

# RAILTRACK

*Safety & Standards*

## SAFETY JUSTIFICATION

**ISSUE: I**

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### DOCUMENT INFORMATION

<b>Document Title:</b>	Rail Traffic Management and Control Systems Safety Requirements	
<b>Document No:</b>	GE/RT8026	<b>Issue:</b> ONE
<b>Primary Subject Committee:</b>	Train Control & Communications	
<b>Other Subject Committee input/ involvement:</b>	Traction and Rolling Stock Operations Safety	
<b>Proposed Date of Submission to Subject Committee:</b>	11/05/2000	
<b>Submitted by: Standards Project Manager</b>	A E Blakeney	Date:21/02/00
<b>Reviewed by: Controller, Safety, Strategy and Planning</b>		Date:21/02/00
<b>Approved by: Controller, Railway Group Standards</b>		Date: 21/02/00

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### PART I – SCOPE OF SAFETY JUSTIFICATION

This Safety Justification describes the rationale behind the controls for the development and implementation of Rail Traffic Management and Control Systems (RTM&CS) which make use of in-cab signalling as specified in Railway Group Standard GE/RT8026 “Rail Traffic Management and Control Systems Safety Requirements” Issue I. The primary objective of the standard is to define the high level requirements for management and control without unnecessarily restricting the solution and allowing some freedom of innovation in the development process.

The scope of the Safety Justification covers the controls as a whole and highlights the specific work involved in the development of the RGS. A diagram of the high level system architecture is provided in the annex to this Safety Justification. This diagram serves to illustrate the general scope / boundaries of the system and the broad partitioning of safety functions between the principal sub-systems. The requirements cover both the train control system itself (the fixed infrastructure and train-borne elements which perform high integrity safety functions) and the control centre systems, where a lower level of integrity may be appropriate. Together, these systems are referred to throughout the requirements as the “system”. The system comprises:

- Interfaces for the signaller and others who operate the System;
  - Train routing and regulation sub-systems;
  - Interlocking and movement authority sub-systems;
  - Trackside equipment; and
  - Train-borne sub systems.
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## **PART 2 – RISKS BEING CONTROLLED**

This standard defines the requirements for rail traffic management and control systems to ensure that the existing levels of safety are at least maintained. Standards for these systems are necessary to ensuring that the following hazards are controlled:

- Collisions between trains (rear end, head on, converging)
- Buffer stop collisions
- Derailments and overturning of trains
- Incidents at level crossings
- Incidents involving personnel working on the railway
- Signals passed at danger

The system also offers the possibility of mitigating the effects of hazards which are not directly within the scope of the system's purpose. This arises largely because of the potential for revoking a movement authority and stopping a train more promptly than is possible with conventional lineside signalling.

In these circumstances, the system would be provided with inputs from other detection mechanisms (which are outside the scope of the system), and it would then respond accordingly.

The inherent nature of the system offers the potential to reduce hazards in some key areas compared with traditional signalling, notably:

- Exceedence of movement authority (via ATP);
- Overspeeding (via ATP);
- Exposure of trackside workers to risk (less equipment on track and better warning/access control);
- Obstacles on the line
- Vandalism (less equipment on track).

## **Part 3 SUMMARY OF CONTROLS**

Railway Group Standard GE/RT8026 Issue 1 defines the controls for RM&CS.

The controls are based upon the key areas associated with RTMCS and the standard. These are:

- Modes of operation
- Movement authorities
- Train speed control
- Driver interface
- Non-driver interfaces
- System management

The requirements include issues relating to transitions between conventionally signalled areas and areas under the control of the system, and also issues relating to dual signalled areas (where lineside signals are provided for conventional trains and the System controls cab-signalled trains in the same geographical area).

The requirements form a high level system safety requirements specification, and also address the life management of the system after initial commissioning. They do not address the processes by which the system is initially designed, constructed, tested and accepted, which is covered in Engineering Safety Management Issue 3 Volume 1 (the Yellow Book).

The standard provides a complete set of requirements for RTMCS, although more detailed control measures may be available in other related Railway Group Standards the application of which, may facilitate

compliance with this standard. Appendix A lists these standards.

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#### **Part 4 – COSTS AND BENEFITS**

The controls are designed to ensure that the introduction of RTM&CS does not increase the risks over that for conventional signalling. The controls are defined at a high level to provide a framework for the development and use of RTM&CS, without being unnecessarily prescriptive nor restricted to any particular solution or technology. The controls are the minimum requirements necessary and sufficient to ensure existing levels of safety are at least maintained. The need to implement these controls is likely to be driven by a business led route upgrade, to permit higher speed or more intensive use of the network, and as such the costs are a component of this upgrade and not an additional cost arising from the implementation of GE/RT8026.

The benefit of the standard is the provision of a framework to ensure that a consistent safety level is maintained when RTM&CS is introduced. The requirements address a critical area of rail safety and ensure that safety levels are at least maintained or improved.

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#### **Part 5- CONCLUSIONS**

The requirements are necessary to control the risks of introducing new technology and new systems into the critical area of train control and rail traffic management. To reflect that such systems are in the development stage, these requirements are considered to represent current best practice to guide that process, rather than outlining any definitive compliance targets.

The requirements ensure that existing levels of safety will be at least maintained after the introduction of RTM&CS.

On this basis it is concluded that the controls specified in the Standard are justified.

## Appendix A: Other Signalling Standards which may be relevant to RTMCS Requirements

Although GE/RT8026 contains all the high level requirements for the provision and use of RTMCS, there are nevertheless other existing Group Standards which may have some relevance to such systems. The table below provides some information on the relevance of these other Standards. For most part these Standards amplify the requirements of GE/RT8026, and thereby provide details on the means by which the high level requirements can be met. However, it should be noted that:

- it should not be presumed that compliance with any particular relevant “classical” standard will ensure compliance with the corresponding high level requirements in GE/RT8026;
- where a “classical” standard is relevant, non-compliance with it will generally be considered acceptable provided it can be demonstrated that compliance is not necessary in order to meet the requirements of GE/RT8026.

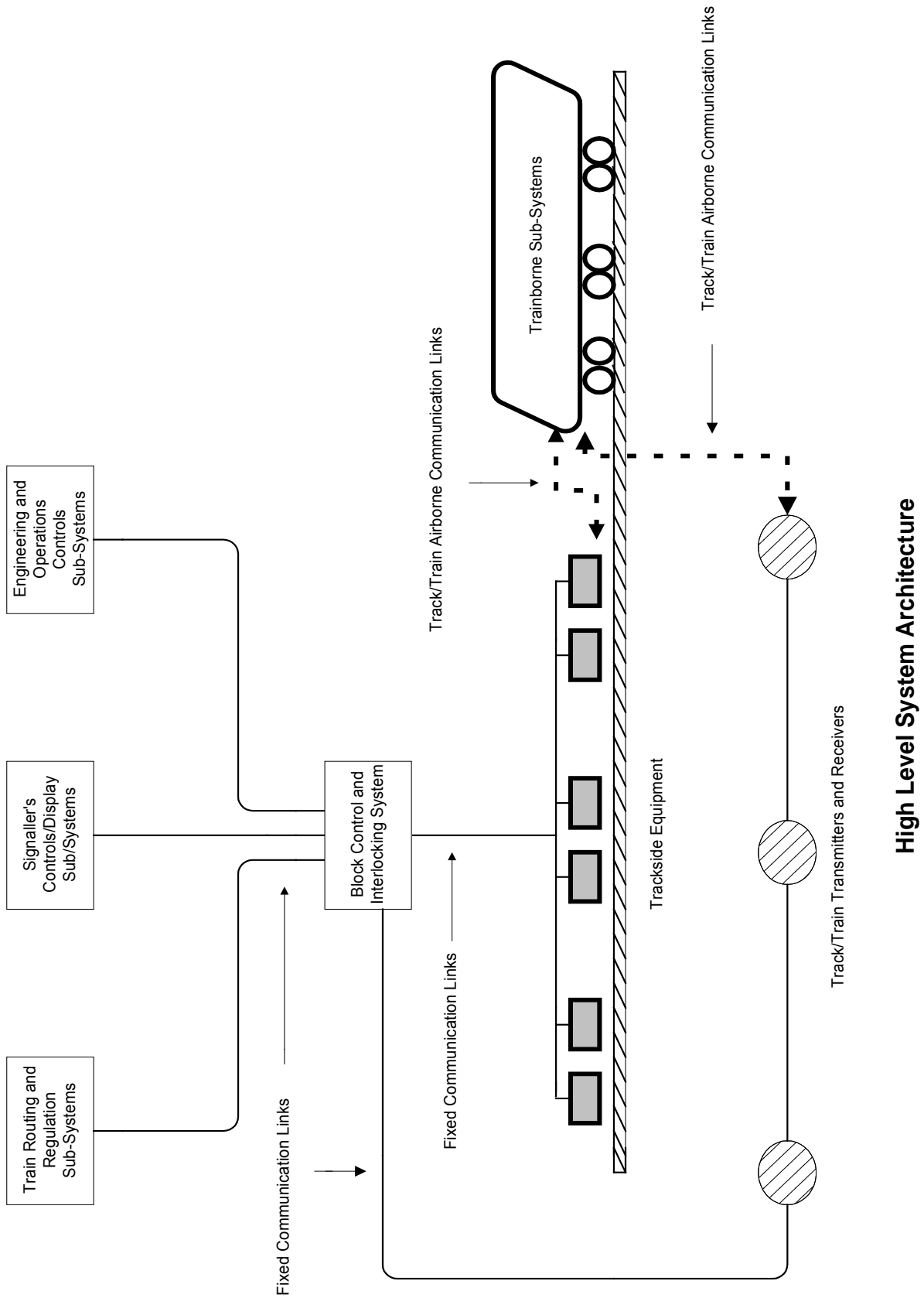
So far as the table below is concerned, note also that:

- A number of Group Standards and Codes of Practice are due to be transferred to Railtrack Line during 2000. These are not included in this list;
- Various draft Group Standards are listed for completeness;
- Standards which are applicable only for the purposes of providing conventional signalling in Dual Signalled Areas or for the transition between conventional and in-cab signalling are not listed.

Standard	Subject	Related Clauses in GE/RT8026	Relevance
GK/RT0007	Alterations to Permissible Speeds	11.2.1	May have some relevance when considering proposed speed alterations, but the Standard is written in the context of conventional lineside signalling, and may not therefore provide a complete set of requirements for in-cab signalling.
GK/RT0009	Identification of Equipment	6.1.3 11.1.7	Provides more detailed requirements relevant to the provision of equipment identifiers for operational and maintenance purposes.
GK/RT0011	Train Detection Systems	Various	Relevant only if track-based train detection systems are to be used as part of the System (e.g. through junctions).
GK/RT0025	Signalling Control and Display Systems	10.1	May provide acceptable solutions for the use of conventional panels and VDU displays with in-cab signalling systems. Mainly relevant to fixed block systems.
GK/RT0026	Signaller's Route List	6.1.3	Provides a means of complying with one element of the need to provide information to signallers for operating purposes. Relevant only for fixed block systems.
GK/RT0027	Resetting and Restoration	6.1.3 11.3.4	Provides more detailed requirements relating to resetting and restoration, but does not adequately address complex software based systems.
GK/RT0029	Train Activated Warning Systems	10.2.1	Provides more detailed requirements for staff warning systems, where such systems are used in cab signalled areas.
GK/RT0030	Lockout Systems	10.2.1	Provides more detailed requirements for lockout systems, where such systems are used in cab signalled areas. Would need interpretation for in-cab signalling, and may not be appropriate for moving block applications.
GK/RT0031	Lineside Signals and Indicators	Various	May have limited application where lineside indicators are to be used, e.g. for station despatch purposes.
GK/RT0033	Lineside Signs	9.3.8	Where suitable signs exist in GK/RT0033 and are appropriate and relevant for a cab-signalled line, these should be used in preference to inventing new forms of sign.
GK/RT0091	Driver's Reminder Appliance	-	Policy on fitment for trains operating in cab-signalled areas is currently undefined. However, since all such trains are likely to operate in conventionally signalled areas as well, fitment is likely to be mandatory.

Standard	Subject	Related Clauses in GE/RT8026	Relevance
GK/RT0101	Competence of S&T Staff	11.1.6 11.3.9	Fully applicable.
GK/RT0105	Transmission of Safety Related Information	5.1.5 11.1.1 11.1.3	Fully applicable. (Note that GK/RT0105 relates to catastrophic loss of telecommunications, resulting in widespread disruption and use of degraded modes.)
GK/RT0106	Management of Failures	5.1.9 11.1.1 11.1.4	Principles generally applicable, but the extent of application, and the apportionment of responsibilities between the Infrastructure Controller and the Train Operating Companies may need re-definition, depending upon how system authority and system ownership issues are decided (see clause 5.1.9 of GE/RT8026).
GK/RT0170	S&T Asset Management	11.1.1	Fully Applicable
GK/RT0207 (Draft)	Signalling Design Production	11.3.1	Applicable to lineside signalled elements (eg dual signalled areas)
GK/RT0208 (Draft)	Installation of S&T Equipment	11.3.2	Fully applicable.
GK/RT0209 (Draft)	Testing of Signalling Systems	11.1.1 11.1.3 11.3.3	Anticipated to be fully applicable.
GK/RT0330	Plug-in / Interchangeable Equipment	5.1.8	Fully applicable.
GE/RT8012	Speed Control of Tilting Trains	8.2	Requirements relevant to in-cab signalling fully applicable.
GE/RT8027 (Draft)	Level Crossings	10.3	Applicable, although some requirements may be modified by the supporting requirements in section 10.3 of GE/RT8026.
GI/RT7001	Infrastructure Records	11.1.5	Fully applicable.
GI/RT7002	Product Acceptance	11.3.6	Fully applicable.
GI/RT7004 (Draft)	Moving Components in the Track	7.1.1 7.3.1	Fully applicable.

# Annex to Safety Justification for GE/RT8026



**High Level System Architecture**