MEETING:	Rolling Stock Standards Committee (RST SC) Control Command and Signalling Standards Committee (CCS SC) Plant Standards Committee (PLT SC)
DATE:	11 March 2022 (RST SC) 14 April 2022 (CCS SC) 4-5 May 2022 (PLT SC)
SUBJECT:	Five-year review of GMRT2045 issue four - Compatibility Requirements for Braking Systems of Rail Vehicles
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1. Purpose of the paper

1.1 This paper sets out the assessment of the five-year review of GMRT2045 issue four - Compatibility Requirements for Braking Systems of Rail Vehicles. It seeks Rolling Stock Standards Committee approval and Command Control and Signalling, and Plant Standards Committees support on the recommendation and way forward.

2. Background

2.1 GMRT2045 issue four amalgamated the National Technical Rules (NTRs) relating to braking which were previously included in a number of separate Railway Group Standards (RGSs). These requirements were redrafted to align with the Locomotive and Passenger Technical Specification for Interoperability (LOC&PAS TSI) and Wagons TSI (WAG TSI). Requirements that were considered to be outside the scope of NTRs were either withdrawn or retained as guidance.

2.2 GMRT2045 issue four thus became the sole RGS setting out braking system NTRs for all rail vehicles on the GB railway. The only exceptions were:

a On-track machines when in working mode, these being covered by RIS-1702-PLT (and thus by reference BS EN 14033-2:2017)

b General Contract of Use (GCU) international wagons, defaulting to the requirement set out in the WAG TSI.

2.3 GMRT2045 issue four was published in March 2016. In 2017 a twelve-month review of the standard was undertaken, with no amendment found to be required at that time. When the list of notified NTRs was updated in January 2018, only the requirements in part two of the standard were found to meet the criteria of NTRs. Those requirements that are out of scope of railway group standards will be withdrawn. If the requirements are valid and useful to industry they will be retained in a Rail Industry Standard (RIS).

3. Impacts of the document(s) following publication/entering into force

3.1 Consideration has been given to the following during the assessment:

a Business case for change – The primary motive for change, amalgamation of the suite of GB braking requirements into a single RGS, was achieved.

b Deviations – The following deviations have been raised against GMRT2045 issue four:

- 18-037-DEV - Class 717 Enhanced Emergency Brake Rate. This deviation covers a particular issue with this family of units, since EB is not load-weighed (unlike service brake) and the tare - crush mass difference is high. Since load-weigh of EB should always be an aspiration to normalise adhesion requirements / stopping distances, the requirement still stands.
- 18-064-DEV - Class 221 Parking Brakes Isolation Switch. This deviation relates to a non-compliance when the vehicle is in a degraded condition only. The requirement against which the deviation was granted assumes the vehicle is operating at full performance. The disparity was identified on submission of a new deviation to replace this time limited deviation. As a result the new deviation application was rejected, since it was not required, and this time limited deviation has been withdrawn.

There are no issues raised by these deviations that require addressing in a revision to GMRT2045 issue four.

c Current projects or proposals being processed – 18-028 - Standardisation of Faster Freight Movement proposes modifications to R2 and TOPS to support use of the true (or calculated) Lambda values for a train made up of arbitrary vehicles when running under ERTMS. This would amend requirements in part three of GMRT2045 with regards to provision of data, and allow the open point in appendix E (calculation of Lambda for vehicles where brake force varies in proportion with load) to be closed.

18-028 is currently proposed to be closed due to the scope being encompassed by RSSB research project T1266 and a Network Rail led project to replace the 2/3 differential speed rule for freight operation applied to Southern Region lines. These will, in combination, cover the same areas related to the standard detailed above.

d Limited change release – No limited change release has been published for GMRT2045 issue four.

e Amendments and clarifications – Four amendments have been issued against GMRT2045 issue four:

- AM001 – This corrects an omission relating to advisory brake release timings for GB wagons in twin pipe mode. It also emphasises the GB specific release timing for both single and twin pipe modes over the international timing. Non-conformance to these release times represents a small risk of new wagons being configured for international (longer) release times in GB trains and thus over-braking during the brake release period.
- AM002 – This highlights the need to consider common mode failures of the braking system generated by external events (particularly obstructions on the track) in the light of the runaway at Markinch, additional guidance being provided for the existing requirement clause.
- AM003 – This addressed an issue whereby service brake failure indications on certain new fleets were not displayed to the driver by the TCMS until a delay time had elapsed (as with general faults, to prevent spurious indications), nor was suitable action taken (application of the emergency brake). The need to take a risk-based approach to the delay time is highlighted, additional guidance being provided for the existing requirement clause. This is related to request for help 17-REQ-075.
- AM004 – This clarifies that the formula developed for conversion between

'brake force' (GB) and 'braked weight' (EN/UIC) is applicable for hauled vehicles only, not self-propelled. The opportunity is also taken to acknowledge the issue of the relevant EN standard in the intervening period since issue four of GMRT2045. This is relevant to request for help 21-REQ-036.

The content of these amendments will be incorporated in the standard at the next revision.

f Enquiries – Two enquiries have been received against GMRT2045 since issue four was published. The first pertains to braking requirements for vehicles operating up to 350 km/h - GMRT2045 covers up to 250 km/h, although provides guidance for up to 300 km/h. There is no proposal to increase this at this time due to infrastructure limitations.

The second, case CAS-02908-Q4F9G7, pertains to calculation of braked weight. This enquiry indicates that GMRT2045 should be updated to refer to BS EN 16834 instead of UIC leaflet 544-1 at the next issue.

g Research projects – Research projects relevant to the content of GMRT2045 have been reviewed. The only one of relevance is T1099 - Enabling Magnetic Track Brakes on GB Mainline Railway. The output of this research is embodied in RIS-2710-RST, which should be referenced against clause F.11.1 of GMRT2045.

h Changes in regulations – Since the publication of GMRT2045 issue four the United Kingdom (UK) has exited the European Union (EU). There is no direct effect on the technical content of the interoperability National Technical Specification Notices that replace the Technical Specifications for Interoperability.

i Changes in technology – No innovations or novel uses of technology have been identified that need to be addressed in GMRT2045 issue four.

j National Technical Specification Notices (NTSNs) and European standards – All TSIs referenced in the standard are those transposed into the NTSNs as of 31 December 2020; as such updates should reference to NTSNs rather than TSIs.

A number of the European standards referenced have been updated since issue four. In addition, the EN standards covering the topics covered by UIC leaflets 541-3 and 544-1 have now been issued – these are BS EN 15328:2020 and BS EN 16834:2019 respectively. Subject to review these should now be the primary reference, with equivalence to the UIC being explained in guidance to ensure continuity of interpretation.

k Published list of national technical rules (NTRs) – GMRT2045 issue four includes requirements which do not meet the criteria for NTRs and are not included on the latest list of notified NTRs published December 2021. Requirements that do not meet the NTR criteria should be removed from the RGS and published in a RIS.

l Any other observations

- Request for help 20-REQ-006 is currently open against GMRT2045 issue four. This requests guidance on reliability and safety assurance to be achieved by the service braking system. This information may not be appropriate to include in the standard. Performance levels are more suitable for inclusion in the train specification, having been determined by a common safety method approach. This is already set out by the standard.

- There are a number of appendices in GMRT2045 (F to K) which are not directly referenced by requirements in the main body of the standard, but rather provide supplemental guidance or descriptions of systems. The content

provided requires review to determine if it remains pertinent to include in the RGS, or (if deemed worthwhile to retain) in another document.

4. Discussion

4.1 Review assessment

4.1.1 This five-year review has identified that GMRT2045 issue four is not fit for purpose as the RGS contains requirements that are not NTRs. It is therefore recommended that a standards project is established to revise GMRT2045. It is proposed that this project will perform the following:

a Withdraw the requirements that are not NTRs and associated guidance from the standard. Those that are deemed worthwhile to retain will be incorporated into a new RIS

b Review the additional guidance in appendices F to K to determine if it is to remain in GMRT2045 or be otherwise retained in another document

c Incorporate the amendments issued against GMRT2045 issue four (AM001 to AM004)

d Update references to TSIs to NTSNs to reflect the post-Brexit legislative environment

e Review all references to EN, UIC leaflets, RGS, RIS and guidance documents and update as required. This will include enhancing guidance on magnetic track brakes by reference to RIS-2710-RST

f Incorporate the findings of research project T1266 if available to close the open point; these are currently expected mid-2023 and could therefore be included in this update

g Incorporate the conclusions of the Network Rail 2/3 Rule Working Group if available relating to additional braking data to be provided; these could be incorporated in this update if dependent upon timescales for that work (including implementation of changes to R2 and TOPS)

5. Recommendations

5.1 The Rolling Stock Standards Committee is asked to:

a DISCUSS the assessment of the five-year review and the following proposed recommendation:

i Conduct a consultation with industry on the findings of this five-year review

ii Initiate a standards change project to revise GMRT2045, withdrawing the requirements which are not NTRs and reviewing for relevance to incorporate into a RIS.

b APPROVE:

i The recommendations including consultation with industry.

5.2 The Control Command and Signalling, and Plant Standards Committees are asked to:

c DISCUSS the assessment of the five-year review and the following proposed recommendation:

i Conduct a consultation with industry on the findings of this five-year review

ii Initiate a standards change project to revise GMRT2045, withdrawing the requirements which are not NTRs and reviewing for relevance to incorporate into a RIS.

d SUPPORT:

i The recommendations including consultation with industry.

RSSB completion: [do not delete]

Lead Standards Committee	*Meeting date*	*Recommendation approved*	*Minute numbers*		*Next review date*
			Pre-consultation review	*Post-consultation review*	
Rolling Stock					

Appendix A Disposition table for document recommended for withdrawal

A.1 GMRT2045 issue four - Compatibility Requirements for Braking Systems of Rail Vehicles

Clause number	Clause title	Proposed Way forward	Comments
Part one	Purpose and Introduction	Retain in GMRT2045 issue five	Standard RGS template - updated as required
Part two	Requirements for Brake Systems	Retain in GMRT2045 issue five	As-per the list of UK (GB) NTRs for vehicles, December 2021, this part is exclusively formed of requirements that are NTRs
Part three	Braking Data for Train Operation	Withdrawing and review for relevance to incorporate into a RIS	The requirements in this part do not qualify as NTRs
Part four	Application of this document	Retain in GMRT2045 issue five	Standard RGS template - updated as required
Appendices A-C		Retain in GMRT2045 issue five	These appendices support specific requirements in part two
Appendices D-E		Withdrawing and review for relevance to incorporate into a RIS	These appendices support specific requirements in part three
Appendices F-K		To be determined	These appendices are noted as being provided for guidance. They are only directly referenced from the guidance clauses in the main body of the standard. It will be determined where this might best be located (if still deemed useful). This might necessitate the creation of one or more new railway industry guidance notes to accommodate the information contained in them.

Appendix B Associated information to support the review

Deviations	List current deviations: - Issue 1: 99-205-DGN, 99-265-DGN. - Issue 2: 00-098-DGN, 01-253-DGN, 02-307-DGN, 08-010-DGN. - Issue 3: 15-050-DEV, 18-020-DEV. - Issue 4: 18-037-DEV.	List deviations in progress: Nil.
Request for Help	Open Requests for Help: - 17-REQ-075 (need to work with Industry before it is translated into a project). - 20-REQ-006 (MO to pass on to R&D for further research to be done before taking forward as a proposal). Outcome of resolved Requests for Help: N/A	
Proposals	List approved proposals: 15-017 & 15-017b.	List proposals not yet approved by the standards committee: Nil.
RSSB Standards Programme	This document is currently not on the RSP.	
Amendments or clarifications	2045 Iss 4 AM001; 2045 Iss 4 AM002; 2045 Iss 4 AM003; 2045 Iss 4 AM004.	
Limited change releases	None	
Enquiries	Cas-02908-Q4F9G7 dated 16/02/2021 from VTG The requester is working for VTG on their new Ecofret 2 wagons and a question has come up on braking relating to the RSL data. GMRT2045 clause 3.4 requires the lambda value to be calculated. This requires a braked weight. Clause 3.4.2 requires that this is calculated in accordance with UIC 544-1 but also mentions a draft EN. The calculations are not carried out in accordance with UIC 544-1 but using EN 14531-6 (as permitted by the WAG TSI), and VTG understands that EN 16834 (now issued) aligns better with EN 14531-6 than the UIC. Therefore, VTG proposes to calculated the braked weight in accordance with EN 16834 rather than UIC 544-1. This is strictly a non conformance against clause 3.4.2, noting that this clause is not mandatory but as part of an RGS is a license condition. VTG is not keen to apply for a deviation (and the project timescales will not permit this) but some confirmation on the view of RSSB on this issue would be helpful. RSSB's response on 17/02/2021: The current consolidated text of the WAG TSI (NTSN in GB) clause **4.2.4.3.2 Brake Performance** includes	

	The brake performance of a unit shall be calculated in accordance with one of the following documents: *— EN 14531-6:2009, or* *— UIC 544-1:2014* You've advised that you will be using EN 14531-6:2009 for the Ecofret 2. But if you were using UIC 544-1:2014, clause **2.2.2.2 Determining the braking performance of wagons**… also states that for wagons that are not fitted with cast iron brake blocks the calculation methods are described in EN 14531-6 (and in 14531-1). So assuming the new Ecofret 2 wagons are not being fitted with cast iron brake blocks, the two options in the WAG TSI / NTSN both point to the same calculation methods. The text in UIC 544-1:2014 clause 2.2.2.2 is the same as that in UIC-544-1:2013, which is mentioned in GMRT2045 issue 4. So the WAG TSI and GMRT2045 (via UIC 544-1) both point to the braking performance stopping distance calculations to be performed using EN 14531. (However CEN has subsequently withdrawn both EN 14531-1:2005 and EN 14531-6:2009 and replaced them by EN 14531-1:2015 and EN 14531-2:2015 respectively.) The 'Braked Weight' value of a vehicle was originally established by the UIC and is published in UIC 544-1 (it is a derived value using vehicle/train stopping distances). The UIC 544-1 methods to establish 'Braked Weight' values have subsequently been published as a European standard in EN 16834:2019. In recognition of their origins EN 16834 also copied the UIC terms 'Braked Weight and 'Braked Weight Percentage' (Lambda). The method (and results) of calculating the braked weight according to UIC 544-1 or EN 16834 should therefore be the same. EN 16834 was not yet complete when GMRT2045 issue 4 was published, and so could not be included in the requirement 3.4.2 alongside UIC 544-1. The next WAG TSI / NTSN revision should include updating the references in clause 4.2.4.3.2 to the current EN 14531-1:2015, EN 14531-2:2015 and EN 16834:2019. The references in GMRT2045 will also be updated when the standard is updated. The future requirement in GMRT2045 would only refer to EN16834, not to UIC 544-1, as that is RSSB's general policy, although the guidance on that requirement may include something similar to what the origins of EN16834 referred to.
Business case for change	16-IA01
Information from RMDB Note: update RMDB to reflect action/decision	The 'Considerations for revisions' file is blank, please confirm with the TS/PM if there is anything to record. Otherwise this can be marked Nil.