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| Ref:             | NR/L2/RVE/0136   |
| Issue:           | 1                |
| Date:            | 01 December 2008 |
| Compliance date: | 01 March 2009    |

## Level 2

## Vehicle Lifting Jacks

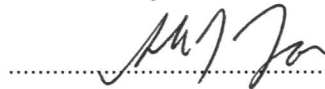
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## Issue record

| Issue | Date     | Comments    |
|-------|----------|-------------|
| 1     | Dec 2008 | First Issue |

## Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 1<sup>st</sup> 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 EN 1493               | Vehicle Lifts                                                                                                                                                     |
| 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 ISO/IEC 17050 -1&2 | Conformity Assessment. Suppliers Declaration of Conformity                                                                                                        |
| 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 1760-2             | Safety of machinery. Pressure sensitive protective devices. General principles for the design and testing of pressure sensitive edges and pressure sensitive bars |
| BS 3858                  | Specification for binding and identification sleeves for use on electric cables and wires                                                                         |
| BS 5499-5                | Graphical symbols and signs. Safety signs, including fire safety signs. Signs with specific safety meanings.                                                      |
| BS 6221-2                | Printed wiring boards. Methods of test                                                                                                                            |
| BS 6221-6                | Printed wiring boards. Specification for multilayer printed wiring boards                                                                                         |
| BS 9000-1                | General requirements for a system for electronic components of assessed quality. Specification of general procedures                                              |
| 2004/108/EC              | Electro-Magnetic Compatibility Directive                                                                                                                          |

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|              |                                                           |
|--------------|-----------------------------------------------------------|
| 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 an exhaustive list of all relevant documents.

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## 1 Purpose

This specification defines the technical requirements for jacks to be used for the raising and lowering of vehicles within maintenance depots to enable the removal/replacement of bogies and other under frame mounted equipment.

## 2 Scope

This specification covers the design, manufacture, installation, testing and commissioning of new jacks at Network Rail owned Light Maintenance Depots (LMD's) and other maintenance facilities owned or operated by Network Rail for maintenance of its own rail vehicle fleet.

## 3 Definitions

### Vehicle lift (or Jack)

A lifting device with guided load carrying device (lifting carriage) for lifting rail vehicles in the vertical plane.

### Mobile vehicle lift

Moveable vehicle lift manually propelled or powered and equipped with wheels such that it can be moved from one place to another and positioned ready for lifting.

### Rail Mounted Vehicle Lift

Moveable vehicle lift, manually propelled or powered, equipped with rail wheels and mounted on rails adjacent to a maintenance shed road such that it can be positioned ready for lifting.

### Rated Capacity

Maximum load, historically referred to as the rated capacity, that the vehicle lift has been designed to carry.

### Anvil (or load carrying arm)

A retractable load carrying arm fitted to the lifting carriage which is in direct contact with the vehicle or lifting bracket.

### Lifting Carriage (or load carrying device)

Load carrying component mounted on rollers designed to impart loads from the anvil to the vertical structure of the lifting jack. The carriage incorporates the retractable anvil, load nut and safety nut, rollers and self aligning bearing.

### Synchronisation

The automatic control system fitted to the jacks to allow the suite of jacks to maintain height and speed of lift between each other at a preset tolerance.

### Jacking Bracket

A lifting accessory used to interface with a specific vehicle type and the vehicle lift.

### 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.

All other terms used within this document shall have their meaning as described in the relevant Railway Group Standards, the Network Rail Train Operations Manual or other applicable Network Rail document.

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## 4 Requirements

### 4.1 General

The vehicle lifting jacks, hereafter referenced as jacks, shall be capable of safely lifting the range of rolling stock detailed in the contract documentation.

The jacks shall be electrically operated screw type, adequately rated for their intended duty. The jacks shall be either of the rail mounted or non rail mounted type depending on the specific requirements at the maintenance facility.

The expected service life of the jacks shall be 25 years.

The jacks shall be designed and manufactured in accordance with BS EN 1493.

All clauses and descriptions in BS EN 1493 relevant to the works shall apply unless directed otherwise in the contract documentation. This specification is for the equipment and works defined. All works supplied shall fulfil the duties described, and shall include all necessary lifting brackets for its correct operation. Lifting bracket requirements are detailed in the contract documentation.

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

The number of jacks required and their rated capacity shall be as detailed in the contract documentation.

The jacks shall be capable of lifting rolling stock at a lifting speed not greater than 300mm/min.

All jacks shall be fitted with an adjustable anvil lifting arm. The anvil height range shall be sufficient to safely lift the types of rolling stock detailed in the contract documentation.

Jacks shall have the capability of further expansion to allow additional identical sets to be used as one synchronised system for lifting multiple vehicles.

The jacks shall be capable of continuous operation in all weather conditions in a temperature range of -5 to +35 degrees centigrade inclusive.

The jacks shall include fork truck lifting pockets and jack lifting points to assist in transporting/moving the jacks.

Individual jacks located in an operational lifting position shall not encroach (other than at the anvil/vehicle jacking pad interface) upon the W6A standard loading gauge. Detailed in Appendix B.

### 4.2 Mechanical

#### 4.2.1 Construction

The jack support frame assembly shall be of basic construction comprising a base plate and main side frames with adequate rigidity and strength for stability at all positions of the load.

The main lifting carriage shall be of steel construction and supported by flange wheels with maintenance free bearings.

The load shall be transmitted through the side frame / base plate assembly and shall be evenly distributed over the base plate area.

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The stability of the jack support frame shall take into account the load on the screw and the overturning moment due to the full extension of the anvil and associated attachments outside of the jacking base.

#### 4.2.2 Lifting Carriage

The carriage design shall incorporate an adjustable lifting anvil actuated by a rack, pinion and hand wheel arrangement to allow manual extension / retraction in the horizontal plane. The hand wheel shall be permanently mounted on the lifting carriage. An interlock shall be fitted to register the anvil in the 'Home' position (fully lowered and retracted) prior to any train movements taking place. The rack and pinion interface shall incorporate suitable guards to prevent injury.

The carriage shall be provided with sufficient guides to enable the lifting anvil to remain horizontal in an unladen condition.

The carriage shall be of rigid construction with accurately bored housings to receive the lifting nut in relation to the roller axles.

The carriage shall be mounted such that any wear on the load rollers does not adversely affect the alignment of the lifting nut with the screw.

Each vehicle lifting jack shall be fitted with a fixed legible height scale and indicating pointer on the framework and carriage respectively to facilitate checking of relative heights during the lifting/lowering operation. The height scale shall be graduated in millimetres and centimetres.

#### 4.2.3 Adjustable Lifting Arm and Anvil

The rack for the extension / retraction mechanism shall be mounted on the lifting arm structure. The lifting arm anvil shall be vertically bored with a nominal 52mm (H11) diameter hole 75mm from the front of the anvil, for attachment of the standard lifting pin detailed in Appendix A, one of which shall be supplied by the jack manufacturer, with each jack.

Permanent mechanical stops shall be fitted to prevent over extension of the anvil in the carriage in both directions.

The anvil lifting face shall be flat and horizontal, and while it is proposed to use lifting brackets at the jacking points, the anvil shall be of sufficient length to enable direct interface with a jacking point without the need for additional attachments. The extension / retraction mechanism shall provide sufficient movement to enable the anvil to be moved clear of the side of a vehicle on the track.

The manufacturer shall state the maximum allowable overthrow of the lifting arm beyond the jack base, at which stability of the jack will be maintained within safe working parameters.

#### 4.2.4 Lifting Nut and Screw

The lifting carriage shall be supported by a main trapezoidal type load screw irreversible in operation and shall support the full jack load without movement if there is motor/gearbox failure. The screw drive shall be mounted on the top of the jack body and powered by an electric motor. The drive gears shall be totally enclosed and designed for long life and low maintenance.