Terminal Tracks – Requirements for Buffer Stops, Arresting Devices and End Impact Walls

Synopsis
This standard sets out requirements for buffer stops, arresting devices and end impact walls for terminal tracks.

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Terminal Tracks – Requirements for Buffer Stops, Arresting Devices and End Impact Walls

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Superseded documents

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GC/RT5033 Issue 1 ceases to be in force and is withdrawn as of 02 February 2008.

Supply

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Terminal Tracks – Requirements for Buffer Stops, Arresting Devices and End Impact Walls

Railway Group Standard
GC/RT5033
Issue Two
Date December 2007

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Part 1 Purpose and Introduction

1.1 Purpose
1.1.1 This standard sets out requirements for buffer stops, arresting devices and end impact walls for terminal tracks.

1.2 Introduction

1.2.1 Related requirements in other documents
1.2.1.1 The following Railway Group Standards contain requirements that are relevant to the scope of this document:

   a) GK/RT0031 defines the means of indicating to the driver the presence of a buffer stop on a signalled route.
   b) GK/RT0032 regards a buffer stop as a stop aspect for signalling purposes and defines the sequence in which signal aspects are to be presented to train drivers.
   c) GE/RT8030 sets out requirements for provision of the Train Protection and Warning System (TPWS) on the approach to the buffer stop at the end of a passenger platform.
   d) GC/RT5021 sets out requirements for track geometry and track construction.
   e) GI/RT7016 sets out requirements for maintaining a clear space behind buffer stops in the overrun risk zone.

1.2.2 Supporting documents
1.2.2.1 The following Railway Group document supports this Railway Group Standard:

   a) GC/RC5633 Recommendations for the Risk Assessment of Buffer Stops, Arresting Devices and End Impact Walls.
Terminal Tracks – Requirements for Buffer Stops, Arresting Devices and End Impact Walls

Part 2 Requirements for buffer stops, arresting devices and end impact walls

2.1 Provision of buffer stops

2.1.1 Energy absorbing buffer stops shall be provided at terminal or bay platforms.

2.1.2 The type of buffer stop selected and its design shall take into account the following factors:

a) Factors influencing speed and force of impact;
   i) Types of rolling stock.
   ii) Minimum and maximum train weights.
   iii) Approach gradient.
   iv) Identified likely track adhesion conditions, including the effect on braking performance of the weather and the covering or otherwise of the track.
   v) Signalling arrangements and sighting distances.
   vi) Permissible speed (shown in the Sectional Appendix) on the approach to the buffer stop.
   vii) Lighting conditions.

b) Other factors;
   i) Space required for movement of the buffer stop.
   ii) Rolling stock coupling systems.
   iii) Requirements for insulated rail joints and electrical insulation of the buffer stop.
   iv) Numbers of trains proposed to use the line.
   v) Any running lines, structures, walking routes, or other areas of risk behind the buffer stop.
   vi) History of train overruns, if appropriate for new construction.
   vii) End impact wall arrangement.

2.1.3 The impact speed to be used in design calculations shall be determined following an assessment of the relevant factors listed above. The determined impact speed shall be not less than 10 km/h.

2.1.4 Buffer stops shall be designed to arrest the full range of trains between the heaviest and lightest using a track without risk of serious injury to people on the train. Trains shall be brought to a controlled halt from the determined impact speed with an average retardation rate not exceeding 0.15g (1.47 m/s²). Where site constraints make it unavoidable, lightweight trains may be subjected to higher retardation rates, but the average retardation rate for any train shall not exceed 0.25g (2.45 m/s²).
2.1.2 Provision of end impact walls

2.1.2.1 Where reasonably practicable, end impact walls shall be provided where they would reduce the risk of a train overrun causing harm to people and damage to critical structures. When assessing this risk, the following shall be taken into account:

a) The positioning of critical structures and supports.
b) The positioning of workplaces and retail outlets.
c) The areas where people are likely to congregate.
d) Other areas of risk behind buffer stops.

2.1.2.2 Appendix A sets out guidance on the design of end impact walls.

2.1.3 Additional requirements for railways in tunnels

2.1.3.1 Terminal tracks at stations in tunnels shall be provided with an adequate length of overrun tunnel. The length of overrun provided shall take account of the factors listed in clause 2.1.1.2.

2.1.4 Additional safety measures

2.1.4.1 Consideration shall be given to the provision of additional safety measures at locations where:

a) An assessment of the factors listed in clause 2.1.1.2 suggests that there may be a high probability of train overruns.
b) An assessment of the factors listed in clause 2.1.1.2 suggests that there may be severe consequences from a train overrun.

2.1.4.2 These additional safety measures include, but are not limited to:

a) Improved illumination.
b) Countdown marker boards. The use of these is described in GI/RT7033.
c) Permanent speed restrictions on the approaches to the buffer stop.
d) Screening or removal of driver distractions, for example advertising hoardings.

2.2 Requirements for new construction for freight lines and sidings

2.2.1 Provision of arrangements for arresting a train

2.2.1.1 Buffer stops or arresting devices shall be provided at terminal tracks on freight lines and sidings.

2.2.1.2 The type of buffer stop or arresting device selected and its design shall take into account the following factors:

a) Factors influencing speed and force of impact:

   i) Types of rolling stock.
   ii) Maximum train weights.
   iii) Approach gradient.
   iv) Identified likely track adhesion conditions.
v) Signalling arrangements and sighting distances.

vi) Permissible speed (shown in the sectional Appendix) on the approach to the buffer stop or arresting device.

vii) Lighting conditions.

b) Other factors:

i) Rolling stock coupling systems.

ii) Requirements for insulated rail joints and electrical insulation of the buffer stop or arresting device.

iii) Likely traffic levels.

iv) Carriage of dangerous goods and their type.

v) Any running lines, structures, walking routes or other areas of risks behind the buffer stop or arresting device.

vi) History of train overruns, if appropriate for new construction.

2.2.2 Provision of end impact walls

2.2.2.1 Where reasonably practicable, end impact walls shall be provided where they would reduce the risk of a train overrun causing harm to people and damage to critical structures. When assessing this risk, the following shall be taken into account:

a) The positioning of critical structures and supports.

b) Other areas of risk behind buffer stops or arresting devices.

2.2.2.2 Appendix A sets out guidance on the design of end impact walls.

2.2.3 Additional requirements for railways in tunnels

2.2.3.1 Where terminal tracks on freight lines or sidings are accommodated within a tunnel, the need for an additional length of overrun tunnel beyond the buffer stop or arresting device shall be assessed, taking into account the factors listed in clause 2.2.1.2.

2.2.3.2 Where a turnback siding is formed by the continuation of a running line through the terminal station of a railway in tunnel, the requirements of section 2.1 shall apply.

2.3 General requirements for new construction

2.3.1 Track at buffer stops and arresting devices

2.3.1.1 A length of straight track, greater than the length of the longest vehicle permitted to use the track, shall be provided wherever reasonably practicable at the approach to the buffer stop, so that any vehicle striking the buffer stop will do so with its longitudinal axis at right angles to the buffer beam.

2.3.1.2 Where sliding or friction buffer stops are proposed, an appropriate length of straight track shall be provided behind the buffer stop to accommodate the movement of the buffer stop and its associated friction shoes (sometimes referred to as ‘slave units’).
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.

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.

2.5 Temporary arrangements

2.5.1 Provision of temporary arrangements

2.5.1.1 A buffer stop or arresting device shall be provided where a terminal track is created by temporary arrangements, for example during works to a station or track remodelling.

2.5.1.2 The design of the buffer stop or arresting device shall take into account the factors listed in section 2.1 (stations) or section 2.2 (freight lines and sidings), as appropriate. It shall also take into account:

a) The duration of the temporary arrangements.

b) Any work site or temporary structures behind the buffer stop or arresting device.
Part 3  Application of this document

3.1  Application – infrastructure managers

3.1.1  Scope
3.1.1.1  The requirements of this document apply to all terminal tracks.

3.1.2  Exclusions from scope
3.1.2.1  There are no exclusions from the scope specified in section 3.1.1 for infrastructure managers.

3.1.3  General compliance date for infrastructure managers
3.1.3.1  This Railway Group Standard comes into force and is to be complied with from 02 February 2008, except as specified in section 3.1.4. Where the dates specified in section 3.1.4 are later than the above date, this is to allow infrastructure managers sufficient time to achieve compliance with the specified exceptions.

3.1.3.2  After the compliance dates or the date by which compliance is achieved if earlier, infrastructure managers are to maintain compliance with the requirements set out in this Railway Group Standard. Where it is considered not reasonably practicable to comply with the requirements, authorisation not to comply should be sought in accordance with the Railway Group Standards Code.

3.1.4  Exceptions to general compliance date
3.1.4.1  There are no exceptions to the general compliance date specified in section 3.1.3 for infrastructure managers.

3.2  Application – railway undertakings
3.2.1  There are no requirements applicable to railway undertakings.

3.3  Health and safety responsibilities
3.3.1  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  Guidance on the design of end impact walls

The content of this appendix is not mandatory and is provided for guidance only.

A.1 End impact walls for stations
A.1.1 For tracks serving passenger traffic, the end impact walls should be designed for a horizontal design force of 5000 kN at a height of 1.0 m above the top of the rail where a buffer stop with a minimum braking capacity of 2500 kNm is provided.

A.2 End impact walls for freight lines and sidings
A.2.1 In shunting and marshalling areas where a buffer stop with a minimum braking capacity of 2500 kNm is provided, the end impact walls should be dimensioned for a horizontal design force of 10000 kN at a height of 1.0 m above the top of the rail.

A.3 General guidance on the design of end impact walls
A.3.1 The buffer stop or arresting device, and end impact wall should be considered together as a single system.

A.3.2 The purpose of the buffer stop or arresting device is to stop an overrunning train safely and without permanent damage and with minimal injury to passengers and staff.

A.3.3 The purpose of the end impact wall is to prevent an overrunning train from intruding into the zone being protected. In this case permanent damage or deformation to the train might be incurred.

A.3.4 The end impact wall should be a minimum height of 1.3 m above the top of the rail.

A.3.5 The design of the end impact wall should ensure that there are no features or protrusions that might cause particular local damage to a train colliding with it, by for example penetrating the cab of the train.

A.3.6 Exceptionally, where the end impact wall is providing protection to a structure that if impacted could collapse onto the track or cause other significant potential for injury, the design could promote deflection of the train laterally away from the structure.
Definitions

Arresting device
An assembly provided at the end of a terminal track to arrest an overrunning train, other than a buffer stop (for example, sand drags or wheel stops).

Buffer stop
An assembly provided at the end of a terminal track to arrest an overrunning train, designed to take the impact of the train at buffer or coupling height.

Energy absorbing buffer stop
A buffer stop designed to bring a train to a controlled halt from a determined impact speed by providing a means of progressively absorbing the kinetic energy of the train.

End impact wall
A structure or other arrangement located behind a buffer stop designed to contain a train that has run through the buffer stop, so preventing harm to people or damage to critical structures that would otherwise have been in the path of the train.

Freight line
A line normally only used by non-passenger carrying trains or empty passenger stock.

New construction
The provision of a buffer stop or arresting device on a new terminal track or the complete replacement of a buffer stop or arresting device on a remodelled track or station layout.

Overrun
The movement of a train or vehicle beyond the designed end limit of a track.

Terminal track
A dead end or terminating track in a station or at the end of a freight line or siding.
References

The Catalogue of Railway Group Standards and the Railway Group Standards CD-ROM give the current issue number and status of documents published by RSSB. This information is also available from www.rgsonline.co.uk.

Documents referenced in the text

RGSC 01 The Railway Group Standards Code

Railway Group Standards

GC/RT5021 Track System Requirements
GE/RT8030 Requirements for a Train Protection and Warning System (TPWS)
GI/RT7016 Interface between Station Platforms, Track and Trains
GI/RT7033 Lineside Operational Safety Signs
GK/RT0031 Lineside Signals and Indicators
GK/RT0032 Provision of Lineside Signals

RSSB documents

GC/RC5633 Recommendations for the Risk Assessment of Buffer Stops, Arresting Devices and End Impact Walls