

NOTICE BOARD

NB 125
Issue 3
23/04/2015
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NETWORK RAIL - SIGNAL ENGINEERING

'Simple is Effective'

Purpose

The notice boards listed below advise signalling system designers and engineers of innovations in interlocking requirements which aim to reduce design complexity while maintaining (and often increasing) safety. These innovations are intended to also reduce data volumes, equipment populations, circuit densities and offer a consequent reduction in the risk of errors arising during the life cycle of the signalling system. They can be applied to solid state signalling systems and route relay technologies and give the following benefits:

- simpler design approaches;
- more effective check and test;
- improved availability of the signalling system;
- reduced likelihood of promulgated error;
- reduced secondary operational risk.

Scope

The suite of supporting notice boards applies to all projects amending or creating all types of data driven and circuitry systems.

This series of notice boards form the starting point of the re-development of generic design rules (principles) for interlocking logic. It is expected that further detail will be captured within the Signalling Principles Handbook, Typical Circuits and the SSI Application Guide.

'Simple is Effective' is part of the wider Network Rail *Safe by Design* initiative.

Background

Safe by Design principles actively look to eliminate or reduce risk during design development for construction, operation and maintenance activities and ensure that remaining risks are effectively communicated.

Safe by Design when applied to signalling controls, is about matching logical controls to meet legitimate layout operability requirements and risks: this began with the concepts outlined in RT/E/G/00028 General Guidelines on Train Protection and the Provision of Signalling. This document offers many techniques which themselves *can* lead to more complex data and thus should be viewed within the context of seeking *overall* simplification; in such circumstances it will be acceptable, as an example, for a route setting request to be unsuccessful rather than seeking to provide logical conditions which maximise route setting possibilities.

The use of swinging overlaps is a good example: it has become accepted wisdom that swinging overlaps (with associated route flank) should be provided to all possible destinations beyond a signal in order to give maximum operational flexibility. In complex station throats this has led to the provision of very complex swinging-overlap controls where it is difficult to fully verify all of the possible permutations of conditions. However, it should be remembered that in mechanical signalling days, swinging overlaps were not provided, even in the most complex areas. Many high profile routes which have problems with RRI-based overlaps (of the BRS-SW67 standard circuits) have these features disabled in many locations, some dealing with significant traffic volumes, without significant disruption.

The need for complex logic therefore needs to be challenged: sometimes minimal gain in operational flexibility is rarely worth the risk that complex swinging overlaps add.

Originator's Details:-

Peter Evans & Graeme Christmas

Network Rail

peter.evans4@networkrail.co.uk graeme.christmas@networkrail.co.uk

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Documents

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List of 'Simple is Effective' Supporting Notice Boards

The following specific Notice Boards have been produced to support the 'Simple is Effective' campaign:

~~NB 125/1 [Issue 2] Trailing, Facing & Flank Point Detection within the Overlap [withdrawn]~~

NB 125/2 [Issue 3] Application of Overlap Route Locking

NB 125/3 [Issue 3] Application of Swinging Overlaps and Flank Protection

NB 125/4 [Issue 3] Non provision of Emergency Signals On Control

NB 125/5 [Issue 3] Application of Overrun Management [SPH E420 and E421].

Signalling Principles Handbook NR/L2/SIG/30009 Issue 10 Section R includes a number of Safe by Design initiatives which bring about change to, or changes in interpretation of, former Railway Group Standards for which the intent is to simplify interlocking provision and increase safety by the reduction in complexity:

- the removal of the long-standing requirement to select overlaps using point detection in favour of point calling alone;
- protection from the loss of train detection (for track circuits AND axle counters) is required and can be legitimately applied within the control system rather than in the interlocking;
- clarification of when shunt movements do not require a train detected overlap;
- the reduction of the need for flank protection where the protection relates to the overlap alone.

The need and relevance of retrospective application is guided by Notice Board 123 which is clarified in Infrastructure Projects' *projects advice note* PAN0041.

Staff to be Informed

Role	Responsible for Briefing
Route Asset Managers [Signalling]	Author
Head of Engineering (Infrastructure Projects – Signalling)	Author
Signalling Delivery Engineers, Project Engineers and Signalling Designers	Head of Engineering (Infrastructure Projects – Signalling)
SSI AG Members	Author

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NETWORK RAIL - SIGNAL ENGINEERING
'Simple is Effective'
Application of Overlap Route Locking

Purpose

This Notice Board supports the 'Simple is Effective' campaign and provides guidance to signalling system designers and engineers on the method to be applied to lock conflicting routes with the Overlap of another.

Scope

This Notice Board applies to all projects amending or creating all types of data driven and circuitry systems.

Abbreviations & Definitions

NR: Network Rail

SPH: The Signalling Principles Handbook NR/L2/SIG/30009: a Network Rail level 2 standard, issued in modules describing how certain Railway Group Standards shall be implemented.

Background

GK/RT0060 C5.1.4 and App.1 clause 8 refers:

The setting of a route shall only be possible when all of the following are satisfied:

- all points and other movable infrastructure are in their required positions (or, in the case of route setting systems, available to move to the required positions)
- no opposing or conflicting routes are set or in use (except where opposing locking is omitted) or a time delay is enforced sufficient to ensure that any previously authorised movement has come to a stand
- all other locking level controls, listed in Appendix 1, that are specified in the control tables for that route are met.

Appendix 1 clause 8 lists: opposing route locking in route and overlap normal (other than conditional overlap locking when an alternative overlap is available).

This Railway Group Standard was issued in 2000 at Issue One and appeared to introduce a requirement for conflicting routes to ascertain whether a train had not entered the overlap of a conflicting route (in the usual cases where routes need to be separated by an overlap).

Guidance

RSSB have clarified that the intention of Appx 1 clause 8 provisions is simply to lock the subject route (at so-called route level) against the *requirement* for a conflicting/opposing overlap rather than its actual occupancy. Any use of the overlap by an overrunning train should be an aspect level control as detailed in the provisions of the NR SPH, section E420; Overrun Detection [and which may actually be implemented at either aspect or at route level].

Consequently the route against route requirement should *now* be to provide a single data or circuit test for the existence of a setting of the conflicting overlap entity in the subject route, which can either be a berth train detection sub route (route stick) or a single sub overlap beyond the signal; whichever offers the simplest arrangement. The requirement for 'timing off' the overlap remains unchanged. The customary approach to proving multiple sub overlaps in data will cease. Proving of opposing sub-overlaps will in future only be required to prevent the setting of routes whose overlaps directly oppose.

Originator's Details:-
Peter Evans
Network Rail
peter.evans4@networkrail.co.uk

Graeme Christmas
Network Rail
graeme.christamas@networkrail.co.uk

Peter Matthews
SSL
peter.matthews@signallingsolutions.com

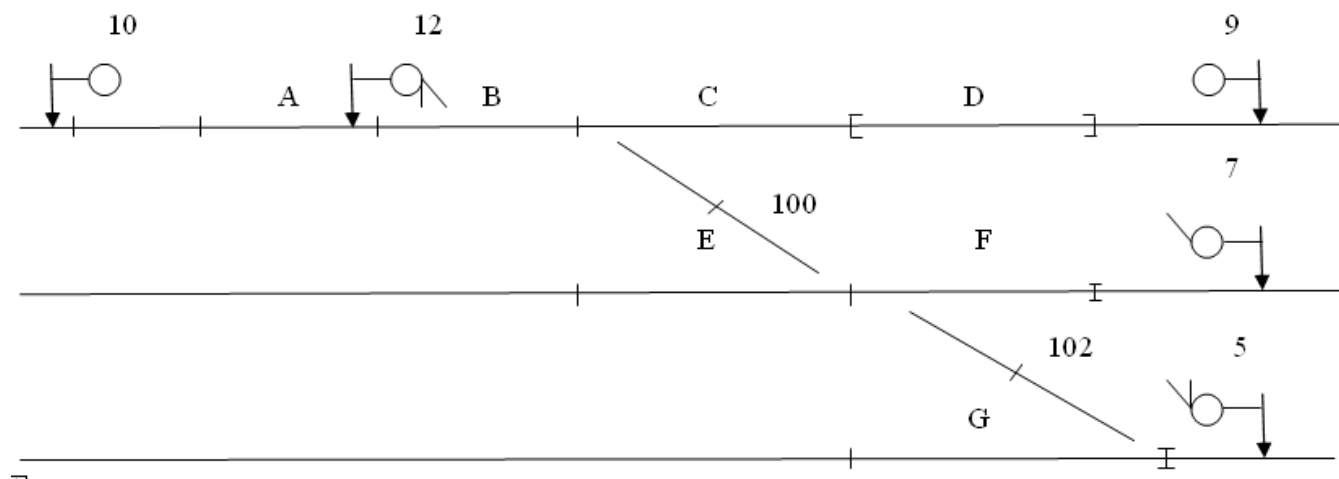
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The SPH and the Data Prep Guide will be amended as part of their next updates. Standard Signalling Circuits have never depicted multiple overlap route locking entities.

Example



Typical locking currently applied to individual routes after 10 used

GK/RT 0060 Issue 1 implied locking (often used practice)

Route	Locking	Reason
9A	UA-BA f, OD-BA f, OE-CA f.	OE-CA proved to prevent alternative overlaps being swung into conflict with 9A route when 100 points called normal.
7B	UA-BA f, OF-CA f, OC-CA f, OG-CA f	OC-CA & OG-CA proved to prevent alternative overlaps being swung into conflict when 100 points called reverse or 102 points called normal.
5C	UA-BA f, OG-CA f, OC-CA f, OF-CA f	OC-CA & OF-CA proved to prevent alternative overlaps being swung into conflict when points called

Expected future practice

9A	UA-BA f	Basic opposing locking See notes below
7B		
5C		

For simplicity, routes 9A, 7B and 5C are assumed to be non-permissive in the above example. If they were permissive, then the UA-BA f control would require extra conditioning.

Note: in these examples a train SPADing 12 signal would already hold the aspects of routes 9A, 7B and 5C at danger. Where this is not so, an overrun control in accordance with SPH E420 is required (either simple or full overrun management).

Also note that the overlaps beyond signals 12 and 9 conflict if 100 points are normal. In such cases, opposing overlap locking is still required: routes up to signal 9 need to prove OD-BA f, and routes up to signal 12 either need to prove OD-AB f or call 100 points reverse.