

***Infrastructure
Projects (Signalling)
Shared Learning
19/01***

**January 2019
– June 2019**

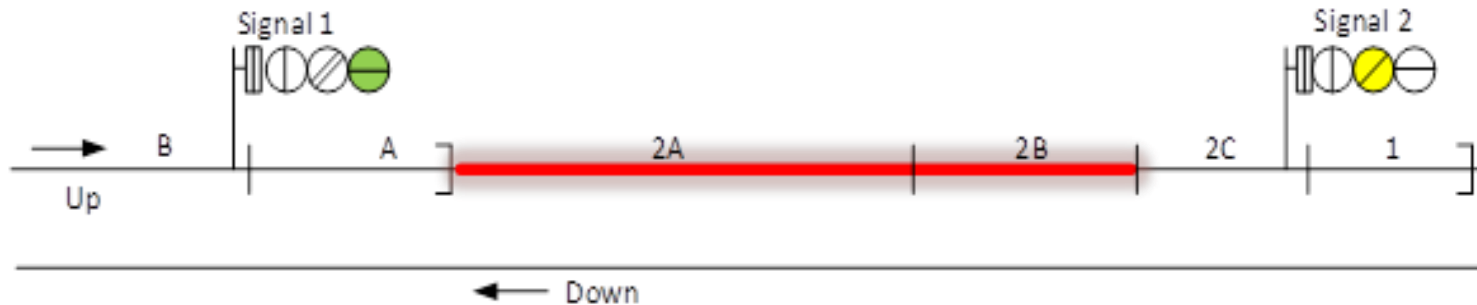


Introduction

This Shared Learning document details key issues and incidents that have occurred on Signalling Projects between January 2019 and June 2019 and provides the key learning points associated with them.

It is intended for distribution within the Network Rail Signalling community and the Supply Chain in order to raise awareness of the learning points within, and to enable best practice to be applied throughout all of our signalling activities.

Control of Signalling Alterations



Track Sections not included within Aspect Controls for Signal 1

Background

A level crossing upgrade project required a Solid State Interlocking (SSI) data change, and associated track circuit alterations for accurate strike-ins. The planned work was unable to be completed due to interface issues with the control system and so it was decided to revert to the signalling arrangements prior to the commencement of works.

A number of required procedural steps were omitted whilst conducting the wiring reversion, and signal wiring changes were incorrectly applied during the installation and test activities. Contacts from an individual track circuit repeat relay, instead of a combined track circuit repeat relay, were wired into signal controls. The commissioned works didn't provide adequate controls to prevent a train being signalled onto an occupied line.

Key learning

When undertaking works, including those to return the signalling system back to its original state, the implications of all changes should be identified, and documented processes are to be applied at all times. Please see Notice Board 174 ([NB174](#)) for further information.



Automatic Warning System (AWS) Wrong Side Failure

Background

The driver of a tamper unit approaching a red signal received an incorrect AWS audible indication; bell vice horn, due to incorrect energisation of the AWS electro magnet.

The immediate cause was identified as the omission of a contact of the relay controlling the most restrictive aspect, in this case the HR (yellow relay), from the AWS controls, normally being included via the DR (green relay) circuit. The signal had been altered as part of the fringe works for a project, changing from 2 aspect (R/G) to 3 aspect (R/Y/G) in the process. When 2 aspect only a DR was provided and during the upgrade to 3 aspect the required control was omitted from the design.

Various checking and testing processes did not identify the omission of the required contact, additionally principles testing was not undertaken based on a desk top review of the circuitry which showed that the magnet wiring was unchanged conceptually from old to new.

The signalling had been in this state since commissioning. In normal service pattern trains approach the signal at Green.

Key Learning

The design, checking and testing process must take due cognisance of all changes undertaken as part of the works.



Power Supply Interruption



Key Learning

Don't assume "Essential" means "Uninterruptible" when working in older Signalling Control Centres. Ensure that equipment provided to ensure resilience is fed from diverse sources as far as practicable.

Full and thorough surveys are essential.

Background

A momentary loss of power due to a Distribution Network Operator (DNO) fault caused a total loss of supply to an SSI interlocking on an Integrated Electronic Control Centre (IECC) Workstation. The loss of power subsequently led to a loss of communications.

It was identified that the Fixed Telecom Network (FTNx) apparatus had failed because it was not fed via an Uninterruptible Power Supply (UPS); the main distribution board was only backed up by a generator.

It had been assumed that as the distribution board was adjacent to a UPS and labelled as an "essential loads panel" it was backed up by the UPS as well as the generator.

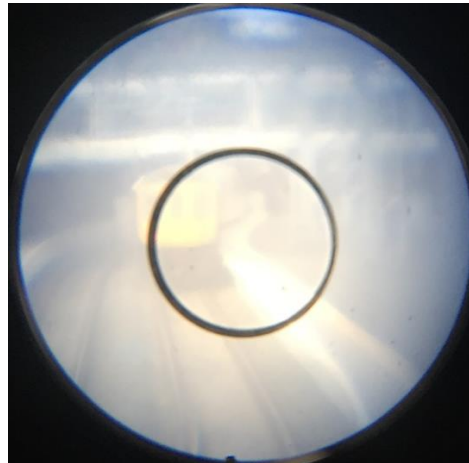
Signal Head Alignment

Background

Incorrect signal beam alignment has been identified as a contributory factor in a number of incidents, and recent experience of new signals provided by projects has highlighted a deficiency in providing correct signal beam alignment.

Key Learning

All projects shall follow the guidance detailed in Notice Board 165 ([NB165](#)) which clarifies the responsibilities of those introducing or adjusting signalling equipment.



Rail Clamp Point Lock (RCPL) Lock Nuts

Background

Following a Switch & Crossing (S&C) renewal, a set of points lost detection. A sparking detection cable on the microswitch assembly was found, and the cable was changed.

Further investigation revealed that incorrect lock nuts had been fitted, and cross threaded the cable termination posts. The cable was slightly loose although the lock nuts appeared to be tight.



Key Learning

Checks should be made that the correct nuts are being used. The correct nuts have a slit in the top of the spring washer as shown below to avoid cross threading.



Level Crossing Overhead Line Signage



Background

There have been a number of instances where Over Head Line Electrification (OHLE) signage at level crossings on newly electrified lines have been incorrectly or poorly installed, as shown.

Key Learning

Projects should seek advice from the E&P Route Asset Manager (RAM) and Level Crossing Manager before modifying or installing any crossing signage.



Electro-Mechanical Signal Box Circuitry



Background

Following the commissioning of a recent Signal Box life extension project a number of design issues were highlighted related to the application of electro-mechanical circuitry, particularly approach locking.

An independent review of the entire design was later carried out, which identified further additional minor errors.

Key Learning

Project staff must have a demonstrable competence for the systems they are altering.

Where design houses, installers, testers and/or project engineers are unfamiliar with equipment; in this case mechanical interlocking design and practices; a suitably competent mentor should be engaged. An independent check of the design by a technical expert should also be considered.



Lightweight Signal in High Winds



Background

A lightweight junction route indicator signal recently snapped off during a period of high winds, due to lack of mechanical strength.



Key learning

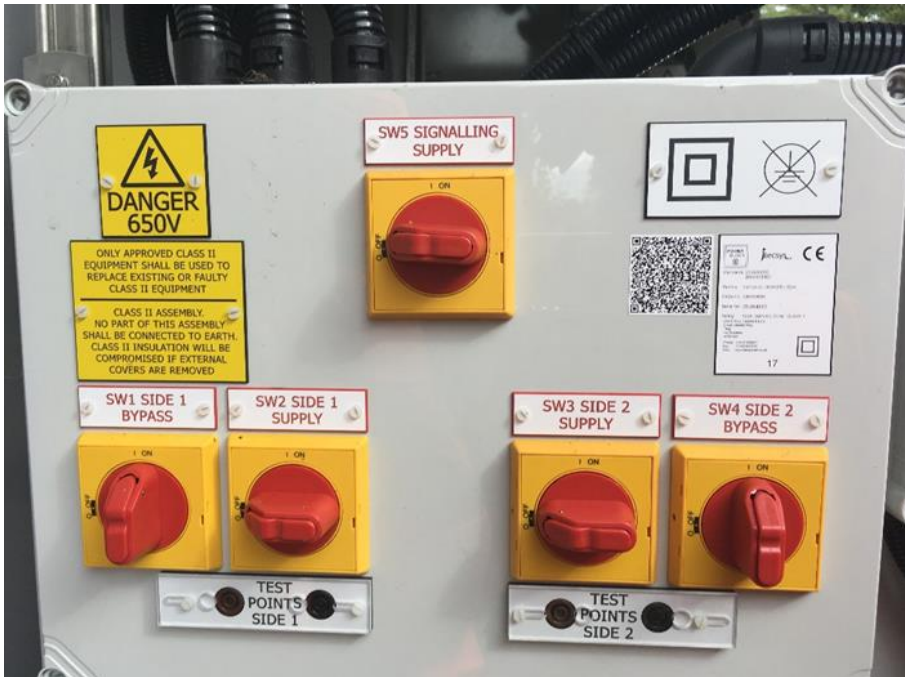
Ensure mounting plates are fit for purpose and inspected for mechanical integrity after high wind or storm conditions.

Power Supply Issue

Background

A complete loss of power to a signalling area was investigated, and a loose cable termination repaired to rectify the fault.

During the investigation, it was identified that the electrical installation did not match the design. Further investigation revealed that the original manufactured power enclosure had used a template design for an auto-reconfigurable system, although it was not required at this location. This resulted in a non-functioning switch in the unit. Neither installation nor testing of the subsequent installation identified the error.



Key learning

Power enclosures should be inspected and design and installations fully tested prior to commissioning.



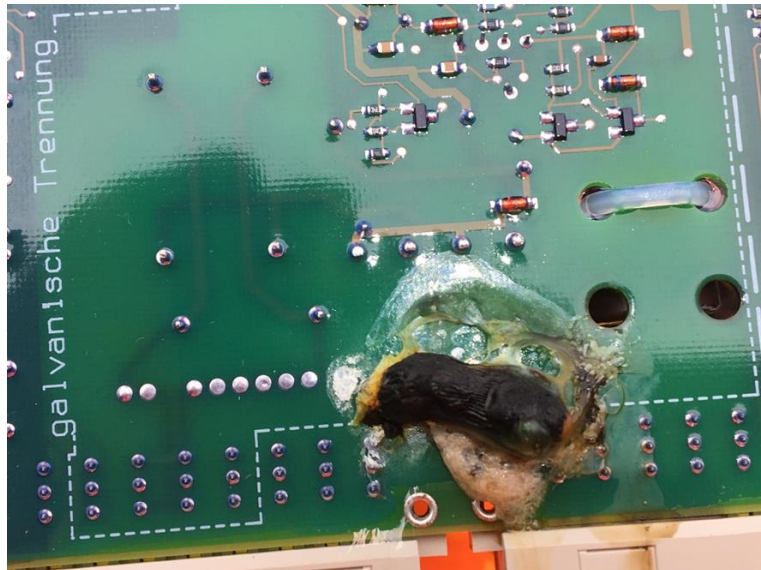
Slugs in Axle Counter

Background

An incident occurred where an axle counter section failed. It was identified that a slug had managed to find its way into the junction box “mushroom” and shorted out the circuit board.

It was noted that blanking plugs were missing from the bottom of the base plate cable entry points.

The failure led to 52 full cancellations, 10 part cancellations and 377 delay minutes.



Key learning

Installers and Maintainers should ensure that all cable entry points are blanked off to maintain the integrity of the IP (Ingress Protection) rated enclosure.

Installation of Non-Signalling Assets

Background

During testing of Intercity Express Trains (IET) trains, unwarranted Vehicle Circuit Breaker (VCB) operations were experienced. These affected trains operating on the rear pantograph and were reported in roughly the same location each time. Investigations identified Automatic Power Control (APC) magnets were incorrectly installed in 3 locations on each line, in the position of Automatic Power Change Over (APCO) balises.

Installation teams were given an incorrect schedule of locations to install equipment that had been derived from the signalling scheme plan. These are not a signalling asset but are shown on the signalling scheme plan.

Key learning

Consider the knowledge, competence and experience of staff in deriving information from signalling scheme plans, especially when installing a non-signalling asset that is shown on a signalling plan.



APC Magnet, installed in pairs before and after neutral sections.



Eurobalise – used for various functions including APCO tilt activation (TASS), ETCS and Selective Door Opening (SDO) etc.



Good practice identified

Background

Recent functional audits of Network Rail's Infrastructure Projects Signalling delivery organisation have identified a number of items of good practice. These include:

- Establishing the management of interfaces early and in detail via the tender process, including endorsement by stakeholders. Supplemented by supplier deliverables briefings and review of shared learning/lessons learnt
- The method and extent of Acceptance Review of design integration was clearly mapped and documented. Simpler final Interdisciplinary Design Check and Review (IDC/IDR)
- Compilation of a risk-based, asset critical, multi-disciplinary surveillance and inspection plan under ICQ001
- A Design Interface Schedule ably demonstrated the progress, status and integration of technical deliverables. Deliverables listed for each spoke deliverer showed detailed reviews are applied to internal suppliers as well as external contractors, with good traceability. The tracker enabled continued monitoring of GRIP 4 Category 2A actions requiring closure in GRIP 5
- The Engineering Compliance Certificate signed off for the core deliverables, inclusive of relevant documents appended to demonstrate full compliance
- Points Management Plan produced in accordance with NR/L2/SIG/11704 for risk assessing the work, had been endorsed by all relevant stakeholders, including arrangements for Maintenance and Operations



Further learning

For full details of the good practice, please contact Helen Whitton, Programme Engineering Manager - Process and Assurance
Helen.Whitton@networkrail.co.uk 07795 647104.

Further Information

For any further details or information please contact:

Chris Ruddy: Senior Project Engineer - Process & Capability
Tel: 07799 336772
email: christopher.ruddy@networkrail.co.uk

