead Travelling Cranes to be used for lifting and transporting activities to enable the removal/replacement of rail assemblies, rail vehicles, bogies and components within maintenance depots.

2 Scope

This specification details the requirements for the design, manufacture, delivery, off-loading, installation, testing and commissioning of slewing/pillar jib cranes and Electric power driven overhead crane facilities and associated equipment at Network Rail owned Light Maintenance Depots and other maintenance facilities used for Network Rail's own rail vehicle fleet.

3 Definitions

Safe Working Load

The maximum load that is permitted to be safely handled by the crane.

Hoisting

The motion of lifting or lowering the load in a vertical direction.

Hook Travel

The maximum distance travelled by the hook in a vertical plane between the hook base and the floor or pit floor level.

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.

Free Standing Crane

Slewing jib crane where the pivoting jib arm is mounted on a steel column or tube. Slewing range is dependent on whether the crane is under braced or over braced. (Refer to Appendix B).

Wall / Column Mounted Crane

Slewing jib crane where the pivoting jib arm is mounted directly onto a wall or structural building column. (Refer to Appendix B).

Depot Protection System

A system that provides protection and warnings to staff working on rolling stock within maintenance depots when any movements of rail vehicles take place.

Crab

An assembly incorporating one or more lifting units that traverses across the bridge of the crane.

Goliath Crane

A crane comprising a bridge supported by legs and capable of travelling on tracks at ground level.

Semi-Goliath Crane

A crane comprising a bridge supported at one end by an end carriage capable of travelling along tracks, one at ground level and the other elevated.

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Overhead travelling crane

A crane comprising a bridge supported by end carriages capable of travelling along elevated tracks.

Span

The horizontal distance between the centres of the tracks that supports the crane.

Bridge

The structural member(s) on which the crabs is supported.

Cross Traverse

Motion of the crab along the bridge.

Long Travel

Motion of the whole crane along the cranes' track.

4 Requirements Slewing/Pillar Jib Cranes

4.1 General

NOTE Slewing / pillar jib crane facilities are required for lifting and transporting activities to enable the removal/replacement of rail vehicle assemblies and components within maintenance depots.

The cranes shall be designed and manufactured in accordance with BS 7333 and BS EN 13001-1:2004 respectively. These shall be read and construed as part of this specification.

All clauses and descriptions in BS 7333 and BS EN 13001-1:2004 relevant to the works shall apply unless directed otherwise. This specification is for the equipment and works defined, and all works supplied shall fulfil the duties described, and shall include all necessary accessories for its correct operation.

The cranes shall be of either the free standing or wall mounted slewing jib type. The safe working load, effective radius, quantity and other detailed requirements for the cranes are detailed in this specification and contract documentation. Appendix A details the information required to be included in the contract documentation. The different types of slewing/pillar jib cranes are shown in Appendix B.

The expected in-service design life of the cranes shall be 25 years.

The cranes shall have a minimum 95% availability, taking account of maintenance and repair times only.

The cranes shall be capable of lifting rail vehicle components or assemblies as listed in this specification and the contract documentation.

An electrically powered low headroom hoist shall be provided with each crane which meets the requirements of "The Supply of Machinery (Safety) Regulations 1992".

The hoist shall be capable of power travelling along the full length of the jib arm at a maximum speed of 11m per minute, electrical power being transferred to the hoist via a festoon type cable system. The hoist shall incorporate dual hoisting speeds of 4 & 1.2 m per minute. The crane shall operate at 400V 3ph 50Hz with control voltage at 110V or lower.

Where required in the contract documentation the jib arm shall be capable of power slewing at a speed of 0.5 rpm.

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Where required in the contract documentation, the cranes shall be fully interlocked with the Depot Protection System to prevent them being operated when the system is active. The crane control system shall provide a feed to the protection system to provide it with an indication to show that the crane is in its parked position.

The parked position interlock shall take account of the following:-

- a) Hoist raised to its maximum height (The removal of any slings/chains etc would be the operator's responsibility).
- b) Jib is moved to its parked position in parallel with the depot wall or road.
- c) Key switch is in the 'off' position.

4.2 Mechanical

4.2.1 Structural

The permissible stresses and design of the cranes shall comply with the requirements of BS EN 13001-1:2004.

The allowable vertical deflection shall be in accordance with Table 4 of BS 7333 so that:

- a) the trolley on the jib arm will not run out of control during normal operation.
- b) the jib arm cannot slew on its own.

All welded joints in the crane structure shall be in accordance with BS 2573: Part 1.

4.2.2 End Stops

Ends stops shall be fitted to the jib arm to prevent the hoist or trolley:

- a) running off the end of its tracks
- b) colliding with the jib under brace or slew bearing
- c) colliding with the post when slewed

They shall be capable of sustaining a collision with a fully loaded hoist at maximum speed.

4.2.3 Lifting Hooks

All hooks shall be fitted with safety catches, the design of which shall not reduce the opening defined in BS EN 1677-5.

Hooks shall swivel upon ball bearing races. Hook shank securing nuts shall be secured hard down onto the top of the shank and positively locked in place.

Hooks shall be tested, certified and stamped with a suitable identification number in addition to the requirements of the appropriate British Standard.

4.2.4 Bearings

All bearings shall be of a capacity adequate to carry the loads imposed upon them under service conditions.

Where ball and roller bearings are used, the fit of the outer races in the housings and inner races on the shafts shall be adequate to prevent 'creep' of the races.