



Appendix H3, *Scheme design guidance*

Network Rail guidance

Contents

1 Introduction	3
2 Movement authorities	4
3 Interlocking	6
4 Level crossings	6
5 Train detection	12
6 Train protection	16
7 Control systems	17
8 Points and ground frames	18
9 Operations	19
Figure 1 – Signal position – Scenario 1	7
Figure 2 – Signal position – Scenario 2	9
Figure 3 – Signal position – Scenario 3	10
Figure 4 – Signal position – Scenario 4	10
Figure 5 – Axle counter head provision	12
Figure 6 – Axle counter stub lengths	15
Figure 7 – Arrangement of overlaps	16
Figure 8 – Protection Limits – Uni-Directional Lines	20
Figure 9 – Protection Limits – Bi-directional lines	21

1 Introduction

1.1 Background

The concept of Modular Signalling has been adopted and developed within Network Rail to introduce new products and changes in the implementation of signalling projects in order to bring about significant cost savings.

1.2 Purpose

This guidance document contains guidance on how certain features of a Modular Signalling scheme should be designed, illustrating certain of the application instructions set out in the Modular Signalling Handbook Appendix C “System Functionality” document.

Adoption of the guidance given in this document can achieve a consistent design approach and minimises implementation costs by avoiding changes to standard design templates.

This document is divided into the same sections as Modular Signalling Handbook Appendix C.

1.3 Scope

This document should apply to any signalling scheme that has been designated a “Modular Signalling scheme” by the Professional Head, Signals and Controls and the Head of Operations Development.

Such schemes will make use of Modular Signalling principles, technology and processes, which are fundamentally different from those used for a conventional resignalling scheme undertaken by Network Rail.

1.4 Definitions

Definitions are contained in the main section of the Modular Signalling Handbook.

2 Movement authorities

2.1 Replacement of Distant signals

As part of the process of minimising the amount of equipment provided, Distant signals should only be replaced by the passage of the train past the associated Stop signal or from the Stop signal replacement switch on the Signaller's workstation. In the event of an incident, operation of the SGRC should replace all signals within an Island to their most restrictive aspect.

No separate train detection section should be provided between the Distant signal and the Stop signal, and no separate replacement device on the Signaller's workstation should be provided for the Distant signal.

2.2 Signal positioning for safe overrun

The lower level of train service and simpler layouts of routes suitable for the Modular Signalling system make it easier to position signals to avoid the risk of collision in the event of overrun. The design process for Stop signals is set out in Appendix H.

2.3 Signal Positioning Tolerances

Wider tolerances on signal positioning are available within a Modular Signalling scheme. The tolerances should be shown on the Signal Sighting form as:

- ±5 m – typically applied to a Distant signal
- ±2 m – typically applied to a Stop signal or Shunt signal
- ±0.5 m – typically applied where a signal is located close to another infrastructure feature and their relative positions has to be maintained.

The increased tolerances make it easier, when installing the signal on site, to avoid drains, cables, etc. not visible from the sighting video without reference back to the Designer or Signal Sighting Committee Chairman. It also reduces the amount of as built updating to the sighting forms required after commissioning.

Lateral and vertical tolerances are increased from ±50 mm to ±100 mm. There is no affect on the visibility of the signal from this increase.

2.4 Provision of gantry or cantilever structures

The order of preference for the mounting of signals is as follows:

- On a straight post, to the left of the track for right direction signals and to the right for wrong direction signals;
- As above, but with a minor track slew to a siding or loop to create space for a straight post.
- On a gantry or cantilever, which will not require ladder access as the signal heads do not need any routine maintenance.

2.5 Signal profiles outside the Modular Signalling criteria

Occasionally a signal profile will be required which is outside the range set out in the Modular Signalling constraints. In these cases, a specially designed structure should be provided which, depending on the equipment elements used to form it, might or might not require ladder access. It will require bespoke design and site investigations.

2.6 Provision of wrong direction signals

Where provided, bi-directional signalling should be “full”, with a wrong direction signal opposite every right direction signal. Where right direction signals are provided in isolated locations purely to divide a block section, a derogation may be sought to not provide the corresponding wrong direction signals.

The basis for a derogation should be confirmation from the signal sighting committee that no risk of confusion will exist as a result of the break in signal provision along the line of route.

2.7 Provision of banner repeating signals

The lower traffic densities and simple layouts of secondary routes generally allow signals to be positioned where they have adequate sighting and avoid the need for Banner signals. However, it is recognised that occasionally a Banner repeating signal cannot be avoided.

Before the use of a Banner repeating signal is accepted, all practical ways of avoiding provision should be examined and determined to be impractical.

Alternative actions include:

- check that sighting is being based on the minimum permissible time and distance
- consider the approach speed to the signal – if the signal is being approached in the On position, the Distant will have been passed in the On position and the train will be below linespeed, increasing the time the signal is visible for.

- move the signal forwards – this might involve the overlap passing through pointwork, but this should be acceptable if it has no impact on the timetabled train movements
- move the signal backwards – this may increase junction re-occupation times but this is unlikely to have an impact on train performance on a secondary route. A derogation against the maximum distance from a signal to points or a level crossing may be possible
- change the height of the signal head
- offset the head of the signal. This will probably involve a bespoke designed structure but it may still be cheaper than providing an extra SEU in the form of a Banner repeating signal.

3 Interlocking

There is no guidance on this subject.

4 Level crossings

4.1 Strike In points for MCB-OD crossings

Various layouts of level crossing, protecting signal and station platforms exist which require different provision of strike in point to initiate the level crossing to give the appropriate operational performance.

The following scenarios set out the positioning of strike in locations for an MCB – OD, for stopping and non-stopping trains for the various layouts. This expands on the guidance given in NR/L2/SIG/11201/ModX21 on strike in arrangements.

Scenario 1: Protecting signal overlap distance (225 m) from crossing, platform on immediate approach to crossing.

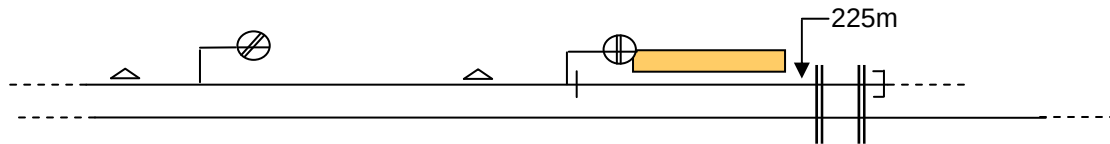


Figure 1 – Signal position – Scenario 1

Positioning the protecting signal overlap distance from the crossing is the preferred choice as it provides opportunity for the train to be brought to a stand before reaching the crossing in the event of a SPAD.

Overrun protection will initiate the crossing if a SPAD occurs. Train operators favour this position for the signal from an operational safety perspective as the Driver can carry out tasks serially – signal first, then platform stop.

From an operational performance perspective crossing closure time is extended by having the signal on the approach to the crossing – at a busy road crossing it may be better overall to position the signal at the end of the platform (scenario 3). Equipment failure can result in a train being held at the signal, unable to reach the platform.

Non-stopping train – the strike in should be positioned as per NR/L2/SIG/11201/ModX21, **10.3.3**, so that the crossing has closed and the approaching train receives an unrestricted aspect 10 seconds before passing the AWS of the Distant signal.

NR/L2/SIG/11201/ModX21, **10.3.3** (3rd bullet) requires that, even at crossings with differential speeds on their approach, all trains should arrive at the crossing within the specified 3 minutes. When designing a Modular Signalling scheme, it is not necessary to comply with this requirement as within the overall (low) number of trains operating on the route only a very small number are likely to operate at a significantly lower speed than the upper speed limit and so provision of speed detection equipment is uneconomic. A derogation authorises this.

Stopping train – the strike in should be positioned such that the crossing will have closed itself and allowed the protecting signal to clear such that the approaching train is 10 seconds running time from the Stop signal AWS when the signal clears. When the signal clears, the train can run into the platform and stop.

Calculation of the strike in point is difficult. The logic followed is based on an assumption that, to stop at the protecting signal, the train will be travelling at around 25 mph at a point 10 seconds from the AWS, based on the Defensive Driving instruction to Drivers to be travelling at no more than 20 mph at the AWS. This gives