

Ref:	NR/L2/SIG/30070
Issue:	1
Date:	06 JUNE 2009
Compliance date:	06 JUNE 2009

Level 2

Signalling of Modular Switch and Crossing Renewals

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Published and Issued by Network Rail, Kings Place, 90 York Way, London, N1 9AG.

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Issue record

Issue	Date	Comments
1	June 2009	First issue for trial purposes only

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 6th June 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

GC/RT5021	Track System Requirements
NR/L2/SIG/11201	Signalling Design: Production
NR/L2/SIG/30014	Signalling Works Testing Handbook
NR/L3/SIG/11231	Signalling Maintenance Testing Handbook
NR/L2/SIG/19803	Signalling Scope of Work for Switch and Crossing Renewal Projects
NR/GN/SIG/11210	Signalling Installation
NR/L3/SIG/30071	Specification for Modular S&C Interface Location
NR/L3/SIG/30072	Testing Specifications for Modular Switch and Crossing Renewals
NR/L3/SIG/10663	Signal Maintenance Specifications

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1 Purpose

This standard details the signalling processes to be followed when planning and implementing a switch and crossing renewal using the pre-fabricated, modular techniques.

The processes support the installation of a replacement turnout using a factory prepared panel transported to site by rail complete with the Hy-drive point operating mechanism already installed and adjusted. The objectives are to maximise the standardisation of the process and design, and to minimise the time to hand back the signalling system following the track renewal.

The objective of the Modular S&C initiative is to achieve the signalling installation and testing once the track unit is handed over in less than 30 minutes.

2 Scope

The processes described include verification that a renewal proposal is suitable for application of these procedures and techniques, design techniques and rules, preparatory works both on site and in the assembly factory, signalling support for the installation of the turnout, testing, recovery of redundant circuitry and maintenance.

This standard shall only be applied to specifically authorised trials of the Modular S&C process.

This standard applies to the renewal of a turnout with an NR60 modular unit fitted with Hy-drive operating equipment. It assumes that the works are undertaken using a standard interface location to interface it with the existing RRI or SSI signalling installation. The full list of assumptions that shall be satisfied are detailed in section 5.

This standard applies equally to the renewal of a single turnout or the two halves of a crossover (either in two possessions or in a single possession). Where a crossover is renewed in two separate possessions it shall normally be out of use for crossover moves between possessions but detection maintained.

For the purposes of this standard, the term turnout shall apply equally to half of a crossover except where otherwise specified.

3 Definitions

3.1 Modular S&C

A generic term for the 'end to end' process of renewal of crossovers and turnouts using a series of short (typically 8 hour) possessions utilising techniques to transport and install the point equipment in panels.

3.2 Point Interface Location (PIL)

A standard apparatus case housing circuitry (in accordance with the approved drawings which can be obtained from the Head of Signal Engineering) to enable a layout equipped with Hy-drive point operating equipment to be controlled from existing signalling circuits.

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3.3 Point Operating Equipment (POE)

The mechanism to move, lock and detect a set of points. For a Hy-drive installation, this includes the Hi-Flow power pack, in-bearer clamp lock and up to 6 SO secondary actuators and detectors.

4 Background and outline of processes

In order to enable turnouts to be renewed in a cost effective manner with the minimum of disruption to the train service, selected installations shall be renewed using the modular S&C process.

Prior to the main possession, the site will be prepared by diverting all cables passing through the dig area, installing hollow sleepers/undertrack crossings and preparing the current signalling control systems, as required. Where practicable, the preparation work shall enable the main possession to complete the changeover works thus enabling any remaining recoveries to be undertaken without possession of the signalling system.

The track element of the works consists of a single possession in which the existing turnout is removed and a new turnout installed. This new turnout shall be prepared in a factory complete with POE and associated equipment. The POE will be adjusted and tested in the factory prior to the whole turnout being transported on a tilting wagon to site.

Once installed at site, the POE shall be connected to pre-prepared control equipment (the PIL) and brought into use with the minimum of further testing. Due to the restricted time available during the possession, the recovery of redundant control circuitry may require a subsequent possession.

4.1 Point Interface Location (PIL)

A standard interface location has been designed which enables the new Hy-drive layout to be controlled from the existing point operating mechanism tail cables or connected as a replacement for the existing control location.

The PIL includes the following features:-

- Integral point battery,
- Capability to monitor up to 6 SO secondary actuators,
- Control from an existing feed to a clamp lock pump unit or point machine,
- Provision of detection circuit replicating existing clamp lock or point machine,
- Provision of detection circuit replicating existing supplementary detector (if required),
- Direct interface to control lines from a remote interlocking,
- Indication and local control panel.

The PIL is manufactured in one of two variants – LHSNC or RHSNC – which require minimal site specific configuration principally through straps on the “external” side of the links.

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Where the existing POE is a point machine equipped with standard plug couplers, then sockets may be provided in the side of the PIL for easy reconnection.

The PIL shall be provided fully tested with appropriate certification.

The internal wiring of the PIL will not be altered other than by application of straps to configure the number of detectors on the new layout.

4.2 Key process stages

4.2.1 Verification that turnout/crossover is suitable

In addition to the selection of the turnout/crossover as suitable from a track and project perspective, it is necessary to check that the renewal will not require alterations to the signalling controls or TPWS installations in the area.

The renewal shall satisfy the criteria for “Modern Equivalent Form” as defined in NR/L2/SIG/19803 and this needs to be verified by a signalling designer. Additionally there will be other checks to ensure that the PIL can be applied without alteration to the existing control systems.

4.2.2 Asset Management Strategy

An asset management strategy shall be produced identifying:-

- The assets to be recovered,
- The assets to be altered,
- New assets to be provided,
- Revised spares requirements,
- Training requirements,
- Responsible engineers for acceptance of the final installation into maintenance (all disciplines).

4.2.3 Site Preparation

The PIL shall be installed on site and connected to a local power supply of sufficient capacity. Additionally the existing control and detection cables to the point mechanism shall be prepared for a quick and standard changeover during the main possession.

Cabling and disconnection boxes for the new point operating mechanism shall also be installed and tested.

4.2.4 Factory Preparation

The turnout shall be constructed in a controlled environment with the POE installed and cabled. A PIL shall be used to enable the POE to be adjusted and fully tested prior to the assembled turnout being loaded onto the delivery wagon.

4.2.5 Site installation

During the main possession, the existing POE and train detection shall be disconnected.

During the renewal of the turnout, the PIL shall be connected to the existing control system utilising techniques to minimise the work and testing required.

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On completion of the installation of the turnout, the POE shall be connected to the PIL.

Train detection bonds (which may include temporary bonds) shall be installed, as required.

All cabling and connections shall be arranged such as not to inhibit subsequent stages of Modular S&C renewal.

4.2.6 Recovery of redundant controls

Since the PIL is designed to be controlled from either the existing control circuits or direct from the interlocking, after the main possession the existing point controls may be recovered including power supplies.

Retention of redundant circuitry requires approval through the granting of a derogation or temporary non-compliance.

5 Assumptions and Constraints

5.1 Verification of “Modern Equivalent Form”

A key assumption of the application of these techniques is that the replacement turnout does not require any alteration to the signalling controls.

The core requirements from NR/L2/SIG/19803 which are applicable are:-

- The foot print does not change such that any tail cable becomes non compliant in terms of length.
- The published speed is not altered.
- No Insulated Joints used for the determination of overlaps or timing functions are relocated.
- All clearance points can be preserved.
- Layout risk is not increased.
- No signals need to be relocated or have amended controls in order to maintain the safety integrity of the layout.

5.2 Suitability for Point Interface Location

Additional requirements for suitability for the modular S&C programme are:-

- The drive circuits for the existing POE are 120V dc (nominal),
- The detection circuits do not comprise more than two separate circuits (e.g. mechanism and a supplementary detection circuit),
- The existing signalling system is capable of feeding each PIL at 110V ac, 5A load,
- A suitable supply is available for the heaters in the SO actuators (110V ac, 0.5A per actuator).

5.3 Other Constraints

There shall be no cables crossing or running within the dig area on the surface (cable diversions shall be part of the preparatory works).

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There shall be a suitable location for disconnection boxes along the length of the turnout, ideally immediately clear of the dig area (e.g. in the cess) or alternatively separated by one track equipped with hollow sleepers.

NOTE The hollow sleepers shall be of a type which makes the installation of cables with a plug couplers already attached quick and easy without precluding subsequent Modular S&C installations.

A site shall exist for the PIL within 50m of the Hi-Flow power pack.

The position of the PIL should enable an operator of the integral Local Control Unit to observe the points whilst operating the controls.

5.4 Track Dig Profile

The design shall assume that the dig area (from which all cables, disconnection boxes and other equipment needs to be excluded prior to the installation) shall be:-

- The length of the track renewal,
- 900 mm from sleeper/bearer ends,
- 600 mm below bottom of sleeper/bearer.

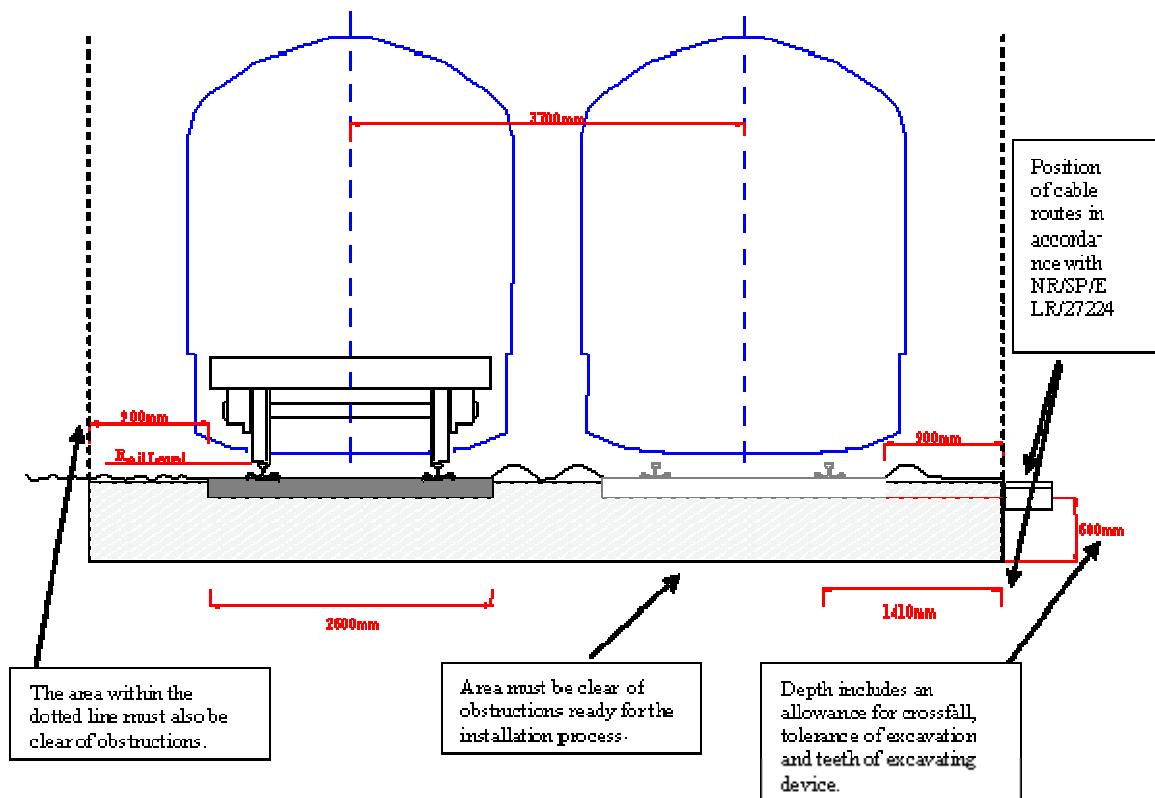


Figure 1 – Dig Area dimensions

5.5 Items outside of scope of this process

Alterations to TPWS, AWS, treadles, Balises (including TASS), ATP equipment, Impedance Bonds or other equipment mounted in the 4 foot or on the rails within the dig area are excluded.

Alterations to the track circuit bonding are excluded (this includes transfer of insulated rail joints to the turnout rail of the new installation).