

Category 2 Standard

S2512 Depot signalling

(Formerly S2512)

Issue No.: A4

Issue date: January 2013
Review date: January 2018

MAYOR OF LONDON

 **Documents**
Document Sharing Hub



Contents

1	Purpose	3
2	Scope	3
3	Requirements	3
3.1	Safety considerations	3
3.2	Functional requirements	4
3.3	Installation	14
3.4	Documentation	14
3.5	Testing and commissioning	15
3.6	Environmental aspects	15
3.7	Concessions	15
3.8	Asset information	15
3.9	Verification	15
4	Responsibilities	16
5	Supporting information	16
6	References	16
6.1	Documentary references	16
6.2	Abbreviations	17
6.3	Definitions	17
6.4	Person accountable for the document	18
6.5	Document history	18

1 Purpose

- 1.1 This standard defines the minimum requirements for the safe design, installation and testing of signalling as applied to London Underground Rolling Stock depots.

2 Scope

- 2.1 The depot signalling control system is a system that provides the depot operators with information and the means of control that allow them to:

- a) observe the status of track sections;
- b) set points and observe point indications;
- c) authorise train movements in the depot.

This system comprises:

- a) vital equipment, for ensuring that all controlled signalling operations, and certain communications operations, are safe;
- b) non-vital equipment, which is employed for depot regulation functions, and warning devices for auxiliary functions such as depot traction power.

3 Requirements

3.1 Safety considerations

3.1.1 Safety of depot control systems

- 3.1.1.1 Depot control systems shall be considered to be of Integrity Level 2 as defined in BS EN 61508, BS EN 50126, BS EN 50128, BS EN 50129 and BS EN 61508 which define dependability, reliability, availability, maintainability, safety and software protection systems.

- 3.1.1.2 Procurement specifications shall ensure that the requirements of the LU standard 1-526, The Assessment and Management of Health, Safety and Environmental Risk are applied.

3.1.2 Consequential effects on other systems

- 3.1.2.1 Depot control systems interface to the main line signalling systems of Integrity Level 4. Wherever there is a possibility that the vital signalling system could be stressed by the depot control system as it attempts to set routes, a means of preventing this situation shall be included in the functionality of the depot control system. A test mode shall be provided to allow the interlocking to be deliberately stressed to ensure that it functions correctly under these conditions.

- 3.1.2.2 The interface provided by the depot control system to the main line signalling system shall be specified such that, in the event of a failure, it is impossible for voltages to be applied to the main line signalling system sufficient to cause it to malfunction or for the main signalling function to cause the signalling control system to malfunction.

- 3.1.2.3 All materials used in the construction of equipment to be installed in underground or enclosed environments shall comply with standard 1-085, Fire Safety Performance of Materials.

3.2 Functional requirements

3.2.1 Signalling principles

3.2.1.1 Introduction

3.2.1.1.1 The Systems Requirements specification shall detail the methods used to control the movements of trains. When selecting the method of control, care shall be taken to avoid impeding the efficient operation of the depot. Examples of methods of control are listed below.

3.2.1.2 Interlocking

3.2.1.2.1 The depot interlocking shall interface with the main line interlocking system to enable trains to be moved safely between the main line and the depot. The interface between the main line and the depot shall be interlocked to main line standards (see S1195, Signalling Functional Requirements, section 3.12.2.1.1).

3.2.1.2.2 At depots where three-lens position-light signals are provided, interlocking shall be installed in the depot between all signals and power-operated point mechanisms. At depots where signals are not provided, a combination of track locking and point-to-point locking is sufficient.

3.2.1.2.3 Interlocking functions shall take place within the signal equipment room.

3.2.1.3 Route-setting

3.2.1.3.1 The process of setting a route from one signal to another shall be controlled at the control interface.

3.2.1.3.2 The safety interlocking shall perform the commands of the control interface to comply with the stated requirements of each signalled route, as established in the control tables, for all types of train and all kinds of movement that take place in the depot. A signal shall not display a 'proceed' aspect until the route locking to the exit of the route has been proved to be effective.

3.2.1.4 Route-holding

3.2.1.4.1 Route-holding shall be provided to maintain the interlocking between a signal and the points in the route. This shall be implemented after a train has passed the signal, and the interlocking has both replaced the signal to danger and released the approach locking.

3.2.1.5 Train-operated route release

3.2.1.5.1 Release shall be on a partial route basis, whereby each part shall be released only after the next two track sections are sequentially proved to be occupied, and then cleared.

3.2.1.5.2 The intermittent or transient 'picking-up' of a track relay during the passage of a train over a route which incorporates track circuits shall not permit any locking to be released.

3.2.1.6 Back-to-back locking

3.2.1.6.1 Signals facing each other on the same running line shall be interlocked, in order to prevent both signals from displaying a 'proceed' aspect simultaneously.

3.2.1.7 Approach-locking

3.2.1.7.1 Approach-locking shall be provided on all signals, to maintain the route-locking from the entrance signal.

3.2.1.7.2 The approach-locking shall be effective for a minimum period of 60 seconds, from the instant when the signal is replaced to danger in front of an approaching train.

3.2.1.7.3 The conditions for release of the approach-locking shall occur in either of the two following situations:

- a) the train occupying the berth track circuit and the first track circuit beyond the signal in sequence, and replacing the signal to danger;
- b) the operation of a timing device initiated by the replacement of the signal to danger in front of an approaching train, and the train has not passed the signal and occupied the track circuit beyond the signal.

3.2.1.7.4 The conditions for train-operated route release in the first part of a route shall be similar to those for approach locking release.

3.2.1.8 Track locking

3.2.1.8.1 Track locking shall prevent points from moving under a vehicle. Track locking shall operate in conjunction with, and independently of, the interlocking, and shall be effective up to a distance of 10 metres from the toes of the point switches, wherever possible.

3.2.1.9 Point-to-point locking

3.2.1.9.1 Point-to-point locking shall be provided at trap points to ensure that trapping is effective until after the route ahead has been set, and that trapping is restored before the route is released.

3.2.1.10 Solid-state interlocking

3.2.1.10.1 There shall be full compliance with the requirements of S1195, Signalling Functional Requirements, section 3.2, except for the MTBF figure.

3.2.1.11 Point control

3.2.1.11.1 The point controls shall be connected directly to the points, with no interlocking except for track locking.

3.2.2 Turnouts

3.2.2.1 Turnouts within areas of depots equipped with depot signalling shall be operated by point mechanisms of the power-operated trailable type. Each point mechanism shall incorporate a locking device to hold the closed switch rail against the stock rail. A constant-pressure trailable mechanism can be used in unsignalled areas of signalled depots.

3.2.2.2 The position of each turnout, whether or not it is locked, shall be monitored by the interlocking. Any combination of incorrect points detection shall prevent a signal from displaying a 'proceed' aspect.

3.2.2.3 The point detection mechanism shall indicate that the appropriate switch rail is closed against the stock rail, and that the other switch rail is open.

3.2.2.4 The switch rail shall not be detected as closed against the stock rail if:

- a) an obstruction of 4 mm or larger is placed between the closed switch rail and the stock rail at the toe of the switch and
- b) on point systems employing flat bottom rails, an obstruction of 12 mm at any other point along the switch rail planing .

Note: Before use of any new point system configuration, a 'first of type test' shall be undertaken to ensure that a 12mm obstruction in the closed switch fails either the primary or supplementary detection where fitted. This does not apply to point systems employing bullhead rail designs.

- 3.2.2.5 To ensure that reliability is not unduly compromised, an obstruction of 2.5 mm or less is placed at the same position as in 3.2.2.4 the switch rail shall be detected as closed.
- 3.2.2.6 At open switches, the flangeways shall be proved clear to prevent derailment and damage to the switch toe. Where necessary, supplementary drives and detectors shall be provided in accordance with paragraphs 3.6.3.4.3 and 3.6.3.4.4.

Note: Determination of whether supplementary drives and supplementary detectors are necessary under this clause, is dependant on production of a suitable and sufficient risk assessment that demonstrates that the risks of infrastructure damage and depot availability is acceptable. If supplementary drives and supplementary detectors are considered necessary, the requirements in Category 1 Standard, S1195, Signalling – Functional Requirements, paragraphs 3.6.3.4.3 and 3.6.4.4.4 shall be complied with.

- 3.2.2.7 It shall be possible to operate each point mechanism manually.
- 3.2.2.8 King points within the depot shall be provided with diverse power sources, and shall be capable of being operated from a local switch.
- 3.2.2.9 Component parts of, and connections to, point operating and detection mechanisms shall be located so as to be unobstructed by any components of the fourth-rail current- collection system. Mechanisms shall be designed so as to be maintainable without having to discharge current in the traction rails, wherever possible.

3.2.3 Signals

- 3.2.3.1 Depot signals shall be of the three-lens position-light type, displaying two aspects to train drivers:
- a) 'stop', which is indicated by two red lights;
 - b) 'proceed', which is represented by one white light.
- 3.2.3.2 The operating rules shall state that any other combination of lights, or the failure to display any lights, will be treated by the driver as a signal to stop.
- 3.2.3.3 Position-light shunt signals shall be located for maximum visibility, and shall be installed on posts 600 millimetres above the ground, on the left-hand side of the track to which they apply.
- 3.2.3.4 There shall be provision in the signal- mounting assembly for lateral and vertical adjustment of the signal head, for sighting and focusing purposes.
- 3.2.3.5 Signals shall be capable of displaying an unmistakable aspect, regardless of the position of the sun or any external area illumination, such as floodlighting. The use of hoods and post mounting, or a combination of both, shall be employed to maximise compliance with this requirement.
- 3.2.3.6 A continuous range of sighting down to 1.5 metres from the signal shall be possible under all conditions of ambient light.
- 3.2.3.7 Signal aspects shall be unmistakably visible from a distance equal to the sum of the worst case emergency braking distance and the distance equivalent to that travelled