GERT8073 issue 4.1 – limited change release

Version:	4.0		
Purpose:	Approval to publish		
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Lead industry committee:	Rolling Stock Standards Committee (RST SC)	**Date:**	14 January 2022
Supporting industry committee:	Infrastructure Standards Committee (INS SC)	**Date:**	11 January 2022

Decision

Rolling Stock Standards Committee (RST SC) is asked to:

DECIDE if the proposed limited change revision of GERT8073 delivers its intentions.
APPROVE the proposed limited change revision of GERT8073 for authorisation to publish.

Infrastructure Standards Committee (INS SC) is asked to:

DECIDE if the proposed limited change revision of GERT8073 delivers its intentions.
SUPPORT the proposed limited change revision of GERT8073 for authorisation to publish.

GERT8073 issue 4.1 – limited change release

This business case for change has been developed to support standards committees in taking decisions related to changes to standards, it includes an assessment of the predicted impacts arising from the change.

Proposed documents

Number	Title	Issue
GERT8073	Application of Standard Vehicle Gauges	4.1

Superseded documents

Number	Title	Issue
GERT8073	Application of Standard Vehicle Gauges	4

Summary

Background and change

GERT8073 issue 4 was published in December 2020.

Since its publication in December 2020, it has been brought to the attention of RSSB that there are issues in implementing the freight gauges (W gauges) in GERT8073 issue 4. The issues highlighted have the potential to have an impact on network capability for freight that was not appreciated at the time of publication.

With regards to freight gauges, the main change in issue 4 is the way in which the dynamic movements have been calculated, informed by RSSB research project T1109 'Freight Suspension Analysis'. Detailed analysis carried out by Network Rail and RSSB has shown that the differences in the gauge dimensions, resulting from the revised method of calculation of dynamic movements, has an impact that was not well understood from the findings of the research project.

Through discussions with industry experts, it was identified that a limited change release is necessary to enable the issue 3 movement tables to be reinstated for the existing W gauges, whilst retaining the rest of the changes brought about by GERT8073 issue 4, including the three new freight gauges.

Industry impact due to changes

Impact areas	Scale of impact	Estimated value
A. Legal compliance and assurance	N/A	N/A
B. Health, safety and security	Low	Not quantified
C. Reliability and operational performance	High	£8.5m over 5 years
D. Design and maintenance	Low	Not quantified
E. People, process and systems	Low	Not quantified
F. Environment and sustainability	Medium	Not quantified
G. Customer experience and industry reputation	Medium	Not quantified
Total value of industry opportunity =		**£8.5m over 5 years**

The standards change contribution to the total value of industry opportunity				
☐ None or low	☐ Minor but useful	☐ Moderate	☑ Important / essential	☐ Urgent / critical

Detail

1. What were the objectives associated with this change?

Objective 1 – Eliminate the significant differences between the freight gauges between issues 3 and issue 4

1.1 The main change in issue 4 was the way in which the dynamic movements were calculated. In advance of the standard's update to issue 4, RSSB research project T1109 developed a new set of benchmark movements using multi-body simulation (MBS) to calculate the movement of bogies and thus the size of the gauge more accurately. This change saw a move away from the BASS501 quasi-static gauging method that underpinned the movements provided for each of the benchmark suspension types in issue 3 of the standard.

1.2 The research project T1109 went through a process of modelling a series of bogies, representative of the suspensions in use on the network, to identify the movements in tare and laden conditions for each of the candidate bogies. These were then combined to generate a set of movements for bulk (W6a), container (W7, W8, W9 and W10a and subsequently the new gauges W7a, W8a and W9a) and a specific set of movements for W10, recognising the benchmark suspension types used in each of the gauges. The intent was to provide simpler and more representative application of dynamic movements applied with the freight gauges.

1.3 A decision was also made to make the gauges agnostic to speed, i.e. they respond to cant/cant deficiency only. The logic for this was that whilst BASS501 used a linearised conversion of Speed to Equivalent Cant (Kspeed), the MBS models relate to line speed rather than actual speed and are not linear. Accordingly, maximum dynamic movements associated with a cant are assumed, bringing the approach in line with lower sector vehicle gauge (LSVG), Passenger Gauge 1 (PG1), PG2, PG3 and Pantograph sways in GMRT2173 'Size of Vehicles and Position of Equipment'. It also greatly simplified manual calculations.

1.4 GERT8073 issue 4 also introduced a fixed wheelset movement, rather than a variable wheelset movement applied with issue 3, since novel suspensions (still to be developed, but which are allowable under the standard) may not have similar curving characteristics.

1.5 By 'compositing' the dynamics, the worst sways are combined with the worst drops and bounces for the full range of bogies. For example, there may be no wagons with LTF13 bogies and a 1000mm deck height, whilst the new gauge may accommodate it, there would be more sway at the top of the gauge than a combination of wagon / bogie would allow in practice. This is a consequence of trying to come up with a benchmarking process against which any new bogie could be compared.

1.6 The result of these changes in GERT8073 issue 4 is that some of the gauges are bigger in places under certain conditions than the previous version of the gauge. Whilst entirely appropriate for new wagons that are aligned to the new envelope and the design of new infrastructure, backward application in the upgrade of existing infrastructure has revealed places where network capability is unduly affected. Some structures have a

smaller clearance when applying the issue 4 standard gauges when compared to the same gauges under issue 3 and, in some extreme cases, it is possible to clear the same gauges in issue 4.

1.7 Network analysis was carried out as part of the T1109 project which showed the changes in clearances. This was accepted by the project steering group at the time, however, it is now apparent that the impact was not fully appreciated by industry.

1.8 It was also noted that in converting the benchmark dynamics to RIS-2773-RST ('Format for Vehicle Gauging Data') compliant data, there needed to be more clarity as to what is and what isn't include in the gauge.

1.9 A significant contribution to the increased gauge sizes at higher cant deficiencies is the influence of low track force bogies on the compound movements. In reality, wagons with LTF bogies have lower deck heights and therefore the additional sway right at the top corner of the gauge does not occur in practice. However, there is a need to prevent future vehicle designs from utilising this space, otherwise there would potentially be a problem on infrastructure cleared to earlier issues of the standard.

Objective 2 – Clarify the interface between the upper and lower sector gauges for the three new freight gauges

1.10 A further observation is that issue 4 didn't preserve the clause in W6a for the W7a, W8a and W9a gauges that stated no part of the upper gauge could, dynamically, go below 1000mm above rail level (ARL). Given W7a and W8a are designed for low decks, the decision by the T1109 steering group to widen the gauges to give greater capability at mid-height missed this rule – noting that the project was targeted on the upper corners of the gauges only. This generates conflict when seeking to apply the gauges through platforms and needed to be clarified.

Objective 3 – Correct an error associated with the overthrows in Locomotive Gauge 2 (LG2)

1.11 An error was spotted with the coefficients in the overthrow formulae.

2. How has the content in the standard changed to achieve the objectives?

2.1 Objective 1 – Eliminate the significant differences between the freight gauges between GERT8073 issues 3 and issue 4

2.2 In order to resolve this issue, it has been necessary to revert to the legacy (issue 3) gauge movements as published within GERT8073 issue 3, whilst retaining the three new freight gauges as published in issue 4. To address this objective, standard vehicle gauge data (SVGD) workbooks have been generated for each individual freight gauge, in the RIS-2773-RST format adopting template version 8.

2.3 The workbooks for gauges W6a, W7, W8, W9, W10 and W10a encapsulate the movements from the issue 3 version of the gauge whilst the workbooks for W7a, W8a and W9a retain the movement tables published with issue 4. The workbook for W12

remains unchanged in the existing format as published with issue 4, as no changes were introduced into W12 in issue 4.

2.4 The main body of the standard has not required significant changes, references to the SVGD workbooks have been updated and some guidance clauses have been modified to align with this change.

2.5 Objective 2 – Clarify the interface between the upper and lower sector gauges for the three new freight gauges

2.6 The clause stating the following *"Any part of the vehicle dropping below 1000 mm above rail level (ARL) under any conditions, shall comply with the requirements of the applicable lower gauge"* has been included in the sections for W7a, W8a and W9a, this was omitted in the original publication.

2.7 Objective 3 – Correct an error associated with the overthrows in LG2

2.8 The coefficient values have been corrected to ensure the formulae are consistent with the parameters for LG2 and the calculation method set out in Appendix A.

3. How urgently did the change need to happen to achieve the objectives?

3.1 Industry key stakeholders were immediately made aware of this issue through the relevant industry groups, and an additional note was placed on the SVGD workbook webpage. The changes to the standard needed to happen promptly; without these changes there is a risk that new wagons could be designed and built that take advantage of the additional space created in the gauges and then be in conflict with the infrastructure.

4. What are the positive and negative impacts of implementing the change?

Justification of impact, scale and quantification for the seven impact areas

A. Legal compliance and assurance

4.1 There are no legislative implications from this change.

B. Health, safety and security

4.2 This change does not have a significant impact on health, safety and security.

C. Reliability and operation performance

4.3 According to the Office of Rail and Road (ORR) figures for 2020-2021, freight revenue was recorded at £818m. Reviewing the freight moved statistics, it can be seen that approximately 41% of freight moved can be attributed to domestic intermodal. Therefore, it can be broadly assumed that the annual revenue attributed to domestic intermodal freight is in the order of £340m.

4.4 The potential loss of network capability arising from the changes in the gauges between issue 3 and issue 4 could be conservatively estimated to 0.5%, equating to a potential disbenefit to industry of £1.7m per year or £8.5m over a 5-year period if the standard was not amended.

D. Design and maintenance

4.5 This change is to revert to previous practice for the pre-existing gauges, so it is not believed to have a significant impact on design and maintenance, however users of the standard will need to ensure they are using correct SVGD workbooks in the gauges and subsequent gauging calculations.

E. People, process and systems

4.6 Organisations performing gauging calculations will need to ensure that the correct SVGD workbooks are read into their gauging software to ensure correct calculation of the gauge.

F. Environment and sustainability

4.7 There are sizable opportunities to move more freight from road to rail and seize the environmental and sustainability benefits. However, the potential loss of network capability as described in 4.3 and 4.4 could have proved a significant barrier to fully unlocking these benefits.

G. Customer experience and industry reputation

4.8 The potential loss of network capability as described in 4.3 and 4.4 could have been significantly detrimental to the industry's reputation, particularly in the eyes of the freight customers.

5. What is the contribution of this standards change in realising the value to industry opportunity?

5.1 This standards change is essential to prevent the realisation of the disbenefits described in section 4.

6. What was the effort required by RSSB to make the change?

6.1 In delivering a limited change release, RSSB was able to respond quickly to implement this change without initiating a full standards change project.

7. Did RSSB deliver against industry's expected timescales?

7.1 In delivering a limited change release, RSSB was able to deliver the change in line with industry's expectations.

8. How will the industry implement the change?

8.1 This change reverts to previous practice for the pre-existing gauges, so it is not believed to have a significant impact as users of the standard will not have to implement something new. Organisations performing gauging calculations will need to make sure that the correct SVGD workbooks are read into their gauging software to ensure correct calculation of the gauge. For most organisations this will be as simple as reverting to their models aligned to GERT8073 issue 3.

8.2 The updated SVGD workbooks will be available on the RSSB website upon publication of this limited change release.

9. How will RSSB assess whether the change is achieving the objectives?

9.1 RSSB is represented on various gauging groups and feedback will be sought from these groups to establish if the changes are achieving the objectives.

9.2 The 12-month review process for standards changes also provides the opportunity to pick up on any queries that have been received against the documents.

Appendix A Disposition Table

Table A1: GERT8073 issue 4 to GERT8073 issue 4.1

From - GERT8073 issue 4	To - GERT8073 issue 4.1	Way Forward	Comments	Objective
Part 1 Purpose and Introduction				
1.1 Purpose	1.1 Purpose	No change	No Changes in 1.1	
1.2.2 Principles	1.2.2 Principles	Revised	TSI changed to NTSN in 1.2.2.3	
1.3 Approval and authorisation of this document	1.3 Approval and authorisation of this document	Revised	Dates updated to reflect approval and authorised dates for issue 4.1	N/A
Part 2 Guidance on the application of Standard Vehicle Gauges				
2.1 Introduction to gauges	2.1 Introduction to gauges	No change	No Changes in Part 2	
2.2 Guidance on the types of vehicle gauges	2.2 Guidance on the types of vehicle gauges	No change		
Part 3 Requirements for the application of Standard Vehicle Gauges				
3.1 Requirements for the application of Standard Vehicle Gauges to vehicles	3.1 Requirements for the application of Standard Vehicle Gauges	Revised	Table 3 updated differentiate between the issue 3 and issue 4 SVGD workbooks for the W gauges to be clear to which gauge each workbook applies	1
3.2 Requirements for the application of Standard Vehicle Gauges to Infrastructure	3.2 Requirements for the application of Standard Vehicle Gauges to Infrastructure	No change	No Changes in 3.2	
Part 4 Gauges applicable to the lower sector				
4.1 W6a lower gauge	4.1 W6a lower gauge	No change	No Changes in Part 4	
4.2 Lower Sector Vehicle Gauge	4.2 Lower Sector Vehicle Gauge	No change		
4.3 Supplementary lower sector vehicle gauges	4.3 Supplementary lower sector vehicle gauges	No change		
Part 5 Freight gauges applicable to the upper sector				
5.1 General guidance on the application of freight upper gauges	5.1 General guidance on the application of freight upper gauges	Revised	Guidance updated to reflect that the (new) issue 4.1 movements apply to W7a, W8a and W9a only. Table 7 removed as the methodology from T1109 is not being taken forward for W7, W8, W9, W10 and W10a.	1

			Therefore, it is not possible to have a table that incorporates all the gauges.	
5.2 Requirements for tolerances associated with the fastening fixity for demountable loads	5.2 Requirements for tolerances associated with the fastening fixity for demountable loads	No change	No Changes in 5.2	
5.3 W6a upper gauge	**5.3 W6a upper gauge**			
5.3.1 Definition of W6a upper gauge	5.3.1 Definition of W6a upper gauge	No change	No Change to the gauge definition	1
5.3.2 Application of W6a upper gauge to rolling stock	5.3.2 Application of W6a upper gauge to rolling stock	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.3.3 Application of W6a upper gauge to infrastructure	5.3.3 Application of W6a upper gauge to infrastructure	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.4 W7 upper gauge	**5.4 W7 upper gauge**			
5.4.1 Definition of W7 upper gauge	5.4.1 Definition of W7 upper gauge	No change	No Change to the gauge definition	1
5.4.2 Application of W7 upper gauge to rolling stock	5.4.2 Application of W7 upper gauge to rolling stock	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.4.3 Application of W7 upper gauge to infrastructure	5.4.3 Application of W7 upper gauge to infrastructure	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.5 W7a upper gauge	**5.5 W7a upper gauge**			
5.5.1 Definition of W7a upper gauge	5.5.1 Definition of W7a upper gauge	No change	No Change to the gauge definition	1
5.5.2 Application of W7a upper gauge to rolling stock	5.5.2 Application of W7a upper gauge to rolling stock	Revised	Updated to reference the correct W7a SVGD workbook and to clarify the 1000mm above rail level cut off.	1, 2
5.5.3 Application of W7a upper gauge to infrastructure	5.5.3 Application of W7a upper gauge to infrastructure	Revised	Updated to reference the correct W7a SVGD workbook	1
5.6 W8 upper gauge	**5.6 W8 upper gauge**			
5.6.1 Definition of W8 upper gauge	5.6.1 Definition of W8 upper gauge	No change	No Change to the gauge definition	1

5.6.2 Application of W8 upper gauge to rolling stock	5.6.2 Application of W8 upper gauge to rolling stock	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.6.3 Application of W8 upper gauge to infrastructure	5.6.3 Application of W8 upper gauge to infrastructure	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.7 W8a upper gauge	**5.7 W8a upper gauge**			
5.7.1 Definition of W8A upper gauge	5.7.1 Definition of W8A upper gauge	No change	No Change to the gauge definition	1
5.7.2 Application of W8A upper gauge to rolling stock	5.7.2 Application of W8A upper gauge to rolling stock	Revised	Updated to reference the correct W8a SVGD workbook and to clarify the 1000mm above rail level cut off.	1, 2
5.7.3 Application of W8A upper gauge to infrastructure	5.7.3 Application of W8A upper gauge to infrastructure	Revised	Updated to reference the correct W8a SVGD workbook	1
5.8 W9 upper gauge	**5.8 W9 upper gauge**			
5.8.1 Definition of W9 upper gauge	5.8.1 Definition of W9 upper gauge	No change	No Change to the gauge definition	1
5.8.2 Application of W9 upper gauge to rolling stock	5.8.2 Application of W9 upper gauge to rolling stock	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.8.3 Application of W9 upper gauge to infrastructure	5.8.3 Application of W9 upper gauge to infrastructure	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.9 W9a upper gauge	**5.9 W9a upper gauge**			
5.9.1 Definition of W9A upper gauge	5.9.1 Definition of W9A upper gauge	No change	No Change to the gauge definition	1
5.9.2 Application of W9A upper gauge to rolling stock	5.9.2 Application of W9A upper gauge to rolling stock	Revised	Updated to reference the correct W9a SVGD workbook and to clarify the 1000mm above rail level cut off.	1, 2
5.9.3 Application of W9A upper gauge to infrastructure	5.9.3 Application of W9A upper gauge to infrastructure	Revised	Updated to reference the correct W9a SVGD workbook	1
5.10 W10 upper gauge	**5.10 W10 upper gauge**			
5.10.1 Definition of W10 upper gauge	5.10.1 Definition of W10 upper gauge	No change	No Change to the gauge definition	1
5.10.2 Application of W10 upper gauge to rolling stock	5.10.2 Application of W10 upper gauge to rolling stock	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.10.3 Application of W10 upper gauge to infrastructure	5.10.3 Application of W10 upper gauge to infrastructure	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1

5.11 W10a upper gauge	**5.11 W10a upper gauge**			
5.11.1 Definition of W10A upper gauge	5.11.1 Definition of W10A upper gauge	No change	No Change to the gauge definition	1
5.11.2 Application of W10A upper gauge to rolling stock	5.11.2 Application of W10A upper gauge to rolling stock	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.11.3 Application of W10A upper gauge to infrastructure	5.11.3 Application of W10A upper gauge to infrastructure	Revised	Updated to reference the SVGD workbook applying the issue 3 movements tables	1
5.12 W12 upper gauge	**5.12 W12 upper gauge**			
5.12.1 Definition of W12 upper gauge	5.12.1 Definition of W12 upper gauge	No change	No Change	
5.12.2 Application of W12 upper gauge to rolling stock	5.12.2 Application of W12 upper gauge to rolling stock	No change	No Change	
5.12.3 Application of W12 upper gauge to infrastructure	5.12.3 Application of W12 upper gauge to infrastructure	No change	No Change	
Part 6 Passenger stock gauges applicable to the upper sector				
6.1 Passenger Gauge 1 (20 m) - PG1	6.1 Passenger Gauge 1 (20 m) - PG1	No change	No changes in part 6	
6.2 Passenger Gauge 2 (23 m) - PG2	6.2 Passenger Gauge 2 (23 m) - PG2	No change		
6.3 Passenger Gauge 3 (26 m) - PG3	6.3 Passenger Gauge 3 (26 m) - PG3	No change		
Part 7 Gauges applicable to Locomotives				
7.1 Locomotive Gauge 1 - LG1	7.1 Locomotive Gauge 1 - LG1	Editorial	Correction of typographical error in final cell of Table 26 (now Table 25 in issue 4.1) to read 3962.5 to match figure 25	
7.2 Locomotive Gauge 2 - LG2	7.2 Locomotive Gauge 2 - LG2	Revised	See 7.2.3	
7.2.1 Definition of LG2	7.2.1 Definition of LG2	No change	No changes in 7.2.1	
7.2.2 Application of LG2 to rolling stock	7.2.2 Application of LG2 to rolling stock	No change	No changes in 7.2.2	
7.2.3 Application of LG2 to infrastructure	7.2.3 Application of LG2 to infrastructure	Revised	Overthrow coefficients have been corrected; the values were incorrect in issue 4	3
Part 8 Application of this document				

8.1 Scope	8.1 Scope	Revised	References to TSIs have been changed to NTSNs	
8.2 Exclusions from scope	8.2 Exclusions from scope	No change		
8.3 General enter into force date	8.3 General enter into force date	No change	Into force date changed to XX June 2022	
8.4 Exceptions to general enter into force date	8.4 Exceptions to general enter into force date	No change	No changes	
8.5 Applicability of requirements for projects already underway	8.5 Applicability of requirements for projects already underway	No change		
8.6 Deviations	8.6 Deviations	No change		
8.7 Health and safety responsibilities	8.7 Health and safety responsibilities	No change		
Appendices				
Appendix A Method for calculating overthrow on curves and height and width reduction	Appendix A Method for calculating overthrow on curves and height and width reduction	No change	No changes to Appendix A	
Appendix B Application of dynamic movements: worked example for PG2	Appendix B Application of dynamic movements: worked example for PG2	No change	No Changes to Appendix B	
Appendix C Method for freight bogie suspension benchmarking	Appendix C Method for freight bogie suspension benchmarking for W7a, W8a and W9a	Revised	Title has been updated to reflect that the content is applicable to W7a, W8a and W9a, these are the only gauges that apply the new benchmarks in issue 4.1	1
Appendix D Guidance on developing new gauges	Appendix D Guidance on developing new gauges	No change	No Changes to Appendix D	
Definitions	Definitions	No change	No Changes to Definitions	
References	References	Revised	References updated to reflect the changes to the W Gauges SVGD workbooks.	1