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**GM/RC2494**  
**Recommendations for Railway Wheelset Design**  
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**Railway Group Recommendations for GM/RT2466**



**Documents**

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## Issue Record

| Issue | Date          | Comments                                                                                                                                         |
|-------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| One   | August 2008   | Original document<br>Supersedes GM/RT2466 Parts D and G, and<br>GM/RC2566 Parts D and G                                                          |
| Two   | February 2010 | Replaces issue one<br>Small scale change amendment – in GM/RT2466<br>reflected in 2.9.3 and by the inclusion of a copy of<br>the new Appendix D. |

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

## Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

| Superseded documents                                                           | Sections superseded | Date when sections are superseded |
|--------------------------------------------------------------------------------|---------------------|-----------------------------------|
| GM/RC2494 issue one August 2008<br>Recommendations for Railway Wheelset Design | All                 | 03 April 2010                     |

## Supply

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# Recommendations for Railway Wheelset Design

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## **Part 1 Introduction**

### **1.1 Purpose and structure of this document**

This document has been published by Rail Safety and Standards Board (RSSB) to give details of a recommended method which, if followed, would meet the requirements of Railway Group Standard GM/RT2466.

Should an infrastructure manager or railway undertaking choose not to follow the recommended method of meeting the requirements of GM/RT2466 laid out in this document, it should assure itself that the method it is following is as effective, and no less safe, than the method that is recommended here.

Relevant requirements in GM/RT2466 are reproduced in the sections that follow. Recommendations are provided as a series of sequentially numbered clauses prefixed 'RC'.

Specific responsibilities and compliance requirements are laid down in the Railway Group Standard itself.

This document contains recommendations that are amended under the Railway Group Standards Code (Issue Three) as a small scale change. Reference to the amended recommendations is made in the 'Issue Record'. All other parts of the document are unchanged from the previous issue.

### **1.2 Copyright**

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### **1.3 Approval and authorisation of this document**

The scope of this document was approved by:

Rolling Stock Standards Committee on 09 October 2009.

This document will be authorised by RSSB on 10 December 2009.

# Recommendations for Railway Wheelset Design

## Part 2 Recommendations for Design

### 2.1 Methodology

#### GM/RT2466 Railway Wheelsets

##### 2.1 Methodology

- 2.1.1 To achieve consistency within a chosen methodology and industry practice where British Standards, European Standards or Association of American Railroads (AAR) standards are adopted to comply with this standard the applicable full suite of British Standards, European Standards or AAR standards shall be applied. Except where otherwise defined within this document, it is not permissible to use selected elements only, nor mix between the regimes for design, manufacture and maintenance of railway wheelsets.
- 2.1.2 Wheelsets shall be designed using actual, or predictions, of service loads so that the fatigue life is not finite. The design shall withstand all the foreseeable inputs under which the vehicle is to remain fully operational. The design shall be capable of being manufactured and maintained in accordance with this document.
- 2.1.3 All new designs of wheelset shall be validated using methods appropriate to the application to demonstrate that the design satisfies the requirements of the standards and complies with the requirements set out in this document.
- 2.1.4 GM/RC2494 provides recommendations for wheelset design, in particular requirement for applications in the UK.

##### 2.1.1 Consistent design, manufacture and maintenance philosophies

- RC001 It is not permissible to use selected elements only, nor mix between the regimes for the design, manufacture and maintenance of railway wheelsets.
- RC002 The definition of load cases, material condition and properties, allowable stresses and maintenance regime for each component should be mutually consistent.
- RC003 The permissible stresses should be consistent with the physical and fatigue properties of the material.
- RC004 The design should include consideration of the operating duty as defined by the customer.
- RC005 The wheelset design, manufacture and duty are to be used in determining the maintenance of that wheelset.

##### 2.1.2 Corrosion protection

- RC006 Details of the wheel and axle surface coating and corrosion protection system should be documented in the wheelset design and drawings.
- RC007 The surface coating and corrosion protection system chosen should be appropriate to the wheelset design. When choosing the protection system the application and the operating environment should be considered, this includes:
  - a) Environmental factors, corrosive material that the wheelset could come into contact with
  - b) Mechanical and impact damage
  - c) Repair systems that are likely to be necessary to rectify damage (including facilities and time constraints)
  - d) Systems necessary for the removal of the coating at overhaul
  - e) Disposal of waste materials
  - f) Adhesion to substrate material at the manufactured surface finishes
  - g) Effects of products remaining on the surface.

## Recommendations for Railway Wheelset Design

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RC008 The effects of corrosion spreading beneath the coating should also be considered during the design stage. The coating should be compatible with other products that come into contact with the wheelset, including non-destructive testing (NDT) materials, coupling compounds and other protective coatings, such as applied to wheelseat to axle body transitions.

RC009 The effect of galvanic corrosion between components should be considered and a means of minimising the effects implemented.

### 2.1.3 Validation requirements

RC010 Validation is the process of demonstrating that a wheelset or wheelset component satisfies the design specification and is fit for purpose.

RC011 Evidence that the requirements of this document have been met should form part of any compliance assessment procedures.

### 2.1.4 Validation of new, novel and unconventional features

RC012 Wheelset designs which embody new, unconventional or novel design features, new materials and / or new manufacturing processes should be fully tested in accordance with RC013 and RC014. Prior to testing on Network Rail managed infrastructure, practical and theoretical methods should be used to demonstrate that the wheelset is safe to use at all times during any experiment, trial or development testing.

RC013 These trials should be complete and have demonstrated that the wheelset design and manufacture meet the requirements of the wheelset standard to the satisfaction of a technically competent authority, before the wheelset is accepted for regular or service use.

### 2.1.5 Validation methods

RC014 Acceptable methods of validation to prove the integrity and suitability of a wheelset are:

- a) Full-scale fatigue tests at the maximum stress ranges used in the design calculations with a load regime no less onerous than that experienced in service.
- b) Fatigue life prediction calculations using stress ranges and various effects as in a) above including thermal loadings, where appropriate, and the material properties obtained from tests on specimens machined from an actual component or accredited, published data for the same grade of material produced in a manner similar to that of the component, with either:
  - i) Strain history under service loads, obtained from strain-gauged tests, used as an input to fatigue life calculations
  - or
  - ii) Service trials to gather stress and strain histories for use in fatigue life calculations.
- c) Satisfactory service on a major railway system under operating conditions equivalent to those prevailing in Great Britain with evidence to show that the requirements of this document are met and that the operating conditions are equivalent.

RC015 Wheels subject to thermal loads should be required to demonstrate that the tread is dimensionally stable under the most extreme thermal braking load case and does not exceed the respective standards axial movement requirements.

RC016 All new designs of wheelsets or components including new design features, materials or processes should be fully tested to ensure they are compatible with the operating conditions and environment to which they are exposed. The testing should include techniques that are appropriate to demonstrate suitability of the wheelset and / or components.