Digital Railway Requirements – ETCS Trackside

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Version History

Issue	Date	Comments
0.1	30/01/19	First draft
0.2	04/02/19	Updated to peer comments
0.3	06/02/19	Issued for RICMWG review
0.4	19/02/19	Updated to DRIIAT comments
0.5	18/03/19	Updated to common comments and template updates
1.0	20/03/19	First issue

Exclusions

These are items currently missing from this version of the document that should be included in a later publication.

1. The industry approved system and sub-system requirements for ETCS Trackside require future updates to reflect emerging knowledge and inclusion of Interlocking functionality within the system boundary.

2. This document has been submitted for Level 3 assurance in accordance with the System Management Plan [RD1]. A response has been received showing no Category 1 comments (i.e. there is no issue associated with a fundamental concern, error, omission or question that has a direct bearing on the acceptability of the document). Other comments will be addressed in a future revision of this document.

Assumptions

These are items upon which the validity of this document relies and which will be delivered by others. Non-delivery of these items will necessitate a change to this document.

1. Pending the update of the requirements to reflect the interlocking functionality of the trackside, it is assumed that conventional interlocking principles apply except where specifically stated.

Dependencies

These are items upon which the validity of this document depends. Any changes to the referenced document may require further changes to this document.

1. None identified.

Content

Digital Railway

Abbreviations and definitions

Abbreviations are explained in full on first use within this document. A comprehensive list of abbreviations and definitions is contained in the Glossary [RI1].

REFERENCES

Dependent References

An update to one of these references requires a review to identify any potential need for an update to this document.

[RD1]   Digital Railway - System Management Plan, 153819-NWR-PLN-MPM-000002, Issue 8.0

[RD2]   Digital Railway Requirements Management Plan, 153819-NWR-PLN-ESE-000006, Issue 2.0

[RD3]   Digital Railway – GB Generic Customer Requirements Specification for ETCS Trackside, 153821-NWR-REP-ESE-000007, Issue 3.0

[RD4]   Technical Standard for Interoperability (CCS), Commission Regulation (EU) 2016/919

[RD5]   ETCS – Baseline 3 – GB System Requirements Specification, NEPT/ERTMS/REQ/0005, Issue 4.0

[RD6]   ETCS – Baseline 3 – GB Trackside Sub-system Requirements Specification, NEPT/ERTMS/REQ/0006, Issue 2.0

[RD7]   ETCS – Baseline 3 – GB Telecoms Sub-system Requirements Specification, NEPT/ERTMS/REQ/0008, Issue 3.0

[RD8]   ETCS – Baseline 3 – GB Operational Sub-system Requirements Specification, NEPT/ERTMS/REQ/0009, Issue 2.0

[RD9]   Digital Railway – Preliminary Hazard Analysis Report, 147883-NWR-REP-ESS-000007, Issue 2.1

Informative References

These references have no material bearing on the content of this document but are referenced within it. Unless otherwise specified, the latest version should be used.

[RI1]   DR Glossary, 153819-NWR-SPE-ESE-000001

[RI2]   Digital Railway Requirements Framework, 153819-NWR-PLN-ESE-000011

[RI3]   Digital Railway – Introduction to the Requirements Structure, 153819-NWR-PLN-ESE-000012

[RI4]   Digital Railway – Customer Requirements – Requirements Change Control Process, 153819-NWR-SPE-ESE-000004

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1 INTRODUCTION

1.1 Purpose

This document provides a specification that is intended to promote effective implementation of the ETCS Trackside. It is applicable to both retrofit and new-build installations and provides requirements that are optimised for operation on the GB rail network and will support the GB rail industry in achieving the outcomes described in the Digital Railway (DR) Requirements Framework [RI2].

As stated in the industry-agreed and issued DR Requirements Management Plan [RD2], the document provides the DR Requirements which have been developed as part of a suite of requirements covering all elements required to optimise performance and operation of a digitally-enabled railway.

This document forms part of a suite of related specifications for both the ETCS Trackside and the DR System of Systems (SoS) as described in the DR Introduction to the Requirements Structure document [RI3]. Further details of the parent requirements that drive the development of this specification are included within the following specifications:

This document supports the Customer Requirements identified for the ETCS Trackside [RD3].

This Specification for the ETCS Trackside has been written to complement the Control, Command and Signalling Technical Specification for Interoperability (CCS TSI) and European Union Agency for Railways specifications for Baseline 3 ETCS [RD4]. Every effort has been made to avoid conflict with the CCS TSI and Baseline 3 specification but, in case of conflict, the CCS TSI (including the UK specific cases) and Baseline 3 specification takes precedence.

The document is set out in the form of standard requirements with the ETCS Trackside Requirement (DRR-ETCS(T)-n) identifier, followed by rationale and guidance notes, where appropriate.

1.2 Scope

This document requires the application of industry approved specifications which describe how the ETCS Trackside is to be implemented in order to optimise its application on the GB rail network and to promote consistency between applications where this has been identified as being in the best long-term interests of the GB rail industry. It complements, constrains and should be applied in conjunction with, the Customer Requirements Specification for the ETCS Trackside [RD3] which sets out what the ETCS Trackside is intended to achieve.

These requirements are intended to enable the ETCS Trackside to operate in conjunction with an interfacing system within the DR SoS and the wider railway. They are not expected to prevent the ETCS Trackside operating with other digital systems outside the DR SoS.

This document contains only generic requirements that are applicable to multiple deployments of the ETCS Trackside. The Contracting Entity, or their appointed Agent is responsible for specifying any deployment-specific requirements as described in the Introduction to the Requirements Structure document [RI3].

Nothing in this document obviates any legal requirement with which any of the parties must comply. Furthermore, it does not preclude operation of a Technical Specification for Interoperability (TSI)-compliant vehicle on the GB rail network, nor a vehicle compliant to this specification operating on TSI-compliant infrastructure outside the GB rail network.

The acceptance criteria applicable to the requirements within this document will be documented separately in a Verification and Validation Matrix.

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1.3 Update Policy

This Requirement Specification is to be reviewed regularly and updated, where required, as the programme progresses. Requirements may need to be changed or new requirements written.

1.3.1 Changed Requirements

Requirements within the database may need to be changed because:

- the requirement is wrong;
- the requirement is valid but cannot be satisfied;
- there is ambiguity or lack of clarity;
- the requirement has been incorporated into a Standard or another contractually authorised document; or,
- the requirement has become normal Infrastructure Manager (IM) / Railway Undertaking (RU) practice.

1.3.2 New Requirement

Additionally, a new Requirement may be necessary to:

- mitigate a new hazard, risk or issue;
- satisfy a sponsor's change of scope;
- satisfy emerging needs; or,
- create a 'parent' for a necessary subsidiary requirement.

1.4 Requirements: Form, Applicability and Identification

1.4.1 Requirement Functionality

Requirements may be functional or non-functional:

- **Functional Requirements** - Technical details that define what a system needs to accomplish, i.e. how the suppliers' equipment will be applied, what it needs to do, and what processes, procedures and rules need to be in place to achieve it.
- **Non-Functional Requirements** - Constraints on the design or implementation, such as performance, security, competence, training, and reliability requirements.

1.4.2 Basic Requirement Form

All requirements are in the following form:

Safety

Requirement text.

Unique Identifier

Status: Normative/Application-Specific/Preferred/Generic Product. (*See* Section 1.4.5 belo*w).*

Rationale: Shows applicability of the requirement.

Guidance: Supplementary information to support Requirement interpretation and satisfaction.

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1.4.3 Safety Requirement

Where a requirement has been associated with a Safety Measure, this is identified.

1.4.4 Unique DRR-ETCS(T) Identifier

Each requirement has been identified uniquely. The requirement numbers have been generated automatically within the DOORS database, which means that the requirement numbering may be neither sequential nor gap-free.

1.4.5 Normative / Application-Specific / Preferred / Generic Product status

Each requirement within this document is identified as one of: normative, preferred, application-specific, or generic product. These are defined as follows:

- Normative

  - o Necessary to achieve compatibility or optimisation of the system in relation to the GB rail network; or

  - o A system feature that is deemed to be cost-effective and universally beneficial.

  Satisfaction of normative requirements in compliance with this document is expected to be a requirement of individual delivery contracts.

- Application-Specific

  - o A requirement which may not be relevant or applicable to every implementation of the ETCS Trackside. It is expected that, where a requirement is applicable, it will be applied.

  Satisfaction of application-specific requirements in compliance with this document is expected to be a requirement of individual delivery contracts, as appropriate to the implementation being considered.

- Preferred

  - o A requirement of lower importance which, whilst not essential, the industry would prefer were satisfied. It is expected that, where a requirement is applicable, it will be applied.

  Satisfaction of preferred requirements in compliance with this document is not expected to be a requirement of individual delivery contracts unless explicitly specified within the relevant contract.

- Generic Product

  - o A feature required to enable the core purposes of the system to be realised; or,

  - o A feature that is necessary to minimise future development of the product for other projects; or,

  - o A feature required to enable all the Reference Design topics (where these exist) to be satisfied.

  Satisfaction of generic product requirements in compliance with this attribute is a requirement of an ETCS Trackside product for acceptance into the GB market.

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1.5 Requirements Assurance

Requirements assurance has been explained in the Preliminary Hazard Analysis Report [RD9].

1.6 Requirements Change

The Requirements Change Control Process [RI4] will be used to raise Change Requests (CRs) to amend existing requirements or add new requirements.

1.7 Areas for Development

Noting that this document represents the best understanding of the needs of GB's rail network at the time of publishing, it is recognised that there are a number of areas where the document may be deficient. New deficiencies may be identified as understanding of the ETCS Trackside develops, as well as areas being closed out through further work being undertaken. The current known areas of deficiency are listed in Appendix A

2 REQUIREMENTS

> *Safety*
>
> The ETCS Trackside shall conform to the ETCS System requirements detailed in NEPT/ERTMS/REQ/0005, v4.0, dated 31st March 2017.
>
> **DRR-ETCS(T)-1**

Status: Normative.

Rationale: The system requirements for ETCS have been developed and approved by the industry. The majority of those requirements are valid to the ETCS Trackside within the Digital Railway System of Systems.

Guidance: Only the requirements applicable to the ETCS Trackside need to be applied and these are linked to ETCS Trackside Customer Requirements in DOORS. A process is underway to update the industry approved requirements to reflect changes in the system boundary (e.g. inclusion of interlocking functionality).

The referenced document is available at https://www.rssb.co.uk/improving-industry-performance/ertms.

> *Safety*
>
> The ETCS Trackside shall conform to the ETCS Trackside Sub-System requirements detailed in NEPT/ERTMS/REQ/0006, v2.0, dated 31st March 2017.
>
> **DRR-ETCS(T)-2**

Status: Normative.

Rationale: The sub-system requirements for ETCS Trackside have been developed and approved by the industry. The requirements are valid to the ETCS Trackside within the Digital Railway System of Systems.

Guidance: A process is underway to update the industry approved requirements to reflect changes in the system boundary (e.g. inclusion of interlocking functionality).

Digital Railway

The referenced document is available at https://www.rssb.co.uk/improving-industry-performance/ertms.

Safety

The ETCS Trackside shall conform to the ETCS Telecoms Sub-System requirements detailed in NEPT/ERTMS/REQ/0008, v3.0, dated 31st March 2017.

DRR-ETCS(T)-3

Status: Normative.

Rationale: The sub-system requirements for Telecoms facilities to support ETCS have been developed and approved by the industry. The requirements are valid to the ETCS Trackside within the Digital Railway System of Systems.

Guidance: A process is underway to update the industry approved requirements to reflect changes in the system boundary (e.g. inclusion of interlocking functionality). It is anticipated that the constraints within this document will be integrated with the communication requirements of the Digital Railway System of Systems.

The referenced document is available at https://www.rssb.co.uk/improving-industry-performance/ertms.

Safety

The ETCS Trackside shall conform to the ETCS Operational Sub-System requirements detailed in NEPT/ERTMS/REQ/0009, v2.0, 31st March 2017.

DRR-ETCS(T)-4

Status: Normative.

Rationale: The sub-system requirements describing the operational issues relevant to ETCS have been developed and approved by the industry. The requirements are valid for the ETCS Trackside within the Digital Railway System of Systems.

Guidance: A process is underway to update the industry approved requirements to reflect changes in the system boundary (e.g. inclusion of interlocking functionality). It is anticipated that the constraints within this document will be integrated with the operations and maintenance requirements of the Digital Railway System of Systems.

The referenced document is available at https://www.rssb.co.uk/improving-industry-performance/ertms.

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Appendix A   Areas for Development

No.	Issue	Description	Identified in version	Closed in version
1	Alignment to DR ETCS Trackside System Definition	The industry approved system and sub-system requirements for ETCS Trackside require future updates to reflect emerging knowledge and inclusion of Interlocking functionality within the system boundary.	0.3	
2	Confirmation of Interface Messages	Functions and messages between ETCS Trackside and TMS are yet to be agreed'	0.3	
3	Amendment of Customer Requirements Specification	Analysis of the ETCS Trackside System Requirements in [RD5] identified three missing CRS and a change request has been raised to create CRS-ETCS(T)-66, 67 & 68.	0.3	1.0

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Appendix B   Linking to Customer Requirements

The table below lists the Customer Requirements for ETCS Trackside in [RD3] and identifies the Digital Railway Requirements in [RD5] which constrain each Customer Requirement. This replicates the linking between the Digital Railway Requirements and Customer Requirements suites which is implemented in DOORS.

Note that Digital Railway Requirements referred to in DRR-ETCS(T)-1 are included within the table; linking between those constraints and the constraints called up by DRR-ETCS(T)-2, DRR-ETCS(T)-3 and DRR-ETCS(T)-4 are identified in DOORS.

All ETCS System Requirements relevant to the ETCS Trackside have been identified as constraints on ETCS Trackside Customer Requirements. Note that some may be constraints on ETCS Onboard Customer Requirements or both.

Customer Requirement Number	Is Constrained by Digital Requirement Number(s)
CRS-ETCS(T)-1	ESR-611
	ESR-670
	ESR-374
	ESR-90
	ESR-659
CRS-ETCS(T)-2	ESR-99
	ESR-76
	ESR-625
	ESR-153
	ESR-368
	ESR-4
	ESR-14
	ESR-228
	ESR-360
	ESR-385
	ESR-617
CRS-ETCS(T)-3	
CRS-ETCS(T)-59	
CRS-ETCS(T)-4	ESR-157
CRS-ETCS(T)-5	ESR-3
	ESR-558
	ESR-4

Customer Requirement Number	Is Constrained by Digital Requirement Number(s)
CRS-ETCS(T)-6	ESR-107
CRS-ETCS(T)-7	ESR-53
	ESR-380
CRS-ETCS(T)-9	
CRS-ETCS(T)-10	ESR-111
	ESR-303
CRS-ETCS(T)-11	ESR-625
CRS-ETCS(T)-12	ESR-11
	ESR-817
CRS-ETCS(T)-13	ESR-281
	ESR-646
	ESR-672
CRS-ETCS(T)-14	ESR-27
	ESR-813
	ESR-21
	ESR-571
CRS-ETCS(T)-60	ESR-36
	ESR-40
	ESR-61
	ESR-64
	ESR-62
	ESR-277
	ESR-55

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Customer Requirement Number	Is Constrained by Digital Requirement Number(s)
CRS-ETCS(T)-15	ESR-381
	ESR-21
CRS-ETCS(T)-61	
CRS-ETCS(T)-16	ESR-162
	ESR-815
CRS-ETCS(T)-17	ESR-372
	ESR-670
	ESR-245
	ESR-303
	ESR-222
	ESR-651
CRS-ETCS(T)-18	ESR-368
CRS-ETCS(T)-20	
CRS-ETCS(T)-21	
CRS-ETCS(T)-62	
CRS-ETCS(T)-22	
CRS-ETCS(T)-24	ESR-218
	ESR-332
CRS-ETCS(T)-25	ESR-218
	ESR-332
CRS-ETCS(T)-26	ESR-629
	ESR-236
	ESR-293
	ESR-389
	ESR-388
	ESR-387
	ESR-291
CRS-ETCS(T)-27	ESR-629
	ESR-236
	ESR-293
CRS-ETCS(T)-28	ESR-635
CRS-ETCS(T)-29	ESR-229
CRS-ETCS(T)-30	

Customer Requirement Number	Is Constrained by Digital Requirement Number(s)
CRS-ETCS(T)-31	ESR-301
	ESR-968
	ESR-179
CRS-ETCS(T)-32	ESR-626
CRS-ETCS(T)-33	
CRS-ETCS(T)-35	
CRS-ETCS(T)-36	ESR-470
	ESR-471
CRS-ETCS(T)-37	ESR-626
CRS-ETCS(T)-38	ESR-380
CRS-ETCS(T)-40	ESR-198
CRS-ETCS(T)-41	ESR-153
	ESR-140
	ESR-614
	ESR-669
CRS-ETCS(T)-42	ESR-556
	ESR-50
	ESR-46
CRS-ETCS(T)-43	ESR-657
	ESR-30
	ESR-111
	ESR-378
	ESR-571
	ESR-161
	ESR-199
	ESR-640
CRS-ETCS(T)-44	ESR-606
	ESR-475
CRS-ETCS(T)-45	ESR-547
	ESR-548
CRS-ETCS(T)-46	

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Customer Requirement Number	Is Constrained by Digital Requirement Number(s)
CRS-ETCS(T)-47	ESR-562
	ESR-563
	ESR-36
	ESR-40
	ESR-61
	ESR-50
	ESR-46
	ESR-62
	ESR-277
	ESR-55
	ESR-101
	ESR-287
	ESR-643
CRS-ETCS(T)-48	ESR-812
CRS-ETCS(T)-49	
CRS-ETCS(T)-50	ESR-817
	ESR-654
CRS-ETCS(T)-51	ESR-244
CRS-ETCS(T)-52	ESR-78
CRS-ETCS(T)-53	
CRS-ETCS(T)-54	ESR-191
	ESR-192
	ESR-253
CRS-ETCS(T)-55	ESR-387
	ESR-968
	ESR-627
CRS-ETCS(T)-56	ESR-99
	ESR-672
	ESR-14
	ESR-228
CRS-ETCS(T)-57	ESR-555
CRS-ETCS(T)-58	
CRS-ETCS(T)-63	ESR-572

Customer Requirement Number	Is Constrained by Digital Requirement Number(s)
CRS-ETCS(T)-64	
CRS-ETCS(T)-65	
CRS-ETCS(T)-66	ESR-276
CRS-ETCS(T)-67	ESR-636
CRS-ETCS(T)-68	ESR-336

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