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Issue:	6
Date:	05/09/2015
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Module

Searchlight Signals and Banner Repeating Signals

Endorsement and Authorisation

For endorsement, authorisation and issue record of this document, please refer to the SSI Applications Manual Contents, NR/L2/SIG/17002.

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User information

This Network Rail standard contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – No variations, could stop the railway

- **Red requirements shall** always be complied with and achieved.
- Red requirements shall be presented in a red box **with the word “shall” or expressed as a direct instruction**.
- Accountability for the efficacy of red requirements lies with the Professional Head/Standard Owner.
- Red requirements are monitored for compliance.
- Corrective actions shall be enforced if deviations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Amber requirements – Controlled variations, approved risk analysis and mitigation

- **Amber requirements shall** be complied with unless variation has been approved in advance.
- Amber requirements shall be presented with an amber sidebar **and with the word “shall” or expressed as a direct instruction**.
- Accountability for the efficacy of these requirements lies with the Professional Head/Standard Owner, or their nominated Delegated Authority.
- Amber requirements are monitored for compliance.
- Variations **may** be permitted. Variations are approved by the Standard Owner or through existing Delegated Authority arrangements.
- Corrective actions shall be enforced if **non-approved** variations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Green – Guidance

- Guidance is based on good practice. Guidance represents supporting information to help achieve **Red** and **Amber** requirements.
- Guidance shall be presented with a dotted green sidebar **and with the word “should” (usually in notes) or as a direct instruction**.
- Guidance is **not mandatory** and is not monitored for compliance.
- Alternative solutions may be used. Alternative solutions do not need to be formally approved.
- Decisions made by a competent person to use alternative solutions should be backed up by appropriate evidence or documentation.

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Issue record

Issue	Date	Comments
5	August 2004	5 th Issue
6	September 2014	Clause 7.2 – Missing lines reinstated in special data example Clause 8.2.3 – Amended to delete the spurious ‘G c 3’

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 06/12/2015.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

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1 Introduction

Electro-mechanical searchlight and banner repeating signals are fitted with a single permanently illuminated lamp, and the required aspect is selected by the mechanical rotation of a filter or mask. One or more outputs from the Interlocking drive the motor which controls the position of the filter or mask; if all outputs are de-energised the filter or mask returns to the most restrictive aspect. Because of the risk of a mechanical fault resulting in the display of an incorrect aspect, proving contacts are provided which allow the Interlocking to detect the displayed aspect, which can then be taken into account in aspect sequencing calculations and in the control of the indications on the Signaller's Panel. Searchlight signals are covered in Sections 2 & 3, and banner repeating signals in Sections 4 & 5.

Fibre-optic banner repeating signals have no moving parts and the standard type employs three lamps, two for the "on" aspect and one for the "off" aspect. Therefore controls and proving are somewhat different from that of electro-mechanically operated banner repeating signals, and are described in Sections 6 & 7. Section 8 covers splitting banner signals but only in fibre-optic form.

2 Searchlight Signals - Principles

2.1 Aspect Sequencing

- (i) The aspect sequencing calculation for the signal in rear of the searchlight signal should be based on either the aspect controls or the detected aspect of the searchlight signal, whichever is the more restrictive.
- (ii) If, for a period of up to 5 seconds, no aspect is detected or more than one aspect is detected simultaneously, then the aspect sequencing for the signal in rear of the searchlight signal should be based on either the aspect controls or the last unambiguously detected aspect of the searchlight signal, whichever is the more restrictive.
- (iii) If, for a period exceeding 5 seconds, no aspect is detected or more than one aspect is detected simultaneously or the detected aspect is less restrictive than the aspect controls, then the signal in rear of the searchlight signal shall be held at its most restrictive aspect.

2.2 Approach Locking Release

The approach locking of a signal may only be released after the signal has been replaced to its most restrictive aspect and certain other conditions have been satisfied (time-out, map search or TISP). For a conventional multiple aspect signal it is only necessary to check the aspect controls for the signal, but in the case of a searchlight it is necessary to confirm that the most restrictive aspect has actually been detected.

2.3 Signaller's Panel Indications

The indications on the Signaller's Panel for the searchlight signal are intended to incorporate positive proving of the aspect being displayed by the signal.

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- (i) If the searchlight signal is lamp proved and the red aspect only is detected, then the red indicator only should be illuminated. If the signal is approach locked and the entrance button on the Signaller's Panel has been pulled to initiate a release, the red indicator should be flashed in the usual manner.
- (ii) If the searchlight signal is lamp proved and one only out of the yellow and green aspects is detected, then the green indicator only should be illuminated.
- (iii) If the searchlight signal is not lamp proved or no aspect is detected or more than one aspect is detected simultaneously, then both the red and the green indicators should be extinguished.

3 Searchlight Signals - Example

This section gives examples of the special requirements in Interlocking and Panel Processor data for a 3 aspect searchlight signal numbered 29, connected to Signal Module 22, with the yellow & green aspect controls and AWS on outputs 2,1,0 respectively, lamp proving on input 7, and aspect proving for the red, yellow and green aspects on inputs 2,1,0 respectively.

3.1 Identities

A conventional signal identity, S29, and two special signal identities, S29DET, S29SEQ, are defined for the searchlight signal. The "lamp proving" bit and aspect code in the signal memories allocated to these extra identities are used to store the current detected aspect of the signal and the aspect code to be used for sequencing to the signal in rear. The two special signal identities should be added at the end of the SIG identity file.

An elapsed timer ES29 is defined which is used to time the period for which the searchlight signal detection has been in a state which may require the signal in rear to be held at its most restrictive aspect. This timer is reset to zero in every major cycle in which the aspect of the searchlight signal is unambiguously detected as equal to or more restrictive than the aspect controls. If no aspect is detected or more than one aspect is detected or the detected aspect is less restrictive than the controls, then the timer is allowed to count upwards.

3.2 Input Telegram Data

The input telegram data for telegram 22 contains a series of conditional statements to set up the aspect code in the two special signal memories associated with the searchlight signal. If one of the three aspect proving bits in the input telegram is set, and the other two aspect proving bits are clear, then the "lamp proving" bit and the appropriate aspect code is set in S29DET. If none of the three aspects is detected unambiguously, then the aspect code is set to the most restrictive (undefined) code, and the "lamp proving" bit is cleared to confirm that the indications on the Signaller's Panel are extinguished.

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If an aspect code is set which is equal to or more restrictive than the aspect code in S29 (the aspect controls), then the elapsed timer ES29 is reset to zero and the same aspect code set in S29SEQ to be used for aspect sequencing for the signal in rear. The next three conditional statements operate on S29SEQ irrespective of the detected aspect, to confirm that the aspect code used for sequencing is never less restrictive than the aspect controls, and that the "lamp proving" bit in signal memory is cleared if the timer ES29 exceeds a value of 5 seconds. Next the "lamp proving" bits in S29DET & S29SEQ are cleared if the lamp proving bit in the input telegram is clear.

Finally, as S29DET signal memory is used by the Panel Processors (or SDS in an IECC scheme) when processing data for any indications associated with the signal, the "bpull", "foal" and "auto" bits are updated to the state of those in S29. The conditional statements updating the "bpull" and "foal" bits may be omitted if the signal is not a controlled signal, and the statement updating the "auto" bit may be omitted if the signal is controlled but without auto operation.