# Requirements for the Application of Standard Vehicle Gauges

## Synopsis

This document defines standard vehicle gauges and the associated application rules for rolling stock and for infrastructure.

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**Railway Group Standard**  
GE/RT8073  
**Issue** Three  
**Date** December 2015

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Issue record

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<tr>
<td>One</td>
<td>April 2008</td>
<td>Original document. Replaces GE/GN8573 Guidance on Gauging, issue 1, Appendices 1, 2, 3, 4, 5, 6, 7, 8, 10, and 11.</td>
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<td>October 2009</td>
<td>Replaces issue one. Small scale change: The requirements in respect to the locomotive gauge in sections 2.13, 3.13 and Appendix L have been amended to correct technical errors and improve clarity.</td>
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Revisions have not been marked by a vertical black line in this issue because the document has been revised throughout.

Superseded documents

The following Railway Group Standard is superseded, either in whole or in part as indicated:

<table>
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GE/RT8073 issue two Requirements for the Application of Standard Vehicle Gauges, ceases to be in force and is withdrawn as of 05 March 2016.

Supply

The authoritative version of this document is available at [www.rssb.co.uk/railway-group-standards](http://www.rssb.co.uk/railway-group-standards). Enquiries on this document can be forwarded to enquirydesk@rssb.co.uk.
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Part 1  Purpose and Introduction

1.1  Purpose
1.1.1  This document defines standard vehicle gauges and the associated application rules for rolling stock and for infrastructure.

1.2  Introduction
1.2.1  Gauging requirements in Railway Group Standards
1.2.1.1  A suite of Railway Group Standards (RGSs) mandates requirements for maintaining adequate clearance between vehicles and adjacent structures, and maintaining adequate passing clearance between vehicles and other vehicles operating on adjacent tracks, as set out below.

1.2.2  Related requirements in other documents
1.2.2.1  The following RGSs contain requirements that are relevant to the scope of this document:

   a)  GI/RT7073 Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances – this document sets out requirements for positioning infrastructure and maintaining the position of track relative to infrastructure to achieve gauge compatibility with rolling stock.

   b)  GE/RT8270 Assessment of Compatibility of Rolling Stock and Infrastructure – this document sets out requirements and responsibilities for the assessment of compatibility of rolling stock and infrastructure.

   c)  GE/RT8273 Assessment of Compatibility of Rolling Stock and Infrastructure – Gauging and Stepping Distances – this document sets out specific requirements and responsibilities for the assessment of gauge compatibility and stepping distances between rolling stock and infrastructure.

   d)  GM/RT2173 Requirements for the Size of Vehicles and Position of Equipment – this document sets out the methods of determining, and the requirements for maintaining, the swept envelope for rail vehicles. It sets out the format of the prescribed parameters for defining the size of railway vehicles.

   e)  GM/RT2453 Requirements for the Identification of Rail Vehicles – this document sets out the requirements for the registration of rail vehicles in the Rolling Stock Library and the data to be displayed on rail vehicles.

1.2.3  Supporting documents
1.2.3.1  The following Railway Group documents support this Railway Group Standard:

   a)  GE/GN8573 Guidance on Gauging – this document sets out information and advisory material in support of the application of the various RGSs covering gauging. It also provides background material on the original derivation of the vehicle gauges in common use.

   b)  RIS-2773-RST Format for Vehicle Gauging Data – this document sets out a standard format for defining the format of data used to describe the swept envelope of a vehicle for the purposes of compatibility assessment when undertaking absolute gauging. The data can also be used for the purposes of assessment against standard dynamic vehicle gauges.
1.2.4 Gauges defined in this document

1.2.4.1 The following standard vehicle gauges are defined in this document:

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<td>E</td>
<td>W7 Upper Gauge</td>
<td>Load gauge (8' 0&quot; containers)</td>
</tr>
<tr>
<td>F</td>
<td>W8 Upper Gauge</td>
<td>Load gauge (8' 6&quot; containers)</td>
</tr>
<tr>
<td>G</td>
<td>W9 Upper Gauge</td>
<td>European swapbody load gauge</td>
</tr>
<tr>
<td>H</td>
<td>W9Plus Upper Gauge</td>
<td>European swapbody load gauge</td>
</tr>
<tr>
<td>I</td>
<td>W10 Gauge</td>
<td>Load gauge (9' 6&quot; x 2500 mm containers)</td>
</tr>
<tr>
<td>J</td>
<td>W10a Gauge</td>
<td>Load gauge (9' 6&quot; x 2500 mm containers)</td>
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<td>N</td>
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</table>

Table 1 Standard vehicle gauges

1.2.4.2 The Appendices are only mandatory if that gauge is being applied.

1.2.4.3 The gauges defined in this document are not intended to be exhaustive. Not all gauges are compatible with all routes on the Great Britain (GB) network. As new gauges are developed, they should be proposed for inclusion within this document to ensure consistent application.

1.2.4.4 A number of the standard vehicle gauges defined in this document are long-established gauges and their associated rules have therefore been retained, but adapted to conform to the concepts set out in GI/RT7073.

1.2.4.5 The gauges defined in this document do not include provision for pantographs, shoe gear, tripcocks and similar equipment designed to come into contact with the infrastructure. These requirements are set out in GM/RT2173.

1.2.5 Gauge co-ordinates

1.2.5.1 For clarity, only principal dimensions and nominal numbered points are shown on the associated gauge diagrams.

1.2.5.2 Co-ordinates relate to the plane of the rails and a datum on the track centreline.

1.2.5.3 The 8073 Standard Vehicle Gauge Data (8073SVGD), where available, should be used to calculate the dynamic movements and the resultant swept envelope, to support gauging studies. Further guidance is given in GE/GN8573.
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1.2.5.4 The 8073 Standard Vehicle Gauge Data (8073SVGD) information for established suspensions for freight W gauges, Passenger Gauge 1 (PG1), Passenger Gauge 2 (PG2), Lower Sector Vehicle Gauge (LSVG) and locomotive gauge is available on the RSSB website [www.rssb.co.uk].

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 August 2015.

1.3.2 This document was authorised by RSSB on 09 October 2015.
Part 2  Description of Standard Vehicle Gauges

2.1 Description of gauges

2.1.1 Types of gauges

2.1.1.1 The gauges specified in this document consist of a profile, which is adjusted according to the movements induced by cant, curve radius and / or speed.

2.1.1.2 There are three approaches to how these movements are expressed:

a) A profile valid for any cant irrespective of speed (W6a lower gauge).

b) A profile adjusted according to the movements provided in the 8073SVGD – LSVG, PG1 and PG2.

c) A profile adjusted according to the movements provided in the 8073SVGD – W Gauges.

2.1.1.3 For the approach set out in clause 2.1.1.2 a) there is no requirement to reference an 8073SVGD document.

2.1.1.4 For the approach set out in clause 2.1.1.2 b) an 8073SVGD document shall be used for calculating the gauge profile at specific cants. The relevant 8073SVGD document consists of movements which should be applied to the static profile as provided in the respective 8073SVGD document.

2.1.1.5 For the approach set out in clause 2.1.1.2 c), if movement data is required, 8073SVGD – W Gauges shall be used for calculating the gauge profile at specific cants and speeds, if necessary by interpolation.

2.1.1.6 GE/GN8573 sets out in more detail the types of gauges defined in this document.

2.1.1.7 GM/RT2173 sets out requirements for when upper and lower gauges overlap.

2.1.2 Calculation of the movements of the standard vehicle gauges to upper sector

2.1.2.1 For locomotive gauge and all upper gauges, excluding PG1 and PG2, the calculated gauge line indicates the maximum co-ordinates with which the vehicle / load combination shall comply.

2.1.2.2 Suspension movements associated with some suspensions compatible with the different gauges as a function of cant deficiency / excess and speed are given in the 8073SVGD – W Gauges (see 1.2.5.3 of this document).

2.1.2.3 For PG1 and PG2, the gauge line in Appendix L and M, respectively, of this document, sets out a static profile. 8073SVGD – PG1 and 8073SVGD – PG2 shall be used for calculating the gauge profile at specific cants.

2.1.2.4 A method to calculate the movement of the profile co-ordinates resulting from the suspension movements is set out in GE/GN8573.

2.1.3 Calculation of the movements of the standard vehicle lower gauges

2.1.3.1 For W6a lower gauge, the gauge profile incorporates all dynamic movements and, for LSVG, 8073SVGD – LSVG shall be used for calculating the gauge profile. In order for the vehicle to be considered compliant, no part of the vehicle shall infringe the vehicle gauge.

2.1.3.2 For LSVG and W6a lower gauge, when appropriate, the gauge shall be adjusted for the effect of curve overthrow.
2.1.3.3  GM/RT2173 sets out the permissions in failure conditions.

2.1.3.4  The parameters considered for the dynamic movements are set out for the respective gauges in Parts 3 and 4 of this document.
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Part 3 Application of Standard Vehicle Gauges to Rolling Stock

This part is to be read in conjunction with Appendices A to N of this document.

3.1 General requirements for the application of standard vehicle gauges to rolling stock

3.1.1 Application of standard vehicle gauges

3.1.1.1 For a vehicle or vehicle-load combination to be declared as conforming to a standard vehicle gauge, as set out in 1.2.4, it shall be assessed using the common application rules set out in 3.1.

3.1.1.2 In addition, specific application rules for each gauge are set out in 3.2 to 3.12.

3.1.2 Construction of vehicles to comply with standard vehicle gauges

3.1.2.1 The established and benchmark suspensions (as defined) for each gauge, where applicable, are set out in the section of this document which defines that gauge.

3.1.2.2 If a vehicle is to be declared as conforming to a standard vehicle gauge set out in 1.2.4, it shall be built within the gauge line defined by the set of co-ordinates for that gauge.

3.1.2.3 It is permissible to declare the vehicle to be compliant with the upper dynamic gauge without further demonstration (see Figure 1) if the vehicle also:

a) Is included in The Rolling Stock Library in R2 and has an established or benchmark suspension.

Or

b) Is not included in The Rolling Stock Library in R2 but uses a benchmark suspension.

3.1.2.4 For all standard gauges except PG1, PG2, W10, W10a and W12 gauge, if the vehicle does not use an established or benchmark suspension, it is permissible to declare the vehicle to be compliant with the upper dynamic gauge if it can be demonstrated that, at all conditions of speed and cant, its swept envelope remains within that of a vehicle or vehicles with a benchmark suspension conforming to the required standard vehicle gauge.

3.1.2.5 For the W10, W10a and W12 gauge, if the vehicle does not use an established or benchmark suspension, it is permissible to declare the vehicle to be compliant with the upper dynamic gauge if it can be demonstrated that, in all conditions of speed, cant and side wind loading, its swept envelope remains within that of a vehicle or vehicles with a benchmark suspension conforming to the required standard vehicle gauge.

3.1.2.6 For PG1 and PG2, it is permissible to declare the vehicle to be compliant with the gauge if it can be demonstrated that, in all conditions of speed and cant, its swept envelope remains within that of the relevant profile, as set out in its respective workbook in document 8073SVGD.
Figure 1  Flowchart to determine whether or not a freight vehicle can be deemed compliant with a gauge.

Note: For vehicle types that are not part of the Rolling Stock Library in R2 and have an established suspension, demonstrate at all conditions of speed and cant, its swept envelope remains within a benchmark suspension.
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3.1.3 Adjustments for width reduction on horizontal curves

3.1.3.1 Width reductions due to overthrow, where required, shall be calculated. An example of an appropriate methodology is set out in GE/GN8573 which uses the following nomenclature:

a) \( R \) is the curve radius, at which the width reduction is calculated, in metres.

b) \( A \) is the bogie centres or axle spacing in metres.

c) \( K \) is the overthrow coefficient, in metres, at the specific curve radius.

3.1.3.2 Where width reductions are applied, these shall ensure that vehicle cross-sections within, between or outside of the bogie centres or wheelbase remain within the gauge.

3.1.4 Adjustments for vertical curvature

3.1.4.1 Vertical curve overthrows, where required, shall be calculated. An example of an appropriate methodology is set out in GE/GN8573.

3.1.5 Adjustments for overthrow of bogies

3.1.5.1 Overthrow of bogies shall be considered if the bogie wheelbase of the vehicle exceeds that specified for the gauge.

3.1.6 Adjustments for wheel flange wear and wheel / rail clearance

3.1.6.1 Adjustments for wheel flange wear and wheel / rail clearance, if required, are defined in 8073SVGD – W Gauges. See 1.2.5.4 of this document, for each benchmark suspension, PG1 and PG2.

3.1.6.2 Limits on wheel flange wear and nominal wheel / rail clearance are delivered by compliance with the requirements for wheelsets set out in GM/RT2466.

3.1.7 Tolerances associated with the fastening fixity for demountable loads

3.1.7.1 Where demountable loads are carried, the tolerances in Table 2 associated with the fastening fixity used to restrain the loads shall be assumed:

<table>
<thead>
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<th>Fastening type</th>
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<tr>
<td>BR twistlock fastenings</td>
<td>± 6 mm</td>
</tr>
<tr>
<td>Holland autolock fastenings</td>
<td>± 6 mm</td>
</tr>
<tr>
<td>UIC spigots</td>
<td>± 12.5 mm</td>
</tr>
</tbody>
</table>

Table 2 Fastening type tolerances

3.1.7.2 When new fastenings are introduced, their fixity shall be considered in determining the load position in relation to the gauge.

3.1.7.3 For each of the freight gauges set out in Appendices D to K, the fastenings for demountable loads that have been used to define the gauge are stated. Where a different fastening system is used, the vehicle profile shall be adjusted to take into account the difference in the tolerance between the fastening used and that already accommodated by the gauge.
3.1.8  Adjustments for effective position of the track

3.1.8.1 Gauges relate to the effective position of the track, as defined in GI/RT7073. Adjustments for the effective position of the track are taken into account by the application rules for infrastructure (see section 4).

3.1.9  Clearances required for wheels and related items

3.1.9.1 For W6a lower sector gauge and LSVG, the location of the wheels is not shown. Requirements for wheelset back-to-back and wheel rim width dimensions are set out in GM/RT2466 and are compatible with the lower sector infrastructure gauge. It is permissible for other items which are in close proximity to the wheels (for example life guards or sander nozzles) to use this space.

3.2  Application of W6a lower gauge to rolling stock

3.2.1  Purpose of W6a lower gauge

3.2.1.1 W6a lower gauge is commonly used for freight wagons.

3.2.2  The W6a lower gauge co-ordinates

3.2.2.1 The W6a lower gauge co-ordinates (below 1000 mm above rail level (ARL)) are set out in Appendix B.

3.2.3  Dynamic gauge

3.2.3.1 All dynamic movement of the items contained in the lower vehicle gauge, including suspension failure conditions, shall be contained within the area bounded by the co-ordinates incorporating dynamic movements. This shall include:

a) Full lateral suspension travel and wear limits.

b) Lateral curve overthrows as follows:

i) \( \geq 360 \) m radius \( 0 \) mm (2700 mm maximum width).

ii) \( < 360 \) m \( \geq 200 \) m radius \( 60 \) mm (2820 mm maximum width).

iii) \( < 200 \) m \( \geq 160 \) m radius \( 100 \) mm (2900 mm maximum width).

c) Full downward vertical suspension movements to bumpstop condition and wear.

d) Vertical curve overthrows in planes at 75 mm, 100 mm and 135 mm ARL (points 1 D to 5 P in Appendix B) when on a vertical curve of 500 m radius.

e) Radial wheel wear.

3.2.3.2 The following shall not be included:

a) Vehicle roll movements.

b) Axle guard / horn guide deflections.

c) Wheel flange wear and wheel / rail clearance.
3.3 Application of lower sector vehicle gauge to rolling stock

3.3.1 Purpose of lower sector vehicle gauge

3.3.1.1 LSVG is a lower sector gauge for rolling stock. LSVG has been established based upon a notional 20 m long bodyshell, 14.173 m bogie centres and 2.6 m axle spacing and dynamic characteristics typical of a 100 mph (160 km/h) vehicle with soft suspension characteristics. The vehicle cross-section shall be reduced to accommodate any increase in lateral or vertical overthrow associated with alternative vehicle dimensions based on a minimum curve radius of 160 m.

3.3.2 The lower sector vehicle gauge co-ordinates

3.3.2.1 The LSVG co-ordinates are set out in Appendix C. The co-ordinates represent the static profile.

3.3.2.2 The gauge line shall be adjusted for lateral curve overthrows, as follows:

a) \( \geq 360 \text{ m radius } 0 \text{ mm.} \)

b) \( < 360 \text{ m radius Points 9 to 12 shall be adjusted for horizontal curve overthrow using the following formulae:} \)

\[
T_1 = \frac{26000}{R} - 72.
\]

\[
T_0 = \frac{26000}{R} - 72.
\]

3.3.2.3 Points 9 to 12 shall be adjusted in accordance with workbook 8073SVGD – LSVG.

3.3.3 Dynamic lower sector vehicle gauge

3.3.3.1 The vehicle, including dynamic movements and tolerances, as set out below, shall remain within the LSVG, incorporating dynamic movements:

a) Radial wheel wear.

b) Flange wear and wheel / rail interface movements.

3.4 Application of W6a upper gauge to rolling stock

3.4.1 Purpose of W6a upper gauge

3.4.1.1 W6a upper gauge is a vehicle gauge commonly used for freight wagons. The gauge requires that the wagons have maximum bogie centres or axle spacing of 12.8 m, maximum bogie wheelbase of 2.2 m and a maximum length such that end overthrow does not exceed centre overthrow.

3.4.2 The W6a upper gauge co-ordinates

3.4.2.1 The W6a upper gauge co-ordinates are set out in Appendix D.

3.4.3 Rules for W6a upper gauge

3.4.3.1 The upper gauge includes all parts of the vehicle that remain above 1000 mm ARL including dynamic movements, allowances and tolerances, but shall exclude allowances for wheel flange wear and wheel / rail clearances.

3.4.3.2 Established bogies / running gear consistent with the dynamic upper gauge are set out below:

a) 3 piece.

b) Y series.
c) LTF (low track force).

d) TF (track friendly).

e) Swing motion.

f) AM3 (axle motion).

g) BR long link.

h) Friction pedestal.

i) UIC double link suspension.

3.4.3.3 The benchmark suspensions consistent with the dynamic upper gauge are set out below:

a) 3 Piece.

b) Y25.

c) Y33.

d) Y33c.

3.4.3.4 The vehicle gauging data for the benchmark suspensions can be found in 8073SVGD – W Gauges (see 1.2.5.3).

3.4.4 Calculation of width reduction on curves for the upper gauge

3.4.4.1 Where the distance between bogie centres or axle spacing exceeds 12.8 m, width reductions shall be applied to the upper gauge. For the methodology set out in GE/GN8573, the gauge width shall be reduced by the difference between the actual maximum overthrow of the vehicle and that given by the following reference values:

\[
\begin{align*}
\text{Curve radius (R)} & = 200 \text{ m.} \\
\text{Bogie centres or axle spacing (A)} & = 12.8 \text{ m.} \\
\text{Overthrow at curve radius R (T)} & = 0.102 \text{ m.}
\end{align*}
\]

3.4.5 Fastenings for demountable loads

3.4.5.1 W6a gauge assumes the use of BR twistlock fastenings for the carriage of demountable loads.

3.5 Application of W7 upper gauge to rolling stock

3.5.1 Purpose of W7 upper gauge

3.5.1.1 W7 upper gauge is a load gauge commonly used for ISO 8’ 0” (2438 mm) high containers carried on lower gauge compliant wagons.

3.5.2 The W7 upper gauge co-ordinates

3.5.2.1 The W7 upper gauge co-ordinates are set out in Appendix E.
**Requirements for the Application of Standard Vehicle Gauges**

### 3.5.3 Rules for W7 upper gauge
3.5.3.1 Rules applicable to the W6a upper gauge, as set out in 3.4.3 to 3.4.5, shall be used for the W7 upper gauge.

### 3.6 Application of W8 upper gauge to rolling stock

#### 3.6.1 Purpose of W8 upper gauge
3.6.1.1 W8 upper gauge is a load gauge commonly used for ISO 8’ 6” (2590 mm) high containers on lower gauge compliant wagons.

#### 3.6.2 The W8 upper gauge co-ordinates
3.6.2.1 The W8 upper gauge co-ordinates are set out in Appendix F.

#### 3.6.3 Rules for W8 upper gauge
3.6.3.1 Rules applicable to the W6a upper gauge, as set out in 3.4.3 to 3.4.5, shall be used for the W8 upper gauge.

### 3.7 Application of W9 upper gauge to rolling stock

#### 3.7.1 Purpose of W9 upper gauge
3.7.1.1 W9 upper gauge is a load gauge carried on lower gauge compliant wagons. It was developed to define the maximum size of a load that may be carried on 780 mm deck height wagons with a maximum bogie spacing (or axle spacing) of 13.5 m and a bogie wheelbase of between 1.8 m and 2.2 m.

#### 3.7.2 The W9 upper gauge co-ordinates
3.7.2.1 The W9 upper gauge co-ordinates are set out in Appendix G.

3.7.2.1 Items highlighted in yellow in Appendix G.2 only apply to cross-sections between bogie centres.

#### 3.7.3 Rules for W9 upper gauge
3.7.3.1 W9 upper gauge shall include all parts of the vehicle above 780 mm ARL, including allowances and tolerances, but shall exclude allowances for wheel flange wear and wheel / rail clearance.

3.7.3.2 Established bogies / running gear consistent with the dynamic upper gauge are set out below:

   a) Y series.
   b) LTF (low track force).
   c) TF (track friendly).
   d) Swing motion.
   e) AM3 (axle motion).
   f) UIC double link suspension.

3.7.3.1 The benchmark suspensions consistent with the dynamic upper gauge are listed below:

   a) 3 Piece.
   b) Y25.
   c) Y33.
d) Y33c.
e) Swing motion.
f) LTF13.

3.7.3.2 The vehicle gauging data for the benchmark suspensions can be found in 8073SVGD – W Gauges (see 1.2.5.3 of this document).

3.7.4 Calculation of width reduction on curves

3.7.4.1 Where the distance between bogie centres or axle spacing exceeds 13.5 m, width reductions shall be applied to the gauge. For the methodology set out in GE/GN8573, the gauge width shall be reduced by the difference between the actual maximum overthrow of the vehicle and that given by the following reference values:

\[
\begin{align*}
\text{Curve radius (R)} & = 200 \text{ m} \\
\text{Bogie centres or axle spacing (A)} & = 13.5 \text{ m} \\
\text{Overthrow at curve radius R} (T) & = 0.114 \text{ m}
\end{align*}
\]

3.7.5 Fastenings for demountable loads

3.7.5.1 W9 upper gauge assumes the use of UIC spigot fastenings for the carriage of demountable loads.

3.8 Application of W9Plus upper gauge to rolling stock

3.8.1 Purpose of W9Plus upper gauge

3.8.1.1 W9Plus upper gauge is an extension of the W9 upper gauge. It was developed to define the maximum size of wagon-load combinations for UIC S-coded swapbody loads.

3.8.2 The W9Plus co-ordinates

3.8.2.1 The W9Plus upper gauge co-ordinates are set out in Appendix H.

3.8.2.2 Items highlighted in yellow in Appendix H.2 only apply to cross-sections between bogie centres.

3.8.3 Rules for W9Plus gauge

3.8.3.1 Rules applicable to the W9 gauge, as set out in 3.7.3 to 3.7.5, shall be used.

3.9 Application of W10 gauge to rolling stock

3.9.1 Purpose of W10 gauge

3.9.1.1 W10 gauge is a load gauge carried on lower gauge compliant wagons. It was developed to define the maximum size of a load that may be carried on wagons with a deck height of between 820 mm and 995 mm with a maximum bogie spacing (or axle spacing) of 14.020 m and a bogie wheelbase of between 1.8 m and 2.2 m.

3.9.2 The W10 gauge co-ordinates

3.9.2.1 The W10 gauge co-ordinates are set out in Appendix I.

3.9.3 Rules for W10 gauge

3.9.3.1 The W10 gauge shall include all parts of the vehicle above 820 mm ARL, including allowances and tolerances, but shall exclude allowances for wheel flange wear and wheel / rail clearance.
3.9.3.2 Established bogies / running gear consistent with the dynamic upper gauge are set out below:

a) Y25.
b) Y33.

3.9.3.3 The benchmark suspensions consistent with the dynamic upper gauge are set out below:

a) Y25.
b) Y33.

3.9.3.4 The vehicle gauging data for the benchmark suspensions can be found in 8073SVGd – W Gauges (see clause 1.2.5.3 of this document).

3.9.4 Fastenings for demountable loads

3.9.4.1 W10 gauge assumes the use of UIC spigot fastenings for the carriage of demountable loads between a height of 995 mm ARL to 3841 mm ARL and BR twistlock fastenings above and below this range of heights.

3.10 Application of W10a gauge to rolling stock

3.10.1 Purpose of W10a gauge

3.10.1.1 W10a gauge is a load gauge carried on lower gauge compliant wagons. It was developed to define the maximum size of a load that may be carried on wagons with a deck height of between 820 mm and 995 mm with a maximum bogie spacing (or axle spacing) of 14.020 m and a bogie wheelbase of between 1.8 m and 2.2 m.

3.10.2 The W10a gauge co-ordinates

3.10.2.1 The W10a gauge co-ordinates are set out in Appendix J.

3.10.3 Rules for W10a gauge

3.10.3.1 The gauge shall include all parts of the vehicle above 820 mm ARL, including allowances and tolerances, but shall exclude allowances for wheel flange wear and wheel / rail clearance.

3.10.3.2 Wagons with established bogies / running gear consistent with the dynamic upper gauge are:

a) 3 Piece.
b) Y25.
c) Y33.
d) Y33c.
e) Swing motion.
f) LTF13.
g) SCT.
3.10.3.3 The benchmark suspensions consistent with the dynamic upper gauge are set out below:

a) 3 Piece.
b) Y25.
c) Y33.
d) Y33c.
e) Swing motion.
f) LTF13.
g) SCT.

3.10.3.4 The vehicle gauging data for the benchmark suspensions can be found in workbook 8073SVGD – W Gauges (see clause 1.2.5.3 of this document).

3.10.4 Fastenings for demountable loads

W10a gauge assumes the use of UIC spigot fastenings for the carriage of demountable loads.

3.11 Application of W12 gauge to rolling stock

3.11.1 Purpose of W12 gauge

W12 gauge defines the maximum size of a load when carried on a lower gauge compliant wagon.

3.11.2 The W12 gauge co-ordinates

The W12 gauge co-ordinates are set out in Appendix K.

3.11.3 Rules for W12 gauge

Established bogies consistent with the dynamic upper gauge are set out below:

a) Three Piece Bogies, with BR Twistlock or Holland Autolock fastenings having a maximum $K_i$ of 25078 and a maximum $K_o$ of 16733 on a 200 m reference curve.
b) Y25 Bogies, with UIC Spigot, BR Twistlock or Holland Autolock fastenings having a maximum $K_i$ of 25760 and a maximum $K_o$ of 16898 on a 200 m reference curve.
c) Y33 Bogies, with UIC Spigot fastenings having a maximum $K_i$ of 21892 and a maximum $K_o$ of -2753 on a 200 m reference curve.
d) Y33 Bogies, with BR Twistlock or Holland Autolock fastenings having a maximum $K_i$ of 30110 and a maximum $K_o$ of -2753 on a 200 m reference curve.
e) Y33c Bogies, with UIC Spigot, BR Twistlock or Holland Autolock having a maximum $K_i$ of 17035 and a maximum $K_o$ of 1549 on a 200 m reference curve.
f) Swing Motion Bogies, with BR Twistlock or Holland Autolock fastenings having a maximum $K_i$ of 23423 and a maximum $K_o$ of 18521 on a 200 m reference curve.
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3.11.4 Fastenings for demountable loads

3.11.4.1 The fastening requirements are set out in 3.11.3.

3.12 Application of Passenger Gauge 1 (20 m) PG1 to rolling stock

3.12.1 Purpose of Passenger Gauge 1 (20 m) PG1

3.12.1.1 PG1 has been established based upon a notional 20.38 m long bodyshell, 14.173 m bogie centres and 2.6 m axle spacing and dynamic characteristics typical of a 100 mph (160 km/h) vehicle with soft suspension characteristics. The vehicle cross-section shall be reduced to accommodate any increase in lateral or vertical overthrow associated with alternative vehicle dimensions based on a minimum curve radius of 120 m.

3.12.1.2 Vehicles can be declared compliant to PG1 and PG1 footstep gauge independently.

Note: The application of PG1 is different from that of the W gauges (see 8073SVGD – W Gauges for further information).

3.12.2 The Passenger Gauge 1 (20 m) PG1 co-ordinates

3.12.2.1 The PG1 co-ordinates are set out in Appendix L. The co-ordinates represent the static profile.
3.12.3 Rules for Passenger Gauge 1 (20 m) PG1

3.12.3.1 The PG1 line shall include all parts of the vehicle, including allowances, tolerances and wheel / rail clearance.

3.12.3.2 Dynamic movements applicable to this gauge are defined in 8073SVGD – PG1 (see 1.2.5.3 of this document).

3.12.3.3 Where the distance between bogie centres exceeds 14.173 m, width reductions shall be applied to the gauge. For the methodology set out in GE/GN8573, the gauge width shall be reduced by the difference between the actual maximum overthrow of the vehicle and that given by the following reference values:

\[
\text{Curve radius (R)} = 120 \text{ m.}
\]

\[
\text{Bogie centres or axle spacing (A)} = 14.173 \text{ m.}
\]

\[
\text{Overthrow at curve radius R (T)} = 0.2165 \text{ m.}
\]

3.12.4 Passenger Gauge 1 (20 m) PG1 footstep gauge

3.12.4.1 The PG1 footstep gauge co-ordinates are set out in Appendix L.

3.12.4.2 The PG1 footstep gauge provides an indicative area for the provision of passenger footsteps. GE/RT8273 and GM/RT2173 set out requirements for the positioning of passenger footsteps. The PG1 footstep is applicable in the shaded areas shown in Figure 2.

![Figure 2](image-url) The rules for PG1 shall be used for PG1 foot step gauge

3.13 Application of Passenger Gauge 2 (23 m) PG2 to rolling stock

3.13.1 Purpose of Passenger Gauge 2 (23 m) PG2

3.13.1.1 PG2 has been established based upon a notional 23.072 m long bodyshell, 16 m bogie centres and 2.6 m axle spacing and dynamic characteristics typical of a 100 mph (160 km/h) vehicle with soft suspension characteristics. The vehicle cross-section shall be reduced to accommodate any increase in lateral or vertical overthrow associated with alternative vehicle dimensions based on a minimum curve radius of 120 m.

Note: the application of PG2 is different from that of the W gauges (see 8073SVGD – PG2 and GI/GN8573 for further information).
3.13.1.2 The PG2 includes a taper section (Figure 3) in order to benefit from the increased width while providing passing clearances similar to those for the PG1. A start of taper section is required at 11.092 m (from the centreline) and the width of the end section reduced to 2656 mm based upon the endthrow of PG2 on a 120 m curve.

![Figure 3](image)

**Figure 3** PG2 (23 m) layout diagram

3.13.2 Co-ordinates of Passenger Gauge 2 (23 m) PG2

3.13.2.1 The PG2 co-ordinates are set out in Appendix M. The co-ordinates represent the static gauge profile.

3.13.3 Rules for Passenger Gauge 2 (23 m) PG2

3.13.3.1 The PG2 line shall include all parts of the vehicle, including allowances, tolerances and wheel / rail clearance.

3.13.3.2 Dynamic movements applicable to this gauge are defined in workbook 8073SVGD – PG2

3.13.3.3 Where the distance between bogie centres exceeds 16 m, width reductions shall be applied to the gauge. For the methodology set out in GE/GN8573, the gauge width shall be reduced by the difference between the actual maximum overthrow of the vehicle and that given by the following reference values:

\[
\text{Curve radius (R)} = 120 \text{ m.}
\]

\[
\text{Bogie centres or axle spacing (A)} = 16 \text{ m.}
\]

\[
\text{Overthrow at curve radius } R \ (T) = 0.274 \text{ m.}
\]

3.13.4 Passenger Gauge 2 (23 m) PG2 footstep gauges

3.13.4.1 The PG2 footstep gauges co-ordinates are set out in Appendix M.

3.13.4.2 The PG2 footstep gauges provide an indicative area for the provision of passenger footstes. GE/RT8273 and GM/RT2173 set out requirements for the positioning of passenger footstes. The PG2 (23 m) contains footstes for three different door configurations as set out below and shown in Figure 4:

- **End footstep** (section distances between 8000 mm and 11000 mm).
- **Inner footstep** (section distances between 6000 mm and 9000 mm).
- **Centre footstep** (section distance of 0 mm +/- 1500 mm).
3.14  Application of locomotive gauge to rolling stock

3.14.1  Purpose of locomotive gauge

3.14.2  The locomotive gauge co-ordinates

3.14.3  Build gauge

3.14.4  Rules for locomotive gauge

3.14.5  Overthrow gauge

3.14.5.1  No part of the locomotive shall exceed the static upper overthrow gauge adjusted for horizontal curve overthrow.

3.14.5.2  No part of the locomotive shall exceed the upper or lower overthrow gauges incorporating dynamic movements when adjusted for horizontal curve overthrow and when operating at up to its maximum speed and cant deficiency.

3.14.5.3  Locomotive overthrow gauge shall be adjusted for horizontal and vertical overthrow using the following formulae:

\[ T_i = \frac{20500}{R} \]

\[ T_o = \frac{20500}{R} \]

3.14.5.4  No part of the locomotive shall exceed the overthrow gauges, adjusted for vertical curve overthrow, on a vertical curve of 500 m radius.
Part 4  Application of Standard Vehicle Gauges to Infrastructure

This part is to be read in conjunction with Appendices A to N of this document.

4.1  General requirements for the application of standard vehicle gauges to infrastructure

4.1.1  Application of standard vehicle gauges

4.1.1.1  For a route or section of a route to be declared as cleared for a standard vehicle gauge, as set out in clause 1.2.4, it shall be assessed using the common application rules defined in 4.1 and the specific application rules defined in 4.2 to 4.12.

4.1.1.2  The range of benchmark suspensions, as set out in document 8073SVGD, and the range of speeds and cant deficiency / excess for the site, shall be taken into account.

4.1.1.3  The benchmark suspensions applicable to each gauge (W6a to W12) are set out in the index sheet of workbook 8073SVGD – W Gauges.

4.1.2  Adjustments for effective position of the track and overthrow on curves

4.1.2.1  Co-ordinates for each of the vehicle gauges relate to the effective position of the track, as set out in GI/RT7073. Co-ordinates, therefore do not include the effect of lateral and vertical track alignment tolerances, continuous cross-level error, wheel / rail clearance, rail sidewear, or any other infrastructure tolerances.

4.1.2.2  Gauges shall be enlarged to accommodate the overthrow effects of track curvature, both laterally and vertically.

4.1.2.3  For each gauge, formulae are provided to calculate overthrow on curves, which use the following nomenclature:

\[ T_i \] is the overthrow towards the centre of the curve in mm.

\[ T_o \] is the overthrow towards the outside of the curve in mm.

\[ R \] is the curve radius in m.

4.1.2.4  In the calculations for overthrow, formulae are presented in simplified form. It is permissible to use an alternative method for the calculation of overthrows. An example of an appropriate methodology is set out in GE/GN8573.

4.1.2.5  Where dynamic gauges are defined by reference to an established suspension, vehicle movements shall be calculated according to the published dynamic behaviour specified for each gauge. This may be undertaken using approved computer software, or by a calculation method. An example of an appropriate methodology is set out in GE/GN8573.
4.1.2.6 An example of an appropriate methodology of calculating cant deficiency is set out in GE/GN8573

4.1.2.7 On transition curves, consideration shall be given to the conditions leading to maximum dynamic movement, and applied appropriately.

4.1.3 Clearances required
4.1.3.1 Clearances required are set out in GI/RT7073.

4.1.3.2 Clearances shall be calculated in relation to the dynamic swept envelope, including appropriate dynamic movements, overthrows and applicable allowances.

4.1.3.3 Where dynamic movements are not calculated with reference to the characteristics of a standard suspension, clearances shall be adjusted to include the effects of 12.5 mm wheel / rail clearance.

4.1.3.4 In exposed locations, clearances shall be calculated to accommodate additional movements of the vehicle under the effects of ten minute mean cross-wind speeds of 0 m/s and 22 m/s acting over the whole height of the vehicle.

4.2 Application of W6a lower gauge to infrastructure
4.2.1 Purpose of W6a lower gauge
4.2.1.1 W6a lower gauge is commonly used for freight wagons.

4.2.2 The W6a lower gauge co-ordinates
4.2.2.1 The W6a lower gauge co-ordinates are set out in Appendix B.

4.2.3 Rules for the calculation of overthrow on curves
4.2.3.1 The W6a lower gauge shall not be adjusted for horizontal curve overthrow on curves of greater than (or equal to) 360 m radius.

4.2.3.2 The W6a lower gauge shall be enlarged for horizontal curve overthrow on curves of less than 360 m radius and greater than (or equal to) 200 m radius using the following formulae:

\[ T_{i} = \frac{27000}{R} - 75. \]

\[ T_{o} = \frac{27000}{R} - 75. \]

4.2.3.3 The W6a lower gauge shall be enlarged for horizontal curve overthrow on curves of less than 200 m radius and greater than (or equal to) 160 m radius using the following formulae:

\[ T_{i} = \frac{32000}{R} - 100. \]

\[ T_{o} = \frac{32000}{R} - 100. \]

4.2.3.4 The W6a lower gauge shall be enlarged for vertical curve overthrow on curves of less than 500 m radius using the following formulae:

\[ T_{i} = 21085 / R. \]

\[ T_{o} = 20480 / R. \]
4.3 Application of lower sector vehicle gauge to infrastructure

4.3.1 Purpose of lower sector vehicle gauge

4.3.1.1 LSVG is a lower sector vehicle gauge for rolling stock and it is compatible with lower sector infrastructure gauge (LSIG) (see GI/RT7073).

4.3.2 The lower sector vehicle gauge co-ordinates

4.3.2.1 The LSVG co-ordinates are set out in Appendix C.

4.3.2.2 Dynamic movements, as set out in workbook 8073SVGD – LSVG, shall be applied to the gauge line.

4.3.2.3 Lateral curve overthrows shall be applied as follows:

a) \[ T_i = \frac{26000}{R} \] - 72.

b) \[ T_o = \frac{26000}{R} \] - 72.

4.4 Application of W6a upper gauge to infrastructure

4.4.1 Purpose of W6a upper gauge

4.4.1.1 W6a upper gauge is a vehicle gauge commonly used for freight wagons. The gauge requires that the wagons have maximum bogie centres or axle spacing of 12.8 m, maximum bogie wheelbase of 2.2 m and a maximum length such that end overthrow does not exceed centre overthrow.

4.4.2 The W6a upper gauge co-ordinates

4.4.2.1 The W6a upper gauge co-ordinates are set out in Appendix D.

4.4.3 Rules for the calculation of overthrow on curves

4.4.3.1 The W6a upper gauge co-ordinates shall be adjusted for horizontal and vertical curve overthrow using the following formulae:

\[ T_i = \frac{21085}{R}. \]

\[ T_o = \frac{20480}{R}. \]

4.4.4 Rules for the calculation of dynamic movement

4.4.4.1 The W6a upper gauge shall be further adjusted for dynamic movements relating to cant and speed, and for wheelset movements depending on curve radius, according to the values in the vehicle gauging data for the benchmark suspensions, which can be found in workbook 8073SVGD – W Gauges (see 1.2.5.3).

4.4.4.2 It is not necessary to consider additional wheel / rail clearance unless rail side wear is present.

4.4.5 Requirements for additional clearance to the W6a upper gauge

4.4.5.1 Lateral clearances set out in GI/RT7073 to the W6a upper gauge shall be increased by 4000/R on horizontal curves of less than 200 m radius.
4.5 Application of W7 upper gauge to infrastructure

4.5.1 Purpose of W7 upper gauge
4.5.1.1 W7 upper gauge is a load gauge commonly used for ISO 8' 0" (2438 mm) high containers carried on lower gauge compliant wagons.

4.5.2 The W7 upper gauge co-ordinates
4.5.2.1 The W7 upper gauge co-ordinates are set out in Appendix E.

4.5.3 Rules for W7 upper gauge
4.5.3.1 Rules applicable to the W6a upper gauge, as set out in 4.4.3 to 4.4.5, shall be used for the W7 upper gauge.

4.6 Application of W8 upper gauge to infrastructure

4.6.1 Purpose of W8 upper gauge
4.6.1.1 W8 upper gauge is a load gauge commonly used for ISO 8' 6" (2590 mm) high containers on lower gauge compliant wagons.

4.6.2 The W8 upper gauge co-ordinates
4.6.2.1 The W8 upper gauge co-ordinates are set out in Appendix F.

4.6.3 Rules for W8 upper gauge
4.6.3.1 Rules applicable to the W6a upper gauge, as set out in 4.4.3 to 4.4.5, shall be used for the W8 upper gauge.

4.7 Application of W9 upper gauge to infrastructure

4.7.1 Purpose of W9 upper gauge
4.7.1.1 W9 upper gauge is a load gauge carried on lower gauge compliant wagons. It was developed to define the maximum size of a load that may be carried on 780 mm deck height wagons with a maximum bogie spacing (or axle spacing) of 13.5 m and a bogie wheelbase of between 1.8 m and 2.2 m.

4.7.2 The W9 upper gauge co-ordinates
4.7.2.1 The W9 upper gauge co-ordinates are set out in Appendix G.

4.7.2.2 Items highlighted in yellow in Appendix G.2 only apply to cross-sections between bogie centres.

4.7.3 Rules for the calculation of overthrow on curves
4.7.3.1 The gauge co-ordinates shall be adjusted for horizontal and vertical curve overthrow using the following formulae:

\[ T_i = \frac{23876}{R} \]

\[ T_o = \frac{18328}{R} \]

4.7.4 Rules for the calculation of dynamic movement
4.7.4.1 The W9 upper gauge shall be further adjusted for dynamic movements relating to cant and speed, and for wheelset movements depending on curve radius, according to the values in the vehicle gauging data for the benchmark suspensions. These can be found in workbook 8073SVGD – W Gauges (see 1.2.5.3).

4.7.4.2 It is not necessary to consider additional wheel / rail clearance unless rail side wear is present.
4.7.5 Requirements for additional clearances to the W9 upper gauge

4.7.5.1 Clearances set out in GI/RT7073 to the W9 upper gauge shall be increased by 4000/R on horizontal curves of less than 200 m radius.

4.8 Application of W9Plus upper gauge to infrastructure

4.8.1 Purpose of W9Plus upper gauge

4.8.1.1 W9Plus upper gauge is an extension of the W9 upper gauge. It was developed to define the maximum size of wagon-load combinations for UIC S-coded swapbody loads.

4.8.2 The W9Plus co-ordinates

4.8.2.1 The W9Plus upper gauge co-ordinates are set out in Appendix H.

4.8.2.2 Items highlighted in yellow in Appendix H.2 only apply to cross-sections between bogie centres.

4.8.3 Rules for W9Plus gauge

4.8.3.1 Rules applicable to the W9 upper gauge, as set out in 4.7.3 to 4.7.5, shall be used for W9Plus upper gauge.

4.9 Application of W10 gauge to infrastructure

4.9.1 Purpose of W10 gauge

4.9.1.1 W10 gauge is a load gauge carried on lower gauge compliant wagons. It was developed to define the maximum size of a load that may be carried on wagons with a deck height of between 820 mm and 995 mm with a maximum bogie spacing (or axle spacing) of 14.020 m and a bogie wheelbase of between 1.8 m and 2.2 m.

4.9.2 The W10 gauge co-ordinates

4.9.2.1 The W10 gauge co-ordinates are set out in Appendix I.

4.9.3 Rules for the calculation of overthrow on curves

4.9.3.1 The W10 gauge shall be adjusted for horizontal and vertical curve overthrow using the following formulae:

\[ T_h = \frac{25175}{R} \]

\[ C_v = \frac{16886}{R} \]

4.9.4 Rules for the calculation of dynamic movement

4.9.4.1 The W10 gauge shall be further adjusted for dynamic movements relating to cant and speed, and for wheelset movements depending on curve radius, according to the values in the vehicle gauging data for the benchmark suspensions. These can be found in workbook 8073SVG D – W Gauges (see 1.2.5.3).

4.9.4.2 It is not necessary to consider additional wheel / rail clearance unless rail side wear is present.

4.10 Application of W10a gauge to infrastructure

4.10.1 Purpose of W10a gauge

4.10.1.1 W10a gauge is a load gauge carried on lower gauge compliant wagons. It was developed to define the maximum size of a load that may be carried on wagons with a deck height of between 820 mm and 995 mm with a maximum bogie spacing (or axle spacing) of 14.020 m and a bogie wheelbase of between 1.8 m and 2.2 m.
4.10.2 The W10a gauge co-ordinates

The W10a gauge co-ordinates are set out in Appendix J.

4.10.3 Rules for the calculation of overthrow on curves

The W10a gauge shall be adjusted for horizontal and vertical curve overthrow using the following formulae:

\[ T_i = \frac{25855}{R} \]
\[ T_o = \frac{16745}{R} \]

4.10.4 Rules for the calculation of dynamic movement

The W10a gauge shall be further adjusted for dynamic movements relating to cant and speed, and for wheelset movements depending on curve radius, according to the values in the vehicle gauging data for the benchmark suspensions. These can be found in workbook 8073SVGD – W Gauges (see 1.2.5.3).

4.10.4.2 It is not necessary to consider additional wheel / rail clearance unless rail side wear is present.

4.11 Application of W12 gauge to infrastructure

4.11.1 Purpose of W12 gauge

W12 gauge defines the maximum size of a load when carried on a lower gauge compliant wagon.

4.11.1.2 The basic gauge includes the following capability:

a) ISO 9’ 6” (2896 mm) x 2600 mm container on 700 mm – 945 mm deck height wagons.

b) ISO 9’ 6” (2896 mm) x 2550 mm container on 700 mm – 1000 mm deck height wagons.

c) S Coded 2551 mm – 2600 mm swap bodies of up to 3810 mm corner height (S365 on 1000 mm deck, S371 on 945 mm deck).

d) S Coded 2500 mm – 2550 mm swap bodies of up to 3815 mm corner height (S36 on 1000 mm deck, S41 on 945 mm deck).

4.11.2 The W12 gauge co-ordinates

The W12 gauge co-ordinates are set out in Appendix K.

4.11.3 Rules for the calculation of overthrow on curves

The W12 gauge shall be adjusted for horizontal and vertical curve overthrow using the following formulae:

\[ T_i = K_i / R \]
\[ T_o = K_o / R \]

Where \( K_i \) and \( K_o \) are the overthrow coefficient of wagons applicable to each established suspension, as set out in 4.11.5.
The W12 gauge shall be further adjusted for dynamic movements relating to cant and speed, and for wheelset movements according to curve radius, according to the values indicated for the established suspensions applicable to the gauge.

It is not necessary to consider additional wheel / rail clearance unless rail side wear is present.

Established bogies / running gear consistent with W12 gauge are set out in 3.11.3.2 and are in the vehicle gauging data for the benchmark suspensions, which can be found in workbook 8073SVGD – W Gauges (see 1.2.5.3 of this document).

PG1 has been established based upon a notional 20.38 m long bodyshell, 14.173 m bogie centres and 2.6 m axle spacing and dynamic characteristics typical of a 100 mph (160 km/h) vehicle with soft suspension characteristics.

The gauge enlarges on vertical and horizontal curves by an amount equivalent to the throw of vehicles with 14.173 m bogie centres, a bogie wheelbase of 2.6 m and a body length of 20.38 m.

PG1 footstep gauges are applicable as set out in 3.12.4.1 of this document.

The PG1 shall be adjusted for horizontal and vertical curve overthrow. If required, overthrow values are set out in 8073SVGD – PG1.

PG2 has been established based upon a notional 23.072 m long bodyshell, 16 m bogie centres and 2.6 m axle spacing and dynamic characteristics typical of a 100 mph (160 km/h) vehicle with soft suspension characteristics.

The gauge enlarges on vertical and horizontal curves by an amount equivalent to the throw of vehicles with 16 m bogie centres, a bogie wheelbase of 2.6 m and a body length of 23.072 m.

PG2 footstep gauges are applicable as set out in 3.13.4.1.

PG2 footstep gauges are applicable as set out in 3.13.4.1.

The PG2 co-ordinates are set out in Appendix M. The co-ordinates represent the static gauge profile.
4.13.3 Rules for Passenger Gauge 2 (23 m) PG2

4.13.3.1 PG2 shall be further adjusted for dynamic movements relating to cant and speed, and for wheelset movements according to curve radius, according to the values indicated in the related suspension movements applicable to PG2. These are set out in workbook 8073SVGD – PG2.

4.13.4 Rules for calculation of overthrow on curves for Passenger Gauge 2 (23 m) PG2

4.13.4.1 PG2 shall be adjusted for horizontal and vertical curve overthrow. If required overthrow values are set out in workbook 8073SVGD – PG2.

4.14 Application of locomotive gauge to infrastructure

4.14.1 Purpose of locomotive gauge

4.14.1.1 Locomotive gauge is a vehicle gauge commonly used for locomotives.

4.14.2 The locomotive gauge co-ordinates

4.14.2.1 The locomotive gauge co-ordinates are set out in Appendix N.

4.14.3 Dynamic locomotive gauge

4.14.3.1 The vehicle gauging data for locomotive gauge can be found in workbook 8073SVGD – Loco Gauge (see 1.2.5.3).

4.14.4 Rules for the calculation of overthrow on curves

4.14.4.1 Locomotive overthrow gauge shall be adjusted for horizontal overthrow using the following formulae:

\[ T_i = \frac{20500}{R} \]

\[ T_o = \frac{20500}{R} \]

4.14.5 Calculation of clearances

4.14.5.1 Clearances shall be taken to be the smaller of:

a) The clearance to the maximum build gauge incorporating dynamic movements.

b) The clearance to the overthrow gauge incorporating dynamic movements after adjustment for curve overthrow.
Part 5 Application of this document

5.1 Scope

5.1.1 GE/RT8273 permits gauging compatibility to be agreed on the basis of standard vehicle gauges. The requirements of this document shall apply when gauges set out in 1.2.4 are used for this purpose.

5.1.2 Where gauging compatibility was agreed on the basis of the standard vehicle gauges set out in 1.2.4 prior to the date at which this document comes into force, such gauging compatibility shall remain valid and no retrospective action is required.

5.1.3 GM/RT2173 permits the size of vehicles to be defined by reference to a standard vehicle gauge. The requirements of this document shall apply when gauges set out in 1.2.4 are used for this purpose.

5.2 Exclusions from scope

5.2.1 There are no exclusions from the scope specified in 5.1.

5.3 General compliance date

5.3.1 This RGS comes into force and is to be complied with from 05 March 2016, except as specified in 5.4 of this document. Where the dates specified in 5.4 of this document are later than the above date, this is to allow sufficient time to achieve compliance with the specified exceptions.

5.3.2 After the compliance dates, or the date by which compliance is achieved if earlier, compliance with the requirements set out in this RGS is to be maintained. Where it is considered not reasonably practicable to comply with the requirements, permission to comply with a specified alternative should be sought in accordance with the RGS Code.

5.4 Exceptions to general compliance date

5.4.1 There are no exceptions to the general compliance date specified in 5.3 of this document.

5.4.2 It is permissible to designate specific infrastructure projects, at an advanced stage of development when this document comes into force, for which compliance with the requirements of this document applicable to the design, construction and commissioning of new or altered infrastructure is not mandatory. When designating such projects, the following shall be considered:

a) Responsibilities under its current safety authorisation.

b) The stage reached by the project at the time this document comes into force (for example, approval in principle).

c) Whether compliance is necessary to ensure compatibility with other parts of the infrastructure.

d) Whether compliance is necessary to facilitate the safe working of the railway system having regard to changes to related requirements mandated on another Infrastructure Manager or a Railway Undertaking.

e) The economic impact of compliance, but subject to its current safety authorisation in relation to the infrastructure in question.
5.4.3 Where any designations are made for infrastructure projects, those projects shall continue to meet the equivalent requirements in the RGSs applying to the project before the designation.

5.5 Health and safety responsibilities

5.5.1 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.
Appendix A  List of Standard Vehicle Gauge Data

The content of this appendix is mandatory

A.1  Issue record

A.1.1  Table A1 sets out the standard vehicle gauge data associated with the standard vehicle gauges in this document.

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<thead>
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<th>Issue</th>
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<td>3</td>
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<td>First issue is three to align with GE/RT8073 issue three.</td>
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Table A.1  List of current SVGD

A.2  Application rules

A.2.1  8073SVGD – W Gauges – This workbook sets out the movements of the established suspensions associated with standard vehicle gauges for the upper sector set out in GE/RT8073: W6a, W7, W8, W9, W9Plus, W10, W10a and W12 gauges.

A.2.2  8073SVGD - LSVG – This workbook sets out the movements of the established suspensions associated with lower sector vehicle gauge.

A.2.3  8073SVGD – PG1 – This workbook sets out the movements of the established suspensions associated with Passenger Gauge 1 (20 m).

A.2.4  8073SVGD – PG2 – This workbook sets out the movements of the established suspensions associated with Passenger Gauge 2 (23 m).

A.2.5  8073SVGD – Loco Gauge – This workbook sets out the movements of the established suspensions associated with locomotive gauge.
Appendix B  W6a Lower Gauge

The content of this appendix is mandatory

B.1  W6a lower gauge diagram

![W6a lower gauge diagram]

Figure B.1  W6a lower gauge diagram

B.2  W6a lower gauge co-ordinates

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Table B.1  W6a lower gauge co-ordinates, incorporating dynamic movements
Appendix C Lower Sector Vehicle Gauge

The content of this appendix is mandatory

C.1 Lower sector vehicle gauge diagram

![Diagram of LSVG](image)

Table C.1 LSVG co-ordinates. Note: co-ordinates 7a and 8a to be used in place of 7 and 8 for non-DC electrified line only
Appendix D  W6a Upper Gauge

The content of this appendix is mandatory

D.1  W6a upper gauge diagram

Figure D.1  W6a upper gauge diagram
## Requirements for the Application of Standard Vehicle Gauges

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**Issue** Three

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D.2 **W6a upper gauge co-ordinates**

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Table D.1 W6a upper gauge co-ordinates
Appendix E  W7 Upper Gauge

The content of this appendix is mandatory

E.1  W7 Upper gauge diagram

Figure E.1  W7 upper gauge diagram
### E.2 W7 upper gauge co-ordinates

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**Table E.1** W7 upper gauge co-ordinates
Appendix F  W8 Upper Gauge

The content of this appendix is mandatory

F.1  W8 upper gauge diagram

Figure F.1  W8 upper gauge diagram
### Requirements for the Application of Standard Vehicle Gauges

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#### F.2 W8 upper gauge co-ordinates

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**Table F.1** W8 upper gauge co-ordinates
Appendix G  W9 Upper Gauge

The content of this appendix is mandatory

G.1  W9 upper gauge diagram

Figure G.1  W9 upper gauge diagram
Requirements for the Application of Standard Vehicle Gauges

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G.2  **W9 upper gauge co-ordinates**

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Table G.1  **W9 upper gauge co-ordinates**

Uncontrolled When Printed
Document comes into force and supersedes GERT8073 Iss 2 on 05/03/2016
Amendments to this document can be found on the RSSB Standards Catalogue - http://www.rssb.co.uk/railway-group-standards
Appendix H  W9Plus Upper Gauge

The content of this appendix is mandatory

H.1  W9Plus upper gauge diagram

Figure H.1  W9Plus upper gauge diagram
H.2 W9Plus upper gauge co-ordinates

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Table H.2 W9Plus upper gauge co-ordinates
Appendix I  W10 Gauge

The content of this appendix is mandatory

I.1  W10 gauge diagram

![W10 gauge diagram](image)

Figure I.1  W10 gauge diagram
I.2  W10 gauge co-ordinates

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Table I.1  W10 gauge co-ordinates
Appendix J  W10a Gauge

The content of this appendix is mandatory

J.1  W10a gauge diagram

![W10a Gauge Diagram](image-url)
## Requirements for the Application of Standard Vehicle Gauges

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### J.2 W10a gauge co-ordinates

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**Table J.1** W10a gauge co-ordinates
Appendix K W12 Gauge

The content of this appendix is mandatory

K.1 W12 gauge diagram

Figure K.1 W12 gauge diagram
Requirements for the Application of Standard Vehicle Gauges

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K.2 W12 gauge co-ordinates

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Table K.1 W12 gauge co-ordinates
Appendix L  Passenger Gauge 1 (20 m) PG1

The content of this appendix is mandatory

L.1  Passenger Gauge 1 (20 m) PG1 diagrams

Figure L.1  PG1 diagram
Requirements for the Application of Standard Vehicle Gauges

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Figure L.2  PG1 footstep gauge

Notes:

1) PG1 footstep gauge is designed to provide clearance to a range of existing platform edge positions.

2) The top line of PG1 footstep gauge is defined by the stepping requirements set out in GM/RT2173 to a standard platform 915 mm high, 730 mm offset. This line should be adjusted accordingly on curve conditions as set out in 4.12.3.

L.2  Passenger Gauge 1 (20 m) PG1 Gauge co-ordinates

<table>
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Table L.1  PG1 co-ordinates for Figure L.1
### Requirements for the Application of Standard Vehicle Gauges

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*Table L.2* PG1 footstep gauge co-ordinates for Figure L.2
Requirements for the Application of Standard Vehicle Gauges

Appendix M Passenger Gauge 2 (23 m) PG2

The content of this appendix is mandatory

Figure M.1  PG2 centre (23 m) diagram
Requirements for the Application of Standard Vehicle Gauges

Figure M.2  PG2 end (23 m) diagram
Requirements for the Application of Standard Vehicle Gauges

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Date December 2015

Notes:
1) PG2 footstep gauges are designed to provide clearance to a range of existing platform edge positions.

2) The top lines of PG2 footstep gauges are defined by the stepping requirements set out in GM/RT2173 to a standard platform 915 mm high, 730 mm offset. These lines should be adjusted accordingly on curve conditions, as set out in 4.13.3.

Figure M.3  PG2 footstep gauges (with platform exceptions)
M.2 Passenger Gauge 2 (23 m) PG2 co-ordinates

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Table M.1 Static co-ordinates of PG2 (23 m) centre and start of taper sections for Figure M.1

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Table M.2 Static co-ordinates of PG2 (23 m) end section for Figure M.2

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Table M.3 Static co-ordinates of PG2 (23 m) centre footstep gauge for Figure M.3
# Requirements for the Application of Standard Vehicle Gauges

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**GE/RT8073**  
**Issue** Three  
**Date** December 2015

## Table M.4
Static co-ordinates of PG2 (23 m) inner footstep gauge for Figure M.3

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## Table M.5
Static co-ordinates of PG2 (23 m) end footstep gauge for Figure M.3

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Uncontrolled When Printed  
Document comes into force and supersedes GERT8073 Iss 2 on 05/03/2016  
Amendments to this document can be found on the RSSB Standards Catalogue - http://www.rssb.co.uk/railway-group-standards

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Appendix N  Locomotive Gauge

The content of this appendix is mandatory

N.1  Locomotive gauge diagram

Figure N.1  Locomotive maximum build gauge diagram
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Figure N.2  Locomotive overthrow gauge diagram
N.2 Locomotive gauge co-ordinates

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Table N.1 Maximum upper build gauge co-ordinates

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Table N.2 Maximum lower build gauge co-ordinates, incorporating dynamic movements

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Table N.3 Static co-ordinates of upper overthrow gauge

Note: There is no figure showing these co-ordinates. The rules for these co-ordinates are set out in 3.14.
## Requirements for the Application of Standard Vehicle Gauges

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<table>
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**Table N.4** Co-ordinates of upper overthrow gauge, incorporating dynamic movements

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**Table N.5** Co-ordinates of lower overthrow gauge, incorporating dynamic movements
Requirements for the Application of Standard Vehicle Gauges

Definitions

ARL
Abbreviation for ‘above rail level’, measured perpendicular to the plane of rails.

Benchmark suspension
A suspension for which 8073SVGD is available. It can be used to demonstrate compliance with a standard gauge or clearance to infrastructure with greater accuracy than established suspension.

Clearance
The minimum calculated distance between the vehicle’s swept envelope(s) and fixed infrastructure or between two vehicles’ swept envelopes on adjacent tracks.

Demountable load
A load attached to a rail vehicle by fastenings.

Dynamic gauge
The maximum envelope relative to the effective position of the track that a vehicle is permitted to occupy. The dynamic gauge includes effects of loading and vehicle tolerances and allowances but requires adjustment to include the effects of a geometric overthrow of the particular cross-section on curved track. See also ‘static gauge’.

Effective position of the track
A position that the track could credibly occupy in relation to structures or an adjacent track at some point within its maintenance cycle, giving the smallest clearances. (See GI/RT7073).

Established suspension
A suspension which has traditionally been used for vehicles conforming to a particular standard vehicle gauge, and whose characteristics have been used by the infrastructure manager to demonstrate that a route is clear for the particular standard vehicle gauge.

Fastening fixity
The amount of free movement in the fastenings used to secure a demountable load, in relation to its central position.

Freight vehicle gauge
A vehicle gauge only applicable to freight wagons and rail mounted maintenance machines. See also ‘vehicle gauge’.

Gauge
Used to refer to a vehicle gauge or structure gauge where the context makes it clear which is meant. See ‘vehicle gauge’.

Infrastructure
For the purpose of this document, track and structures in combination. Compare with ‘structure’.

ISO
International Standards Organisation.

K_i and K_o
K_i (inner) and K_o (outer) are the overthrow coefficients for each established suspension, used in curve overthrow formulae.
Requirements for the Application of Standard Vehicle Gauges

Load
For the purposes of this document, a load is defined as the physical size of the payload carried by a wagon..

Lower gauge
That part of the vehicle gauge for items adjacent to low-lying structures, such as platforms, with a requirement for proximity. The lower gauge is not limited to 1100 mm above the plane of the rails. See also ‘upper gauge’.

Lower sector
The area up to and including 1100 mm above the plane of the rails. See also ‘upper sector’.

Overthrow
A geometric projection of a vehicle when on curved track.

Plane of rail
An imaginary surface coplanar with the top of both rails of a track.

Route
The physical path of a journey to be undertaken by a vehicle or a collection of vehicles, where the path is comprised of a number of track sections, each of which has individually defined characteristics.

S-code
A UIC coding system used to describe the size and shape of swapbody loads. Details of the UIC S-code system are set out in GE/GN8573.

Side wind
For the purposes of this document, a wind of constant velocity, impinging on the vehicle perpendicularly to the direction of travel.

Static gauge
The maximum envelope relative to the effective position of the track that a vehicle is permitted to be built to, or loaded to, at a particular cross-section. The static gauge requires adjustment to include the effects of a geometric overthrow of the particular cross-section on curved track. Unless specifically stated wheel / rail clearances are taken account of elsewhere. See also ‘dynamic gauge’.

Structure
Compare with ‘infrastructure’. An element of the infrastructure adjacent to, or crossing over, a railway track. So far as this document is concerned ‘structures’ include, but are not limited to:

a) Train control and communications equipment (for example, signals).

b) Station platforms.

c) Overhead contact line equipment supporting structures at earth potential, but excluding insulators.

d) Civil engineering structures such as retaining walls, tunnels and bridges.

e) Other isolated structures.

f) Temporary works.
Swapbody
A particular type of demountable load attached to a rail vehicle by fastenings.

Swept envelope
A cross-sectional profile, taken at right angles to the track, enclosing all dynamic movements, static deflections and overthrow of all points along the surface of the vehicle that can reasonably be expected to occur under the appropriate range of operating conditions as it sweeps past a theoretical track location. A family of swept envelopes is required to define a vehicle's behaviour on a route.

The swept envelopes referred to within this document exclude the effects of track tolerance and rail sidewear previously included in kinematic envelopes developed under GM/RT2149 or earlier documents.

Ten minute mean wind speed
Speed of the instantaneous wind averaged over 10 minutes (as defined in BS EN 1991-1-4 2005, Eurocode 1, wind actions).

$T_i$ and $T_o$
$T_i$ (inner) and $T_o$ (outer) is the nomenclature for overthrow on curves.

Upper gauge
That part of the vehicle gauge for items above low-lying structures, which is not constrained by a requirement for proximity. See also 'lower gauge'.

Upper sector
The area above 1100 mm above the plane of the rails. See also 'lower sector'.

Vehicle gauge
The maximum envelope that a vehicle conforming to the gauge is permitted to occupy statically and/or dynamically, which prescribes maximum permissible vehicle and loading dimensions, certain suspension displacements, and certain curve overthrow limitations, for example, W6a gauge.

Width reduction
A reduction to the width of a vehicle gauge that is applicable to vehicles with a longer wheelbase than the reference vehicle on which the gauge is based. Width reduction compensates for the greater overthrow on curves due to the longer wheelbase than those already accommodated by the standard gauge.
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Date December 2015

References

The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from 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

GE/RT8270 Assessment of Compatibility of Rolling Stock and Infrastructure
GE/RT8273 Assessment of Compatibility of Rolling Stock and Infrastructure – Gauging and Stepping Distances
GI/RT7073 Requirements for the Position of Infrastructure and for Defining and Maintaining Clearances
GM/RT2173 Requirements for the Size of Vehicles and Position of Equipment
GM/RT2453 Registration, Identification and Data to be Displayed on Rail Vehicles
GM/RT2466 Railway Wheelsets

Other Relevant Documents

8073SVGD – LSVG Dynamic movements for Lower Sector Vehicle Gauge workbook, version 3 dated 20/03/2014 – Available at: www.rssb.co.uk
8073SVGD – W Gauges Dynamic movements for freight gauges workbook, version 3 dated 20/03/2014 – Available at: www.rssb.co.uk
8073SVGD – Loco Gauge Dynamic movements for locomotive gauge workbook, version 3 dated 20/03/2014 – Available at: www.rssb.co.uk
8073SVGD – PG1 Dynamic movements for PG1 workbook, version 3 dated 20/03/2014 – Available at: www.rssb.co.uk
8073SVGD – PG2 Dynamic movements for PG2 workbook, version 3 dated 20/03/2014 – Available at: www.rssb.co.uk

RSSB documents

GE/GN8573 Guidance on Gauging
RIS-2773-RST Format for Vehicle Gauging Data