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Requirement Specification for Performance of Position Light Signals (formerly RT/E/S/10110)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.

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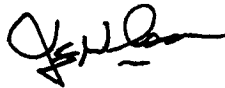


RAILTRACK LINE SPECIFICATION

REQUIREMENT SPECIFICATION FOR PERFORMANCE OF POSITION LIGHT SIGNALS

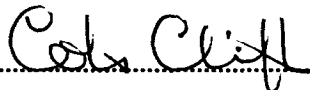
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REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

SUMMARY

This specification is for the performance requirements of position light signals.

ISSUE RECORD

This specification will be updated when necessary by the distribution of a complete replacement.

Amended or additional parts of revised pages will be marked by a vertical black line in the adjacent right hand margin.

Issue	Date	Comments
I	August 1999	New Issue

Responsibilities and Distribution

This specification shall be complied with by suppliers of the signals and by those engaged in the acceptance or type approval thereof.

IMPLEMENTATION

The requirements specified in this document shall be enforced from August 1999 and shall be met by the Supplier of the signal unless express written permission is obtained for any deviation from the Professional Head of Signalling. Retrospective compliance for existing signals is not required.

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REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

CONTENTS

Section	Description	Page
1. SCOPE		6
1.1	Purpose.....	6
1.2	Background	6
1.3	Overview of Requirement.....	6
1.4	Other Specifications to be Considered.....	7
1.5	Safety Requirements	7
2. DEFINITIONS		8
3. MANDATORY FUNCTIONAL REQUIREMENTS		10
3.1	Driver Interface	10
3.2	Signalling System Interface.....	14
3.3	Vandalism.....	15
3.4	Signal Head Construction.....	16
4. DESIRABLE FUNCTIONAL REQUIREMENTS		19
4.1	Heater	19
4.2	Requirements For Backwards Capability	19
4.3	Diagnostics.....	23
4.4	Reliability	24
5. SAFETY		25
5.1	Safety Integrity Level.....	25
5.2	Safety Performance Targets.....	25
5.3	Health & Safety Issues.....	25
6. RELIABILITY, AVAILABILITY & MAINTAINABILITY		27
6.1	Reliability & Availability	27
6.2	Maintainability.....	27
7. DESIGN METHOD & DOCUMENTATION		29
7.1	Language	29
7.2	System	29
7.3	Hardware.....	29

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

7.4 Product Functional Software	29
8. TRAINING AND DOCUMENTATION -----	30
8.1 Training	30
8.2 Documentation	30
9. TESTING & COMMISSIONING -----	31
9.1 Method.....	31
9.2 Documentation	31
10. LIFE -----	32
10.1 Operational Life.....	32
10.2 Product Life	32
10.3 Whole Life Costs	32
11. CONSTRAINTS -----	33
11.1 Year 2000 Compliance.....	33
11.2 Compatibility With Current Interlockings.....	33
11.3 Replacement Signal.....	33
12. ENVIRONMENTAL CONDITIONS-----	34
12.1 Operating Environment	34
12.2 Electromagnetic Compatibility	35
12.3 Power Supplies.....	35
12.4 Storage & Transport Environment.....	35
13. DEVELOPMENT POTENTIAL -----	36
13.1 Current and Voltage Options	36
13.2 Condition Monitoring	36
13.3 Radio Control	36
14. LIST OF REFERENCED DOCUMENTS-----	37

REQUIREMENT SPECIFICATION**PERFORMANCE OF POSITION LIGHT SIGNALS****List of Tables**

TABLE 1: TYPES OF SIGNAL AND ASPECTS	10
TABLE 2: LUMINANCE VALUES.....	12
TABLE 3: LUMINOUS INTENSITY LIMITS.....	13
TABLE 4: APPLICATION IN BACKWARDS COMPATIBILITY SITUATIONS.....	19
TABLE 5: ELECTRICAL COMPATIBILITY.....	21
TABLE 6: TERMINAL ALLOCATION (BR-SE-160 PL2R & PL2Y COMPATIBILITY).....	21
TABLE 7: TERMINAL ALLOCATION (BR-SE-160 PL1R COMPATIBILITY).....	22
TABLE 8: TERMINAL ALLOCATION (BR-SE-160 PL1W COMPATIBILITY).....	22
TABLE 9: TERMINAL ALLOCATION (BR165I COMPATIBILITY).....	23

List of Figures

FIGURE 1: SIGNAL CONTEXT DIAGRAM	6
FIGURE 2: FIXING DETAILS OF POSITION LIGHT SIGNAL	23

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

I. SCOPE**I.1 Purpose**

The purpose of this specification is to define the performance requirements for position light signals used either independently, as Limit of Shunt signals, or as subsidiary signals to main signals.

I.2 Background

Earlier specifications for signals laid down requirements for components which, when assembled, were deemed to comprise an adequate position light signal. These specifications laid down no performance requirements and were specifically related to the use of filament lamps.

This is a performance specification which does not prescribe the source of illumination or the means by which the light from that source is presented to the driver.

I.3 Overview of Requirement

A block diagram of the context in which the signal operates is shown in Figure I: Signal Context Diagram. Note that the functional elements which are identified need not be physically separate entities.

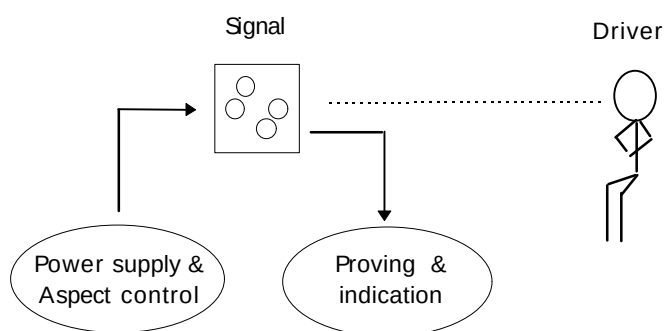


Figure I: Signal Context Diagram

The signal must produce an unambiguous output to the driver.

The signal output to the driver must not indicate a less restrictive aspect than required by the control system.

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

The principal functional elements of the signal are as follows:

- A means of converting electrical energy to optical energy.
- A means of focusing and filtering the optical energy so that it is of the colour and concentrated into a beam appropriate to the type of signal.
- A means of masking so that the shape of the light aperture is appropriate to the type of signal.
- Means of terminating and securing the cable connecting the signal to the controlling devices.
- A housing for the components described above to provide environmental protection and maintain the correct spatial relationship between them.
- A means of mounting the signal head on a support structure; the support structure itself not being the subject of this Requirement Specification.

1.4 Other Specifications to be Considered

The Group Standard for Lineside Signals and Indicators ^[1], which relates to the existing signal, apply to the signal specified in this document. A list of referenced documents is given at Section 14.

1.5 Safety Requirements

Throughout this document, Functional Safety Requirements are identified by an **(S)** at the end of the requirement statement.

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

2. DEFINITIONS

Specific terms and abbreviations used in this specification are defined below:-

Abbreviation	Term	Explanation
	(Signal) Aspect	A light or combination of lights which has a defined significance to the driver of a train.
Cd	Candela	The unit of luminous intensity.
	Driver	Train driver or any other authorised person on or about the railway required to read signals.
	First filament failure	The condition, where lamps with main and auxiliary filaments are provided, that the main filament has failed and the auxiliary filament is lit.
	Interlocking	The logic which defines the aspect to be displayed by a signal.
	Restrictive aspect	An aspect is restrictive, compared to the reference aspect, if its interpretation by the driver would be a need to stop or be prepared to stop.
	Light Aperture	The individual aperture through which light emerges from the signal.
	Link	A means of disconnecting an electrical circuit without removing any wires from terminals and where the movable parts are captive.
	Maintenance	Any activity, either routine or of an exceptional nature, which is carried out so that the product remains or is restored to its correct function.
ART _{MAX}	Maximum Active Repair Time	The maximum time from personnel commencing repair work to its satisfactory conclusion and the restoration to service of the item.
ART _{MEAN}	Mean Active Repair Time	The mean time from personnel commencing repair work to its satisfactory conclusion and the restoration to service of the item.
	Mutilated	The light output from a light aperture is regarded as mutilated if it no longer appears as a single, uniform, circular source of light.
	Non-urgent alarm	An alarm which indicates that an item of equipment requires the attention of the maintainer but does not require immediate action from the signaller.
	Off (aspect)	The aspect denoting proceed.
	On (aspect)	An aspect denoting stop, which may be qualified.

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

Abbreviation	Term	Explanation
	Phantom (aspect)	An aspect appearing to be lit when not.
	Proving (of a signal)	A safety related feature - the function of detection that a signal aspect is lit.
SSI	Solid State Interlocking	The UK developed system of processor based interlocking for railway signalling applications.

3. MANDATORY FUNCTIONAL REQUIREMENTS

This section provides a statement of the mandatory features, functionality and levels of performance of the signal.

3.1 Driver Interface

3.1.1 Signal Aspects

- 3.1.1.1 Position light signals are of a number of types each of which is required to be capable of displaying different aspects. The arrangement and meaning of the aspects is described in GK/RT0031^[1]. Table 1 specifies the colours of the aspects for each type of signal.

Type Reference	On aspect colour	Off aspect colour
PL2R	Red	Lunar White
PL2RW	Red & Lunar White	Lunar White
PL2Y	Yellow	Lunar White
PL2YW	Yellow & Lunar White	Lunar White
PL1W	Blanked	Lunar White
PL1R	Red	Blanked

Table 1: Types of Signal and Aspects

- 3.1.1.2 Each aspect shall comprise two lights of the colour or colours shown in Table 1 except where two colours are shown in the 'On aspect colour' in which case the aspect will be one light of each colour. The appearance of the 'on' aspect shall be two lights whose centres shall be horizontally positioned in relation to each other. For those 'on' aspects which comprise one Lunar White and one coloured light, the Lunar White light shall be the one on the right. **(S)**
- 3.1.1.3 The appearance of the 'off' aspect shall be two lights. These shall be arranged so that a line joining their centres is at 45° to the horizontal, with the upper light to the left of the lower light, as viewed by a driver **(S)**.
Note: There is no requirement for the spatial relationship between the 'On' and 'Off' aspects.
- 3.1.1.4 The separation between the geometric centres of the pair of light apertures forming each aspect shall be not less than 202mm and not more than 260mm **(S)**.

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

- 3.1.1.5 All unlit apertures to appear the same and as dark as practically possible. **(S)**
- 3.1.2 Changing Aspects
- 3.1.2.1 In normal operation, there shall be no perceptible period when the signal has no aspect lit (except in the case of signal type PLIW) or when two aspects of the signal are displayed simultaneously. **(S)**
- 3.1.2.2 The delay in the commencement of lighting or extinction of aspects after the controlling supply is energised or de-energised shall be no greater than 20 ms and the signal shall reach its defined output within 100ms. The delays in illumination and extinction shall be similar in duration **(S)**.
- 3.1.3 Signal Background
- 3.1.3.1 The front face of the head shall extend so as to provide a surrounding border to each aspect of a minimum width of 20mm in order to provide a dark background to improve conspicuity.
- 3.1.4 Sighting and Viewing Angle
- 3.1.4.1 The beam profile shall be circular, within the limits specified for the light aperture in Clause 3.1.5.5.
- 3.1.4.2 All aspects shall be readable at distances up to 100 metres as specified for a Category 3, Short Range, signal in GK/RT0031^[1].
- 3.1.4.3 The requirement for aspects to be readable at distances up to 100 metres shall apply at angles from the axis of up to 10°.
- 3.1.4.4 All aspects shall be readable, at angles from the axis of up to 45°, at distances up to 5 metres.
- 3.1.4.5 All lights of all aspects shall appear to be of similar intensity.
- 3.1.4.6 The optical axes of all aspects shall be parallel to each other and normal to the front face of the signal.
- 3.1.4.7 There must be the ability to view a signal close up as well as at a distance. The design, including any arrangement of any hoods, shall take into account that the signal may be viewed from either left or right sides and from above or below. **(S)**
- 3.1.5 Light Output
- 3.1.5.1 The light output of each light aperture comprising an aspect shall comply with the requirements set out in Table 2 and Table 3 over the life of the signal. **(S)**

REQUIREMENT SPECIFICATION

PERFORMANCE OF POSITION LIGHT SIGNALS

Property	Red aspect	Yellow aspect	Lunar White aspect
Luminance over 100mm ² circular area (Measured on axis): Minimum:	1350 Cd m ⁻²	1700 Cd m ⁻²	2050 Cd m ⁻²

Table 2: Luminance Values