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Infrastructure Based Train Detection Systems

Synopsis

This document sets out requirements and guidance on infrastructure based train detection systems.

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Infrastructure Based Train Detection Systems

Issue Record

Issue	Date	Comments
One	03/09/2016	Original document.

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

Supply

The authoritative version of this document is available at www.rssb.co.uk/railway-group-standards. Enquiries on this document can be forwarded to enquirydesk@rssb.co.uk.

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Part 1 Purpose and Introduction

1.1 Purpose

1.1.1 This document is a standard on Infrastructure Based Train Detection Systems, for members of RSSB to use if they so choose.

1.1.2 This document is harmonised with issue three of Railway Group Standard GKRT0028.

1.2 Application of this document

1.2.1 A member of RSSB may choose to adopt all or part of this document through internal procedures or contract conditions. Where this is the case the member of RSSB will specify the nature and extent of application.

1.2.2 Therefore compliance requirements and dates have not been specified since these will be the subject of internal procedures or contract conditions.

1.2.3 The Standards Manual and Railway Group Standards (RGS) Code does not currently provide a formal process for deviating from a Rail Industry Standard (RIS). However, a member of RSSB, having adopted a RIS and wishing to deviate from its requirements, may request a Standards Committee to provide opinions and comments on their proposed alternative to the requirement in the RIS. Requests for opinions and comments should be submitted to RSSB by e-mail to proposals.deviation@rssb.co.uk. When formulating a request, consideration should be given to the advice set out in the 'Guidance to applicants and members of Standards Committee on deviation applications', available from RSSB's website.

1.3 Structure of this document

1.3.1 This document sets out a series of requirements that are sequentially numbered.

1.3.2 This document also sets out the rationale for the requirement. The rationale explains why the requirement is needed and its purpose.

1.3.3 Where relevant, guidance supporting the requirement is also set out in this document by a series of sequentially numbered clauses and is identified by the letter 'G'.

1.4 Health and safety responsibilities

1.4.1 Users of documents published by RSSB are reminded of the need to consider their own responsibilities to ensure health and safety at work and their own duties under health and safety legislation. RSSB does not warrant that compliance with all or any documents published by RSSB is sufficient in itself to ensure safe systems of work or operation or to satisfy such responsibilities or duties.

1.5 Approval and Authorisation

1.5.1 The content of this document was approved by Control Command and Signalling (CCS) Standards Committee on 07 July 2016.

1.5.2 This document was authorised by RSSB on 26 July 2016.

Part 2 Track Section Dimensions

2.1 Track Section Clearance Point

2.1.1 The distance from the fouling point (FP) to the track section clearance point (CP) shall include the maximum vehicle nose overhang (o) dimension plus a safety margin (s). See Figure *1 Clearance and Fouling Points at a diverging or converging junction* on page 6 for dimensions.

Rationale

G 2.1.2 The safety margin is included to provide additional clearance between trains, taking account of the operational context at the location.

Guidance

G 2.1.3 Figure *1 Clearance and Fouling Points at a diverging or converging junction* on page 6 and Figure *2 Clearance and Fouling Points at a straight (90 degree) crossing* on page 7 show the safety margin in relation to the clearance and fouling points.

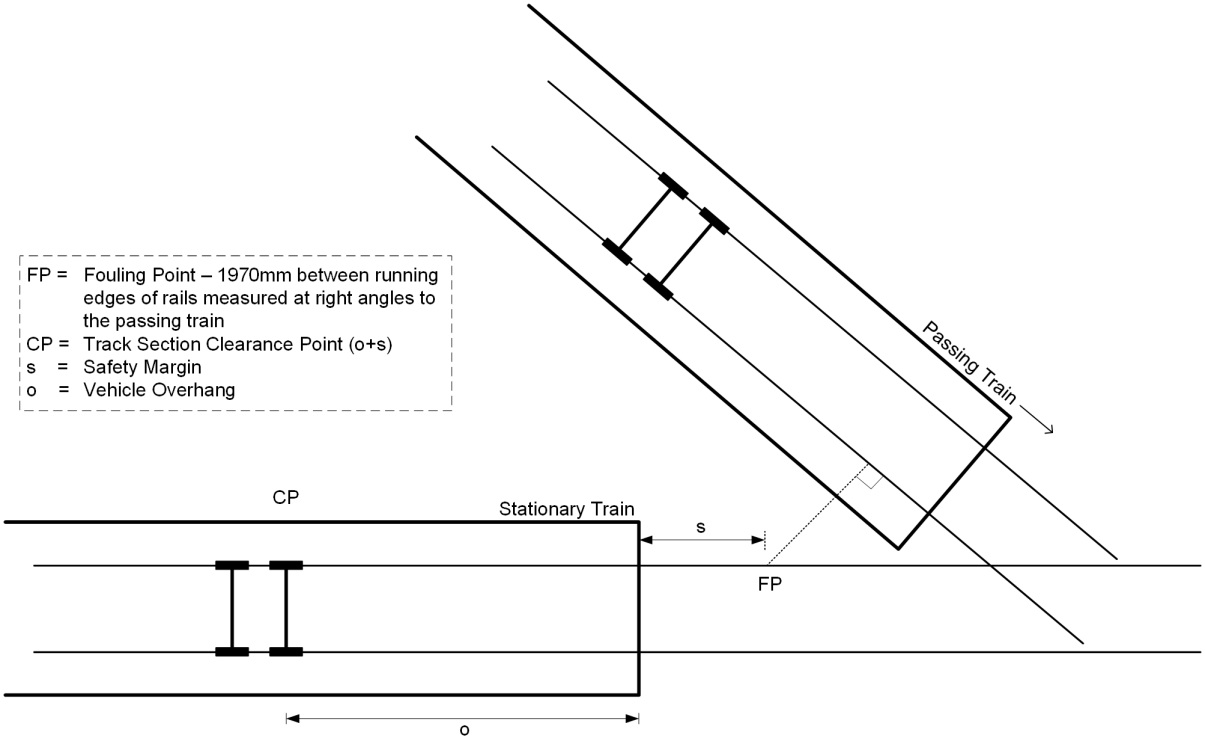

Figure 1: Clearance and Fouling Points at a diverging or converging junction

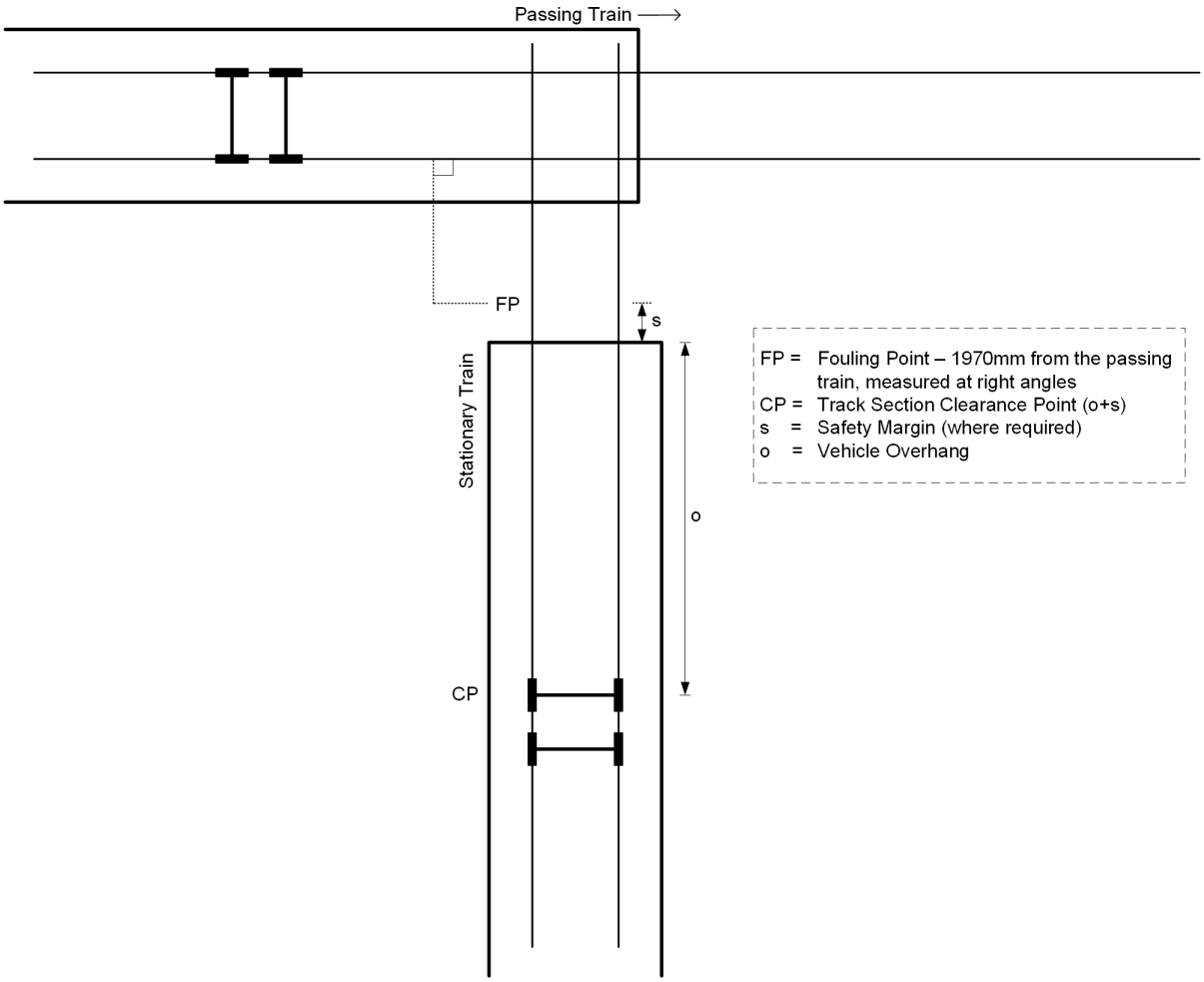

Figure 2: Clearance and Fouling Points at a straight (90 degree) crossing

G 2.1.4 The fouling point and clearance point are considered together in the calculation of the passing clearance between a stationary train and a passing train on the adjacent line at a crossing. The requirements for defining and maintaining clearances are set out in GIRT7073.

G 2.1.5 The fouling point at a junction is the point where the distance between the running edges of the adjacent rails on both lines is 1970 mm, measured at right angles from the line carrying the passing train.

G 2.1.6 The maximum vehicle nose overhang dimension equates to the maximum distance between the end of a train and the first axle. For conventional rolling stock, this is set out in section 3.1.2.6 of ERA/ ERTMS/033281.

G 2.1.7 A clearance point dimension of 4880 mm has historically been applied on the GB mainline railway, based on a maximum vehicle overhang length of 3226 mm, as set out in GMRT2173. This provides an effective safety margin of 1654 mm.

G 2.1.8 Where a TSI-compliant train with a 4200 mm nose overhang is operated on existing lines where the clearance point is 4880 mm, a safety margin of 680 mm is available.

G 2.1.9 Where a planned change to the railway has the potential to reduce the safety margin, either of the following can be used in the application of the common safety method on risk evaluation and assessment (CSM RA) as controls against the hazard of a vehicle obstructing the fouling point:

a) The historic value of 1654 mm can be applied as a reference system.

b) A reduced safety margin can be justified through explicit risk estimation.

G 2.1.10 Factors affecting the assessment of the safety margin include:

a) The frequency that a train will stop close to the clearance point.
b) The likelihood of a vehicle with the maximum nose overhang approaching the clearance point.
c) The likelihood that a train stopped close to the clearance point will move towards the fouling point.
d) The distance that a train is likely to move towards the fouling point.
e) The likelihood that a train infringing the fouling point will result in a train-on-train collision.
f) The requirement to maintain the passing clearance between trains.
g) The curvature of lines on any side of a 90 degree (straight) crossing, which can cause a vehicle end overthrow.

2.2 Axle Counter Specific Dimensions

2.2.1 The distance that an axle counter track section extends beyond the clearance point on each of the diverging or converging routes of a junction shall be compatible with the requirement for a driver to confirm by direct observation that the axle counter section is clear.

Rationale

G 2.2.2 This requirement is consistent with section 21 of Rule Book module GERT8000-TS11 resetting and restoring axle counters when the driver is requested to examine the line.

Guidance

G 2.2.3 Some axle counter reset and restoration processes rely on the driver examining the line from a moving train. A site specific assessment would provide confidence in the distance over which drivers can examine the line beyond the clearance point from the normal driving position. There is benefit in avoiding the use of different distances along a route because of the additional demand this would place on a driver's route knowledge.

G 2.2.4 The general operating procedures of how to carry out an examination of the line are set out in section 12 of GERT8000-TW1.

G 2.2.5 The general operating procedures of how to carry out the reset and restoration of axle counters are set out in section 21 of GERT8000-TS11.

Appendices

Appendix A Guidance on train detection compatibility assessments

A.1 Guidance on train detection compatibility assessments

Guidance

G A.1.1 General requirements for the assessment of compatibility between rail vehicles and infrastructure are set out in GERT8270.

G A.1.2 When a change to a route is proposed, the following may have an effect on the compatibility between vehicles and infrastructure:

a) New or modified infrastructure or vehicles
b) A change in the volume, speed or type of rail traffic.

G A.1.3 A compatibility assessment of the train detection system examines the suitability of the selected system with regards to:

a) The ability of the train detection system to correctly detect the vehicles that operate over it and the types of movement that will take place.
b) The ability of vehicles to reliably actuate the train detection system.

G A.1.4 The frequency of the train service can have an effect on the rail head conditions, which in turn can have an effect on the integrity of track circuit based train detection systems. For example, a low intensity train service can lead to the railhead becoming contaminated, which impacts on the ability of trains to reliably actuate track circuits.

G A.1.5 A review of the train detection system is undertaken when it is proposed to change the permissible speed. A slow axle counter response time is a factor to consider in the train detection compatibility assessment as it can cause delay in the interlocking, creating a potential hazard.

G A.1.6 Information on railway vehicles relevant to compatibility with the train detection system and the types of movement required over the train detection system can be provided by railway undertakings.

G A.1.7 The following factors are relevant to the selection of the method of train detection:

a) Wheel construction.
b) Wheel diameter.
c) Flange height and profile.
d) Axle spacing.
e) Speed of trains passing detection points.
f) Any other parts on trains which could cause unintentional detection, for example, track brakes.

G A.1.8 Other controls are applied to the operation of certain types of vehicle which cannot be relied upon to reliably actuate train detection systems, for example:

a) On-track machines which are identified as being unable to actuate train detection systems (see GERT8000-OTM).
b) Vehicles being used within a possession for engineering purposes.
c) Vehicles under test prior to engineering acceptance.

G A.1.9 The requirements for reliable operation of track circuits for on-track machines are set out in GMRT2400.

G A.1.10 Some vehicles which are not inherently capable of reliably actuating track circuits have been fitted with a track circuit assister (TCA). The requirements for fitting a TCA onto a vehicle are set out in GMRT2477.

G A.1.11 Operating procedures for trains which cannot be relied upon to actuate track circuits are set out in section 12 of GERT8000-TS1.

G A.1.12 GERT8000-T3 sets out the procedures for vehicles operating within a possession.

G A.1.13 The requirements to assess adequate communication between the driver and signaller are set out in GERT8217, for axle counter based train detection.

G A.1.14 The requirements for operation of track circuits during the leaf fall contamination period are set out in GORT3208.

G A.1.15 For compatibility with train detection systems, rolling stock characteristics are not restricted to comply with ERA/ERTMS/033281. The Application Guide to the LOC&PAS TSI clause 4.2.3.3.1 clarifies that alternative technical solutions are permitted. The RGSs GMRT2461, GMRT2466 and GMRT2173 set out the GB national technical rules for the parameters that provide compatibility with the existing GB mainline infrastructure.

Definitions

Axle Counter System	A type of train detection system in which track-mounted equipment counts axles entering and leaving a track section at each extremity. This information is evaluated to determine whether the track section is occupied or clear.
Clearance Point (CP)	The position at which an infrastructure based train detection system will detect that a rail vehicle with the maximum nose overhang is clear of the fouling point and any assessed safety margin.
Fouling Point (FP)	The position on a converging, diverging or crossing line beyond which the encroachment of any part of a vehicle would infringe the required passing clearance for a vehicle on the other line.
On-Track Machine	Any rail mounted machine, whose primary function is for the renewal, maintenance, inspection or measurement of the infrastructure, meeting the requirements set out in.
Passing Clearance	The minimum calculated distance between the swept envelopes of two specific types of rail vehicle as they pass on adjacent tracks at nominated speeds, taking account of appropriate track tolerances and accuracy of measurement.
Track Circuit	A type of train detection system that detects the presence or absence of a rail vehicle within a defined section of track, by means of the electrical circuit created between the running rails by one or more wheelsets.
Track Circuit Assister (TCA)	A device mounted on a rail vehicle to assist with the reliable operation of track circuits by inducing an electrical potential between the associated wheelset and the rail head. Typically, a TCA consists of a control unit (installed in the vehicle), and aerial with associated tuning unit (mounted between a pair of wheelsets, close to the rails), and assocciated cabling and power supplies. *GKGN0628 Issue 2*
Track Section	A portion of railway track having fixed boundaries and for which the train detection system provides information on its state of occupancy, which can be made up of one or more train detection sections (for example, track circuit or axle counter sections).
Train Detection System	Equipment and systems forming part of, or providing input to, the signalling systems to detect, either: • The presence or absence of vehicles within the limits of a track section

- That a train has reached, is passing, or has passed a specific position

References

The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from http://www.rgsonline.co.uk.

RGSC 01	Railway Group Standards Code
RGSC 02	Standards Manual

Documents referenced in the text

LOC & PAS TSI	Locomotives and Passenger Rolling Stock TSI Regulation. No. 1302/2014/EU (OJ L356, 12.12.2014, p228)
ERA/ERTMS/033281	Interfaces between control-command and signalling trackside and other subsystems (Referenced in Index 77 of the CCS TSI)Interfaces between control-command and signalling trackside and other subsystems (Referenced in Index 77 of the CCS TSI)
GERT8000	Rule Book
GERT8217	Introduction and Use of Axle Counters - Managing the Risk
GERT8270	Assessment of Route Compatibility of Vehicles and Infrastructure
GIRT7073	Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances
GMRT2173	Requirements for the Size of Vehicles and Position of Equipment
GMRT2400	Engineering Design of On-Track Machines in Running Mode
GMRT2461	Sanding Equipment Fitted to Multiple Units and On-Track Machines
GMRT2466	Railway Wheelsets
GMRT2477	Track Circuit Assister Configuration for Rail Vehicles
GORT3208	Arrangements Concerning the Non-operation of Track Circuits During the Leaf Fall Contamination Period