



Appendix C, *System functionality*

Network Rail specification

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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 specification specifies the system functionality to be provided by a Modular Signalling System. These descriptions and definitions are supported by an application statement to aid designers in understanding how to apply them in the context of a Modular Signalling Scheme.

1.3 Scope

This specification applies to all projects deemed to be Modular Signalling Schemes and being implemented on Network Rail infrastructure.

The principles described in this section of the Handbook may only be used in the context of a Modular Signalling Scheme and use in any other context or project type is not supported by this Handbook.

1.4 Definitions

Common definitions are contained in the main section of the Modular Signalling Handbook.

2 Document structure

2.1 General

The functionality specified in this document is supported by an application statement which informs the designer whether or not the functionality is supported and, if so, how it is to be applied in a Modular Signalling Scheme.

Functionality that is deemed “not supported” cannot be provided using Modular Signalling principles, processes and techniques.

Such functionality could be provided using conventional signalling methods, albeit at an additional cost. This incurred cost reflects the bespoke design, testing and alternative equipment needed to provide the functionality that is outside of the Modular Signalling “envelope”.

2.2 Categories of system functionality

2.2.1 Signalling Principles

Signalling Principles has been subdivided into the following eight categories:

1. Movement Authorisation
2. Interlocking
3. Train Detection
4. Train Protection
5. Level Crossings
6. Control System
7. Points and Ground Frames
8. Operations

Within the categories, the entries have been listed in alphabetical order for convenience.

2.2.2 Power system

See Appendix A and Appendix B of the Modular Signalling Handbook.

2.2.3 System architecture

See Appendix A of the Modular Signalling Handbook.

2.2.4 Definition of headings

Table 1 lists of the headings used in clause 3 onwards together with a definition of their meaning.

Heading	Definition
Requirement number	This is the Modular Signalling specific identification number of the functionality feature. Provision of an identifier aids compliance demonstrations.
Name	This is the name of the function and the preferred term to be used.
Definition/Description	This gives an explicit definition or description of the function in the context of a Modular Signalling scheme.
Relevant Standard	This lists the principal Network Rail standard or Railway Group standard which relates to the function. It is not an exhaustive list of all the standards which relate to the function, and other standards are likely to be applicable also. Where the reference is in <i>italics and bold</i> , a non-compliance has been granted against the standard.
Specification Application Statement	This specifies the application of the function with respect to a Modular Signalling scheme. Where there is no fundamental difference in application from that of a conventional resignalling scheme, the term “to be provided in accordance with current standards” is used. Where a non-compliance has been granted against current standards for an application specific to Modular Signalling, full details are contained in Appendix F. Further guidance on the application of certain features is contained in Appendix H3 of the Modular Signalling Handbook.

Table 1 – Definition of headings

Table 2 – Signalling principles – Movement authorisation

Req. No.	Name	Definition/Description	Relevant Standard	Specification Application Statement
MSAC 4.1C	Aspect Sequences	The order of the displayed aspects to give the driver information about the aspect of the signal(s) ahead.	GK/RT0045	<p>Modular Signalling uses two aspect, fixed block signalling.</p> <p>The following simple aspect sequences are used:</p> <ol style="list-style-type: none"> 1. Yellow – Red; 2. Green – Green; 3. Green – Yellow – Red. <p>An isolated three aspect signal may be used where 2 successive stop signals within an Island are required and thus the first requires a yellow aspect.</p> <p>Modular Signalling DOES NOT SUPPORT double yellow aspects or flashing aspects.</p>
MSAC 4.2C	Banner Repeating Signals	A signal that provides the driver with advanced information about whether an approaching signal is <i>on</i> or <i>off</i> . This is provided where the sighting for the approaching signal is inadequate.	GK/RT0045	<p>The provision of Banner repeating signals will be made only after all other solutions to provide adequate sighting distances have been examined and found not practical. Train performance is not as critical on routes equipped with Modular Signalling as it is elsewhere and so more scope exists to position signals to optimise visibility.</p> <p>Where a Banner repeating signal is to be deployed it shall always be of the 3 state type to aid standardisation of supply, the use of standard drawings etc.</p>
MSAC 4.3C	Bidirectional Signalling	Signalling which permits trains to be signalled normally in either direction on a running line.	GK/RT0045	<p>To be provided in accordance with current standards for 'Full' bi-directional signalling – i.e. a wrong direction signal is provided opposite every right direction signal</p> <p>Modular Signalling is able to provide bidirectional train movements where necessary and as required by the scheme plan. Suppressed AWS equipment shall be provided at all bi-directional signals.</p> <p>See Appendix H3 for application guidance.</p>

Req. No.	Name	Definition/Description	Relevant Standard	Specification Application Statement
MSAC 4.4C	Braking Distance – Service Braking Distance	The distance in which a passenger train is capable of stopping from a given speed at such a deceleration rate that passengers do not suffer discomfort or alarm or at an equivalent deceleration in the case of non-passenger trains. Service braking distance is affected by gradients and the individual braking characteristics of specific types of trains.	GK/RT0075	A Modular Signalling scheme shall use the signal spacing data in Appendix A, B or C of GK/RT0075 during the design process. The distance between stop signals and distant signals shall be at a maximum of 150% of the service braking distance at the current permissible speed in order to allow for future permissible speed increases up to a maximum of 100 miles per hour. Braking distances shall be kept consistent along the line of route. Exceeding 150% of the service braking distance between distant and stop signals will require an over braking risk assessment to be carried out.
MSAC 4.5C	Class of Route	A category of route which determines the type of signal controls to be provided.	GK/RT0060 RT/E/C/11600	Modular Signalling supports three classes of route; main class, shunt class and call-on class (for both passenger and freight moves, but only if the route already exists). Modular Signalling DOES NOT SUPPORT the following routes; warning class or proceed on sight aspects (PoSA).
MSAC 4.6C	Junction Signalling Controls	These are speed controls provided up to a signal that protects a set of facing points where more than one main class route exists. Such controls force a train to adopt the correct speed through the junction as required by that main class route.	GK/RT0045	Modular Signalling SUPPORTS two types of junction signalling; main aspect free (MAF) or main aspect released from red (MAR). This reduces complexity and design. All other types of junction signalling controls are NOT SUPPORTED .
MSAC 4.7C	Lightweight Signal	This is a single aperture LED colour light signal head and straight post which is made of lightweight materials (e.g. polymers) and requires a smaller foundation than a conventional signal head and structure.	RT/E/S/10062	Lightweight signals can support a two or three aspect single aperture main signal with up to 3 position light junction indicators or a Standard indicator together with a position light signal and Miniature Indicator.

NR/L2/SIG/30097/AppC

Issue 3 | Publication date: 07 April 2014

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MSAC 4.8C	Number of Routes	This is the number of destinations that are possible from each signal.	GK/RT0045	A maximum of four main class routes (the straight route, plus three more) and four shunt class routes can be supported from each main signal, matching with the available signal profiles described previously.
MSAC 4.9C	Preliminary Route Indicator (PRI)	An indicator associated with a junction giving the driver prior information about which route is set at the junction.	GK/RT0045	Modular Signalling DOES NOT SUPPORT preliminary route indicators.
MSAC 4.10C	Preset Shunt Signals	These are facing shunting signals which exist in the line of route of other route classes which will be cleared (generally automatically) before the main signal clears.	GK/RT0045	Modular Signalling DOES NOT SUPPORT preset shunts.
MSAC 4.11C	Proceed on Sight Aspect (PoSA)	A signal aspect for use during lineside signalling failures to instruct the driver to enter a signal section and proceed at such a speed that the train can be stopped short of any obstruction.	GE/RT8071	PoSA aspects are NOT SUPPORTED . Modular Signalling only has main, call-on and shunt class routes.
MSAC 4.12C	Replacement of Distant Signals by the Passage of a Train	This is the replacement of a distant signal to its most restrictive aspect after it has displayed a less restrictive aspect by the passage of a train. It occurs when the conditions required by the interlocking aspect level cease to be satisfied	GK/RT0060,	Distant signals do not have an individual replacement train detection section. In normal operation, a distant signal is only replaced to a single yellow aspect when its associated main stop signal is displaying a red aspect. Where a train detection section is provided between the distant signal and stop signal (e.g. for approach release purposes) it will replace the distant signal.
MSAC 4.13C	Replacement of Signals by a Signaller	This is the replacement of a signal to its most restrictive aspect after it has displayed a less restrictive aspect manually by the signaller. It occurs when the conditions required by the interlocking aspect level cease to be satisfied	GK/RT0060	A signaller will be able to replace signals to their most restrictive aspect by cancelling the appropriate route, i.e. main stop signal to main stop signal. A distant signal does not have a separate replacement device. In emergency situations, all signals will display their

Req. No.	Name	Definition/Description	Relevant Standard	Specification Application Statement
				most restrictive aspect after the signaller has used the appropriate Signal Group Replacement Facility.
MSAC 4.14C	Replacement of Stop Signals by the Passage of a Train	This is the replacement of a stop signal to its most restrictive aspect after it has displayed a less restrictive aspect by the passage of a train. It occurs when the conditions required by the interlocking aspect level cease to be satisfied.	GK/RT0060	In normal operation, a main stop signal is replaced to a red aspect by the occupation of the first train detection section past the signal. The guidance in Appendix 3 of GK/RT0060 is applicable to Modular Signalling systems.
MSAC 4.15C	Replacement of Shunt Signals by the Passage of a Train	This is the replacement of a shunt signal to its most restrictive aspect after it has displayed a less restrictive aspect by the passage of a train. It occurs when the conditions required by the interlocking aspect level cease to be satisfied.	GK/RT0060	In normal operation a shunt signal is replaced to its most restrictive aspect by the occupation of the first train detection section past the signal. Where required for operational reasons last wheel replacement may be provided.
MSAC 4.16C	Signal Positioning	This is the position of signals relative to the track in the direction of travel.	GE/RT8037	For signals in the predominant direction of travel, it shall be acceptable to place signals on the right hand side of the running line to avoid installing a gantry or cantilever if no other location for the signal can be found that satisfies operational requirements. Slewing of the track should be considered as a viable alternative to installing a gantry or a cantilever. The least preferred option is to provide a gantry or cantilever structure. The use of lightweight signals which do not require routine maintenance means that such structures do not require fixed access arrangements. On bidirectional lines, signals in the less predominant