RAIL SAFETY AND STANDARDS BOARD

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Rail Industry Standard for Driving Cabs

This document sets out supplementary requirements for the design, layout and operational equipment in driving cabs of rail vehicles to the Locomotive and Passenger (LOC&PAS) National Technical Specification Notice (NTSN), in line with GB practice.

Published by **Rail Safety and Standards Board**

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Synopsis

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Issue record

Issue	Date	Comments
One	June 2020	Original document. This RIS has been produced to provide requirements, that do not fulfill the criteria to be national technical rules (NTRs), and guidance for the driving cabs of rail vehicles.
1.1	March 2022	This document contains updated references to National Technical Specification Notices (NTSN) and removes all references to Technical Specifications for Interoperability (TSI).
Two	June 2024 [proposed]	Additional sections added on driving cab side windows and an appendix on human factors for the design of driving cabs.

Revisions have been marked by a vertical black line in this issue. Definitions and References may also have been updated but these are not marked by a vertical black line.

Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are RIS superseded
RIS-2761-RST issue 1.1 Rail Industry Standard for Driving Cabs	All	June 2024 [proposed]

Supply

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Part 1 Purpose and Introduction

1.1 Purpose

1.1.1 This document sets out requirements for the design and layout of driving cabs of rail vehicles in line with practice in Great Britain (GB), as well as requirements for operational equipment in the driving cab. The requirements supplement those in the Locomotives and Passenger Rolling Stock National Technical Specification Notice (LOC&PAS NTSN) and national technical rules (NTRs) in GMRT2161. Elements of this standard aim to improve human factors integration in driving cabs which will reduce instances of error, injury and discomfort, based on human centred design.

1.1.2 The requirements in this document do not apply to either on-track machines (OTMs) or to on-track plant (OTP). Requirements for the driving cabs of OTMs and OTP are set out in GMRT2400 and RIS-1530-PLT respectively, and associated referenced standards.

1.1.3 The requirements in this document can be used by railway undertakings (RUs) and/or project entities (as defined in the Railways Interoperability Regulations 2011 (RIR 2011) (as amended)) when introducing a new vehicle or if a vehicle currently in operation is undergoing a renewal or upgrade as defined in RIR 2011 (as amended). The requirements may also be used for other changes if considered relevant and applicable based on a suitable and sufficient risk assessment such as the Common Safety Method on Risk Evaluation and Assessment (CSM RA).

1.2 Application of this document

1.2.1 Compliance requirements and dates have not been specified because these are the subject of internal procedures or contract conditions.

1.2.2 If you plan to do something that does not comply with a requirement in this RIS, you can ask a Standards Committee to comment on your proposed alternative. If you want a Standards Committee to do this, please submit your deviation application form to RSSB. You can find advice and guidance on using alternative requirements on RSSB's website www.rssb.co.uk.

1.3 User's responsibilities

1.3.1 Industry experts representing railway industry stakeholders are involved in the process for settling the content of documents which are prepared in accordance with the procedures set out in the Railway Standards Code and Manual.

1.3.2 Users of documents published by RSSB are expected to be competent or should take specialist advice before following or applying any practices or principles contained within them and are reminded of the need to consider their own responsibilities to ensure safe systems of work and operation, health and safety at work and compliance with their own duties under health and safety legislation. While documents published by RSSB can be used to help inform and devise safe practices and systems of work, their content has not been designed or prepared for:

a) reliance by any specific person or organisation;

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1.3.4 Users and duty holders remain responsible at all times for assessing the suitability, adequacy and extent of any measures they choose to implement or adopt and RSSB does not accept, and expressly disclaims, all and any liability and responsibility except for any liability which cannot legally be limited.

1.4 Structure of this document

1.4.1 This document sets out a series of requirements that are sequentially numbered. This document also sets out the rationale for the requirement, explaining why the requirement is needed and its purpose and, where relevant, guidance to support the requirement. The rationale and the guidance are prefixed by the letter 'G'.

1.4.2 Some subjects do not have specific requirements but the subject is addressed through guidance only and, where this is the case, it is distinguished under a heading of 'Guidance' and is prefixed by the letter 'G'.

1.5 Approval and authorisation of this document

1.5.1 The content of this document will be approved by Rolling Stock Standards Committee on 14 March 2024 [proposed].

1.5.2 This document will be authorised by RSSB on 11 April 2024 [proposed].

Part 2 Cab Layout

2.1 Guidance on driver's controls and instruments

Guidance

G 2.1.1 GMRT2100 sets out requirements for the structural integrity and design of driving cab interiors to minimise injury risk in the event of a train collision.

G 2.1.2 BS EN 16186-2:2017 sets out rules for the positioning of controls and instruments in the driving cab and on the driver's desk. The content of BS EN 16186-2:2017 is not mandated by the LOC&PAS NTSN.

G 2.1.3 Standardised control layouts are shown in BS EN 16186-2:2017. These are for a central driving position and might be appropriate for left-hand running or for units with an offset driving position. BS EN 16186-2:2017 includes national deviations applicable to trains that will operate solely on the Great Britain (GB) mainline railway. The control layouts in BS EN 16186-2:2017 do not include integration of Class B train protection systems.

G 2.1.4 RIS-0775-CCS sets out requirements for the automatic warning system (AWS) / train protection and warning system (TPWS) driver machine interface (DMI). AWS/TPWS is the primary GB Class B train protection system.

Note: The following clauses have been renumbered, but the text remains unchanged.

G 2.1.5 It is considered good practice to create a target audience description prior to starting design work, which includes the appropriate anthropometric data including appropriate clothing and personal protective equipment (PPE) adjustments for drivers, maintainers and guards who are expected to use the cab regularly.

G 2.1.6 Wherever practicable, the visual field directly in front of the driver (when in the driving position) is reserved for siting primary controls and instruments vital to the continuing safe operation of the train. Their locations reflect their importance, frequency, function and sequence of use. The amount of head and eye movements needed by the driver is taken into account, with the objective of maximising the driver’s visual concentration on track and signals.

G 2.1.7 Where fitted in GB driving cabs, the following controls and instruments are located to be operable and/or viewable by the driver whilst at the main driving position:

a) Passenger alarm acknowledgement and indicator. Requirements for the passenger alarm system are set out in BS EN 16334-1:2014+A1:2022;
b) Fire extinguisher delay system;
c) On-train camera/monitor (OTCM) system displays for use with driver controlled operation (DCO). RIS-2703-RST sets out requirements for DCO OTCM system monitors;
d) Controls for automatic coupling and uncoupling;
e) Controls and indicators for radio electronic token block (RETB). GKGN0554 provides guidance on RETB equipment;
f) Driver's reminder appliance (DRA). Clause *3.1* sets out requirements for the DRA;
g) Depot whistle; and

h) Platform monitors or mirrors.

G 2.1.8 RSSB research report T698 (2008) gives guidance on human factors assessment of cab design which includes holding a start-up meeting to discuss requirements for any re-design project, the identification of user requirements based on human factors good practice desk design, a review of statistics documenting current musculoskeletal injuries in drivers that are caused by cab design, integration of the user requirements in the cab design process and assessment, mock-up, finalising of user requirements and testing in an operational setting.

G 2.1.9 Good practice is to assess the design of the driving cab to evaluate whether the design supports human performance and does not cause adverse health or musculoskeletal issues for operators or increase the risk of human error. The likelihood of achieving a suitable design will be improved by early engagement and continuous integration of human factors throughout the design process. This includes engaging with human factors experts, applying human factors methods and anthropometric data, engaging with end users and using computer aided design (CAD) as a method of evaluating cab designs before they are built. The Musculoskeletal Risk Assessment for Train Drivers (MAT) tool developed by RSSB research report T940 (2012) can be used to assess and manage the risk of musculoskeletal disorders for train drivers by comparison of cab dimensional data with anthropometric data, and risk assessment of the driving tasks to be performed.

G 2.1.10 BS EN 16186-1:2014+A1:2018 sets out upper and lower values of anthropometric data that have been used in defining the requirements of that document. These values are based on body data from European countries, and may not be appropriate for use in vehicles that will only operate domestically on the GB mainline railway. Alternative anthropometric data sets are available in PD CEN ISO/TR 7250-2:2011+A1:2013 and in PeopleSize 2020.
PD CEN ISO/TR 7250-2:2011+A1:2013 contains various national data sets, but it does not include data for the UK. In the absence of a PD CEN ISO/TR 7250-2:2011+A1:2013 data set for the UK, recent RSSB human factors projects have used the PD CEN ISO/TR 7250-2:2011+A1:2013 data set for Germany as a close approximation for the UK population. PeopleSize 2020 is a commercially available product that has traditionally been used by the GB mainline railway industry and which includes data for the UK population. *Appendix C.2* includes good practice on using the data set that has the greatest range for the dimensions of interest.

G 2.1.11 The LOC&PAS NTSN requires that a multiple unit or locomotive is able to continue to be driven to a firefighting location in the event of a fire on board. This may require the activation of an onboard fire extinguishing system to be delayed, for example in the case where activation of the fire extinguishing system would disable the traction system. BS EN 16186-2:2017 states that it is prohibited for there to be any means for the driver to interfere with the fire extinguishing system, thereby disabling or deactivating it (for example by placing the train into a maintenance mode). This does not prevent the driver operating the system as designed, such as delaying the activation of the system to enable the vehicle or unit to continue to a firefighting location.

G 2.1.12 The colour-coding of the brake pipe and main reservoir pipe icons shown in BS EN 16186-2:2017 is the reverse of normal GB practice. Normal GB practice is to

colour the brake pipe red and the main reservoir pipe yellow as set out in GMRT2045. Users of this standard may adopt the brake pipe and main reservoir pipe icons shown in BS EN 16186-2:2017 but use the same colour coding as set out in GMRT2045.

G 2.1.13 The direction of operation and labelling of the driver's traction and brake control set out in BS EN 16186-2:2017 are the reverse of normal GB mainline practice. For GB domestic vehicles, Annex F of BS EN 16186-2:2017 permits the application of the brake by movement of the handle away from the driver. This reflects the GB specific case in the LOC&PAS NTSN clause 7.3.2.19. For more information see GMRT2045.

G 2.1.14 The LOC&PAS NTSN sets out requirements for storage space located in or near the driving cab for equipment that may be used in an emergency situation. RIS-2730-RST sets out requirements and guidance for emergency and safety equipment to be carried on board trains, including equipment to be located within the driving cab.

G 2.1.15 An outcome of RSSB research project T1273 (2022) indicated that a horn and power brake controller located closely together can make simultaneous operation of both the brake and horn difficult in an emergency scenario. Separating the horn and power brake controller and placing them on opposing sides of the cab desk, whilst remaining in reaching distance, may reduce the risk of their operation being problematic for the driver.

2.2 Guidance on auxiliary driving positions

Guidance

G 2.2.1 BS EN 16186-2:2017 sets out design rules and guidance on the positioning of auxiliary driver's desks and control equipment. The LOC&PAS NTSN does not cover the subject of auxiliary driving positions, therefore their provision is not prohibited.

G 2.2.2 Where an auxiliary driving position is provided, GB practice is to:

a) Automatically limit the maximum speed that can be achieved when the vehicle is operated from an auxiliary driving position, with the limit being appropriate for the nature of the operations performed from that position, such as low-speed shunting movements or the initial movement away from a platform;
b) Ensure the driver is able to move easily from an auxiliary driving position to the main driving position whilst the train is in motion; and
c) Ensure that the train is automatically brought to a stand if the driver becomes incapacitated during the movement from auxiliary driving position to main driving position.

Part 3 Driver's Reminder Appliance (DRA)

3.1 Fitment of a DRA

3.1.1 Trains that operate in passenger service and perform station duties, other than those listed in *Appendix A.1,* and are either not equipped with European Rail Traffic Managment System (ERTMS) / European Train Control System (ETCS), or will operate over lines that are not equipped with ERTMS/ETCS, shall be equipped in each driving cab with a DRA that meets the requirements set out in clauses *3.2*, *3.3* and *3.4*.

Rationale

G 3.1.2 The DRA, when set, indicates to the driver that the signal ahead may be at danger and prevents the driver taking power. The DRA provides a reminder to the driver of the signal indication.

G 3.1.3 A DRA is not necessary when operating under ERTMS/ ETCS as the signalling system provides protection to prevent the train passing a signal at danger.

Guidance

G 3.1.4 RSSB-ERTMS-OC provides further guidance on the use of the DRA where ERTMS equipment is fitted.

G 3.1.5 GERT8000-TW1 Section 10 sets out when the DRA is to be used, if fitted.

3.2 DRA functionality

3.2.1 A DRA shall:

a) As a minimum, consist of a control permitting the DRA to be set and reset, and an indicator showing the DRA status;
b) Prevent the driver from taking power, only when set in the active cab and regardless of the status of the DRA in any other driving cabs of the train;
c) Except as set out in *b)*, not impede or be impeded by other controls and instruments, and not affect the correct and safe operation of other systems (trackside, trainborne or otherwise);
d) Have a means of isolation to enable the train to take power, for use when a failure of the DRA could result in the train being unable to take power; and
e) Be labelled 'DRA'.

Rationale

G 3.2.2 The control and indicator enable the driver to operate the DRA and receive feedback on the DRA status.

G 3.2.3 The driver sets the DRA when stopping, as set out in GERT8000-TW1 Section 10. By preventing the driver from taking power when set, the DRA protects against the driver inadvertently moving the train.

G 3.2.4 Enabling isolation of the DRA ensures that, in case of a failure of the DRA resulting in the train being unable to take power, the train is able to continue in service.

G 3.2.5 Preventing the functioning of the DRA from non-active driving cabs ensures that a set DRA in a non-active driving cab cannot prevent the driver from taking power.

G 3.2.6 Labelling the DRA equipment mitigates the risk of it being mistaken for other equipment.

Guidance

G 3.2.7 Requirements for the control and indicator are set out in clauses *3.3* and *3.4*. The control and indicator may be combined in a single component.

G 3.2.8 The DRA is a train safety system for the purposes of applying the requirements set out in clauses *6.2* and *6.3*, which set out additional requirements relating to the isolation of train safety systems.

G 3.2.9 GERT8000-TW5 sets out the rules for operation of a train with a defective DRA.

G 3.2.10 Requirements for the recording of the operational use of the DRA by the on-train data recorder (OTDR) are set out in RIS-2472-RST.

G 3.2.11 Additions to the functionality of the DRA or changes to the equipment design can be incorporated, as long they do not prevent the equipment from complying with the requirements set out in sections *3.3* and *3.4*.

G 3.2.12 Additional guidance for controls and status indicators in driving cabs is set out in clause *2.1*.

3.3 DRA operation

3.3.1 The DRA set and reset control shall:

a) Require a positive action by the driver to set the DRA and a positive action by the driver to reset the DRA;
b) Be operable by the driver when seated at the driving position; and
c) Be separate from the traction control device.

Rationale

G 3.3.2 Requiring a positive action to set and reset the DRA reduces the likelihood of accidental operation of the DRA switch.

G 3.3.3 Separating the DRA control from the power control device ensures that operation of the DRA is a separate action from that used to take power, and therefore reduces the likelihood that the DRA is reset automatically by the driver whilst taking power.

Guidance

G 3.3.4 The table in Appendix *DRA Control Types* sets out a range of acceptable control types and associated movements.

3.4 DRA status indicator

3.4.1 The DRA status indicator shall:

a) Illuminate to indicate that the DRA is set and remain lit for as long as the DRA remains set;
b) Emit a steady light, red in colour and visible in all lighting conditions;
c) Be positioned within the driver's primary vision area; and
d) Be clearly identifiable by the driver from the driving position.

Rationale

G 3.4.2 The requirements ensure that the driver is provided with a clear, visible indication of the DRA status.

Guidance

G 3.4.3 BS EN 16186-2:2017 sets out general requirements for indicators in the driving cab, but does not specifically reference the DRA, as this is a GB domestic requirement.

Part 4 Driver-Controlled Operation (DCO) and Driver-Only Operation (DOO)

4.1 General

Guidance

Note: The following clauses have been renumbered, but the text remains unchanged.

G 4.1.1 RIS-2703-RST sets out requirements for on-train cameras and monitors used in Driver-Controlled Operation (DCO) and Driver-Only Operation (DOO).

G 4.1.2 RIS-3703-TOM sets out requirements and guidance for the development, review and implementation of passenger train dispatch processes, including considerations for DCO and DOO.

G 4.1.3 RIS-8060-CCS sets out requirements for equipment used in the dispatching of DCO and DOO passenger trains from platforms.

4.2 Door controls for DCO and DOO

4.2.1 If DCO or DOO requires the driver to move from the main driving position to a side-window to view platform-mounted equipment or to look back along the train, then passenger door controls and a driver's activity control input device shall be provided for use whilst the driver is positioned at the window.

Rationale

G 4.2.2 Positioning door controls for use whilst the driver is positioned at the side-window enables the doors to be closed whilst the driver has a full view of the platform.

G 4.2.3 Positioning a driver's activity control input device for use whilst the driver is at the side-window ensures that the driver's activity continues to be monitored whilst viewing the platform.

Guidance

G 4.2.4 Requirements for the driver's activity control function are set out in the LOC&PAS NTSN. It performs the functions previously covered by the driver's safety device (DSD) and driver's vigilance equipment.

G 4.2.5 It may be necessary to consider, as part of the design process, the time necessary to move from the side-window to the main driving position, when defining the value of the time period after which the driver's activity control function triggers an alarm.

Part 5 Cab Access and Egress

5.1 External access to driving cab

Guidance

G 5.1.1 The LOC&PAS NTSN, BS EN 16186-4:2019 and BS EN 16116-1:2013 set out requirements and design rules for external access to the driving cab, including dimensions and characteristics of equipment, doors and steps that are appropriate for use by train staff. The requirements of these documents may not be sufficient or compatible with GB mainline railway infrastructure, such as reduced gauge clearance or operation over third-rail energy infrastructure.

G 5.1.2 It is good practice for the means of access and egress between vehicle and trackside to be ergonomically assessed. This assessment can consider, for example:

a) Signage; and
b) Access / egress over external obstacles (for example third-rail energy infrastructure).

G 5.1.3 Where the driver's access to the driving cab is via a vestibule that is also used by passengers, the following arrangements ensure that the vestibule is free of passengers whilst the driver is occupying the cab:

a) The internal door between the vestibule and adjacent passenger saloon is kept locked while the driver is occupying the driving cab;
b) Whilst the internal vestibule door is locked, control over the respective bodyside doors is available only to train crew;
c) From within the vestibule, the locked internal vestibule door can be opened without the need for a key or tool, to enable emergency egress; and
d) From within the saloon, the locked internal vestibule door can be opened only using a security key or emergency release device.

G 5.1.4 Structural requirements for external access doors are set out in GMRT2100.

G 5.1.5 Drivers can be expected to use an external cab door to perform dispatch duties. This can be problematic due to door interlocking as the vehicle cannot be moved unless all doors are closed and locked but the door needs to remain open during the dispatch process. *Part 7* sets out requirements and guidance for openable windows that can be installed to overcome this problem.

G 5.1.6 The design of cab-to-saloon door locks so that they can only be opened by specialist keys provides additional safety and security of the driving cab, and restricts general access for passengers. The cab-to-saloon door, and its associated lock, can also benefit from a design that withstands access by hand tools for a defined period of time.

5.2 Cab access illumination

5.2.1 If drivers are expected to exit and enter the vehicle to / from ballast level, the following items shall be illuminated by a light fitted to the vehicle:

a) The entry / exit steps to the vehicle; and

b) The ballast area below the rail level in the immediate vicinity of the steps.

Rationale

G 5.2.2 Drivers are expected to operate vehicles during hours of darkness and may struggle to see where to place their feet when entering / exiting the cab to / from ballast level if there is no source of illumination, which is typical in yards and sidings.

G 5.2.3 RAIB report 02/2023 Figure 7 gives a still image of a reconstructed scenario showing a detached conductor rail board. During the reconstructed scenario, the detached conductor rail board was contacted by the boot of the person climbing down from the driving cab on four out of five occasions, which can therefore be considered as a tripping hazard.

Guidance

G 5.2.4 When determining the luminance of the entry / exit steps and ballast area, BS EN 12464-2:2014 gives guidance on directional lighting that can be used to highlight objects.

G 5.2.5 Placement of a light source which is too bright or points in the direction of travel can result in other drivers being dazzled and result in them stopping the train that they are operating.

G 5.2.6 Off-train illumination provides a method of illuminating the entry / exit steps to the vehicle and the ballast area below the rail level in the immediate vicinity of the steps, but this is not typically provided in all locations where rolling stock can operate such as sidings in remote locations.

Part 6 Isolation of Train Safety Systems

6.1 Restrictions on isolation of train safety systems

6.1.1 It shall not be possible for the driver to isolate the following train safety systems whilst the train is moving:

a) Driver's activity control function;
b) Passenger alarm;
c) Train speed indication;
d) Any emergency brake devices which are remote from the active driving cab; and
e) DRA.

Rationale

G 6.1.2 Train safety systems, when operated, provide protection by bringing the train to a stand in an emergency situation. It is therefore essential to prevent these systems being isolated when the train is in motion.

Guidance

G 6.1.3 It is good practice to position safety system isolation devices beyond the reach of the driver when seated at the normal driving position.

G 6.1.4 The LOC&PAS NTSN sets out requirements for the passenger alarm. Regulation 4 of the Railway Safety (Miscellaneous Provisions) Regulations 1997 requires train operators to have, within passenger trains, a means whereby passengers can communicate to the driver that there is an emergency and, if necessary, stop the train.

G 6.1.5 Requirements for the driver's activity control function are set out in the LOC&PAS NTSN. The driver's activity control function performs the functions previously covered by the DSD and driver's vigilance equipment by monitoring the driver's activity. The driver's activity control function provides an alarm and then applies the train's brakes if, for a specified time, either:

a) No activity is detected; or
b) A single continuous activity is detected.

G 6.1.6 RIS-0775-CCS sets out requirements for the isolation of AWS and TPWS equipment.

G 6.1.7 RIS-2472-RST defines requirements for the recording of isolation of safety systems on the OTDR.

6.2 Indication of isolated train safety systems

6.2.1 If a means of isolating any train safety system is provided, then isolation of that system shall display a reminder, located in the driving cab and visible to the driver, indicating that the system is isolated.

Rationale

G 6.2.2 An indication to the driver that a safety system is isolated identifies that the train should be operated in line with the requirements set out in Rule Book module GERT8000-TW5.

Guidance

G 6.2.3 System-specific isolation requirements are set out in RIS-0775-CCS for AWS / TPWS and in RIS-0799-CCS for ERTMS/ETCS.

G 6.2.4 It is permissible to provide a general isolation indicator in the cab backed up by detailed indicators, identifying the isolated system(s), that may be remote from the cab. It is also permissible to provide a general isolation indicator on the train management system (TMS), so that the TMS can be interrogated to identify the isolated system(s).

G 6.2.5 Best practice is to ensure that the reminder is visible and continues to be visible in the event of loss or failure of any of the power supply systems to or on the train.

G 6.2.6 A train safety system performs one or more of the following functions:

a) Supports the correct interdependency between the train crew and train controls
b) Supports the correct interdependency between the train crew and other infrastructure based safety systems (including signals and signs to be observed)
c) Supports the correct interdependency between the train controls and other infrastructure based safety systems
d) Supports the correct interfacing between the train and any people on or near the track
e) Permits communications between the train crew and passengers in an emegency
f) Permits communications between train crew members and between train and track based systems.

6.3 Resetting of isolated train safety systems

6.3.1 Except where resetting of train safety systems is required as part of routine operational duties, train safety systems shall be designed so that they cannot be reset after isolation by train crew.

Rationale

G 6.3.2 This requirement, together with the requirement of clause *6.2*, ensures that it is clear that a train safety system has been isolated, so that appropriate corrective actions can be taken.

Guidance

G 6.3.3 Resetting of isolated train safety systems can be performed by maintenance staff.

G 6.3.4 To indicate to train staff that resetting of isolated train safety systems is not possible, except by maintenance staff, a 'break seal' arrangement may be employed. This arrangement also visibly records the isolation of the train safety system. Information provided by remote condition monitoring systems may also provide a record and indication of the isolation of a train safety system.

Part 7 Side glazing and windows

7.1 General

Guidance

G 7.1.1 Rolling stock driving cabs are typically installed with either side glazing or windows, which are located to the left and right of the driver's seated position.

G 7.1.2 Glazing is the transparent material inside held by a window frame, and therefore does not open. Windows open and glazing is a component of a window.

G 7.1.3 The typical position of cab side glazing or windows is shown in *Figure 1*.

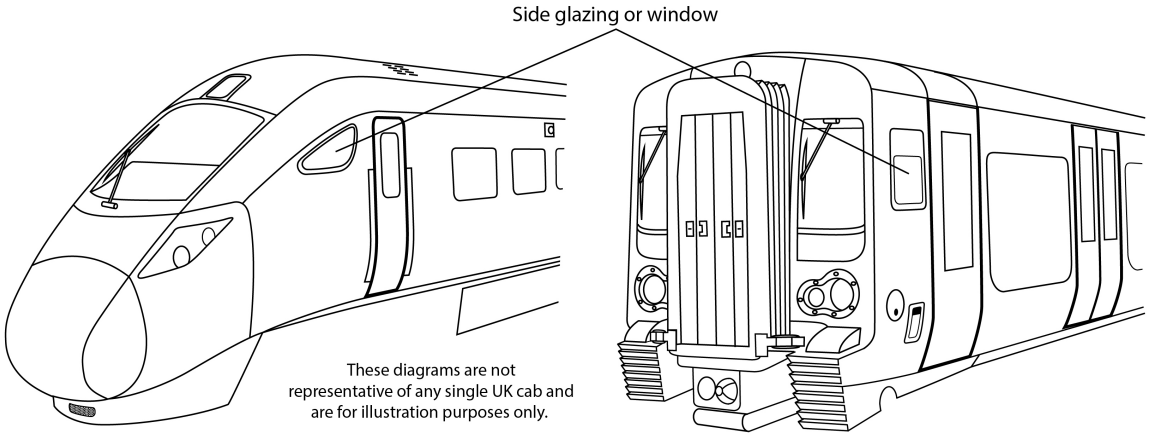

Figure 1: Typical cab side glazing or window location

7.2 Side glazing

7.2.1 Glazing shall be installed in each driving cab to the left and right of the driver's seated position.

7.2.2 Where side glazing is provided in the driving cab to enable the driver to view platform-mounted equipment (for example mirrors or CCTV monitors for DCO, or car stop markers), it shall not cause distortion of platform-mounted equipment that could mislead the driver or affect their judgement.

Rationale

G 7.2.3 The view through driver's side glazing supports operational requirements such as the correct alignment with platform stop car markers when stopping the vehicle and the observation of hand signals. Side glazing that is in line with the driver's seat, and not obscured, permits these tasks along with those for train dispatch.

G 7.2.4 Ensuring the driver has a view through the side glazing that is free of distortions / loss of visibility enables them to have an accurate view of the platform-mounted

equipment. This is necessary for them to be able to decide whether it is safe to start dispatch duties and to be able to stop the train effectively.

Guidance

G 7.2.5 The consideration of the following parameters support good side glazing design:

a) Variations in driver's seat adjustments such as longitudinal and height movement; and
b) Variations in the sitting or standing eye height of the driver; and
c) Consider the objects which are expected to be viewed through the window, such as DCO monitors and mirrors; and
d) Livery or decal placement so that they do not obscure the window.

G 7.2.6 Where side glazing is installed and can be expected to be used for viewing coloured objects, such as signals, the distortion of glazing can result in an optical effect that can alter colours seen by the driver. BS EN 15152:2019 sets out requirements and guidance for light transmittance for windscreens that can be used for side glazing to prevent such optical effects from occurring.

G 7.2.7 If glazing size and position is determined using 95th percentile anthropometric data, this can be problematic for 5th percentile drivers who may find the window placed too high up the side of the cab to see out of it with ease. It is considered good practice to create a target audience prior to starting design work, as given in guidance clause *2.1.5*.

G 7.2.8 Where vehicles operate in tunnels that are installed with lights, or next to locations where lights are at the same height as the side glazing, such as roads and low-level sidings, light strobing may occur through the side window which can be a distraction to the driver. A blind that can be lowered by the driver when passing through such locations prevents this distraction from occuring.

G 7.2.9 Reflections can appear in side glazing as a result of other cab instruments that emit light, such as illuminated push-buttons and indicators, and may result in the driver not being able to see objects on the other side of the glazing clearly.

G 7.2.10 It is important to keep glazing clean and smear free to provide an unobstructed view to the outside of the vehicle by the driver.

G 7.2.11 Identification of the uses for side glazing, such as viewing on-platform screens or mirrors, platform and signal sighting can aid in determining the size of the side window.

G 7.2.12 Items such as stop-car markers may be placed at a higher point in a station than items such as on-platform screens or mirrors, and signage may be placed on the opposite side of the vehicle to the driver if they are operating a train with a corridor through the cab.

G 7.2.13 The following standards set out requirements and give guidance on operational, infrastructure and control, command and signalling (CCS) features that may be considered when determining the size of side glazing:

a) RIS-7016-INS;
b) RIS-3782-TOM;

c) RIS-0737-CCS;
d) RIS-8060-CCS.

G 7.2.14 RSSB research report T1175 (2021) set out to determine technologies that are available to advise drivers of correct platform stopping positions, which may also be useful when determining the size of side glazing.

G 7.2.15 BS EN 16186-1:2014+A1:2018 gives a definition for a seat reference point (SRP). The SRP can be used to determine the placement of a cab side glazing where the seat position is critical to its location.

G 7.2.16 Requirements for the optical characteristics of driving cab windscreens are set out in the LOC&PAS NTSN. The LOC&PAS NTSN is silent on optical characteristics for cab side-windows.

7.3 Side window

Guidance

G 7.3.1 LOC&PAS NTSN clause 4.2.9.1.3.2 sets out requirements for rear and side view of the vehicle, which includes the option of opening side windows or panels at each side of the cab. Where the term side panel is used, this is considered to be a side door, typically providing access or egress to or from the driving cab.

G 7.3.2 LOC&PAS NTSN clause 4.2.9.1.3.2(2) sets out a requirement for a cab window that is capable of opening to be sufficiently large for the driver to put their head through the aperture. In addition to this, a 95th percentile head and both shoulders, as well as necessary clothing adjustments, can be useful to determine the window size which may be applicable when trains are being designed that operate on lines where forms of authority, such as tokens, are required to be passed between the driver to other staff through the window.

G 7.3.3 Safety Management Intelligence System (SMIS) data indicates that injuries are sustained by drivers due to the poor design or maintenance of driving cab windows, such as having to use an awkward motion or excessive force to open or close the window. BS EN 16186-4:2019 sets out requirements for the maximum forces to fully open and close the window.

G 7.3.4 If a side window is designed to be a means of emergency evacuation, BS EN 45545-4:2013 clause 4.3.3.1(c) sets out the minimum dimensions of the side window.

G 7.3.5 Openable side windows can improve driver operation of trains that operate on lines fitted with train crew operated level crossings. Positioning the window so that the driver can operate the level crossing control equipment whilst observing the level crossing area through the cab windscreen enables the driver to stop the level crossing closure sequence quickly if they observe a hazardous situation in the level crossing area.

G 7.3.6 Where there is not a station platform on the approach to a train crew operated level crossing, the level crossing control equipment for the level crossing typically comprises a pull cord arrangement mounted alongside the track. The pull cord is positioned so

that it can be operated by the driver via a side window without them having to leave the train.

G 7.3.7 Train crew operated level crossing control equipment is typically configured so that the pull cord can be used to both start and stop the level crossing closure sequence.

G 7.3.8 Cab side windows that can be opened typically use a mechanism which permits the window pane to move up and down within the bodyside of the vehicle. Other types of opening and closing, such as a window that opens outwards, pose a risk of fouling infrastructure.

G 7.3.9 Horizontally sliding side windows can unintentionally close and cause injury to drivers, such as during sudden or harsh braking applications.

G 7.3.10 Modern rolling stock can be fitted with side windows that are hinged and open inwards. Such windows also typically have large rubber seals and mechanical locks fitted to prevent water and air (wind) ingress.

G 7.3.11 A side window that opens can impact the performance of heating, ventilation and air conditioning (HVAC) systems.

G 7.3.12 Side windows that can be opened increase the likelihood of:

a) The possible ejection of articles from the vehicle; and
b) The capability for the driver to be injured.

G 7.3.13 Spring-loaded droplights can cause injury to drivers, if the spring force is sufficient to overcome the force exerted by the user and strike their body whilst their head is extended through the window to support the dispatch of the train.

Part 8 Thermal Comfort

8.1 General

Guidance

G 8.1.1 Thermal comfort is a term used to indicate a comfortable workplace temperature and includes six factors which are:

a) Air temperature;
b) Radiant temperature;
c) Air movement and speed;
d) Humidity;
e) Clothing;
f) Personal protective equipment (PPE); and
g) Work rate and metabolic heat.

G 8.1.2 The Health and Safety Executive (HSE) advise that feeling uncomfortably hot or cold can result in unsafe behaviour and affect decision making and/or manual tasks, for example:

a) People may take short cuts to get out of cold environments;
b) Workers might not wear personal protective equipment (PPE) properly in hot environments;
c) A worker's ability to concentrate may start to drop off, which increases the risk of errors.

G 8.1.3 HSE gives guidance on assessing and controlling thermal comfort (HSE, 2007).

G 8.1.4 RSSB research report S359 (2021) provides information on the use of solar reflective materials that can reduce the temperature inside driving cabs.

8.2 Air Conditioning

8.2.1 Air conditioning for driving cabs shall be designed to, and operate in accordance with, BS EN 14813-1:2006+A1:2010.

Rationale

G 8.2.2 BS EN 14813-1:2006 is a European standard that sets out requirements and guidance for air conditioning in driving cabs and specifies the comfort parameters for the driving cab to ensure driver comfort.

G 8.2.3 BS EN 14813-1:2006 supports the optimal operation of driving cab air conditioning.

Guidance

G 8.2.4 HVAC systems in non-active driving cabs do not typically permit other members of onboard staff to adjust the controls and are automatically set to the same temperature as the saloon when a cab is deactivated. This prevents driving cabs from being too hot or too cold when a driver comes to operate the vehicle, which may otherwise result in a delay whilst the temperature is adjusted.

G 8.2.5 If a driving cab is fitted with vents that direct air on to a driver's face, adjustment to be able to redirect the air, or the ability to close the vent, prevents the driver from becoming distracted or frustrated that is caused by the air being applied to their face or from the noise caused by the air conditioning.

Appendices

Appendix A Vehicles for which fitment of a DRA is not required

Note: The content of this appendix forms part of requirement *3.1.1*.

A.1 Vehicles used for passenger services

Guidance

G A.1.1 Driving cabs of the following types of vehicle, used for passenger services, are not required to be fitted with a DRA, although a DRA may still be fitted if desired:

a) Vehicles of the following classes:

- Class 33;
- Class 37;
- Class 47;
- Class 73;
- Class 82.1 (Mk 3 DVT);
- Class 86;
- Class 90;
- Class 373 (fitted with brake interlock switch);

b) All London Underground Ltd trains and Tyne and Wear Metro trains;
c) Driving Brake Standard Open (DBSO) vehicles;
d) Infrequently used cabs, such as the the No. 2 end of a Class 91;
e) Steam locomotives and other preserved traction units used for heritage services;
f) Where a train is fitted with automatic train protection (ATP) or tripcocks as means of controlling the risk of passing a signal at danger, and is confined to routes equipped with that means of control.

A.2 Vehicles used for non-passenger services

Guidance

G A.2.1 Driving cabs of the following types of vehicle, used for non-passenger services, are not required to be fitted with a DRA:

a) Freight and shunting vehicles used for limited passenger train operations;
b) Vehicles not scheduled to perform station duties (including freight trains and Class 325 EMUs); and
c) Infrastructure monitoring vehicles.

Appendix B DRA Control Types

Note: The content of this appendix is intended as guidance in support of requirement *3.3.1*.

B.1 Table of agreed DRA control types

Guidance

G B.1.1 The DRA control may be selected from the table below, which sets out a variety of permissible control types and associated movements.

Control type		**Movement**	**Set**	**Reset**
1	**Rotary***	**Rotation**	**Clockwise**	**Anti-clockwise**
2	Toggle	Horizontal alignment	Right	Left
3	**Toggle***	**Vertical alignment**	**Down**	**Up**
4	Rocker	Horizontal alignment	Right in	Left in
5	Rocker	Vertical alignment	Bottom in	Top in
6	Latching	Push/push	Push in	Push in
7	**Latching***	**Push/pull**	**Push in**	**Pull out**
In order to promote consistency, good practice is to use control type 1, 3 or 7, as shown in bold.				

Table 1: DRA control types and movements

Appendix C Human factors guidance for driving cabs

C.1 Cab noise

Guidance

G C.1.1 In-cab noise from external sources, such as passing trains or maintenance vehicles, can distract the driver or cause injury if sufficiently loud. The Noise (NOI) National Technical Specification Notice (NTSN) sets out requirements for driving cab interior noise. The Health and Safety Executive (HSE) also provides good practice guides for managing noise risks.

G C.1.2 In-cab noise from internal sources, such as alarms and alerts, can also distract the driver or cause injury if sufficiently loud. RSSB research project T326 (2006) gives good practice for managing alarms and alerts, including how high alarm levels in decibels (dB) are set above the ambient noise level of the cab and how to manage fluctuating noise levels. In addition, it can be useful to verify the audibility of alarms and alerts with a practical assessment.

G C.1.3 LOC&PAS NTSN clause 4.2.9.3.4(5) sets out a requirement for the minimum decibel level, above the background noise level in the cab, for audible alarms and alerts generated inside the cab.

G C.1.4 GMRT2161 sets out requirements for the audibility of detonators in driving cabs, which may be considered in combination with guidance given in clauses *G C.1.1*, *G C.1.2* and *G C.1.3* when determining the acoustic properties and performance of a driving cab.

C.2 Cab layout

Guidance

G C.2.1 Throughout the development of a driving cab, a human factors integration plan defines how human factors will be managed through all project phases including bid, design, development, verification and validation, installation, operation and maintenance with active end user participation throughout. The goal of the human factors activities is to demonstrate compliance with all relevant human factors requirements, identify and mitigate human factors related risks, support the wider approvals process and enable the cab to be accepted for use in operational service. A human factors integration plan can identify the scope of the project in relation to the users, clarify the HF requirements, identify the HF activities to be completed at each stage of the project lifecycle in relation to the requirements, and the deliverables that will be produced to demonstrate compliance and gain approval. BS EN ISO 6385:2016 Ergonomic principles in the design of work systems and the ISO 9241 series standards for ergonomics of human-system interaction support the design of a human factors integration plan as well as the Office of Rail and Road (ORR) webpage on human factors integration, its objectives, principles and evidence ORR looks for.

G C.2.2 The LOC&PAS NTSN sets out the requirement to use driver anthropometric data, with further reference to UIC 651 4th edition, July 2002. Additionally, the BS EN 16186 series of standards and BS EN ISO 15537:2022 set out requirements and guidance on

anthropometric data sets and PeopleSize 2020 is a commercially available anthropometric data set and includes data for the UK population.

G C.2.3 It is good practice for cabs to cater for 5th to 95th percentile in all dimensions and to consistently use one anthropometric data set from *G C.2.2* across all cab design aspects. This allows the majority of users to be able to move around the cab freely and comfortably and may influence the positioning of the driving seat.

G C.2.4 LOC&PAS NTSN clause 4.2.9.1.2.2 sets out a requirements for the interior evacuation point in a cab to be free from obstruction to allow for emergency evacuation. Positioning cab seating and equipment at least 400 mm from the exit point can aid evacuation and supports the LOC&PAS NTSN requirement.

G C.2.5 BS EN 16186-4:2019 sets out a requirement for the cab to be 1800 mm high for a width of 1200 mm. Having a width of 1200 mm throughout the cab can support free movement of the driver. BS EN 16186-4:2019 part 6 sets out requirements and gives guidance on other points of consideration when determining driving cab dimensions.

G C.2.6 Positioning of the driver's seat within the cab can directly have an influence on the driver's ability to move around within the cab. To reduce the risk of the driver experiencing physical strain and contortion when moving in to, out of and around the seat, it is good practice to place driver's seats so that:

a) The driver can move easily in and out of the seat; and
b) The driver can move around the seat.

G C.2.7 Foldable armrests can be provided on each side of driver's seats to provide support for the driver's arms when not undertaking driving activities. Armrests are useful in reducing physical strain on the neck, shoulders and upper back.

G C.2.8 The inclusion of the following adjustable features in driver's seats can improve comfort and reduce musculoskeletal injury:

a) A backrest with lumbar support;
b) A headrest;
c) Height controls;
d) Lateral movement controls;
e) Lockable seat swivel;
f) Lockable tilt controls.

G C.2.9 The LOC&PAS NTSN sets out requirements for the positioning of driver's seats within the cab so that the train can be operated whilst the driver is either seated or standing.

G C.2.10 A central driving position supports:

a) The capability to freely move around the cab as a result of a natural walkway behind the driver's seat; and
b) The ability to look out of all windows with ease without causing discomfort.

G C.2.11 An outcome of RSSB research report T1273 (2022) indicated that a horn and power brake controller located closely together can make simultaneous operation of both the brake and horn difficult in an emergency scenario. Separating the horn and power brake controller and placing them on opposing sides of the cab desk, whilst remaining

in reaching distance, may reduce the risk of their operation being problematic for the driver.

C.3 In-cab amenities

Guidance

G C.3.1 Where cup holders or places for a cup are provided in a driving cab, their location can result in scalding or burning if a spillage occurs because of the driver accidentally knocking the cup over or due to the ride quality being poor on certain routes. Placing cups out of the usual range of motion of the driver and in a location that is greater than ninety degrees from the direction they are facing can mitigate injury.

G C.3.2 The inclusion of litter bins in cabs aids a clean and tidy workplace and reduces instances of spillages from disposable coffee cups.

G C.3.3 Charging points, such as 230 V ac sockets and Universal Serial Bus (USB) charging points can be useful for:

a) Drivers if they may be permitted to use mobile telephones or computer tablets as part of the driving tasks; and
b) Staff performing training who require additional work equipment to perform their duties; and
c) Additional staff during degraded operations when a second person may be in the cab.

G C.3.4 A reading zone allows documents to be read safely, without the risk of accidentally enabling switches and controls. LOC&PAS NTSN clause 4.2.9.1.6(2) sets out a requirement for the size of a reading zone, and 4.2.9.1.8(2) sets out a requirement for the luminance of the reading zone.

G C.3.5 Universal mounting points for mobile phones and tablets, where they are used as driving aids, can be useful for a driver and prevent such equipment from moving during vehicle operation.

G C.3.6 Depending on the role, size and design characteristics of a locomotive, additional welfare facilities, such as fridges and cooking equipment, can support drivers in such instances where they are expected to work long distances through remote areas.

C.4 Lighting conditions

Guidance

G C.4.1 When creating a target audience description prior to starting design work, it can be useful to assess the possible visual discomfort of individuals within the target audience under a range of lighting conditions, as is suggested in RSSB research report S329 (2018), as an effective way to determining the quality of a lighting installation.

G C.4.2 LOC&PAS NTSN clause 4.2.9.1.8 sets out requirements for lighting in the driving cab.

G C.4.3 The addition of lighting in cab storage areas can support drivers in identifying personal effects or articles of concern.

G C.4.4 Illuminating emergency equipment within the cab can aid the driver in finding items during poor visibility or darkness.

C.5 Positioning of screens and equipment to alleviate the impact of glare and reflections

Guidance

G C.5.1 The location and specification of screens and equipment can result in increased glare and reflections. Adjustable control panels where the angle of the screen can be changed by the driver before they begin the driving task can mitigate glare and reflections.

G C.5.2 BS EN 16186-3:2022 sets out requirements and gives guidance on driver's displays, which includes luminance levels, colours and user/display interaction.

G C.5.3 Some driving cabs have numerous screens within them for different functions such as for the train control and management systems (TCMS), European train control system (ETCS), driver advisory system (DAS) and driver only operation (DOO) cameras. Having numerous, larger screens within the driving cab can lead to a greater risk of glare and reflections.

C.6 Tinted glazing in the driving cab

Guidance

G C.6.1 Tinting driving cab glazing can improve thermal comfort by decreasing cab temperatures as a result of the reflection of sunlight, and improve energy consumption of the vehicle through a reduction in the work cycle of air conditioning equipment. Ceramic window tints are the most effective type of tint.

G C.6.2 The use of tinted glazing layers in the driving cab protects drivers from ultraviolet (UV) A and B radiation, mitigating drivers' risk to sun burns and skin cancer.

G C.6.3 The effects of glare can be reduced by applying tinted glazing layers. Tint with a high visual light reflected (VLR) value is most effective for reducing glare.

G C.6.4 Tinted glazing with low visual light transmitted (VLT) values can result in hazards and trackside signals being harder to interpret. Using tinted glazing layers with high VLT values allows more light to pass into the cab. Darker tints with a higher VLT values are typically found in driving cabs with lighter tints applied in passenger areas.

G C.6.5 Using tinted glazing can create a shift in the percived colour of signals. Glazing tints with a strong blue coloured hue can absorb significant amounts of red or green light. As a result, a red signal may appear darker or even purple depending on lighting conditions and the tint VLT value. BS EN 15152:2019 sets out the requirements for the allowed maximum colour shift a cab windscreen can cause.

G C.6.6 BS 857:1967 sets out requirements and gives guidance for the visual transmission of light through toughened glass on a windscreen.

G C.6.7 The use of specific glazing tint types in the driving cab can interfere with wireless signals to and from the vehicle. Metallic glazing tints can also interfere with wireless signals and risk interfering with work devices such as mobile phones.

C.7 Glare and reflections

Guidance

G C.7.1 A methodology for assessing glare can mitigate risk of driver injury and improve safety; however, the LOC&PAS NTSN does not consider glare discomfort, rather the impact glare can have on the operation of a vehicle.

G C.7.2 A reference cube can be used throughout glare testing to provide points at which glare is measured. GMRT2161 sets out requirements and gives guidance on establishing a reference position within the driving cab.

G C.7.3 Glare can be measured either objectively or subjectively. Using subjective ratings can provide a more pragmatic approach. Using the de Boer rating scale for glare discomfort for a given light intensity experienced by a driver can inform the types of measures that may be put in place to alleviate the impact of glare.

G C.7.4 Throughout the testing of glare from external sources, using a powerful light source can cause significant discomfort to the assessor and potentially cause injury. A weak light source, however, can fail to simulate real life light intensity that would be produced from real-world sources such as sunlight. A middle ground solution can provide a suitable compromise between maximising light intensity and minimising the discomfort of the person conducting the assessment. A DCA Design International and Hitachi Rail Europe report (2011) on applied ergonomics gives guidance on the type of light source for such an assessment giving a power value of 2000 W to simulate light from external sources during glare testing.

G C.7.5 Simulation software is available to support the assessment of glare in the driving cab.

G C.7.6 The BS EN 12464 series of standards for the light and lighting of workplaces can be used as guidance to support the effective testing of glare.

G C.7.7 Reflections can be caused on HMIs due to internal and external lighting sources. Sunblinds typically reduce external reflections; however, internal reflections can be caused by numerous different sources. Using halo type internal indicator lights for system indicators that are expected to be illuminated for a significant length of time, as well as considerations towards apparel such as white and reflective garments, can reduce the impact of reflections for the driver.

G C.7.8 Continuously illuminated indicators placed on the cab back wall reflect on to the drivers windscreen and HMIs and are problematic, particularly during hours of darkness or when travelling through tunnels. An assessment of the location of continuously illuminated indicators and their location in relation to windscreens and HMIs reduces the likelihood of them causing a reflection.

G C.7.9 The addition of guarding / shielding around instruments, indicators and screens which are expected to be visible at all times during the driving task can reduce the likelihood of them being indistinguishable. Verification of their visibility after initial train testing can help identify where guarding / shielding may need to be installed as train

orientation and route differences often cause variations in sunlight intensity and angle throughout the year.

C.8 Driver's Safety Devices (DSD)

Guidance

G C.8.1 Drivers can be sat for extended periods with pressure being applied to the driver's safety device (DSD) pedal, which can lead to discomfort and injury. A survey of 950 Southern Railway train drivers by the ORR (2013) indicates that this has been a problem for some time, with the main concerns being the awkward angle of operation, the excessive force required in some designs to depress the pedal and off-centre positioning of pedals.

G C.8.2 The Gary Davis Associates report (April 1994), although dated, indicated that of the cabs surveyed for the report, driver's seats did not go low enough to accommodate comfortable foot operation of the DSD pedal for shorter drivers, resulting in the driver sitting further forward to operate the DSD with the ball of their foot and compromising any postural support gained from the seat back.

G C.8.3 Additionally, the supporting Gary Davis Associates report (March 1994) indicates that floor mounted DSD pedals being height adjustable may alleviate some of the problems identified and that a given resistance is useful for hinged pedals. Further, good practice is to design hinged pedals as follows:

a) With a large area to reduce local pressure under the foot; and
b) Not to travel more than 100 mm for leg movement and 65 mm for ankle flexion; and
c) To maintain an angle between the upper and lower leg of 105˚ to 110˚ for pedal pressures under 22.7 kg.

The Gary Davis Associates report (March 1994) also gives the value for resistance required to overcome a resting foot as 1.8 kg to 3.2 kg.

G C.8.4 Adjustable height DSD pedals can prevent operational errors through supporting better foot placement.

G C.8.5 Regular maintenance of the DSD pedal which includes the removal of dirt and debris from around the pedal and checking the spring pressure is appropriately set can prevent equipment failure and reduce the risk of musculoskeletal injuries through the application of excess force on to the pedal to maintain operation.

G C.8.6 It is good practice to design a DSD pedal to prevent the ingress of small objects, such as stones; this can result in better DSD pedal performance and reduce instances of pedal failure.

C.9 Second Person's Position

Guidance

G C.9.1 Second persons' seats can be fitted to cabs where it is necessary for other members of operational staff, such as driver instructors or assessors, to be present whilst the vehicle is in operation.

G C.9.2 When a driver is undertaking training, they may be in control of the vehicle but not the one responsible for its safety. Therefore, where possible, it is considered good practice for the second person's seat to mirror the functionality and comfort of the primary driver's seat as this can be where the person responsible for the safety of the vehicle is sitting.

G C.9.3 Where it is not possible for the functionality and comfort of the second person's seat to mirror the primary drivers seat, the following features can improve the comfort of the other member of operational staff:

a) A back rest with lumbar support;
b) Fully adjustable controls that facilitate easy adjustment on the move.

G C.9.4 Second screens for monitoring HMIs and other cab monitors can be beneficial to operational training and assessment staff.

G C.9.5 To support operation during future events similar to the COVID-19 pandemic it could be beneficial for:

a) The second person's area to be easily cleanable; and
b) The cab to be designed so that the driver's area and the second person's area can be separated; and
c) The significant touch points in the cab to be highlighted.

Definitions

automatic train protection (ATP)	A system that continually checks that a train does not exceed the permitted speed or distance allowed by the signalling system.
Automatic Warning System (AWS)	A system that gives train drivers in-cab warnings of the approach to signals, reductions in permissible speed and temporary/emergency speed restrictions, and to apply the brakes in the event that a train driver does not acknowledge cautionary warnings given by the system within the specified time. Source: *GERT8075*
auxiliary driving position	A driving position for authorised movements which cannot be safely made from the main driving position and for which the full range of driving controls and the full viewing requirements cannot be provided.
Class B systems	Existing non-ETCS national signalling systems. **Note:** For list of Class B systems, see European Union Agency for Railways technical documents *List of CCS Class B systems, ERA/TD/2011-11, version 3.0*.
closed circuit television (CCTV)	A television system in which the video signal is not publicly distributed but is monitored, primarily for surveillance and security purposes. The monitoring may be undertaken by an operator in real time, or recorded for later analysis in the event of an incident. Equipment that is used for remote monitoring and supervisory purposes, usually at a station platform or level crossing.
detonator	A device placed on a running rail which explodes whem impacted by a vehicle wheel, causing an audible warning to the driver and to persons on or near the track in the vicinity of the train. Also known as Railway Fog Signals.
Driver Controlled Operation (DCO)	A method of working where the train driver is in control of the opening and closing of the train's doors.
Driver Machine Interface (DMI)	Provides indications to the driver of the system status, as well as allowing the driver to control selected system functions.
driver safety device (DSD)	A device to detect driver incapacity.
driver's primary vision area	The area within the cab viewable by the driver when at the driving position.
driver's reminder appliance (DRA)	A device in a driving cab to enable the driver to set a reminder that the signal ahead may be at danger.
driving position	The normal position from which the driver controls the train, by operating the primary controls. It may be seated or standing or both, depending on operational requirements.
European Rail Traffic Management System (ERTMS)	Signalling and operation management system encompassing ETCS for control command, and GSM-R for voice and data. It is a system for providing real-time control and supervision of trains, consisting

	of trainborne, track and lineside equipment. The objective is to enable the operation on compatible signalling systems across European borders.
European Train Control System (ETCS)	The signalling, control and train protection part of the European Rail Traffic Management System designed to provide interoperability and standardisation across European railways.
glare	The discomfort or impairment of vision experienced when parts of the visual field are excessively bright in relation to the general surroundings.
glazing	The transparent material held by a window frame.
on train data recorder (OTDR)	Equipment provided on a train to record data about the operation of its controls and performance in response to those controls. A TDR may also be referred to as an On Train Monitor Recorder (OTMR), Data Logger or Event Recorder.
on-track machine (OTM)	Any rail-mounted machine, whose primary function is for the renewal, maintenance, inspection or measurement of the infrastructure, meeting the requirements of GMRT2400 and permitted by the Rule Book to be moved, either self-propelled or in train formation, outside a possession.
on-track plant (OTP)	Machines with rail wheels capable of running on railway track, limited by their engineering acceptance to running within a possession only. They are split into three main groups: demountable machines, road-rail vehicles (RRVs), and trailers.
primary control	A control essential for the safe driving of a train or rail vehicle, operable by the train driver from the normal driving position.
radio electronic token block (RETB)	A method of protecting a single line of railway through the use of an electronic interlocking and a radio link to the trains which use the line.
Railway undertaking (RU)	Has the meaning given to the term 'transport undertaking' in the Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended, but is limited to any private or public undertaking the principal business of which is to provide rail transport services for goods and/or passengers, with a requirement that the undertaking must ensure traction. Source*: ROGS*
reflection	the throwing back by a body or surface of light, heat, or sound without absorbing it.
side	A position to the left or right of an object, place, or central point.
Train Protection and Warning System (TPWS)	A system mitigating Signals Passed At Danger and non-respect of permissible speeds.
tripcock	Valve, the action of which is initiated by contact with a feature of the railway infrastructure, resulting in the input of a brake demand.

window	An apeture in the wall or roof of a building or vehicle, fitted with an glass in an openable frame to admit light or air and allow people to see out.

References

The Standards catalogue gives the current issue number and status of documents published by RSSB: http://www.rssb.co.uk/railway-group-standards.

RGSC 01	Railway Group Standards Code
RGSC 02	Standards Manual

Documents referenced in the text

Railway Group Standards

GMRT2045	Compatibility Requirements for Braking Systems of Rail Vehicles
GMRT2100	Rail Vehicle Structures and Passive Safety
GMRT2161	Requirements for Driving Cabs of Railway Vehicles
GMRT2400	Engineering Design of On-track Machines in Running Mode

RSSB documents

GERT8000-TW1	Preparation and movement of trains
GERT8000-TW5	Preparation and movement of trains: Defective or isolated vehicles and on-train equipment
GKGN0554	Guidance on Radio Electronic Token Block (RETB)
RIS-0737-CCS	Rail Industry Standard for Signal Sighting Assessment Requirements
RIS-0775-CCS	AWS and TPWS Application Requirements
RIS-0799-CCS	ERTMS/ETCS Baseline 3 Onboard Subsystem Requirements
RIS-1530-PLT	Rail Industry Standard for Technical Requirements for On-Track Plant and their Associated Equipment and Trolleys
RIS-2472-RST	Data Recorders on Trains
RIS-2703-RST	Driver Controlled Operation (DCO) On-Train Camera/Monitors (OTCM)
RIS-2730-RST	Vehicle Fire Safety and Evacuation
RIS-3703-TOM	Passenger Train Dispatch and Platform Safety Measures
RIS-3782-TOM	Car Stop Markers Provision on Station Platforms
RIS-7016-INS	Interface between Station Platforms, Track, Trains and Buffer Stops
RIS-7702-INS	Rail Industry Standard for Lighting at Stations
RIS-8060-CCS	Engineering Requirements for Dispatch of Trains from Platforms
RSSB-ERTMS-OC	Operational Concept for ERTMS
S329 RSSB (2018)	The effects of bright light on night vision and health

T1175 RSSB (2021)	Enabling Drivers to Reliably Stop Trains in the Correct Position at Stations
T1273 RSSB (2022)	Optimising drivers' use of audible warnings
T326 RSSB (2006)	Human factors good practice guide to managing alarms and alerts
T698 RSSB (2008)	Human Modelling of Train Cabs & Train Driver Ergonomics
T940 RSSB (2012)	Identifying, quantifying and managing the risk of musculoskeletal injuries and illness among train drivers

Other references

6297345	Driver-Centred Safety Device. Office of Rail and Road. London. December 2013.
BS 857:1967 (R12)	Specification for safety glass for land transport
BS EN 12464 (series)	Light and lighting. Lighting of work places
BS EN 15152:2019	Railway applications. Windscreens for trains
BS EN 16116-1:2013	Railway Applications. Design requirements for steps, handrails and associated access for staff. Passenger vehicles, luggage vans and locomotives
BS EN 16186-1:2014+A1:2018	Railway Applications. Driver's cab. Anthropometric data and visibility
BS EN 16186-2:2017	Railway Applications. Driver's cab. Integration of displays, controls and indicators
BS EN 16186-3:2022	Railway applications. Driver's cab - Design of displays for heavy rail vehicles
BS EN 16186-4:2019	Railway Applications. Driver's cab. Layout and access
BS EN 16334-1:2014+A1:2022	Railway applications. Passenger Alarm System - System requirements for mainline rail
BS EN 45545-4:2013	Railway applications. Fire protection on railway vehicles - Fire safety requirements for rolling stock design
BS EN ISO 15537:2022	Principles for selecting and using test persons for testing anthropometric aspects of industrial products and designs
BS EN ISO 6385:2016	Ergonomic principles in the design of work systems.
BS ISO 9241	Ergonomics of human-system interaction
CSM RA	Common Safety Method on Risk Evaluation and Assessment
DAV/BR/0001-94	Anthropometric limits of British Rail cabs: Summary report and recommendations for design guidelines. Gary Davis Associates for the British Railways Board. March 1994.

DAV/BR/0002-94	Anthropometric limits of British Rail cabs: An independant ergonomics study. Gary Davis Associates for the British Railways Board. Baldock. April 1994.
DCA Design International and Hitachi Rail Europe	Applied Ergonomics. DCA Design International and Hitachi Rail Europe. Warwick / London. September 2014.
Health and Safety Executive (HSE), Thermal Comfort 2007 [Online]	Available from: hse.gov.uk [Accessed 26 May 2023]
Locomotive and Passenger National Technical Specification Notice (LOC&PAS NTSN)	Locomotive and Passenger National Technical Specification Notice (LOC&PAS NTSN). Published by the Secretary of State on 1 January 2021 pursuant to regulation 3B of the Railways (Interoperability) Regulations 2011. This NTSN replaces and substantially reproduces the provisions of Commission Regulation (EU) 1302/2014 (the LOC&PAS TSI), and includes relevant amendments made by Commission Implementing Regulation (EU) 2018/868 of 13 June 2018, and Commission Implementing Regulation (EU) 2019/776 which came into force in June 2019.
Noise National Technical Specification Notice (NOI NTSN)	Noise National Technical Specification Notice (NOI NTSN). Published by the Secretary of State on 1 January 2021 pursuant to regulation 3B of the Railways (Interoperability) Regulations 2011. This NTSN replaces and substantially reproduces the provisions of Commission Regulation (EU) 1304/2014 of 26 November 2014 (the NOI TSI) and includes relevant amendments made by Decision 2008/232/EC of 21 February 2008 and repealing Decision 2011/229/EU of 04 April 2011 and Commission Implementing Regulation (EU) 2019/774 which came into force in June 2019.
PD CEN ISO/TR 7250-2:2011+A1:2013	Basic human body measurements for technological design. Statistical summaries of body measurements from national populations.
Report 02/2023	Rail accident report: Train driver struck by a train near West Worthing Middle Siding, West Sussex, 1 February 2022. Rail Accident Investigation Branch (RAIB), Derby, February 2023.
SI 1997/553	The Railway Safety (Miscellaneous Provisions) Regulations 1997
SI 2011/3066	Railways Interoperability Regulations 2011 (as amended)
UIC 651	Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers.4th Edition. July 2002.