



Engineering Standard

Signalling

CRN SD 000

SIGNAL DESIGN PRINCIPLES - INTRODUCTION

Version 1.1

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Document control

Revision	Date of Approval	Summary of change
3.0	May 2003	RIC Standard SC 00 13 01 00 SP Version 3.0 May 2003.
1.0	May 2011	Conversion to CRN Signalling Standard CRN SD 000
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Summary of changes from previous version

Section	Summary of change
	No Change from V1.0

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1 Introduction

1.1 Basic Signalling and Safeworking Principles

A signalling system provides for the safe and efficient movement of trains. While the method of implementation has changed over the years, the purpose remains the same, namely to:-

- provide a reliable means of communicating information to the driver so that the driver may control the train safely according to the track and traffic conditions ahead
- maintain a safe distance between following trains on the same line so that, irrespective of train frequency, a train cannot collide with a preceding train which has stopped or is running more slowly
- maintain a safe distance between opposing trains and provide interlocking between proceed authorities for opposing train movements
- provide interlocking between points and proceed authorities so that conflicting movements are prevented and points are held in the required position until the train has safely passed over them
- provide adequate warning of the approach of trains to road users and pedestrians where active level crossing warning systems are provided
- allow trains to run at the frequency demanded by the timetable to meet commercial requirements
- be reliable but fail-safe such that any predictable type of failure of an item of signalling equipment will lead to a more rather than less restrictive operating condition.

The principles assume trains will be driven within authorised speeds but where additional risks are identified, high-speed supervision and/or braking enforcement systems may be included in the signalling system.

The following basic principles cover the fundamental requirements in operating trains. Various systems may be developed to fulfil these requirements. The CRN Signalling Standards are one such solution.

The signalling principles are to be consistent with the requirements of AS4292.4 "Railway Safety Management. Part 4 Signalling and telecommunications systems and equipment"

1.2 Handsignalling

Movements Over Facing Points

Train movements must be made over facing points only after they have been visually observed to be in position. Movements conveying passengers must only be over facing points, which have been secured or locked

Speed of Trains

Speeds of trains must be regulated so as to be able to stop at points or other obstruction on sighting.

System to Ensure Points Secured

If not feasible due to the speed of traffic, then a system needs to be enforced to ensure points are locked in the correct position for the movement. This may be procedural, or by signalling equipment.

1.2.1 Safeworking

Authority to Proceed

An Authority to proceed must only be given after adequate assurance is given that the route of the train is safe and will not be obstructed.

Only Authorised Personnel to Control

Safeworking systems must be controlled only by authorised personnel and any indications or orders given are to be rigidly controlled to prevent confusion or acting on unauthorised instructions.

Safety Devices to Give Protection

Safety devices must be used to prevent unattended wagons or vehicles in sidings from running away and fouling running lines.

Level Crossings

Level crossing protection is to be provided in accordance with AS1742 and JHR CRN signalling and civil standards.

1.3 Signalling

Operator to Observe Equipment

Signalling equipment must be within good visibility of the person operating the equipment.

Equipment Beyond Visible Range

Equipment beyond the visible range of the operator or where viewing is obstructed must be enhanced with appropriate interlocking and indicators to give the operator clear understanding of the states of the equipment and/or train location and to prevent the operation of points under a train.

Design to be Fail Safe

All signalling must be designed in accordance with accepted railway fail safe principles for both mechanical and electrical equipment, e.g., the failure of any component is not to present an unsafe condition.

Equipment to be Secured

Signalling equipment is to be secured against unauthorised interference.

Equipment to be Interlocked

Signalling equipment is to be interlocked to prevent conflicting and unsafe movements and signals must separately detect the correct position and locking of facing points

Equipment to be Correctly Located

Fixed signals must be correctly located to avoid misunderstandings as to their purpose. The distance between the first warning signal and the stop signal to which it applies must be such that a train travelling at its highest authorised speed can be stopped before the stop signal.

Design, Installation, Maintenance and Testing Standards to be Defined

The design, installation, maintenance and testing of any signalling equipment must be in accordance with nominated minimum written standards. Maintenance is to be regularly done on those safety critical items where an unsafe situation could develop as a result of deterioration or adjustment of the equipment.

System to be Documented

The system is to be comprehensively documented. This documentation must be promptly updated with any changes to the system.

Alterations to be Tested and Certified

Any changes to the signalling system are to be comprehensively tested and certified before being used for train movements.

Staff to be Qualified

Staff involved in signalling installation, maintenance and testing are to be appropriately trained and qualified for the tasks they perform.

Faults to be Corrected Without Undue Delay

When a failure occurs in a component, which is essential to the safe operation of trains, the fault shall be corrected without undue delay.

1.4 New South Wales Signalling Configuration Standards

Item	Requirement	Applies To
Type of Signalling Indications	Double Light Signalling	Area within Hornsby, Emu Plains, Loftus, Macarthur and Fassifern to Newcastle
	Single Light Signalling	Areas beyond Hornsby, Emu Plains, Loftus, Macarthur and Fassifern to Newcastle
Modifications to existing installations	New works to be operationally consistent with existing control arrangements	Existing Installations
Braking Distances	To meet longest braking distance train that normally operates on the line	All areas
Overlaps for full Caution aspect on running signals in power signalling areas	Trip braking distance of suburban trains.	Train stop fitted areas
	Minimum	Non train stop fitted areas
	300m – below 60km/h 400m - 60-80km/h 500m – above 80km/h or braking distance, if less	
Conditional Overlaps	Overlap length to be trip braking distance for conditional timing applied	Trainstop fitted areas
Headway	Defined for full clear aspects for a specified train on the particular line to meet operational requirements	All areas
System Robustness	The measure of system response to permit the return to on time running after a delay, as defined by operational requirements, and which may result in the provision of additional or conditional aspects	All areas
Train Detection	Audio Frequency Jointless track circuits	D.C. Electrified Areas
	Impulse track circuits	
	Axle Counters	

Item	Requirement	Applies To
Train Detection	DC track circuits -Impulse track circuits	Non-Electrified Areas
	Coded track circuits - Audio Frequency Jointless track circuits	
Method of Control from Major Control Location	Axle Counters	
	Impulse track circuits	Track circuits over points, in coal loops, and infrequently used tracks
Emergency Facilities	Entrance - Exit Route Setting	Complex layouts and multiple tracks
	One Control Switch (OCS) Route Setting	Simple layouts/single lines generally without point sequencing
Level Crossing Protection	Emergency Releasing Locks	Ground Frames at unattended remote interlockings
	Emergency Switch Machine Locks or Emergency Operation Locks	Power operated point mechanisms - Electro Pneumatic point mechanisms
	Half Pilot Staffs	Single line sections
	Emergency Local Control Panels	Remote locations with no duplicated links
Interlocking	AS1742.7 - Type F lights - Type F lights & booms – Pedestrian.	Single Lines - Single/Multiple Tracks
Interlocking	All signals and points to be interlocked to prevent conflicting movements.	All signalled areas.