

Railway Group Standard

GM/RT2130

Issue Four

Date December 2013

Vehicle Fire, Safety and Evacuation

Synopsis

This document mandates requirements for the provision of rail vehicle fire safety and evacuation arrangements. In particular, it addresses matters of rail vehicle design associated with fire safety, diesel propulsion, emergency lighting, emergency and safety equipment, emergency and safety information and emergency evacuation.

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Issue	Date	Comments
One	June 2008	Original document Supersedes GM/RT2120, GM/RT2176, GM/RT2177, GM/RT2300, GM/RT2462, AV/ST9002 and AV/ST9005
Two	August 2009	Replaces issue one Small scale change amendment – addition of clause 8.2.2.2
Three	December 2010	Replaces issue two Small scale change amendment – withdrawal of 6.5.3, and revision of clauses 6.5.2 and 8.2.2.1
Four	December 2013	Replaces issue three Revised to align with fire categories in the Rolling Stock Technical Specification for Interoperability (RST TSI) and BS EN 45545:2013, to facilitate open wide gangways, remove duplication of testing between GM/RT2130 and BS 6853:1999, revise the requirements for emergency lighting outside of exterior doorways and remove the requirements for emergency lighting to charge luminescent signage.

Amended or additional parts and / or sections of revised pages have been marked by a vertical black line in the adjacent margin.

Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GM/RT2130, Issue Three, December 2010 Vehicle Fire, Safety and Evacuation	All	01 March 2014

GM/RT2130 Issue Three ceases to be in force and is withdrawn as of 01 March 2014.

Supply

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Part 1 Purpose and Introduction

1.1 Purpose

- 1.1.1 This document mandates requirements for the provision of rail vehicle fire, safety and evacuation arrangements. In particular, it addresses matters of rail vehicle design associated with fire safety, diesel propulsion, emergency lighting, emergency and safety equipment, emergency and safety information and emergency evacuation.

1.2 Introduction

1.2.1 Background

- 1.2.1.1 The implementation of the Technical Specifications for Interoperability (TSIs) mandated through a series of European Union Directives has resulted in a review of all requirements mandated in Railway Group Standards.

1.2.2 Support to Essential Requirements

- 1.2.2.1 The EU Directives applicable to Interoperability mandate that each TSI is required to address a number of essential requirements. In supporting specific requirements in Rolling Stock (RST) TSIs, the following essential requirements are addressed.

- 1.2.2.2 The Directive 2008/57/EC contains within Annex III Essential Requirements the following relevant essential requirements:

2.4. Rolling stock

2.4.1. Safety

Emergency exits must be provided and indicated.

Appropriate provisions must be laid down to take account of the particular safety conditions in very long tunnels.

An emergency lighting system of sufficient intensity and duration is compulsory on board trains.

2.4.2. Reliability and availability

The design of the vital equipment, of the running, traction and braking equipment and of the control and command system must be such as to enable the train to continue its mission, in a specific degraded situation, without adverse consequences for the equipment remaining in service.

1.2.3 Supporting documents

- 1.2.3.1 The following Railway Group documents support this Railway Group Standard:

- a) GM/GN2630 Guidance on Rail Vehicle Fire Safety
- b) GM/RC2531 Recommendations for Rail Vehicle Emergency Lighting
- c) GM/RC2532 Recommendations for Rail Vehicle Emergency and Safety Equipment
- d) GM/RC2533 Recommendations for Rail Vehicle Emergency and Safety Information
- e) GM/RC2534 Recommendations for Rail Vehicle Emergency Evacuation

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1.3 Approval and authorisation of this document

- 1.3.1 The content of this document was approved by Rolling Stock Standards Committee on 28 June 2013.
- 1.3.2 This document was authorised by RSSB on 31 July 2013.

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Part 2 Fire Safety

2.1 General requirements

- 2.1.1 The objectives of Part 2 of this document are to minimize the probability of a fire starting, to control the rate and extent of fire development and through this, to minimize the impact of the products of fire on passengers and staff. The objectives are considered in the context of the Operation Category and design characteristics of the rail vehicle.
- 2.1.2 The objectives set out in 2.1.1 of this document, in terms of the vehicle design configuration and the materials used in its construction, are to ensure that:
- a) The mechanical strength of the primary vehicle structure is retained to achieve continued operation as required (see 2.3 of this document) and to enable evacuation and escape.
 - b) The rates of fire propagation, of flame spread, heat release and of smoke and toxic gas emissions are controlled to:
 - i) Enable people not to be unduly hindered in their escape and evacuation to a place of safety, taking account of the specific operational characteristics of the category of vehicles as described in 2.2 of this document.
 - ii) Minimise the effects on the railway infrastructure and on railway operations, which could endanger people not on the vehicle.

2.2 Vehicle fire performance categories

- 2.2.1 All rail vehicles shall be designed, constructed and maintained in accordance with one of the following fire categories:
- a) Operation Category 1 (OC1)
Rail vehicles for operation on infrastructure where rail vehicles are able to be stopped with minimum delay, and where a safe area for train evacuation can always be reached immediately.
 - b) Operation Category 2 (OC2)
Rail vehicles for operation on underground sections, tunnels and / or elevated structures, with side evacuation available and where a safe area is reachable within a short running time.
 - c) Operation Category 3 (OC3)
Rail vehicles for operation on underground sections, tunnels and / or elevated structures, with side evacuation available and where a safe area is reachable within a long running time.
 - d) Operation Category 4 (OC4)
Rail vehicles for operation on underground sections, tunnels and / or elevated structures, without side evacuation available and where a safe area is reachable within a short running time.

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The Operation Category required for the vehicles to form a given service should form part of the route compatibility assessment process in accordance with GE/RT8270. The Operation Categories are consistent with BS EN 45545:2013 and the relationship between these categories and applicable TSIs. See Appendix A of this document for guidance on the characteristics of the infrastructure.

- 2.2.2 In the event of a fire on a rail vehicle, to permit continued operation and facilitate evacuation of the train, in accordance with the requirements of 2.3 of this document, the following running times shall be required (also referred to as the 'relevant period of the incident' in BS EN 50553:2012):
- a) OC1: A running time is not specified as these vehicles may be stopped with minimum delay and evacuation started.
 - b) OC2: The running time shall be 4 minutes.
 - c) OC3: The running time shall be 15 minutes.
 - d) OC4: The running time shall be 4 minutes.
- 2.2.3 Material properties shall be determined according to the following classifications and therefore the required performance:
- a) Materials for OC1: Vehicles shall meet the requirements for BS 6853:1999 Category 2.
 - b) Materials for OC2: Vehicles shall meet the requirements for BS 6853:1999 Category 1b.
 - c) Materials for OC3: Vehicles shall meet the requirements for BS 6853:1999 Category 1b.
 - d) Materials for OC4: Vehicles shall meet the requirements for BS 6853:1999 Category 1a.
- 2.2.4 Irrespective of Operation Category, vehicles with berths or seating intended for sleeping passengers or traincrew shall assumed to be OC3 vehicles and meet the requirements for BS 6853:1999 Category 1b.
- 2.2.5 Rail vehicles in OC4 shall be equipped for evacuation of passengers and traincrew from either end of any train formed of such vehicles.
- 2.2.6 For vehicles operating on infrastructure subject to EU Directives applicable to Interoperability (see Part 1) the following relationships shall apply:
- a) OC2 corresponds to TSI Category A.
 - b) OC3 corresponds to TSI Category B.
- 2.2.7 The suitability of vehicles for a given infrastructure shall be in accordance with compatibility matrix set out in Table 1 of this document.

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	OC1 infrastructure	OC2 infrastructure	OC3 infrastructure	OC4 infrastructure
OC1 vehicle	Yes	No	No	No
OC2 vehicle	Yes	Yes	No	No
OC3 vehicle	Yes	Yes	Yes	No
OC4 vehicle	Yes	Yes	No	Yes

Table 1 Vehicle fire safety and evacuation compatibility matrix

2.3 Safeguarding continued operation in the event of fire

- 2.3.1 Rail vehicles in OC2, OC3 and OC4 shall comply with the requirements of BS EN 50553:2012.
- 2.3.2 Rail vehicles in OC2, OC3 and OC4 shall comply with the requirements for fire barriers set out in BS 6853:1999 section 7.
- 2.3.3 Rail vehicles in OC2, OC3 and OC4, where open wide gangways are used and there are no vehicle end fire barriers, shall satisfy the following requirements:
- The gangway floor shall be considered to be a continuation of the vehicle floor and, accordingly, shall satisfy the applicable floor fire barrier integrity and insulation requirements specified (see 2.5 and 2.8 of this document and BS 6853:1999 section 7).
 - The gangway interior floor, sides and ceiling shall be considered to be a continuation of the vehicle interior and, accordingly, shall satisfy the applicable requirements specified for these surfaces (see 2.8 of this document and BS 6853:1999 section 6).
 - Automatic smoke or fire detection equipment shall be fitted to the vehicles in accordance with the requirements of BS 6853:1999 section 8.
- 2.3.4 A means of visually assessing whether fire is present shall be incorporated in doors in fire barriers that are part of an escape route (such as bulkhead doors between vestibules and engine compartments). Where a means of visual assessment is provided it shall meet the conformance requirements of the fire barrier.
- 2.3.5 Doors in fire barriers shall be self-closing. However, the passage of people through such doors shall not be impeded by that feature.

2.4 Reducing the risk of ignition

- 2.4.1 The design of the vehicle and its equipment (either located inside the vehicle or located outside), including its structures, systems, equipment, components and materials, and their relative positions and proximities to each other, shall be arranged so that as far as reasonably practicable the risks of ignition are minimised.

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- 2.4.2 An assessment of normal operation, foreseeable equipment and component failure modes shall be undertaken to demonstrate that fire risks have been identified and measures adopted to control these risks.
- 2.4.3 Except where functionality demands otherwise, sources of heat and ignition such as internal combustion engines, electrical equipment, braking systems, cooking equipment, heaters and hot surfaces, shall be separated from flammable fluid systems and lubricating oil systems along with associated tanks, pipework and ancillary equipment by physical distance or suitable barriers.
- 2.4.4 The measures contained in BS 6853:1999 section 5 relating to design considerations with the aim of protecting passengers and staff in rail vehicles in the event of a fire on board shall apply to all categories of rail vehicle. The objectives are to minimise the risk of a fire starting, to delay fire development and to control the spread of fire products through the rail vehicle.
- 2.4.5 Any potential leakage or seepage of flammable liquids shall be managed. This shall include consideration of flexible pipes or joints in the lines used for circulation or distribution of pressurised fluids.
- 2.4.6 Equipment containing flammable liquid, such as fuel and oil tanks, transformers, hydraulic systems, cooling systems using flammable refrigerants and their associated pipework, shall be either:
- a) Protected against risk of puncture.
- Or
- b) Of proven durability for its environment.
- 2.4.7 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 mechanical sources below the floor of the vehicle. Examples of such mechanical sources include cast iron brake blocks, and rail grinding equipment.

2.5 Reducing the risk of fire development

- 2.5.1 The measures contained in BS 6853:1999 section 7 for the control of spread of fire and its products, primarily requirements for fire barriers, shall apply to all categories of rail vehicle.

2.6 Fuel systems and storage

- 2.6.1 The fuel installation shall be so designed and constructed that its components are able to resist internal and external corrosion phenomena to which they are exposed.
- 2.6.2 Risks from fuel storage on the vehicle are reduced by achieving the following:
- a) The fuel tank(s) shall be made of a fire-resistant material.
 - b) A fire barrier shall be provided to separate the fuel tank(s) from passenger compartments.
 - c) The fuel tank(s) shall be placed so as to ensure that any fuel leaking from the tank(s), its filler hole or its pipe connections does not come into direct contact with any source of ignition.