



Rail Safety & Standards Board

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RC

GC/RC5633

**Recommendations for the Risk Assessment of Buffer
Stops, Arresting Devices and End Impact Walls**

Issue Two December 2007

Railway Group Recommendations for GC/RT5033



Documents

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Recommendations for the Risk Assessment of Buffer Stops, Arresting Devices and End Impact Walls

Issue Record

Issue	Date	Comments
One	October 2005	Original document Superseded GC/GN5533 Issue 1 December 2001
Two	December 2007	Replaces issue one Updated to reflect up-issue of GC/RT5033 to issue 2 and up-issue of Risk Profile Bulletin to issue 5.

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Superseded documents

The following Railway Group documents are superseded, either in whole or in part as indicated:

Superseded documents	Sections superseded	Date when sections are superseded
GC/RC5633 issue 1	All	02 February 2008

GC/RC5633 issue 1 is withdrawn as of 02 February 2008.

Supply

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Recommendations for the Risk Assessment of Buffer Stops, Arresting Devices and End Impact Walls

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Recommendations for the Risk Assessment of Buffer Stops, Arresting Devices and End Impact Walls

Part 1 Introduction

1.1 Purpose and structure of this document

1.1.1 General

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 section 2.4 of Railway Group Standard GC/RT5033 Terminal Tracks – Requirements for Buffer Stops, Arresting Devices and End Impact Walls to assess their adequacy.

Should an Infrastructure Manager choose not to follow the recommended method of meeting the requirements of GC/RT5033 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 GC/RT5033 are reproduced in the sections that follow. Recommendations are provided as a series of sequentially numbered clauses prefixed 'RC'. [Where there are no recommendations to support a specific requirement, this is stated.]

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

1.1.2 Use of the risk estimation methodology

RSSB notes that increasing use has been made of the risk estimation methodology, set out in part 3 of this document, to support proposals to encroach into the 'overrun risk zone' defined in GI/RT7016. Whilst the methodology may serve to inform such judgements, it should be noted that it, alone, is not sufficient for this purpose.

1.2 Copyright

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1.3 Approval and authorisation of this document

The content of this document was approved by:

Infrastructure Standards Committee on 26 September 2007.

This document was authorised by RSSB on 18 October 2007

Recommendations for the Risk Assessment of Buffer Stops, Arresting Devices and End Impact Walls

Part 2 Recommendations for the risk assessment of buffer stops, arresting devices and end impact walls

2.1 Risk assessment of buffer stops, arresting devices and end impact walls at existing locations

2.1.1 Relevant extract from GC/RT5033 section 2.4

GC/RT5033 Issue 2

Section 2.4 Requirements for existing locations

2.4.1 Provision of buffer stops

2.4.1.1 Buffer stops or arresting devices shall be provided at the following locations:

- a) Terminal or bay platforms
- b) Terminal tracks on freight lines and sidings.

2.4.1.2 Where the terminal track is at a station a current risk assessment shall be in place which indicates that the buffer stop or arresting device is adequate for the location concerned. The risk assessment shall take account of:

- a) Risk of harm to people.
- b) Risk to critical structures.
- c) The factors listed in section 2.1.2 (of GC/RT5033).
- d) The type and condition of the buffer stop or arresting device provided.
- e) The history of buffer stop collisions.

2.4.1.3 GC/RC5633 sets out a recommended method of risk assessment, which if followed, would meet the requirements of clause 2.4.1.2 (of GC/RT5033).

RC01	GC/RT5033 requires all terminal or bay platforms to have a current, documented assessment of the risk arising from a train overrun at a terminal or bay platform (see section 2.4 of GC/RT5033).
RC02	The risk assessment should consider both the likelihood of overrun and the potential consequences. It should consider the range of possible overruns contributing to the risk, from the low speed events (which may result in injuries) to higher speeds events (which are less likely, but could have more significant consequences).
RC03	Section 2.2 of this document, together with Tables A1 to A5, describes a model for estimating the risk arising from a train overrun at a terminal or bay platform, taking these considerations into account.
RC04	The estimates of equivalent fatality produced by the model in Tables A1 to A5 are based on the estimates and breakdown of buffer stop collision risk in RSSB's Safety Risk Model, as documented in issue 5 of the Risk Profile Bulletin.
RC05	Section 2.3 of this document, together with Table B1, presents mitigation measures that should be considered based on the estimated buffer stop collision risk.
RC06	Models and tools such as those presented in this document for estimating buffer stop collision risk are an aid to the assessment of risk and should always be used in conjunction with professional expertise and judgement.

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2.2 Risk estimation

- RC07 Tables A1 to A5 set out an approach that allows the risk arising from a train overrun at a terminal or bay platform to be estimated. All five tables need to be completed to estimate the buffer stop collision risk.
- RC08 Table A1 contains instructions for carrying out the overall assessment of risk. It requires the input of the average number of buffer approaches per day, the average number of passengers per train, and four combined risk weighting factors based on the potential for collision, features of the buffer stop, the trains approaching the buffer stop and the area behind the buffer stop.
- RC09 The four combined risk weighting factors are calculated by completing Tables A2 to A5 and transferring the result to the appropriate section of Table A1. Tables A2 to A5 are completed by identifying the relevant category for each factor affecting the buffer stop risk and assigning the appropriate risk weighting factor. Where none of the categories are applicable, then an appropriate risk weighting factor should be estimated by judgement based on comparison with the existing categories.
- RC10 The risk weighting factors included in the model should be generally applicable for the majority of buffer stops. However, for particular buffer stops there may be additional factors significantly affecting the risk. Where this is the case these additional factors need to be identified and incorporated appropriately into the estimate of risk.
- RC11 The appropriate risk weighting factors are multiplied on Table A1 to get an overall risk weighting factor. The overall risk weighting factor is multiplied by a risk index for each risk category to get an estimated equivalent fatality rate per 100 years. These are then summed across the risk categories to get a total estimated equivalent fatality rate for the buffer stop.

2.3 Risk mitigation measures

- RC12 The estimated risk calculated using Tables A1 to A5 may indicate that risk mitigation measures are required. If so, the existing arrangements at the location should be reviewed and work planned to implement risk mitigation measures.
- RC13 The appropriate train and station operators should be informed of the output of the risk assessment and their views considered in the review of existing arrangements.
- RC14 Table B1 presents mitigation measures that should be considered based on the estimated buffer stop collision risk. These measures are not necessarily exhaustive and other buffer stop collision risk mitigation measures unique to the location also need to be identified and considered, where appropriate.
- RC15 Table B1 indicates that a more detailed risk assessment and cost benefit analysis may be required to consider more costly measures such as providing end impact walls or relocating structures. This more detailed assessment is likely to include:
- a) assessment of a probability distribution of buffer stop collision with speed.
 - b) more accurate consequence models to consider the effects of a buffer stop collision across the range of potential impact speeds.

2.4 Reassessment of risk

- RC16 Risk is to be reassessed when there is reason to believe that the previous risk assessment has become invalid or after any significant change in the circumstances at a location.
- RC17 Significant changes include:
- a) Remodelling of track layouts.

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- b) Introduction of significantly different rolling stock.
- c) Any increase in approach speed.
- d) Significant increase in the number of trains using the line.
- e) Significant changes to signalling arrangements.
- f) Significant change in use of the area behind buffer stops or arresting devices.
- g) Construction of structures or other critical supports behind buffer stops or arresting devices.

RC18 If the risk assessment has been based on the approach presented in this document, a change affecting terminal tracks can be considered significant if it is likely to change any of the identified risk weighting factors in Tables A2 to A5. This may include the occurrence of buffer stop collision incidents.

RC19 As the accumulation of small changes can sum up to a large change over a period of time, the continued validity of the risk assessment at a location should be periodically reviewed. The interval between reviews should not exceed 10 years.

RC20 When action has been taken to reduce the risk at a buffer stop the risk assessment should be updated to take account of the change.

2.5 Competencies of people carrying out the risk assessment

RC21 People carrying out risk assessments based on the approach presented in this document should:

- a) Have been briefed on and understand the risk assessment process presented in this document.
- b) Have the professional expertise and judgement necessary to understand the required technical aspects of the infrastructure, operations and buffer stop equipment.
- c) Have the ability to gain and make use of local knowledge regarding the surroundings of the buffer stop.

2.6 New construction

RC22 For new construction the risk estimation model set out in this document may be of assistance when considering:

- a) The type of buffer stop to be provided and its design.
- b) The provision of end impact walls.
- c) The need for additional safety measures.

(See section 2.1 of GC/RT5033.)