Vehicle Fire Safety and Evacuation

Synopsis
This document sets out requirements and guidance for rail vehicle fire safety arrangements, including vehicle design, maintenance and servicing, and engineering change. Specifically, it addresses emergency lighting, emergency and safety equipment, signs and labels, and evacuation considerations.

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</thead>
<tbody>
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</tbody>
</table>

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Superseded documents

The following Railway Group documents are superseded, either in whole or in part, as indicated:

Note: The listed documents are superseded by the combination of GMRT2130 issue five and RIS-2730-RST issue one.

| Superseded documents                                           | Sections superseded | Date when sections are superseded |
|                                                               |                     |                                  |
| GMRT2130 issue four Vehicle Fire, Safety and Evacuation       | All                 | June 2020 [proposed]             |
| GMRC2531 issue one Recommendations for Rail Vehicle Emergency Lighting | All                 | June 2020 [proposed]             |
| GMRC2532 issue one Recommendations for Rail Vehicle Emergency and Safety Equipment | All                 | June 2020 [proposed]             |
| GMRC2533 issue one Recommendations for Communication of Emergency and Safety Information | All                 | June 2020 [proposed]             |
| GMRC2534 issue one Recommendations for Rail Vehicle Emergency Evacuation | All                 | June 2020 [proposed]             |
| GMGN2630 issue one Guidance on Rail Vehicle Fire Safety       | All                 | June 2020 [proposed]             |

Supply

The authoritative version of this document is available at www.rssb.co.uk/railway-group-standards. Enquiries on this document can be submitted through the RSSB Customer Self-Service Portal https://customer-portal.rssb.co.uk/
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1</td>
<td>Purpose and Introduction</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1.1 Purpose</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1.2 Introduction</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>1.3 Application of this document</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1.4 Health and safety responsibilities</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1.5 Structure of this document</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1.6 Approval and authorisation of this document</td>
<td>5</td>
</tr>
<tr>
<td>Part 2</td>
<td>Vehicle design</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2.1 General</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2.2 Fire barriers</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2.3 Reducing the risk of ignition: sources</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>2.4 Reducing the risk of ignition: liquids and gases</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>2.5 Fuel systems and storage</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>2.6 Emergency stop and isolation devices</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2.7 Emergency lighting</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>2.8 Emergency and safety equipment</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>2.9 Signs and labels</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>2.10 Evacuation</td>
<td>15</td>
</tr>
<tr>
<td>Part 3</td>
<td>General considerations</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>3.1 Maintenance and servicing</td>
<td>18</td>
</tr>
<tr>
<td>Appendices</td>
<td>Good practice for the application of fixed fire protection systems and protection of systems</td>
<td>19</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Specifications for additional emergency equipment</td>
<td>21</td>
</tr>
<tr>
<td>Appendix C</td>
<td>A procedure for evaluating passenger evacuation from rail vehicle interiors</td>
<td>23</td>
</tr>
</tbody>
</table>

### Definitions

### References
Part 1 Purpose and Introduction

1.1 Purpose

1.1.1 This document is a Rail Industry Standard (RIS) on the design of rail vehicles, setting out requirements and guidance for rail vehicle fire safety arrangements, including vehicle design, maintenance and servicing. Specifically, it addresses aspects of vehicle design, emergency lighting, emergency and safety equipment, and evacuation considerations.

1.1.2 This RIS sets out requirements that are considered useful to the Great Britain (GB) rail industry and addresses points in European standards that are permitted to be specified in the technical specification.

1.1.3 The requirements in this document can be used for the design of new vehicles and those undergoing renewal or upgrade as defined Railway (Interoperability) Regulation 2011 (as amended).

1.1.4 This document can be adopted by railway undertakings (RUs) and rolling stock companies (ROSCOs) under their respective safety/quality management system or when specifying products and services, or by manufacturers when designing products.

1.2 Introduction

1.2.1 This document is intended to be read in conjunction with the LOC & PAS TSI, the Persons with Reduced Mobility (PRM) TSI, the Safety in Rail Tunnels (SRT) TSI, the rolling stock - freight wagons (WAG) TSI, the BS EN 45545 series of standards and GMRT2130 issue five, as there are requirements for rail vehicle fire safety within these documents that are not duplicated in this document.

1.2.2 This RIS sets out requirements that are considered useful to the GB rail industry, and is complementary to issue five of GMRT2130, which sets out national technical rules for vehicle fire safety.

1.2.3 The LOC & PAS TSI sets out requirements for fire safety on rail vehicles and requires compliance with specific clauses of BS EN 45545-2:2013.

1.2.4 The PRM TSI sets out additional requirements for rail vehicles, particularly relating to accessibility for passengers.

1.2.5 The SRT TSI sets out requirements for rail vehicle evacuation.

1.2.6 The WAG TSI sets out requirements for fire safety on freight wagons.

1.2.7 Appendix A of this document provides details of GB practice for the application of fixed fire protection systems and protection of systems, supporting BS EN 45545-6:2013.

1.2.8 Appendix B of this document provides specifications for emergency equipment.

1.2.9 Appendix C of this document provides a procedure for evaluating passenger evacuation from rail vehicle interiors, in support of clause 4.2.10.5.1 of the LOC & PAS TSI.
1.3 Application of this document

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

1.3.2 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.

1.4 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 Structure of this document

1.5.1 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’.

1.5.2 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’.

1.6 Approval and authorisation of this document

1.6.1 The content of this document [will be] approved by Rolling Stock Standards Committee on [03 April 2020] [proposed].

1.6.2 This document will be authorised by RSSB on [24 April 2020] [proposed].
Part 2  Vehicle design

2.1  General

2.1.1 Rail vehicles shall be designed in accordance with BS EN 45545-4:2013.

2.1.2 Materials and components used on rail vehicles shall be designed and tested in accordance with prEN 45545-2:2018 (BS EN 45545-2:2020 when published).

2.1.3 Fire control and management systems on rail vehicles shall be designed in accordance with BS EN 45545-6:2013.

Rationale

G 2.1.4 The LOC & PAS TSI requires compliance only with ‘relevant clauses’ of BS EN 45545-2:2013. BS EN 45545-4:2013 contains good practice for rail vehicle design which assists in fulfilling the requirements for fire safety in the LOC & PAS TSI.

G 2.1.5 The passenger seat tests in BS EN 45545-2:2013 are considered insufficient in GB. BS EN 16989:2018 addresses this concern when used with the acceptance criteria specified in prEN 45545-2:2018 (BS EN 45545-2:2020 when published); this refers to BS EN 16989:2018 for passenger seat testing and BS EN 17084:2018 for toxicity testing.

G 2.1.6 The requirement to comply with prEN 45545-2:2018 will be superseded when BS EN 45545-2:2020 is published and the LOC & PAS TSI is revised.

Guidance

G 2.1.7 The scope of vehicle design for fire safety includes:

a) Categorisation of rail vehicles and interfaces with infrastructure (clauses 4.1.4 and 4.2.10.1 of the LOC & PAS TSI, SRT TSI, BS EN 45545-1:2013 section 5). Vehicles are categorised according to the risks specific to the nature of their operation. Passengers in sleeping vehicles, for example, require longer protection than those in ‘day’ vehicles because such passengers may need time to wake before making their escape.

b) Provision of protection for safety-critical systems (clause 4.2.10.4.4 of the LOC & PAS TSI, BS EN 50553:2012+A1:2016). This is to ensure that the train is capable of continued operation in the presence of the specified fires, so that it can reach a location where passengers and crew may be evacuated to a place of safety.


d) Provision of fire barriers (clauses 4.2.10.3.4 and 4.2.10.3.5 of the LOC & PAS TSI, BS EN 45545-3:2013). These cover the requirements for the protection of passengers and staff in the event of a fire developing on board. Additional requirements for GB practice are contained within this document.

e) Reduction, elimination or isolation of sources of ignition (clause 4.2.10.3.3 of the LOC & PAS TSI, BS EN 44545-4:2013 and BS EN 45545-7:2013). These standards
contain detailed requirements for vehicle design to inhibit fire initiation and development inside or on the outside of a vehicle. These requirements are to reduce the likelihood that a fire will develop to an extent where it will endanger passengers within the affected vehicle, or people outside the vehicle, for example, passengers on stations. This includes the carriage of fuel for use by the vehicle’s systems.


g) Provision of fire detection and suppression systems (automatic and manual) (clauses 4.2.10.3.1 to 4.2.10.3.3 of the LOC & PAS TSI and BS EN 45545-6:2013). These cover the detailed requirements for vehicle design measures to detect and extinguish fires.

h) Provision of emergency lighting (clause 4.2.10.4.1 of the LOC & PAS TSI and BS EN 13272:2019). These ensure that passengers have sufficient lighting in the event of an emergency, for example to aid evacuation.


j) Provision of emergency stop devices to enable the rapid shut down or isolation of the traction supplies, including engines, of a vehicle, from appropriate locations, in an emergency such as a fire (BS EN ISO 13850:2015, BS EN 45545-6:2013 and BS EN 45545-7:2013).

k) Requirements for ensuring that acceptable fire performance is retained during maintenance and servicing (see Annex A of BS EN 45545-4:2013) and when engineering change occurs (see clause 7.1.2.3 of the LOC & PAS TSI).

G 2.1.8 This list is not exhaustive; the guidance in this document is aimed at assisting preparation of a vehicle fire risk assessment in accordance with the Common Safety Method for Risk Assessment and Evaluation (CSM-RA; see also GEGN8646 Guidance on the Common Safety Method for Risk Evaluation and Assessment).

2.2 Fire barriers

2.2.1 Fire barriers and arc barriers on rail vehicles shall be designed in accordance with BS EN 45545-3:2013.

2.2.2 Doors in fire barriers, where these are part of an escape route, shall:

a) Be self-closing in accordance with section 4 of BS EN 45545-6:2013;

b) Be able to be opened by passengers in case of power failure, in accordance with clause 4.3.2 of BS EN 45545-4:2013; and

c) Incorporate a means of visually assessing whether a fire is present.

2.2.3 Where a means of visual assessment is provided it shall meet the requirements of the fire barrier.

Rationale

G 2.2.4 These requirements support clauses 4.2.10.3.4 and 4.2.10.5.1 of the LOC & PAS TSI. They are to reduce the likelihood of a door being opened behind which a fire is
present, thereby controlling the hazard of fire spreading through a vehicle. They reflect GB practice for fire doors.

**Guidance**

G 2.2.5 See also clause 4.2.4 of BS EN 45545-4:2013 and clause 5.6.2 of BS EN 45545-3:2013.

G 2.2.6 This requirement includes bulkhead doors between vestibules and engine compartments, in addition to those specified in clause 4.2.4 of BS EN 45545-4:2013.

G 2.2.7 A window could be a suitable means of visual assessment.

G 2.2.8 This is not a requirement to provide means of visual assessment into a toilet or sleeping compartment, as these are not considered escape routes. It may however be appropriate to equip a sleeping compartment door with a means of looking out, such as a spyhole.

### 2.3 Reducing the risk of ignition: sources

#### 2.3.1

Except where functionality demands otherwise, sources of heat and ignition shall be separated from flammable fluid systems and lubricating oil systems, by physical distance or suitable barriers. This shall include:

- a) Internal combustion engines; these shall also meet the requirements of section 7 of BS EN 45545-7:2013;
- b) Electrical equipment; this shall also meet the requirements of BS EN 45545-5:2013;
- c) Braking systems;
- d) Cooking equipment; this shall also meet the requirements of clause 4.2.2 of BS EN 45545-4:2013;
- e) Heaters; and
- f) Other hot surfaces.

#### 2.3.2

Tanks, pipework and ancillary equipment shall also meet the requirements of BS EN 45545-7:2013.

#### 2.3.3

Where sparks are inherent to normal vehicle operation, shielding shall be provided to prevent ignition of combustible materials by such sparks. Particular attention shall be given to sources below the floor of the vehicle.

**Rationale**

G 2.3.4 These requirements support clause 4.2.10.1 (2) of the LOC & PAS TSI. They control the hazards associated with ignition sources and reflect GB practice.

**Guidance**

G 2.3.5 Additional guidance for rolling stock design is given in the informative Annex A of BS EN 45545-4:2013:

- a) Braking systems are covered in clause A.2.
- b) Heaters are covered in clause A.5.
c) Protection against sparks is covered in clause A.6.

2.4 Reducing the risk of ignition: liquids and gases

2.4.1 The requirements set out in BS EN 45545-7:2013 shall be applied to all systems using flammable liquids and gases on rail vehicles.

2.4.2 In particular, the following requirements shall be applied to all fuel systems used for traction:
   a) Section 4 (General requirements).
   b) Section 5.1 (Flammable liquids and gas tanks: general).
   c) Section 5.2 (Tanks).
   d) Section 6 (Pipe work and associated fittings).

2.4.3 Battery enclosures shall meet the requirements of clause 5.6 of BS EN 45545-5:2013.

Rationale

G 2.4.4 This requirement supports clause 4.2.10.2.2 of the LOC & PAS TSI. It controls the hazards associated with on-board fuel systems and other flammable gases and liquids, and reflects GB practice.

Guidance

G 2.4.5 The scope of BS EN 45545-7:2013 specifically excludes "measures for flammable gases, other than LPG." However, clause 4.3 of BS EN 45545-1:2013 states "the effects of any flammable gases[...]." Therefore, the principles associated with reducing the risk of ignition are considered applicable to any equipment containing flammable liquid or gas, such as:
   a) Fuel and oil tanks;
   b) Transformers;
   c) Hydraulic systems;
   d) Cooling systems using flammable refrigerants;
   e) Traction systems using alternative fuels; and
   f) Associated pipe work.

G 2.4.6 RSSB is currently conducting research (T1172) into approvals for the use of hydrogen for traction.

2.5 Fuel systems and storage

2.5.1 The fuel installation shall be designed and constructed so that its components are able to resist internal and external corrosion phenomena to which they are exposed.

2.5.2 A fire barrier shall be provided to separate the fuel tank(s) from passenger compartments.

2.5.3 If mounted on the underframe, fuel tanks shall not be located:
2.5.4 Fuel tanks shall be protected from stray arcs, either by physical separation or by arc barriers.

Rationale

G 2.5.5 These requirements support clause 4.2.10.2.2 of the LOC & PAS TSI. They control the hazards associated with onboard fuels and reflect GB practice. Preventing fuel leaks is beneficial for the environment as well as reducing the likelihood of fire.

Guidance

G 2.5.6 Additional requirements for fuel tanks are set out in 2.4.1 and 2.4.2.
G 2.5.7 See 2.2 for requirements for fire barriers, including arc barriers.
G 2.5.8 See Annex A of BS EN 45545-4:2013 for guidance on the design of rail vehicles to prevent fires.

2.6 Emergency stop and isolation devices

2.6.1 Emergency stop device(s) for combustion engines and heaters shall be provided in accordance with clause 7.1 of BS EN 45545-7:2013.

2.6.2 Emergency isolation device(s) for electric traction equipment shall be provided in accordance with clause 5.4.2.2 of BS EN 45545-6:2013.

2.6.3 Emergency stop and isolation device(s) shall be:

a) Designed in accordance with BS EN ISO 13850:2015; and
b) Clearly labelled in accordance with BS ISO 3864-1:2011.

Rationale

G 2.6.4 These requirements support clause 4.2.10.3.2 of the LOC & PAS TSI. They control the hazards from combustion engines and traction equipment in fires, and reflect GB practice.

G 2.6.5 BS ISO 3864-1 is referenced in the PRM TSI for customer information; it is also considered relevant for signs and labels provided for staff.

Guidance

G 2.6.6 BS EN 45545-6:2013 calls up BS EN 61310-1:2008, which in turn calls up BS EN ISO 13850:2015.

2.7 Emergency lighting

2.7.1 Emergency lighting systems shall be designed in accordance with section 4.3 of BS EN 13272-1:2019.
2.7.2 The emergency lighting system shall continue to operate after being subjected to two successive test pulses in accordance with Annex C of the same standard.

Rationale

G 2.7.3 These requirements support clause 4.2.10.4.1 of the LOC & PAS TSI; this requires compliance with clause 5.3 of BS EN 13272:2012. BS EN 13272-1:2019 contains additional requirements which are relevant to GB practice.

G 2.7.4 The system’s continued operation after two successive test pulses is ‘according to agreement between contractors’, but reflects GB practice.

Guidance

G 2.7.5 Traditionally, vehicles have been provided with a reduced level of lighting, often referred to in Great Britain as ‘emergency lighting’, the purpose of which was to conserve the life of the vehicle battery in order to retain the operation of key systems for as long as possible in the event of electrical supply interruption. This lighting is referred to in European standards as ‘standby lighting’.

G 2.7.6 In the event of an accident, the immediate reaction of many passengers is to escape from the vehicle, by whatever means. Generally, the risks associated with escaping from the vehicle are greater than remaining in the vehicle until advised to evacuate or until rescued.

G 2.7.7 It is vital that the emergency lighting adjacent to the egress points provides sufficient illumination to enable passengers to read emergency evacuation information and enable them to operate controls for opening doors, including emergency override operation.

G 2.7.8 Passengers may be familiar with the provision of floor level (way-finder) lighting as a means to support escape from aircraft. With the large quantities of highly volatile fuel on board aircraft, emergencies usually demand very rapid evacuation of the aircraft. On trains, rapid evacuation is rarely required and is seldom the safest course of action. For this reason, way-finder or other low-level location lighting is not specified; good practice is to ensure that escape routes are no more brightly illuminated than the saloon.

G 2.7.9 Meeting the lux level requirements of BS EN 13272-1:2019 may lead to conflicting requirements placed on a lighting system. The most obvious of these is the need to encourage the passenger to remain on the train in nearly all circumstances, whilst still providing a suitable level of lighting to show the passenger how to escape or evacuate in the event that this becomes necessary.

G 2.7.10 By the very nature of emergency lighting, the coverage of the lighting cannot be as comprehensive as with the normal lighting. The uniformity is an important feature when designing emergency lighting. A good level of uniformity is more useful in relation to egress and visual acuity than lighting the coach to a greater level but introducing dark and light spots. The difficulty of the eye rapidly adjusting to alternating light and dark spots along the vehicle is likely to reduce the speed of egress. Experiments have demonstrated that a lower light level with increased uniformity gives the impression of a raised general level of illumination.
G 2.7.11 The surfaces within the vehicle will also significantly affect the performance of the emergency lighting system. Light coloured, highly reflective surfaces will improve the spread of light within the carriage but may lead to excessive glare. Conversely, dark coloured and matt surfaces will absorb more of the light reducing the efficacy of the lighting system. Dark carpet and seat covers will reduce the impression of the amount of light within a vehicle. It is good practice to consider these points when designing vehicle interiors to cater for emergency lighting.

G 2.7.12 Testing has indicated that a light located above each bodyside door is more likely to promote desirable passenger behaviours. Locating the light in the centre of the vestibule creates a “target” for passengers in the saloon and may encourage passengers to believe they must move towards the vestibule and evacuate. This is not the case when the lighting is located above the bodyside doors. Also, with a centrally located light, shadows are created which impede people trying to operate the door for egress. Illumination is much better when the lighting is located at each door position. It is good practice to ensure that the lighting levels in the vestibule are in the same order of magnitude as those in the saloon to reduce the effect of the lighting encouraging inappropriate behaviour such as unnecessary egress.

G 2.7.13 In circumstances in which smoke is present in a vehicle, but there is no fuel source or other immediate danger, the preferred passenger action is to move to another vehicle. To do so requires the passenger to pass through the vestibule of the vehicle concerned, through the gangway and through the vestibule of the next vehicle and into its saloon. It is therefore good practice to ensure that in this case the route is lit sufficiently to allow this movement to be completed safely, but not so brightly that the passenger is encouraged, on reaching the vestibule, to get out of one of the exterior doors rather than move to the next vehicle.

G 2.7.14 It is important that emergency equipment cupboards are not more brightly illuminated than the general area in which they are located, as this may encourage passengers to access the cupboards unnecessarily. Good practice would be to provide illuminance of 5 lux in these areas.

2.8 Emergency and safety equipment

2.8.1 Additional equipment may be required for GB rail applications, for example, for operation through tunnels or where third rail dc traction is used. The requirement for such additional equipment shall be determined on the basis of risk, in co-operation with the relevant railway undertaking(s) and infrastructure owner(s).

Rationale

G 2.8.2 This requirement supports clause 4.2.9.4 of the LOC & PAS TSI, controlling the hazards associated with train failure and reflecting GB practice.

Guidance

G 2.8.3 Clause 4.2.9.4 of the LOC & PAS TSI sets out minimum requirements for emergency equipment accessible to the driver.
G 2.8.4 It is good practice to ensure that storage space is provided to accommodate any of the additional emergency and safety equipment as determined on the basis of risk.

G 2.8.5 Additional equipment that is currently provided on GB trains, for use by traincrew only (that is, not available to passengers) is as follows:

a) In each operative driving cab:
   i) At least ten detonators.
   ii) Two sets of track circuit operating clips (except that only one set of such clips is required in the cab on multiple unit type trains operated with a guard, where an additional two sets are located in the guard’s accommodation).
   iii) Two red flags with sticks (one in each cab on a multiple unit train).

b) Readily available to the driver (preferably in the driving cab):
   i) One brake stick on locomotive hauled trains comprising vehicles fitted with manually operated ‘lever’ type hand brakes such as those installed on freight vehicles.
   ii) One spare portable tail lamp on locomotive hauled driver-only trains.
   iii) Four wheel scotches in trains where electric parking brakes are provided.

c) Available to the guard, within, or adjacent to, accommodation provided for a guard on passenger trains:
   i) Two sets of track circuit operating clips.
   ii) Six wheel scotches on air-braked locomotive-hauled trains.

d) Available to members of the traincrew for use in passenger and other crew areas:
   i) One ladder or step ladder made from non-conducting material.
   ii) One defibrillator.

   These items may be made accessible for passengers’ use as well as that of traincrew if desired.

G 2.8.6 For operation on dc electrified lines, the following additional equipment is currently provided, preferably located in the operative driving cab, or otherwise easily and quickly accessible to the traincrew:

a) One conductor rail short-circuiting bar.
b) One conductor rail hook switch pole.
c) Shoe fuse key (where applicable).
d) Shoe paddles: the number of shoe paddles carried shall be the greater of:
   i) One paddle for each track short-circuiting bar carried.
   ii) For vehicles with non-retractable shoe gear, the number of current collector shoes plus one.
   iii) For vehicles with retractable shoe gear, a minimum of two paddles.
e) One roll of insulating tape.
f) 8 m of stout cord.

G 2.8.7 Specifications for emergency and safety equipment that are in use at the date of issue of this document are set out in Appendix B.
G 2.8.8 Where such equipment is provided, it is good practice to ensure that:

a) It is readily accessible to the intended user, with minimal risk of injury.
b) If it is provided for persons untrained in its use, it is simple in operation.
c) If accessible to passengers, it is protected from misuse.
d) Its storage is designed in accordance with the requirements of BS EN 12663:2010+A1:2014 for body mounted equipment.
e) It is suitably labelled; see 2.9.
f) If retained in a cupboard or container where the contents are not visible, the cupboard or container is sealed closed when checks of the content are completed.

G 2.8.9 GB practice has been also to provide the following equipment as personal issue to train crew:

a) A three-pointed screwdriver for vehicles with toilet compartments;
   This is unlikely to be useful for new vehicles.
b) A hand lamp capable of showing red, green and white aspects.
   The inclusion of a green aspect contradicts the requirement in clause 4.2.9.4 of the LOC & PAS TSI.

2.9 Signs and labels

2.9.1 Signs and labels on rail vehicles shall be provided in accordance with:

a) Clauses 4.3.1.1 (g), 4.3.1.2 (f) and 4.3.2.1 (f) of BS EN 45545-4:2013.
b) Section 4, clause 6.3.3 if required, and 8.1 of BS EN 45545-6:2013.
c) Sections 5.2 and 6.1 of BS EN 45545-7:2013.
d) Section 5.3.5 and Annex A.2 of BS EN 16584-2:2017.

2.9.2 Materials for signs shall be chosen to reduce the likelihood of damage and to facilitate cleaning.

2.9.3 Signs provided for passenger emergency equipment, egress facilities and routes shall use photo-luminescent materials and shall not rely solely on the availability of emergency power supplies.

2.9.4 Safety and emergency signs shall be subjected to a recognised validation process of review and evaluation designed to demonstrate a high probability of comprehension on the part of the travelling public.

Rationale

G 2.9.5 These requirements support clause 4.2.2.7.2 of the PRM TSI and control the hazards associated with passenger safety and evacuation. They reflect GB practice.

Guidance

G 2.9.6 Additional requirements for emergency and safety information are set out in the following standards:

a) BS EN 13272:2019 for illumination of signs.
b) BS EN 14752:2015 for signs associated with doors, as referenced in 
BS EN 45545-4:2013.

c) BS EN 61310-1:2008, as referenced in BS EN 45545-6:2013.

d) BS EN ISO 7010:2012+A1:2017, as referenced in BS EN 45545-7:2013 for signs 
associated with flammable liquids.

e) BS ISO 3864-1:2011 and BS ISO 3864-3:2011, as referenced in 
BS EN 45545-7:2013. BS ISO 3864-1:2011 is also referenced in the PRM TSI.

G 2.9.7 A suitable validation process is described in BS ISO 9186-1:2014, as referenced in 
BS ISO 3864-1:2011.

G 2.9.8 Damage to signs can arise from the environment in which they are located, for 
example, accidental impacts from items carried by passengers, malicious damage, or 
cleaning.

G 2.9.9 It is good practice to create and maintain a risk assessment to establish the need for 
and type of signs required. For example, where there is a risk of serious injury or 
death, a prohibition sign is likely to be more appropriate than a warning sign. See the 
RAIB report into the fatal accident at Twerton.

G 2.9.10 Clause 4.2.9.3.5 of the LOC & PAS TSI sets out requirements for labelling of controls in 
the cab.

2.10 Evacuation

2.10.1 General vehicle design for evacuation and escape

2.10.1.1 Rail vehicles shall be designed for evacuation and escape in accordance with section 
4.3 of BS EN 45545-4:2013.

Rationale

G 2.10.1.2 This requirement supports clause 4.2.10.5 of the LOC & PAS TSI.

Guidance

G 2.10.1.3 In order to reduce the risk to people in emergency conditions, the vehicle design 
needs to consider the environment in which the vehicle is operating and the hazards 
that this may present. It is good practice to undertake a risk assessment to identify 
those hazards, including misuse of equipment provided. This can be included in the 
overall assessment associated with the introduction of new trains.

G 2.10.1.4 The ability of passengers to evacuate and escape will be influenced by a range of 
measures which may include, but are not limited to:

a) Staff management of the situation;
b) Adequate vehicle end design for evacuation and escape;
c) Adequate vehicle side egress and evacuation facilities supplemented where 
required by emergency escape exits through the vehicle body;
d) Adequate information, signs, and lighting;
e) The number and mobility of people present in the vehicle;
f) Vehicle or train stopping time and braking distance;
g) Emergency equipment available;

h) Orientation of the vehicle; and

i) The location of the vehicle, that is, access to a place of safety.

2.10.2 Internal doors

2.10.2.1 If internal sliding doors are fitted, they shall:

a) Slide open in opposing directions at each end of the passenger saloon;

b) Be bi-parting; or

c) Be fitted with a means of escape within the door opening which allows through egress in the event of the door becoming jammed, so as to comply with clause 4.3.2.1 (e) of BS EN 45545-4:2013.

Rationale

G 2.10.2.2 This requirement supports clause 4.2.10.5.1 of the LOC & PAS TSI, controlling the hazards associated with emergency egress, particularly when vehicles are partially or wholly overturned. This requirement reflects GB practice.

Guidance

G 2.10.2.3 There is a risk that, under accident conditions, sliding doors may become jammed and hinder escape; particularly bi-parting doors due to the narrow width of each leaf. It is therefore good practice to ensure that, where bi-parting doors are used, the door mechanism allows for distortion of the floor without jamming.

G 2.10.2.4 Requirements for hinged doors are set out in clause 4.3.2 of BS EN 45545-4:2013.

2.10.3 Evacuation trials

2.10.3.1 For side evacuation, under conditions of ‘team effort’ (see C.6) and with normal passenger loading conditions (see C.5), all passengers shall be evacuated to platform level in a period not exceeding 180 seconds (see 2.10.3.5).

2.10.3.2 For end evacuation, where evacuation to track level through the end door is required, a minimum flow rate of 30 passengers per minute shall be achieved once the end door has been opened. The time taken for the end door to be opened and the evacuation device to be deployed shall be measured and the risk associated with that time shall be reviewed.

2.10.3.3 For vehicle to vehicle evacuation, under conditions of ‘team effort’ and with maximum passenger loading conditions in the vehicle under test, all passengers shall be evacuated to adjacent vehicles in a period not exceeding 180 seconds (see 2.10.3.5). Where the vehicle under test is the end of a train formation, then a minimum passenger flow rate to the adjacent vehicle of 40 passengers per minute shall be achieved.

2.10.3.4 The flow rates set out in 2.10.3.2 and 2.10.3.3 of this document shall be the evacuation rate averaged over the evacuation period. In the case of 2.10.3.2 of this document, it is to be measured once the door has been opened and in the case of
2.10.3.3 of this document, it is met in the case where initially there are no people in
the adjacent vehicle or vehicles.

2.10.3.5 For existing vehicles in GB, the applicable evacuation times shall be 90 seconds.

**Rationale**

G 2.10.3.6 These requirements support clause 4.2.10.5.1 of the LOC & PAS TSI and section 4.3 of
BS EN 45545-4:2013.

**Guidance**

G 2.10.3.7 Clause 4.2.10.5.1 of the LOC & PAS TSI requires "a physical test under normal
operating conditions." GB practice for evacuation trials is contained in Appendix C of
this document.

G 2.10.3.8 GB practice is to achieve evacuation of a vehicle with 'maximum design capacity
(non-crush)’ loading. This loading is equivalent to normal design payload as set out in

G 2.10.3.9 The 180 second evacuation time specified in the TSI LOC & PAS is only applicable to
fully TSI compliant vehicles, which can include, for example, double-deck vehicles. Any
deviation from the 90 second practice for GB legacy vehicles would need to be
supported by a suitable and sufficient risk assessment.

G 2.10.3.10 GB interpretation of the requirement for a physical test is that it is permissible to
compare a new vehicle design to a design which has previously undergone validated
evacuation trials. In assessing the comparability of a new vehicle design or
refurbishment design with a vehicle already validated for evacuation, the critical
factors determining the validity of the comparison are:

a) Seating configuration and pitch;
b) Aisle width and linearity;
c) The presence and width of interior doors;
d) The distance to and width of the exterior bodyside doors; and
e) The size of vestibules relative to the exterior doors.

G 2.10.3.11 It is good practice to assess each of these factors to establish whether they represent
a significant effect on the evacuation speed of passengers under the test conditions.
Where no significant effect on evacuation time exists and the vehicle configurations
have been determined to be similar in all the critical factors listed in G 2.10.3.10,
comparability with a validated vehicle is established.
Part 3 General considerations

3.1 Maintenance and servicing

3.1.1 General

Guidance

G 3.1.1.1 Requirements for vehicle maintenance are set out in section 4.2.11 of the LOC & PAS TSI and RIS-2004-RST. Clause 3.2.8.1 (o) of RIS-2004-RST specifically mentions fire protection system maintenance.

G 3.1.1.2 Clause 4.2.10.3.4 (5) of the LOC & PAS TSI sets out additional considerations for fire containment and control systems where these are used in place of fixed fire barriers.

G 3.1.1.3 Good practice for vehicle design for maintenance to prevent fire is set out in Annex A of BS EN 45545-4:2013.

3.1.2 Manual fire extinguishers

Guidance

G 3.1.2.1 Clause 6.3.1 of BS EN 45545-6:2013 requires that extinguishers shall be usable when the train is operating. It is therefore good practice to ensure that manual fire extinguishers are maintained in accordance with BS 5306-3:2017.

3.1.3 Cleaning

Guidance

G 3.1.3.1 It is good practice to ensure that maintenance activities on a vehicle do not degrade the fire performance of its constituent materials.

G 3.1.3.2 Cleaning, polishing and other treatments can affect the fire performance of the materials to which they are applied. For example, the following treatments may have an adverse effect on the fire performance:

a) The application of any permanent or temporary finish to a surface, including polishes and anti-static treatments.

b) The removal or modification of any finish or treatment by the action of cleaning agents or cleaning processes as part of the maintenance plan.

G 3.1.3.3 It is therefore good practice, prior to the introduction of any cleaning agent or finishing treatment, to conduct an assessment to demonstrate that the fire performance of the constituent materials is not degraded. This could take the form of a risk assessment; this may need to be supported by flammability and/or toxicity tests on samples of affected materials.
Appendices

Appendix A  Good practice for the application of fixed fire protection systems and protection of systems

This appendix supports clause 4.2.10.3 of the LOC & PAS TSI and BS EN 45545-6:2013 by detailing GB practice for the application of fire protection systems.

Fire detection systems

A.1 Effective fire detectors for automatic detection are:

a) Suitable for detecting the type or types of fire from which the areas or locations are most at risk;
b) Suitable for the environmental conditions normally present in the area given protection; and
c) Capable, where reasonably practicable, of automatic reactivation in the event of a previous fire re-igniting.

A.2 Environmental conditions could include, for example:

a) Airborne dusts or mists.
b) Vibration.
c) Ambient temperatures.
d) Air movements.
e) Electro-magnetic fields.

A.3 An ideal detector will give the earliest possible detection with the lowest possibility of false alarms.

Fire extinguishing systems

A.4 It is established practice to design the fire extinguishing system on the basis of:

a) Risks to people (if present) when extinguishing agent is released;
b) The major fire risks within the protected area;
c) The location of the potential fire and its likely spread;
d) Speed of fire detection;
e) Links to disparate systems to provide maximum effectiveness of extinguishing agent;
f) Concentration of agent (if applicable); and
g) Delivery rate of agent (if applicable).

A.5 Where driving cabs are equipped with a red push button to manually activate the fire protection system, the red push button is used to either:

a) Initiate an alarm stage in the fire protection system, to cause activation of the fire warning and extinguishing sub-systems and/or initiation of events by disparate systems; or
b) Cause discharge of the extinguishing agent by a separate direct means.
Where driving cabs are fitted with an illuminated amber push button to allow the driver to delay the discharge of extinguishing systems, this button is visible and operable from the driving position. Use of the button is within a specific sequence of events, defined as follows;

a) The detection system in the remote locomotive or power car enters an alarm state following detection of a fire.

b) The fire alarms sound and the amber push button in the driving cab lights up as an indication to the driver to push the button and delay extinguishment of the fire.

c) If the push button is not depressed within ten seconds the automatic extinguishing system operates (and this sequence terminates).

d) Where an extended delay period is required (for example, in a long tunnel) the requirement for the driver to keep the amber button pressed continuously may be avoided by either:

i) Use of a push on / push off button, for example, one which is stable in the on position; or

ii) Use of the button to initiate a fixed time delay which can be reinitiated by a further press of the button. In this case there would need to be an additional means of activating the extinguishing system without waiting for the end of the time delay.

e) At the end of the delay period, the system goes to b) in this sequence.

Note: Fitment of the amber push button could be to support the requirement for running capability set out in clause 4.2.10.4.4 of the LOC & PAS TSI.

Isolation

A.7 Isolation of the fire protection system is provided to avoid further alarms once a fire has been detected and extinguished, or in the event of system failure. This will enable the vehicle to be moved with the appropriate sub-systems and fire source isolated.

A.8 In multiple units fitted with a diesel engine, or locomotives in multiple operation, good practice is to ensure it is possible to isolate the fire protection system on individual vehicles, silence the fire alarms and operate the fire protection system normally on the remainder of the train. This will enable the system to continue to detect fires and provide warning in the other vehicles.
Appendix B Specifications for additional emergency equipment

B.1 The following list provides examples of acceptable specifications for items of safety or emergency equipment which may be required by section 2.8 of this document:

B.2 a) In each driving cab:
   i) Detonators to British Rail specification No. 640A: 1964, in a detonator case to British Rail drawing L-A0-11558 item 4 or L-A1-11443 item 5.
   
   Note: On trains for international traffic only, near-equivalent European standards may be followed for detonators and detonator cases.
   ii) Track circuit operating clips (British Rail specification No. BRS-SE89 meets the requirement).
   iii) Red flags to British Rail specification No. 218, and 19 mm flag sticks.

b) Readily available to the driver:
   i) Brake stick to British Rail specification No. BR 532B.
   ii) Portable tail lamp to specification BR/TS0630.
   iii) Wheel scotches (British Rail document No. EI G/096 is an acceptable example).

c) Available to the guard:
   i) Track circuit operating clips
   ii) Wheel scotches

d) Available to members of the traincrew:
   i) Extending type ladder or step ladder to British Rail drawing B1-A0-9007630;
   ii) One defibrillator.

B.3 For operation on dc electrified lines:

a) Conductor rail short-circuiting bar to British Rail drawing No. C60051/12.
b) Hook switch pole to British Rail drawing No. B77642.
c) Shoe fuse key to British Rail drawing Nos B-1152 or C-1524.
d) Shoe paddles to British Rail drawing No. SR-A2-6523/1.
e) Roll of PVC electrical insulating tape, 0.15 mm x 12 mm x 20 metres to BS EN 60454-3-1:1998.
f) 8 m of rope to BS 4928 Part 1 (or equivalent) for plaited ropes, with the exception that the yarn is to be constructed from high tenacity continuous multi-filament bright polypropylene with:
   i) Nominal circumference 13 mm;
   ii) Approximate diameter 4 mm;
   iii) Nominal mass per 30.5 m = 0.25 kg; and
   iv) Minimum breaking load = 227 kgf.

B.4 The following list provides examples of acceptable specifications for additional items of safety or emergency equipment which may be required by section 2.8 of this document:
a) Straight pein 3.2 kg (7 lb) sledgehammer to BS 876:1995 Table 8, with a total length of 762 mm.
b) Fireman’s axe to BS 2957:1958 Fig. 1.
c) 11 metres of 18 mm nylon rope to BS 4928 Part 2 Table 1 (or equivalent).
d) Multi-purpose saw (British Rail Catalogue No. 39/52800).
e) Long crowbar: 1500 mm long, 32AF hexagonal, with one pointed and one chisel/lever end (with no stress raisers), made from 0.4% plain carbon steel to PD 970 080M40. The ends are to be heat treated to condition R.
f) Insulated rubber gauntlets to BS 697:1986 Table 3, red up to 1 kV; green up to 3.3kV (or equivalents to BS EN 60903:2003).
g) First aid equipment. It is established practice to:
   i) Clearly identify the equipment, with a label listing contents on the container;
   ii) Seal the container with a security device to indicate when it has been opened; and
   iii) Ensure that the contents follow the Health and Safety (First Aid) Regulations 1981 (updated 2018) approved code of practice (ACOP).

B.5 Details of items with British Rail catalogue numbers, documents and drawings are normally available from Railway Documentation and Drawing Services Limited (RDDS).
Appendix C  A procedure for evaluating passenger evacuation from rail vehicle interiors

This procedure describes a set of conditions under which the emergency evacuation from rolling stock can be safely evaluated, as required by clause 4.2.10.5.1 of the LOC & PAS TSI. It describes a method of testing to demonstrate that evacuation from the side of a vehicle onto a platform, from the end of a vehicle into an adjacent vehicle, and from the end vehicle in a train formation to track level can be carried out safely under emergency conditions. It can be used for new vehicles and those undergoing significant engineering change.

General

C.1 The procedure seeks to establish realistic conditions whereby the rate of passenger evacuation in an emergency can be safely determined for a non-specific emergency situation. For this purpose, the passenger trials are to be conducted by using a sample of volunteers representing, as closely as possible, passengers in everyday situations.

C.2 The trials are to be conducted under conditions of external darkness.

C.3 The vehicle conditions are prescribed to represent it having become detached from the main train power supplies and thus having only its own back-up power sources available.

C.4 The vehicle selected for the trials is to represent a ‘non-specific, foreseeable worst-case’ scenario for passenger evacuation in an emergency. The choice of vehicle is to be supported by a short rationale detailing the critical factors influencing the selection such as:

a) Passenger load density and seating arrangements;
b) Number of exit doors and door throughway dimensions;
c) Identified pinch points within the vehicle design, which could slow egress rates;
d) Step position in relation to the platform; and
e) The design of any door opening devices (internal and external).

C.5 The number of volunteers required for the egress trial will vary according to the vehicles chosen for the trial. The number of volunteers is to be calculated in accordance with BS EN 15663:2017+A1:2018 for normal payload as specified in BS EN 45545-4:2013.

C.6 The emergency evacuation trials for both side egress and vehicle to vehicle egress are designed to create, as near as possible, real life egress conditions for the volunteers. In real life emergencies it would be likely that some passengers would have some knowledge of the vehicle and the location of some of the emergency equipment. In order to try to simulate a general awareness of the vehicle, both the side egress and end egress trials are to be undertaken once for familiarisation, before a second ‘team effort’ test is undertaken. The second ‘team effort’ test will create a manageable emergency condition by offering a financial incentive to volunteers if they better the time to evacuate the vehicle in ‘familiarisation’ mode by 20% (see the Test procedure section of this appendix).

Note: Although the use of financial incentives may have ethical implications, it is consistent with practice in the aircraft industry. The use of such incentives...
may create a ‘push’ to exit, therefore approaching a panic situation. The safety of volunteers will be managed through the measures described in this procedure.

**Preparation**

**C.7** The person or organisation responsible for conducting the evacuation trials is to conduct a risk assessment of the evacuation trial in order to establish the following:

a) Safe system of work, including the measures required to mitigate the identified risks.

b) Designated person in charge (PIC).

c) Responsible engineer from the company manufacturing or supplying the test vehicle.

d) Number of volunteers; see **C.5**.

e) Number of marshals; see **C.9**.

f) Provision of first aid.

**C.8** The site is to be adequately provisioned to meet the circumstances of the individual test and staffed by at least two persons qualified to administer first aid.

**C.9** The number of marshals is to be determined as follows:

a) One marshal to be positioned outside each exterior door to be used for evacuation.

b) An appropriate number of marshals is to be positioned inside the vehicle for safety reasons at points designated by the PIC.

c) Each volunteer needs always to be visible to at least one marshal.

**C.10** Each marshal is to be equipped with a calibrated stopwatch (or other agreed method of recording time) and a passenger counter.

**Vehicle preparation - side access trials**

**C.11** The vehicle chosen for the trials is to be positioned in its normal attitude adjacent to a platform and will be in a safe condition. During the trials, the vehicle will only have emergency passenger lights illuminated. Before the trials commence, the following vehicle features are to be in the stated condition:

a) All passenger seat armrests are to be in the down (lowered) in use position.

b) All saloon fixed tables, which have folding leaves to aid access to seats, are to have the leaves in the down (in use) position.

c) All external passenger vehicle doors are to be closed and locked. The door controls are not to be enabled. The doors on the non-platform side are to be locked out of use.

d) All luggage facilities in the vehicle being tested are to contain typically-sized pieces of luggage. The luggage is to be weighted proportionately to its size to simulate real-life conditions. At least two folding child pushchairs will be placed in the luggage storage provisions of the trial vehicle. The inclusion of these items is to simulate any partial obstruction to evacuation that would be experienced in service conditions.

e) All internal doors are to be closed.
f) 50% of the seats having fold-down passenger tables are to have a temporary identity mark fixed to them. During the egress trials the volunteers are to be asked to place the marked tables in the down (in use) position before the start of the trial.

h) If, in calculating the seats to be marked, the calculation does not produce a whole number, the number of tables is to be rounded up to the next whole number.

i) Video cameras are to be positioned at each door or pinch-point and additionally to give a view along the passenger saloon.

Vehicle preparation - vehicle to vehicle egress trials

C.12 The vehicle undergoing the test is to be prepared as described in C.11 with the following specific requirements:

a) Two additional vehicles are to be coupled, one each end of the test vehicle. The additional vehicles are to share the same platform access as the first vehicle and are to be in a safe condition.

b) The vehicles are to be prepared as follows:

i) Emergency passenger lights only illuminated in all vehicles.

ii) All internal doors on all vehicles are to be closed.

iii) All external doors on the non-platform side are to be closed and locked out of use.

iv) The platform side doors on the trial vehicle are to be closed.

v) The platform side doors on the adjacent vehicles are to be closed at the vestibules adjacent to the trial vehicle, but are to be open at the far end to the trial vehicle.

Vehicle preparation - vehicle to track egress trials

C.13 The vehicle undergoing the test is to be prepared as described in C.11 with the following specific requirements:

a) Emergency passenger lights only illuminated on all vehicles.

b) All internal doors on all vehicles are to be closed.

c) All external bodyside doors are to be closed and locked out of use.

d) The external vehicle egress door is to be closed and any detrainment device is not to be deployed.

Test passenger volunteers

C.14 Test passengers are to be selected from healthy volunteers aged between 16 and 65 years. They will be asked to declare any relevant medical conditions; see C.33.

C.15 In order to reflect the mixed leisure / business usage of the vehicle service, 50% of both the male and female volunteers are to be requested to be clothed appropriately for travelling to a business meeting. The remaining volunteers are to be requested to be clothed appropriately for travelling on a day of leisure. Additionally, volunteers are to be requested to bring articles of warm outdoor clothing.
C.16 The volunteers are to be requested not to wear clothing or shoes which could cause injury to themselves or to others. For end egress trials the choice of shoes is to take account of the need to evacuate onto track ballast.

C.17 No groups of more than six volunteers are to share a common, close working environment.

C.18 There is to be no family grouping of more than six volunteers.

C.19 Approximately 40% of the volunteers are to be selected to represent passengers travelling on their own.

C.20 In addition to the volunteers, two infant manikins (dummies) are to be used for the trials. The manikins are to be of the correct mass for their age. Two of the volunteers, one male, the other female, are to be requested to take reasonable and appropriate action to evacuate with the manikins during the trials. The volunteers are to be requested to leave their luggage on the train during the trials.

Site preparation

C.21 The site for the evacuation trials is to be prepared to the satisfaction of the person in charge (PIC).

C.22 There is to be a continuous platform or staging along one side of all vehicles required by the test. The extent of the test site is to be bounded along all perimeters by appropriate markings. Where there are any steps required for access to the site or where there are any drops or potential areas for the volunteers to fall (for example the platform edge), these are to be protected by the erection of appropriate handholds or barriers. All steps are to be adequately illuminated and are to be conspicuous.

C.23 Access to the site and all areas accessible to the volunteers for the duration of the trials are to be adequately lit.

C.24 There is to be adequate provision at the site for the volunteers to store heavy outdoor clothing. The site is to be chosen to protect volunteers from rain or adverse weather conditions as far as practicable to do so.

C.25 In accordance with the safe system of work, the appropriate methods are to be identified and undertaken to protect the site, the vehicles involved in the trials and the volunteers during the period of the trials.

C.26 The evacuation trials are not to commence or are to be aborted, if the weather or ambient conditions at the site become such as to affect the control of the site or give concern for the welfare and safety of the volunteers.

C.27 During the evacuation trials the platform is to be lit sufficiently to give a good level of background lighting. As a minimum this is to be 40 lux.

C.28 The platform or staging is to be a minimum of 5 m deep for a length at least equal to that of the vehicles required for the evacuation trials. The platform height is to be 915 mm above rail level and is to be free of any slip or tripping hazards.
Test procedure

C.29 Two evacuation trials for both side egress and vehicle-to-vehicle egress are to be undertaken. Both the side egress and the vehicle-to-vehicle egress trials are to be conducted as ‘familiarisation’ trials before tests are conducted as ‘team effort’ trials. The volunteers are not to be informed of the value of the incentive for the ‘team effort’ trials until the ‘familiarisation’ trials have been conducted.

C.30 The vehicle-to-vehicle egress trials are to be conducted from the test vehicle into both adjoining vehicles.

C.31 The volunteers and the marshals are to be briefed thoroughly on the safe system of work before the start of the tests. The briefing will emphasise the need for safe practices and safety consciousness by all parties and is to include at least the following information:

a) A brief explanation of the purpose of the tests.
b) The type(s) of vehicle(s) and the location of the test site.
c) The identification worn by the PIC and the marshals and their functions during the tests.
d) The nature and purpose of the signals to start the tests and, in particular, the nature and purpose of the signal for aborting a test whilst it is in progress.
e) The location and meaning of any signs that may have been installed, concerning the general safety of the volunteers on the test site and the need for these to be adhered to at all times.
f) An outline of the procedure to be adopted to conduct a test, emphasising the importance for the volunteers to follow any instructions given by the PIC or marshals, particularly with regard to safety.

C.32 Following the briefing, the volunteers are to be offered the opportunity to ask questions and request clarification.

C.33 The volunteers are to be asked to sign a statement indicating that they have received the briefing on the safe method of working. The statement is to include a declaration that test passengers will not undertake any action which may cause injury to themselves or to others, and a declaration of any relevant medical conditions. Any volunteer not willing to sign the statement is not to be permitted to participate in the tests. It is to be made clear that any volunteer may leave the evacuation trial at any time.

C.34 Before the evacuation trials commence, the PIC and marshals are to check that the volunteers are not wearing clothing or shoes which could cause injury to themselves or to others.

C.35 During the evacuation trials, the PIC and marshals are to monitor the behaviour of the volunteers. Any behaviour which could have safety implications, whether for the volunteer exhibiting that behaviour, for other volunteers, or the site staff, is to be corrected or eliminated by removing the relevant volunteer from the trial.

C.36 The PIC and all marshals are to be equipped with whistles to signal an abort of the test, and are to be clearly identifiable to the volunteers. The number of marshals determined in C.9 represents the minimum number required and there may be
circumstances when more are required, as an example, in adjacent vehicles for safety reasons.

C.37 The test is to be started by a pre-arranged signal given by the PIC or a marshal, at which time the door marshals are to start their stopwatches and commence counting volunteers exiting as appropriate. A note is to be taken of the time for the volunteers to open the door and commence evacuation of the vehicle. If a situation develops which may compromise the safety of the volunteers, the test can be aborted by any of the marshals or the PIC sounding a whistle.

C.38 The marshals with stopwatches are to continue timing and counting as appropriate until the last volunteer leaves the door at which they are stationed. These times and volunteer counts are to be noted.

C.39 The PIC is to check that the vehicles involved in the trials are empty of volunteers, that there is no injury to volunteers and that the vehicles are in a safe condition.

C.40 A report for the series of the evacuation trials is to be compiled by the PIC. The report is to contain the following information:

a) The name of the establishment undertaking the tests.
b) The test site location.
c) The date of the test.
d) The start and end times for the complete trial period.
e) The time of each trial.
f) The vehicle details including design code, vehicle / coach type and number.
g) Seating capacity (with source of information named), test loading and passenger positions;
h) Diagram of the vehicle interior showing corridor widths, the number, position and dimension of seats, tables, luggage stacks, luggage racks, interior doors, draught screens and any other fitments likely to influence the movement of passengers to the exterior doors.
i) The maximum, minimum and average age of the volunteers.
j) The number of males and females.
k) The general weather conditions during the test.
l) The measured times for volunteer egress and the numbers of volunteers egressing through each door or location.
m) Details of any tests aborted for safety reasons.
n) The instructions given to the volunteers.
o) The signed statements of consent from the volunteers.
p) The risk assessment.
q) Any other comments considered relevant.
r) Authorisation of the tests by the PIC.
s) Stopwatch serial number and calibration record, or details of the agreed method of timing.
t) Copies of the required video recording and any photographs of the site or equipment used are also to form part of the report.
u) Details of any injuries caused that result in a trial not being completed.
v) Details of any trials repeated for any reason.
w) Records of any other factors, whether internal or external, that may have influenced the outcome of the trial.
Definitions

Egress  The normal actions of passengers and crew as they get off rail vehicles in normal conditions.

Escape  The actions of passengers and crew as they seek to get off rail vehicles in abnormal conditions and when normal egress routes and facilities are unavailable, or are blocked as a result of the vehicle condition. Passengers may have to use the emergency equipment provided in the process of escape.

Escape route  A route which provides a means of escape from a point in a vehicle to a final exit from the train.

Evacuation  The act of emptying rail vehicles of passengers and crew using normal egress routes or facilities as a reaction to abnormal conditions.

Exterior  A location which is outside of the vehicle structural bodyshell.

Fire performance  The measured or assessed behaviour of the constituent combustible materials and component parts of a vehicle, or of the vehicle as a whole, when subjected to prescribed fire tests.

Interior  A location which is within the vehicle structural bodyshell.

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.

Railway Documentation and Drawing Services Limited (RDDS)  A wholly owned subsidiary of RSSB, managed on behalf of RSSB by Serco Raildata under a business services agreement. See https://www.rssb.co.uk/Governance/Railway-Documentation-and-Drawing-Services-Limited
References

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

GERT8000 Rule Book
GMRT2130 issue five Vehicle fire safety

RSSB documents

RIS-2004-RST Issue one Rail vehicle maintenance.
RIS-8270-RST Issue one Route Level Assessment of Technical Compatibility between Vehicles and Infrastructure.

Other references

BS 6853:1999 Code of practice for fire precautions in the design and construction of passenger carrying trains.
BS EN 13272:2012 Railway applications. Electrical lighting for rolling stock in public transport systems.
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<th>Standard</th>
<th>Description</th>
</tr>
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<tr>
<td>BS EN 61310-1:2008</td>
<td>Safety of machinery. Indication, marking and actuation. Requirements for visual, acoustic and tactile signals.</td>
</tr>
<tr>
<td>Persons with Reduced Mobility TSI (PRM TSI)</td>
<td>Commission Regulation (EU) No 1300/2014 on the technical specifications for interoperability relating to accessibility of the Union’s rail system for persons with disabilities and persons with reduced mobility.</td>
</tr>
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