

MEETING: Rolling Stock Standards Committee
DATE: 10/12/2021
SUBJECT: Five-year review of GMRT2131 issue one - Audibility and Visibility of Trains.
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1. Purpose of the paper

- 1.1 This paper sets out the assessment of the five-year review of GMRT2131 issue one Audibility and Visibility of Trains. It seeks Standards Committee approval on the recommendations and way forward.

2. Background

- 2.1 GMRT2131 issue one was published in December 2015. It combined the predecessor standards GMRT2483 issue one Visibility Requirements for Trains and GMRT2484 issue two Audibility Requirements for Trains into a single document, and aligned the content with the requirements of the LOC&PAS TSI.
- 2.2 The technical requirements of the LOC&PAS TSI concerning train visibility were contained within BS EN 15153-1:2013 Railway applications - External visible and audible warning devices for trains - Part 1: Head, marker and tail lamps. In turn these requirements had been developed from RSSB research project T530 'Review of train head-lamps' optical requirements'.
- 2.3 GMRT2131 issue one retained a National Technical Rule (NTR) for existing rolling stock which does not have front end lamps (headlamps and marker lamps) that are compliant with the requirements of the LOC&PAS TSI to display a yellow warning panel on the front end. GMRT2131 issue one also included guidance for users introducing front end colours other than yellow, because, in a change to its predecessor, the requirement to display a yellow front end warning panel does not apply to rolling stock with TSI-compliant front end lamps.
- 2.4 GMRT2131 issue one addressed a specific case in the LOC&PAS TSI to permit trains in GB to be equipped with a warning horn that emits a lower sound level at speeds below 100 mph.

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

- 3.1 Consideration has been given to the following during the assessment:
- a Impact assessment – The changes introduced to remove the requirement for a yellow front end on rolling stock with TSI-compliant front end lamps and introduce guidance on front end colour have been subject to different interpretations by industry, and railway undertakings seeking to introduce rolling stock with NTSN/TSI-compliant front end lamps and a front end without a yellow warning have encountered difficulties in the process. Partly this can be attributed to the wording of certain parts of GMRT2131 issue one, notably Appendix E. RSSB is developing additional guidance on this area under project 19-011, which it is

expected will be published initially as stand-alone guidance before subsequently being incorporated into standards publications when GMRT2131 is revised.

The impact assessment accompanying publication of GMRT2131 issue one states that it is considered that industry is better served by containing audibility and visibility requirements in a single document. It is not clear whether this is indeed the case, and indeed it is possible that combining both subject areas into a single document could slow down the publication of updates if, for example, there are agreed changes to be made to audibility content but a lack of consensus over the visibility content.

- b Deviations – The single deviation against GMRT2131 issue one was approved within six months of the publication of the standard and concerned a follow-on build of rolling stock to an existing design compliant to the predecessor documents, for which it was not proportionate to modify the design to comply with the new requirements in GMRT2131 issue one. This deviation does not introduce a need to change the technical requirements of GMRT2131 issue one.
- c Current projects or proposals being processed – RSSB assessed the suitability of reflective plates to provide the rear end signal on freight trains in GB under project 19-007 in mid-2020. Revision of GMRT2131 would provide an opportunity to incorporate guidance informed by RSSB project 19-007.

Additionally, as described, above RSSB project 19-011 is producing guidance on the assessment of front end visibility and front end colour selection, which could be incorporated into a revised version of GMRT2131.

- d Limited change release – There have been no limited change releases to GMRT2131 issue one published.
- e Amendments and clarifications – Two amendments and one clarification have been published for GMRT2131 issue one. The two amendments addressed minor typographical errors in the document. The clarification, GMRT2131 AM002, was published following an enquiry from industry on the required dimensions of a yellow warning panel on the front of a train when the warning panel does not have a regular shape, and provided additional guidance on what does and does not meet the requirements contained in GMRT2131. The content of this clarification will need to be incorporated into GMRT2131 at its next revision.
- f Enquiries – Enquiries have been received on various topics related to GMRT2131 issue one, including:
 - i Requirements for lamp controls and the permitted number of lit front end lamps. GMRT2131 issue one requires only three front end lamps to be lit, which places an additional requirement on users over and above those in the NTSNs. This has been captured on the NTSN issues log and the issues log entry is reproduced in Appendix A. Revision of GMRT2131 would support the close out of the identified issue.
 - ii Horn switching arrangements to change between low and high sound levels. Clarification of this is also recommended by RSSB research project T1205 (see 3.1g below).
 - iii Introduction of new or modified rolling stock without a yellow front end warning panel. As mentioned above, project 19-011 is producing guidance on this subject.

- iv The use of LED light strips for the upper marker lamps.
- v Dimensions of the yellow warning panel required on rolling stock which does not have TSI/NTSN-compliant front end lamps fitted. As noted in 3.1e above, this has resulted in a clarification to GMRT2131 issue 1 being published.
- vi Operation of rolling stock which has a yellow warning panel when part or all of that warning panel is missing or not visible.

- g Research projects – RSSB research project T1205 *Relationship between horn test measurements and perceived sound levels on the track* made two recommendations that are relevant to the content of GMRT2131 issue one, these are: a) Revise GMRT2131 concerning the application of low speed settings; and b) Develop guidance in an RSSB standard on design and maintenance to minimise excess attenuation.

Further relevant RSSB research projects that are ongoing or in development are 2021-SSH-002 *Improving the effectiveness of the train horn in emergency situations* and *Optimising drivers' use of audible warnings in all potential scenarios* [reference not yet allocated]. Whilst these are System Safety / Human Factors and Operations focused projects respectively they have the potential to produce recommendations that are relevant to GMRT2131.

- h Changes in regulations – Since GMRT2131 issue one was published, the UK has left the EU and TSIs have been replaced in GB by NTSNs. The relevant ENs called up by the TSIs/NTSNs have also been revised and republished in 2020. However despite these legislative changes, there are no material changes to the technical requirements for train audibility and visibility.
- i Changes in technology – There are no developments in technology that need to be addressed in GMRT2131.
- j National Technical Specification Notices (NTSNs) and European standards – Through discussions with stakeholders as well as during the course of RSSB project 19-007 it has been identified that there are elements of the LOC&PAS, WAG and OPE NTSNs that do not accurately describe the situation in GB concerning front and rear end visibility, and where the guidance in GMRT2131 issue one does not provide sufficient guidance on the NTSN requirements or obligations. These include;
 - i Statements in the NTSNs that the headlamps provide visibility for the driver at night and the marker lamps make the train visible to others, whereas it is the headlamps that make the train visible and are specified to provide sufficient warning time to trackside staff and level crossing users.
 - ii Lack of alignment concerning rear-end signals on freight trains, where the OPE NTSN states that there is a requirement for the end indication on freight trains to be two steady red lights and also includes reference to requirements for reflective plates, whereas the practice is to display a single flashing red light to the specification given in GMRT2131.
 - iii Inconsistent terminology – e.g. 'day' and 'night' headlamp settings vs 'full' and 'dimmed'

These are all issues that already existed within the TSIs that previously applied in GB. Whilst resolution of some of these issues may require changes to the NTSNs,

additional guidance within GMRT2131 would likely be beneficial.

- k Published list of NTRs – GMRT2131 issue one contains requirements that do not meet the criteria of NTRs, and which are not on the published list of NTRs. To align with the standards strategy, requirements that do not meet the NTR criteria should be removed from the RGS and published in a RIS.
- l Any other observations – It has been established that the specification for the portable head lamp contained in GMRT2131 issue one was defined to provide 25 seconds of warning time at 75 mph. At that speed it therefore does not provide the 45 seconds of warning time in daylight that a main headlamp is designed to provide. A review of the portable headlamp specification and its usage is recommended so that in use it can provide 45 seconds warning time.

4. Discussion

4.1 Review assessment

4.1.1 The outcome of the review is that GMRT2131 issue one is no longer fit for purpose and requires revision. It is recommended that a standards project is established to revise GMRT 2131 issue one. It is anticipated that the project will, inter alia:

- a) separate requirements that do not meet the criteria of an NTR into one or more RISs;
- b) incorporate outputs from the T1205 RSSB research project on audibility of train horns;
- c) develop improved guidance on the process of assessing visibility when introducing or modifying rolling stock;
- d) revise the requirements and guidance in GMRT2131 to support close-out of the issue concerning the number of lit front end lamps described in the NTSN issues log;
- e) align references with the post-Brexit legislative landscape;
- f) incorporate outputs from ongoing RSSB research projects that are delivered ahead of or during the drafting phase of the revision; and
- g) review the portable headlamp specification.

Development of the revision will also consider whether it remains appropriate to combine audibility and visibility requirements and associated content in the same document, or whether separate documents should be produced for audibility and visibility respectively.

4.1.2 There are errors in the relevant NTSNs that require correction. Undertaking a revision of GMRT2131 will help to identify the necessary changes.

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 recommendations:

Action required:

- i) In line with the Standards Code and Manual, conduct a consultation with industry on the findings of this five-year review. This consultation should also ask for views on whether audibility and visibility requirements should continue to be contained in the same document(s), or whether separate documents

should be produced for audibility and visibility requirements respectively.

- ii) Initiate a standards change project to revise GMRT2131.
- iii) Submit one or more Requests for Help to amend the NTSNs to correctly describe the situation in GB concerning front and rear end visibility.

b APPROVE/SUPPORT:

The recommendations including consultation with industry.

RSSB completion: [\[do not delete\]](#)

<i>Lead Standards Committee</i>	<i>Meeting date</i>	<i>Recommendation approved</i>	<i>Minute numbers</i>		<i>Next review date</i>
			<i>Pre-consultation review</i>	<i>Post-consultation review</i>	
Rolling Stock	10/12/2021				

Appendix A Extract from NTSN Issues Log

Issue:

The LOC& PAS TSI requires the fitment of 2 headlights in order to give visibility for the train driver. It also allows for additional head lamps to be provided (for example upper head lamps). It also says that additional head lamps are not mandatory and their use at operational level may be subject to restrictions.

The TSI also requires 3 white marker lamps to be provided at the front end of the train in order to make the train visible. The third marker lamp is to be located centrally above the two lower lamps. It is permitted to use the same component for both head lights and marker lights but there no explicit restriction ie separate head lights and white marker lamps can be installed giving more than 3 lights (at least 5 lights). The requirements in the LOC&PAS TSI on lamp controls are also not precise in this regard. It should be noted that the LOC&PAS TSI does not refer to any other external lights other than those fitted on the driving cab. Therefore the LOC&PAS TSI gives a degree of flexibility to vehicle manufacturers on the number of lights that can be fitted to the driving cab. However operationally railway undertakings have to comply with the OPE TSI which contains a requirement for the front of a train to be recognised by 3 white lights in an isosceles triangle formation.

The OPE TSI is not clear on whether the three lights layout explicitly includes or excludes one or more head lights to aid the visibility for the driver. In any case, at least one head light would be expected to be lit by night and during low light conditions. Therefore it is not clear whether despite their presence, the lighting of additional lights is permitted or forbidden when the vehicle is in operation. Operating with extra lights lit is likely to improve visibility of a train and perform other functions but recognisability could be affected as additional lights could jeopardise the triangle layout agreed. This leads to two questions for railway undertakings in terms of compliance with the OPE TSI:

- Whether marker lamps and adjacent headlamps may be illuminated simultaneously (resulting in more than 3 lights, in an approximate isosceles triangle).
- Whether lights for different purposes can be additionally displayed (for example low-level track illumination lights, pantograph monitoring system lights), potentially resulting in more than 3 lights not in an isosceles triangle, being lit and visible from in front of the train.

Solution:

Safe integration of vehicles with operations (railway undertakings and other affected parties) is an obligation on railway undertakings to be managed under their Safety Management System. Therefore any railway undertaking operating a train where more than 3 lights may be lit and visible from in front of a train when in operation, should assure themselves (for example by undertaking a risk assessment and consultation with affected parties where necessary) that the triangle light layout required by the OPE TSI for Interoperability is not jeopardised to the extent that it causes confusion to track workers or members of the public who are likely to encounter the train.

OPE TSI Mirror Group agreed:

November 2020: The OPE TSI Mirror Group approved the following 'way forward' which closes the issue:

Railway undertakings operating a train where more than 3 lights may be lit and visible from in front of a train when in operation, should assure themselves that the triangle light layout required by the OPE TSI is not jeopardised to the extent that it causes confusion to track workers who are likely to encounter the train.