Guidance on the Application of the Control Command and Signalling TSI

Synopsis
This document provides guidance on the application of the CCS TSI.
Guidance on the Application of the
Control Command and Signalling TSI

Issue Record

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<th>Issue</th>
<th>Date</th>
<th>Comments</th>
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<tr>
<td>One</td>
<td>03/12/2016</td>
<td>This new document arises from a review of GEGN8605 ETCS Systems Description (now withdrawn). It was considered more useful to provide wider guidance on the CCS TSI.</td>
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This document will be updated when necessary by distribution of a complete replacement.

Supply

The authoritative version of this document is available at www.rssb.co.uk/railway-group-standards. Enquiries on this document can be forwarded to enquirydesk@rssb.co.uk.
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Part 1 Introduction

1.1 Purpose

1.1.1 This document gives guidance on the Control Command and Signalling (CCS) Subsystem Technical Specification for Interoperability (TSI) (2016/919/EC) for application to the Great Britain (GB) mainline railway. It provides guidance on the following areas:

a) The purpose, geographic and technical scope of the CCS TSI.
b) The relationship between the essential requirements, CCS TSI and national rules.
c) The relevance of the Railway Interoperability Regulations 2011 (as amended) and the Common Safety Method on Risk Evaluation and Assessment (CSM RA).
d) A summary of the chapters of the CCS TSI.
e) The scope of the CCS subsystem, including the Class A and Class B train protection systems.
f) The minimum implementation requirements of the CCS TSI.
g) How to address the GB specific cases and CCS TSI open points.

1.1.2 The users of the CCS TSI include:

a) Project designers.
b) ‘Applicants’ and ‘Proposers’ in the context of their legal definitions.
c) Conformity assessment bodies.
d) Asset owners (vehicles and infrastructure).
e) Suppliers.
f) Maintainers.

1.1.3 This document does not set out requirements.

1.2 Structure of this document

1.2.1 Guidance is provided as a series of sequentially numbered clauses.

1.2.2 Specific responsibilities and compliance requirements are laid down in the relevant Railway Group Standard (RGS) or TSI.

1.2.3 Part 2 sets out the legislative context in which the CCS TSI applies. This covers:

a) The purpose, geographic and technical scope of the CCS TSI.
b) The relationship between the essential requirements, CCS TSI and national rules.
c) The relevance of the Railway Interoperability Regulations 2011 (as amended) and the Common Safety Method on Risk Evaluation and Assessment (CSM RA).
d) A summary of the chapters of the CCS TSI.
e) How to implement the CCS TSI.

1.2.4 Part 3 sets out the Control Command and Signalling Subsystem. This covers:

a) The scope and definition of the CCS structural subsystem.
b) The European Train Control System (ETCS) and Global System Mobile - Railway (GSM-R).
c) Mandatory and optional functions.
d) Specific Transmission Modules (STMs).
e) Train detection.
f) Specific cases and open points.

1.2.5 Part 4 sets out a list of frequently asked questions with the associated reference to the part of the document that answers each question.

1.3 Approval and Authorisation

1.3.1 The content of this document was approved by Control Command and Signalling (CCS) Standards Committee on 07 October 2016.

1.3.2 This document was authorised by RSSB on 28 October 2016.
Part 2 Guidance on the Legislative Context in which the CCS TSI Applies

2.1 Purpose of the CCS TSI

2.1.1 Directive 2008/57/EC on the interoperability of the rail system within the European community (the Interoperability Directive) lays down essential requirements for the railway system. These are all the conditions set out in Annex III which must be met by the rail system, the subsystems, and the interoperability constituents, including interfaces (Article 2(g) of Directive 2008/57/EC).

2.1.2 The TSI defines the technical and operational standards which must be met in order to satisfy the ‘essential requirements’ and to ensure the ‘interoperability’ of the European railway system. Up-to-date information about the current status of all TSIs, including links to the TSI content and all amendments, is published by the European Union Agency for Railways on its website. www.era.europa.eu

2.1.3 The CCS TSI (2016/919/EC) sets out requirements applicable to the CCS subsystem and associated interoperability constituents (ICs) identified in the TSI.

2.1.4 Previous versions of the CCS TSI were implemented by Commission Decision 2012/88/EU, which repealed two CCS TSIs applicable to the trans-European high-speed rail system (2006/860/EC) and the trans-European conventional rail system (2006/679/EC). On 07 January 2015, Commission Decision (EU) 2015/14 of 05 January 2015 amended Decision 2012/88/EU.

2.2 Scope of the CCS TSI and relationship with national rules

2.2.1 Technical and geographic scope of the CCS TSI

2.2.1.1 The CCS TSI applies to the whole mainline rail system in the scope of the Railway (Interoperability) Regulations 2011 (RIR 2011) (as amended), and not just the part of the network classified as part of the trans-European network (TEN), as in previous TSIs. The Department for Transport (DfT) provides information on the precise scope.

2.2.1.2 The technical scope of the CCS TSI is set out in Chapter 2. This limits the CCS TSI to train protection, radio communication and train detection requirements which are necessary to ensure interoperability and compliance with the essential requirements. The CCS TSI uses the terms ‘Class A’ and ‘Class B’:

a) Class A is the target European CCS structural subsystem.

b) Class B which is a limited set of national train protection systems that were in use before 20 April 2001. CCS TSI Chapter 7 includes some constraints applicable to developing the functionality of Class B systems.

2.2.1.3 A list of Class B CCS systems is published in European Rail Agency (ERA) technical document ERA/TD/2011-11 (version three), ‘List of CCS Class B systems’.

2.2.1.4 Figure 1 Class A and Class B CCS systems on page 10 shows the context of the Class A target structural subsystem and Class B train protection systems within the overall CCS subsystem architecture. Figure 8 The scope of the CCS system on page 24 shows this in more detail.
2.2.1.5 Although RETB is registered as a Class B system it does not contain any train protection functionality. It is included because of the need for on train equipment.

2.2.2 The relationship of essential requirements, TSIs, national rules

2.2.2.1 Commission Recommendation 2014/897/EU on matters related to the placing in service and use of structural subsystems and vehicles under Directives 2008/57/EC and 2004/49/EC of the European Parliament and of the Council (often referred to as DV29bis) in clauses 25 to 41 sets out the relationship between ‘essential requirements’, TSIs and national rules.

2.2.2.2 Member State National Technical Rules (NTRs) supplement the requirements in the TSIs by setting out requirements addressing:

a) GB specific cases.
b) Closing open points in TSIs.
c) The alternative requirements to implement TSI derogations.
d) Technical compatibility of infrastructure and vehicles with national legacy systems.

2.2.2.3 A majority of the NTRs relevant to the GB mainline railway are set out in RGSs, whose scope is defined in the RGS Code issue 3 (section 5) and in the Standards Manual issue 3 (section 11) which are published on the RSSB website. www.rssb.co.uk

2.2.2.4 The RSSB website includes a link to the DfT list of notified national rules.

2.2.2.5 RGS and UK specific cases in the CCS TSI: There are four UK specific cases in the CCS TSI, three of which are applicable to the GB mainline railway and have requirements set out in RGSs. Further information about each GB mainline specific case is given in 3.9 GB specific cases in the CCS TSI on page 29.

2.2.2.6 RGS and CCS TSI open points: Further information about using RGSs to close CCS TSI open points is given in 3.10 Open points in the CCS TSI on page 30.
2.2.2.7 RGS and CCS TSI derogations: At the time of writing, there are no RGSs that implement CCS TSI derogations.

2.2.2.8 RGS and technical compatibility with legacy national systems: In the CCS domain, most RGSs specify technical compatibility requirements for legacy national CCS systems and functions, which include requirements for Class B train protection systems, lineside signalling systems, train detection systems, train radio systems and other CCS systems associated with train operations.

2.2.3 The relationship between TSIs, national rules, safety obligations and other standards

2.2.3.1 Commission Recommendation 2014/897/EU clause 26 summarises the relationship of the essential requirements associated with ‘technical compatibility’ (defined in the Recommendation) and the wider safety obligations:

<table>
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<th>Clause 26 of 2014/897/EU</th>
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<td>Technical compatibility at the interface between network and vehicles is crucial for safety. Although the safety aspect of this interface could be proven through the use of reference systems or explicit risk estimations in accordance with Commission Regulation (EC) No 352/2009 of 24 April 2009 (repealed by Regulation 402/2013 (as amended)) on the adoption of a common safety method on risk evaluation and assessment (CSM RA), for interoperability reasons, technical compatibility should be proven on the basis of harmonised Union rules, that is the TSIs, or, if no such rules exist, on the basis of national rules. Therefore, for the sake of interoperability, interfaces between vehicle and network should be demonstrated using a rule-based approach.</td>
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2.2.3.2 Further guidance on the application of the CSM RA is provided by the Office of Rail and Road (ORR) and in six Rail Industry Guidance Notes GEGN8640 to GEGN8645.

2.2.3.3 It is important to note that compliance with TSIs and national rules may not be sufficient to meet all legal (especially safety) and other obligations/needs. Where necessary, and considered useful, the industry has set out requirements and guidance in Rail Industry Standards (RISs) and other documents and specifications, which can be adopted by projects and transport operators if they so choose. These requirements and guidance capture ‘good practice’ and principles which would be beneficial to consider as they could save cost, time and effort in identifying alternative requirements from first principles.

2.3 Relevant legislation

2.3.1 Railways (Interoperability) Regulations 2011

2.3.1.1 In the UK, RIR 2011 (as amended) transposes the Interoperability Directive.

2.3.1.2 RIR 2011 (as amended) requires any new, upgraded or renewed railway subsystem to comply with the applicable TSIs and national rules and, as necessary, seek an authorisation to place in service the new, upgraded or renewed subsystem from the National Safety Authority (the ORR for the GB mainline railway).

2.3.1.3 The DfT publishes the ‘Approved List of Exclusions from the scope of the RIR’, which excludes the regulations to particular networks, vehicle types and lines.

2.3.1.4 Each project is responsible for determining whether the RIR 2011 is applicable and for notifying the DFT of their decision. Further guidance on how to determine whether the RIR 2011 is applicable to a project is published on the DFT www.gov.uk/government/organisations/department-for-transport and www.orr.gov.uk websites.

2.3.1.5 If the project is in the scope of RIR 2011 (as amended) and it includes a new, upgraded or renewed CCS subsystem, then the CCS TSI applies and must be complied with.
2.3.1.6 Regulation 13 of RIR 2011 (as amended) provides a mechanism for the Applicant to request a decision from the DfT that an authorisation is not required for specific upgrade and renewal projects. For CCS, this might be appropriate to projects that do not form a part of the GB European Railway Traffic Management System (ERTMS) national implementation plan and if the scope of change is limited to upgrade and renewal of national legacy CCS systems.

2.3.1.7 If the RIR is applicable, the Applicant has to follow a framework and seek an authorisation from the ORR, to place new, upgraded or renewed infrastructure or vehicle into service.

2.3.1.8 Requirements for independent conformity assessment against the TSIs and applicable national rules are set out in the RIR 2011 (as amended).

2.3.1.9 Meeting the six essential requirements is a prerequisite of obtaining an authorisation. The essential requirements means all the conditions set out in Annex III of the Interoperability Directive.

2.3.1.10 To obtain an authorisation requires a demonstration of conformity with the relevant TSIs and NTRs. Conformity with the CCS TSI means that the CCS structural subsystem, interoperability constituent (IC) or IC group:

a) Meet the essential requirements of the trans-European rail system.
b) Are capable of being safely integrated into the trans-European rail system.

2.3.1.11 Conformity with NTRs means that the CCS structural subsystem, assembly or component:

a) Meet the compatibility requirements of the GB mainline railway.
b) Are capable of being safely integrated into the GB mainline railway.

2.3.1.12 Figure 2 Authorisation and compliance with standards on page 13 shows the relationship between authorisation for placing into service, meeting the essential requirements and conformity with TSIs and RGSs.
2.3.2 Regulation (EU) 402/2013 Common Safety Method on Risk Evaluation and Assessment (CSM RA)

2.3.2.1 The CSM RA is a framework that describes a common, mandatory European risk management process for the rail industry.

2.3.2.2 Conformity with the CSM RA is relevant to obtaining an authorisation for placing into service for new, upgraded or renewed infrastructure or vehicle because:
2.3.2.3 Application of the CSM RA is also relevant to the process of putting into use (commissioning), which takes place after authorisation is obtained. In this case, the CSM RA is applied to confirm safe integration of the change project into the operational railway.

2.3.2.4 Irrespective of whether or not a project needs to obtain an authorisation, the aim should be to produce a design that meets the essential requirements and is capable of being safely integrated into the rest of the railway. Conformity with TSIs, RGSs and application of the CSM RA is a good way of achieving this aim and should form the basis of the initial requirements capture at the project outset.

2.3.2.5 Figure 3 Compatibility, authorisation and safe integration on page 14 shows how compliance with TSIs, and NTRs is used in combination with the CSM RA to achieve safe integration as part of the processes of authorisation and putting into use.

2.3.2.6 Further guidance on applying risk management processes is given in RSSB publication ‘Taking Safe Decisions’, www.rssb.co.uk

Figure 3: Compatibility, authorisation and safe integration

2.4 Conformity assessment

2.4.1 Projects are responsible for:
a) Identifying which standards and requirements are applicable to the work.
b) Conforming to the applicable requirements.
c) Carrying out any required assessments.
d) Putting the arrangements in place for conformity assessment.

2.4.2 Certain requirements for independent conformity assessment are set out in the RIR and CSM RA:

a) For projects to which the RIR apply, conformity with the essential requirements is subject to independent
verification by a conformity assessment body as follows:

i) Conformity with applicable TSI requirements is verified by a Notified Body (NoBo).

ii) Conformity with NTRs is verified by a Designated Body (DeBo).

b) Regulation (EU) 402/2013 requires that correct application of the CSM RA to projects that are deemed
‘significant’ is checked by an Assessment Body (AsBo).

2.4.3 The NSA, before granting authorisation, checks that the applicant / project entity has conformed to
the appropriate NTRs.

2.4.4 For projects to which the RIR do not apply or that are not deemed ‘significant’, there is no mandatory
requirement for independent verification; however, the principles enshrined in the regulations are good
practice and should be applied in a proportionate way.

2.4.5 In the UK, NoBos and DeBos are appointed by the Secretary of State after considering advice from
the United Kingdom Accreditation Service (UKAS), which also monitors their performance.

2.4.6 The DfT publishes the list of companies working as NoBos and DeBos in the UK on its website
publishes a complete list of NoBos on its website (Nando).

2.5 Summary of the chapters of the CCS TSI

2.5.1 The requirements in the CCS TSI follow the structure used by all TSIs comprising seven chapters,
supplemented by annexes and appendices.

2.5.2 Chapter 1 sets out the technical scope and geographical applicability of the CCS TSI in the context

2.5.3 Chapter 2 sets out the scope, features and functions of the CCS structural subsystem and its
interfaces, limited to the following:

a) The Class A train protection system – ETCS.

b) The Class A radio communications system – GSM-R.

c) Train detection system interfaces with vehicle.

d) A definition of Class B CCS structural subsystems.

2.5.4 Chapter 3 sets out the essential requirements of the CCS structural subsystem and its interfaces.

2.5.5 Chapter 4 sets out the functional and technical specifications (the characteristics) of the Class A
trackside and trainborne CCS structural subsystems and their interfaces, as follows:

a) Section 4.1 sets out the characteristics of the CCS structural subsystem in terms of meeting 16 basic
parameters. Further guidance on these is given in 3.2 Class A CCS: scope and definition on page 25.

b) Section 4.2 sets out the functional and technical requirements of each basic parameter using references
to mandatory specifications in Annex A, known as ‘Indexes’. The mandatory specifications are set out in
CCS TSI Annex A Table A2.

c) Section 4.3 sets out the functional and technical specifications of the CCS structural subsystem
interfaces with other structural subsystems and functional subsystems. This content is presented using
tables, which cross-reference the CCS TSI clauses to relevant clauses in other TSIs specifying the interfacing subsystems.

d) Section 4.4 references the OPE TSI regarding the rules for operating a railway fitted with ETCS and GSM-R.

e) Section 4.5 sets out the responsibilities of equipment manufacturers and applicants for maintaining conformity with the CCS TSI for the lifetime of the CCS structural subsystem. This includes the requirements for maintenance rules that maintain the level of safety, while recognising the potential for degradation over time.

f) Section 4.6 sets out the responsibilities of manufacturers for defining the professional competencies needed to meet the requirements in section 4.5.

g) Section 4.7 sets out the health and safety responsibilities of manufacturers towards the operators and maintainers of the CCS structural subsystem.

h) Section 4.8 comprises a reference to the EC decisions regarding infrastructure and vehicle registers.

2.5.6 Chapter 5 sets out the functional and technical specifications (the characteristics) of ICs. This content is presented using tables, which cross-reference the relevant subsystem requirements in Chapter 4.

2.5.7 Chapter 6 sets out the requirements for demonstrating conformity with the CCS TSI, including reference to the conformity assessment modules implemented by EC decision 2010/713/EU, as follows:

a) Section 6.1 sets out the general principles to be applied to conformity assessment.

b) Section 6.2 sets out the requirements for assessing the conformity of ICs with all the relevant basic parameters using the assessment modules set out in 6.2.2. This is needed to obtain an ‘EC’ declaration of conformity in order to place an IC on the market. Table 6.1 sets out assessment requirements specific to the CCS ICs and the evidence needed to demonstrate conformity.

c) Section 6.3 deals with the ‘EC’ declaration of verification for the Control-Command and Signalling Onboard Subsystem and the ‘EC’ declaration of verification for the Control-Command and Signalling Trackside Subsystem. Tables 6.2 and 6.3 set out assessment requirements specific to the CCS structural subsystems and the evidence needed to demonstrate conformity.

d) Section 6.4 sets out situations where an intermediate statement of verification (ISV) may be issued by a NoBo to record partial conformity.

2.5.8 Chapter 7 sets out the requirements for implementing the CCS structural subsystem, in particular the migration to Class A CCS structural subsystems and maintaining the current functionality of legacy systems (including Class B CCS structural subsystems).

a) Section 7.2 sets out the generally applicable implementation rules, which cover:

i) Upgrading or renewing the Control-Command and Signalling Track-side Subsystem or parts of it. Further guidance about what constitutes an upgrade or renewal is given in 2.6.2 Legal terms on page 18.

ii) Legacy systems. Further guidance on GB legacy systems is given in 3.8.1 Linside signalling system on page 29.

iii) Availability of specific transmission modules (STM). Further guidance on GB STMs is given in 3.6 Specific transmission modules (STMs) on page 27.

iv) Class B equipment on a line fitted with Class A CCS structural subsystem.

v) Rolling stock fitted with Class A and Class B equipment.

vi) Conditions for mandatory and optional functions. Further guidance on using optional functions is given in 3.5 Mandatory and optional functions on page 27.

vii) GSM-R specific implementation rules (trackside and onboard).

viii) Train detection specific implementation rules.

ix) Specific cases. Further guidance on the GB specific cases is given in 3.9 GB specific cases in the CCS TSI on page 29.
Guidance on the Application of the Control Command and Signalling TSI

2.6 How to implement the CCS TSI

2.6.1 Guidance on CCS TSI Part 7 – implementation for CCS

2.6.1.1 The minimum criteria defining when the CCS TSI applies are set out in Chapter 7 of the TSI. Implementation might be done in conjunction with other TSIs, but this does not have to be the case.

2.6.1.2 The fitment criteria that are set out in this document are an agreed GB interpretation of the CCS TSI and are intended to provide high-level guidance. Projects can seek detailed guidance from other sources, for example the ERA, DfT or the ORR.

2.6.1.3 Network Rail is remitted by the DfT to take on the leadership and management of the cross-industry ERTMS programme.

2.6.1.4 The Digital Railway Programme aims to implement the CCS subsystem more widely than the minimum criteria set out in the CCS TSI.

2.6.1.5 The Digital Railway Programme is developing and managing specifications for the GB national ETCS system in accordance with baseline 3 release 2. These requirements will be an input into future projects within the scope of the Digital Railway Programme.

2.6.1.6 For information on the above, contact digitalrailwaydevelopment@networkrail.co.uk.

2.6.1.7 Implementation requirements are split between the following parts of the CCS subsystem:

a) GSM-R onboard and GSM-R trackside.

b) ETCS onboard and ETCS trackside.

c) Train detection.

2.6.1.8 The different parts of the CCS subsystem may be upgraded or renewed separately.
2.6.2 Legal terms

2.6.2.1 The CCS TSI uses the terms upgrading and renewal. The meaning of these terms is defined in Directive 2008/57/EC, as follows:

a) Upgrading as ‘any major modification work on a subsystem or part of a subsystem which improves the overall performance of the subsystem’.

b) Renewal as ‘any major substitution work on a subsystem or part of a subsystem which does not change the overall performance of the subsystem’.

2.6.3 GSM-R trackside

2.6.3.1 The flowchart below shows the fitment criteria for trackside GSM-R voice and data.

Figure 4: Minimum requirement to fit GSM-R trackside

2.6.3.2 ETCS Level 2 or Level 3 has more demanding quality of service requirements for GSM-R data than is required for GSM-R voice. Therefore, when fitting with GSM-R voice, it is appropriate to consider the possible future requirements for ETCS data transmission.

2.6.4 GSM-R onboard

2.6.4.1 The flowchart at 5 Minimum requirements to fit GSM-R onboard on page 19 shows the rolling stock fitment criteria for GSM-R voice and data.
2.6.4.2 The TSI only mandates rolling stock to be fitted with GSM-R data when the rolling stock operates on ETCS Level 2 or Level 3 fitted routes; therefore, when fitting with GSM-R voice, it is appropriate to consider the possible future requirements for ETCS data transmission.

2.6.5 ETCS trackside

2.6.5.1 The flowchart at Figure 6 Minimum requirement to fit ETCS trackside on page 20, shows the fitment criteria for ETCS trackside.
2.6.5.2 EU regulation no. 1315/2013 is available on the Europa website.

2.6.5.3 The high-speed network comprises:

a) Specially built high-speed lines equipped for speeds generally equal to or greater than 250 km/h.

b) Specially upgraded high-speed lines equipped for speeds of the order of 200 km/h.
c) Specially upgraded high-speed lines which have special features as a result of topographical, relief or town-planning constraints, on which the speed must be adapted to each case. This category also includes interconnecting lines between the high-speed and conventional networks, lines through stations, accesses to terminals, depots, etc, travelled at conventional speed by ‘high-speed’ rolling stock.

2.6.5.4 The GB high-speed network is shown in the Trans-European Transport Network (TEN-T) infrastructure maps available on the Europa website.

2.6.5.5 The CCS TSI mandates the fitment of ERTMS on six corridors. GB is not part of any corridor.

2.6.5.6 Bristol is on the list of main European ports, marshalling yards, freight terminals and freight transport areas in section 7.3.5 of the Annex of Decision 2012/88/EU. This should be linked to a corridor by a date that is to be determined.

2.6.5.7 The Digital Railway programme aims to implement the ETCS trackside more widely than the minimum criteria set out in the CCS TSI.

2.6.6 ETCS onboard

2.6.6.1 The flowchart at Figure 7 Minimum requirement to fit ETCS onboard on page 22, shows the fitment criteria for a vehicle to be fitted with an ETCS onboard.
Figure 7: Minimum requirement to fit ETCS onboard
2.6.6.2 In addition to the minimum requirement to fit ETCS on a vehicle, it is a requirement for a vehicle to be compatible with ETCS when it is to operate on a section of line fitted with ETCS without lineside signals.

2.6.6.3 The high-speed network comprises:

a) Specially built high-speed lines equipped for speeds generally equal to or greater than 250 km/h.
b) Specially upgraded high-speed lines equipped for speeds of the order of 200 km/h.
c) Specially upgraded high-speed lines which have special features as a result of topographical, relief or town-planning constraints, on which the speed must be adapted to each case. This category also includes interconnecting lines between the high-speed and conventional networks, lines through stations, accesses to terminals, depots, etc, travelled at conventional speed by ‘high-speed’ rolling stock.

2.6.6.4 The GB high-speed network is shown in the Trans-European Transport Network (TEN-T) infrastructure maps available on the Europa website.

2.6.6.5 The Digital Railway programme aims to implement the ETCS on vehicles more widely than minimum criteria set out in the CCS TSI.

2.6.6.6 Operating on lines providing connections in the context of the CCS TSI, means lines providing connections to main European ports, marshalling yards, freight terminals and freight transport areas in section 7.3.5 of the Annex of Decision 2012/88/EU. Bristol is listed in section 7.3.5 of the Annex of Decision 2012/88/EU and this should be linked to a corridor by a date that is to be determined.

2.6.7 Train detection

2.6.7.1 The CCS TSI sets out the minimum fitment requirements for train detection.

2.6.7.2 The CCS TSI requirements for train detection apply to the whole geographic scope of the CCS TSI.

2.6.7.3 In practical terms, when projects are making modifications to train detection systems, and / or track layout, the requirements of the CCS TSI will apply. This includes train detection used for the operation of level crossings.

2.6.8 Guidance on when meeting the TSI is the best thing to do

2.6.8.1 When a project introduces a change that is outside the scope of the CCS TSI and the digital railway programme, it may be more cost effective for the industry if the project still complies with the CCS TSI because the rail industry has agreed to migrate to a TSI compliant railway.

2.6.8.2 When the CCS TSI and the digital railway programme do not require a train to be fitted with ETCS, it may be more cost effective to fit it with ETCS the first time rather than retrofit at a later date due to a change in requirements. This may allow the train to operate on another ETCS fitted infrastructure.
3.1 The scope of the CCS structural subsystem

3.1.1 The CCS structural subsystem, as defined in the CCS TSI, is made up of features that apply technology to railway functions associated with authorising train movements, safeguarding the safe operation of trains and communication systems provided for safety purposes in the direct operation of the railway.

3.1.2 Figure 8 The scope of the CCS system on page 24 is a simplified diagrammatical representation of the CCS system, showing:

a) The scope of the structural subsystem which is the Class A and Class B CCS systems.

b) How the systems are made up of trackside and onboard subsystems.

c) The applicability of the CCS TSI and RGSs.

d) The parts of the CCS system that are not relevant to interoperability and so are not specified in the CCS TSI. For example, level crossing systems and interlocking systems.

3.1.3 Some of the non-interoperable parts of the CCS system are provided by technological systems that need to be compatible at infrastructure manager (IM) or railway undertaking (RU) interfaces. The NTRs are set out in the RGS.
3.1.4 Figure 8 The scope of the CCS system on page 24 also shows some CCS functions that are neither relevant to interoperability nor include any IM or RU interfaces. In this case, the relevant IM or RU is responsible for specifying the systems that provide these functions.

3.2 Class A CCS: scope and definition

3.2.1 The scope and definition of the Class A part of the CCS structural subsystem are set out in the CCS TSI section 2.1 and incorporate only those features that are necessary for interoperability.

3.2.2 The CCS structural subsystem has 16 basic parameters. For the Class A system these are set out in the CCS TSI chapter 4, sections 4.2.1 to 4.2.16, as follows:

a) Control-Command and Signalling safety characteristics relevant to interoperability (section 4.2.1).
b) Onboard ERTMS/ETCS functionality (section 4.2.2).
c) Track-side ERTMS/ETCS functionality (section 4.2.3).
d) Mobile communication functions for railways – GSM-R (section 4.2.4).
e) ERTMS/ETCS and GSM-R air gap interfaces (section 4.2.5).
f) On-board interfaces Internal to Control-Command and Signalling (section 4.2.6).
g) Track-side interfaces Internal to Control-Command and Signalling (section 4.2.7).
h) Key management (section 4.2.8).
i) ETCS-ID management (section 4.2.9).
j) Train detection systems (section 4.2.10).
k) Electromagnetic compatibility between vehicle and Control-Command and Signalling track-side equipment (section 4.2.11).
l) ERTMS/ETCS driver machine interface (DMI) (section 4.2.12).
m) GSM-R DMI (section 4.2.13).
n) Interface to data recording for regulatory purposes (section 4.2.14).
o) Visibility of track-side Control-Command and Signalling objects (section 4.2.15).
p) Environmental conditions (section 4.2.16).

3.3 Class A CCS: interoperability constituents (ICs)

3.3.1 The Class A CCS structural subsystem is made up of the following ICs, which are specified in CCS TSI Chapter 5:

a) For the CCS onboard subsystem:
   i) ERTMS/ETCS onboard.
   ii) Odometry equipment.
   iii) Interface of external STM.
   iv) GSM-R voice cab radio.
   v) GSM-R ETCS data only radio.
   vi) GSM-R Subscriber Identity Module (SIM) card.

b) For the CCS trackside subsystem:
   i) Radio block centre (RBC).
   ii) Radio infill unit (RIU).
   iii) Eurobalise.
   iv) Euroloop.
   v) Lineside encoder unit (LEU) Eurobalise.
3.3.2 There is no plan to use the Radio infill unit, Euroloop, or the LEU Euroloop on the GB mainline railway.

3.3.3 The CCS TSI includes specifications for the following groups of ICs:

a) For the CCS onboard subsystem: ERTMS/ETCS onboard + odometry equipment.

b) For the CCS trackside subsystem:

i) Eurobalise + LEU Eurobalise.

ii) Euroloop + LEU Euroloop.

3.4 ETCS and GSM-R baselines

3.4.1 What is a baseline?

3.4.1.1 A baseline is a suite of mandatory specifications that are set out in Table A2 of the CCS TSI. A baseline is a stable kernel in terms of system functionality, performance and other non-functional characteristics. With each baseline there is also the possibility of several maintenance releases.

3.4.1.2 A new baseline occurs when significant changes are made. A maintenance release is a modification to an existing baseline.

3.4.1.3 The ETCS and GSM-R parts of ERTMS can be regarded as two separate systems in terms of baseline. It is possible for some changes to one of them to impact the other one, but this does not mean that the evolutions of the ETCS and GSM-R systems have to be synchronised unless there is a related impact.

3.4.1.4 The ERA have published a document called, ‘ERTMS Change Control’ which describes what a baseline is and a release version is. This is available on the ERA website as ERA_ERTMS_0001 Version 2.0, 03/06/10.

3.4.2 How many baselines are there?

3.4.2.1 The following baselines are set out within Annex A, Table A 2.1 - List of mandatory specifications:

a) Set of specifications #1, ETCS baseline 2, GSM-R baseline 1.

b) Set of specifications #2, ETCS baseline 3 maintenance release 1, GSM-R baseline 1.

c) Set of specifications #3, ETCS baseline 3, release 2, GSM-R baseline 1.

3.4.3 Which baseline should I use?

3.4.3.1 The CCS TSI only permits the implementation of ETCS baseline 2 or ETCS baseline 3.

3.4.3.2 Digital Railway is developing the national ETCS requirements in accordance with baseline 3 release 2.

3.4.3.3 Further guidance on baselines, and which would be suitable to procure, can be sought from the ERTMS System Body.

3.4.4 Backwards / forwards compatibility

3.4.4.1 The CCS TSI specifications support backwards compatibility. This allows for a baseline 3 fitted train to be able to operate on either a baseline 2 or baseline 3 trackside infrastructure.

3.4.4.2 A baseline 2 fitted train is not able to operate on a baseline 3 infrastructure because it is not compatible.

3.4.4.3 Subset-104 describes compatibility of ETCS system versions.
3.4.4.4 Before introducing a new or upgraded ETCS onboard subsystem, projects will need to select an ETCS baseline that is compatible with all the ETCS fitted trackside infrastructure that the vehicle is intended to operate on.

3.4.4.5 Before introducing a new or upgraded ETCS trackside subsystem, the project will need to determine the impact the ETCS baseline implemented on the trackside will have on the ETCS fitted trains operating on that line.

3.5 Mandatory and optional functions

3.5.1 The TSI classifies the CCS functions into mandatory and optional functions.

3.5.2 Projects need to assess the optional functions listed in the CCS TSI and implement them, if they are required by:

a) Other TSIs.

b) National rules.

c) The application of risk evaluation and assessment for safe integration of subsystems.

3.5.3 The mandatory and optional functions categories are defined in Annex A 4.1a for ERTMS/ETCS and Annex A 4.1b for GSM-R.

3.5.4 The ERTMS/ETCS onboard equipment implements all mandatory requirements, with only those exceptions and conditions explicitly stated in the CCS TSI.

3.5.5 For ERTMS/ETCS trackside, the implementation of functions is defined according to the characteristics of the specific lines and the related operational needs. When a function is implemented the applicable CCS TSI requirements apply.

3.5.6 For GSM-R, the European Integrated Railway Radio Enhanced Network (EIRENE) Functional Requirement Specification (FRS) and System Requirement Specification (SRS) provide the applicability for each requirement. The applicability is mandatory for interoperability, mandatory for the system or optional (meaning a national decision). When an option is selected, the requirements within the FRS/SRS become mandatory.

3.6 Specific transmission modules (STMs)

3.6.1 An STM is an interface module fitted on a vehicle that enables the ETCS onboard equipment to be interfaced with the onboard equipment of legacy national train control systems, so that:

a) The functionality of the ETCS onboard equipment and the STM operating in level national train control (NTC) and mode system national (SN) is equivalent to that of the legacy national train control system, and

b) Transitions between ETCS and a national system, and between different national systems, are seamlessly performed, with no additional constraint exported on the trackside other than the installation of eurobalises for the level transitions.

3.6.2 There are currently no national specifications for STMs for any GB class B systems. There are STM products available for AWS/TPWS.

3.6.3 Subset-035 sets out the form, fit and functional requirements on an STM interface.
3.7 Train detection

3.7.1 Introduction

3.7.1.1 Train detection requirements are specified at European and Network level in the following standards:

a) Trackside train detection is a basic parameter specified in the CCS TSI section 4.1.1.10, which references mandatory specification Index 77.

b) The NTRs for infrastructure based train detection systems are set out in GKR0028.

3.7.1.2 The GB strategy is to provide train detection infrastructure that is compliant with the CCS TSI, wherever possible.

3.7.2 CCS TSI Index 77

3.7.2.1 Index 77 references document ERA/ERTMS/033281 ‘Interfaces between control-command and signalling trackside and other subsystems’, which includes requirements relevant to train detection system types that are intended to be used on interoperable lines: axle counters, track circuits, wheel detectors (that is treadles) and vehicle detectors based on inductive loops.

3.7.2.2 ERA/ERTMS/033281 section 3.1 specifies train detection parameters in terms of the following vehicle characteristics, including some different limits for high-speed lines and other lines:

a) Axle distances:
   i) Maximum axle distance.
   ii) Minimum axle distance.
   iii) Distance between end of train and first axle.

b) Wheel geometry (relevant to axle counter systems):
   i) Minimum wheel rim width.
   ii) Minimum wheel diameter.
   iii) Minimum flange thickness.
   iv) Flange height.
   v) Metal and inductive components free space between wheels.
   vi) Wheel material.

c) Use of sanding equipment:
   i) Maximum amount of sand.
   ii) Sand characteristics.

d) On-board flange lubrication.

e) Use of composite brake blocks.

f) Vehicle axle load and metal construction.

g) Use of shunt assisting devices.

h) Impedance between wheels.

i) Combination of rolling stock characteristics influencing shunting impedance.

3.7.2.3 A justification is provided with each requirement, which helps users to understand the applicability of the requirement to particular train detection system types. For example, wheel geometry is specified for technical compatibility with axle counters.

3.7.2.4 Index 77 is not mandated in TSIs that apply to rail vehicles. Instead, there is an assumption that a vehicle that is compliant with Index 77 should be compatible with a train detection system that is also compliant with Index 77.
3.7.3 RIS-0728-CCS

3.7.3.1 RIS-0728-CCS includes further requirements and guidance on safe integration of infrastructure based train detection systems, including determination of track section clearance points.

3.8 GB legacy CCS systems

3.8.1 Lineside signalling system

3.8.1.1 The CCS TSI does not include requirements for lineside signalling systems, because the target CCS system is ERTMS.

3.8.1.2 The OPE TSI sets out requirements on the IM and RU in relation to the braking performance and maximum speed allowed.

3.8.1.3 The GB requirements for lineside signalling systems are set out in the RGS and RIS. These include requirements for:
   a) Lineside signalling products.
   b) Lineside signal aspects and indications.
   c) Lineside signalling system layouts.
   d) Signal sighting assessment.
   e) Lineside signalling layout route compatibility assessment.

3.8.1.4 The CSM RA is applied before a new or altered signalling system is put into use to confirm that sufficient risk controls have been put in place. Risks to be considered include signal overrun risk, misrouting risk, excessive speed risk and collision risk due to permissive working.

3.9 GB specific cases in the CCS TSI

3.9.1 Specific cases are provisions made in TSIs to deal with particular circumstances prevailing in a particular Member State.

3.9.2 Specific cases for all Member States are included in Chapter 7 of each TSI.

3.9.3 Table 1 List of GB Specific Cases in the CCS TSI on page 29 sets out the three GB specific cases listed in the CCS TSI clause 7.6.2.2 with the associated NTR.

<table>
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<th>National Technical Rule</th>
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<td>Entry of train running numbers using alpha-numeric characters in ETCS DMI</td>
<td>GERT8402</td>
</tr>
<tr>
<td>Display of miles per hour on the ETCS DMI</td>
<td>GERT8402</td>
</tr>
<tr>
<td>Sanding for traction purposes on multiple units</td>
<td>GMRT2461, issue two, aligns the sanding requirements with the CCS TSI, which will require GB to apply to the ERA for the withdrawal of this specific case</td>
</tr>
</tbody>
</table>

Table 1: List of GB Specific Cases in the CCS TSI
3.10 Open points in the CCS TSI

3.10.1 What is an open point?

3.10.1.1 An open point is a point in the TSI where Member States cannot reach agreement, so it is left ‘open’ to allow Member States to notify their own NTRs.

3.10.2 Index 15: Braking aspects

3.10.2.1 The GB position is to use the Baseline 3 braking model in Baseline 2 applications.

3.10.3 Index 28: Availability

3.10.3.1 To address this open point, projects will need to determine their own reliability and availability requirements.

3.10.3.2 These are the minimum requirements for authorisation, which may be much lower than required for operational service.

3.10.3.3 Projects should gain acceptance of their proposed reliability and availability requirements through appropriate governance arrangements.

3.10.3.4 The GB position is to engage with the ERA when there is visibility of further work being undertaken. The opportunity should be taken to consider whether CCS structural subsystem availability should be deleted as a mandatory specification if it can be agreed that it is covered by contractual obligations between duty holders.

3.10.4 Index 77: Interfaces between CCS track-side and other subsystems

3.10.4.1 Index 77 is not mandatory in the RST TSI, so a CCS project cannot assume that vehicles will be compatible with a train detection system that conforms with Index 77. Compatibility with the trains being operated on the route should be assessed as a part of the route compatibility assessment.

3.10.4.2 Index 77 includes nine open points relevant to the compatibility of rail vehicles with infrastructure based train detection systems, covering:

a) The combination of vehicle characteristics for the purpose of dynamic shunting impedance. This is only relevant where train detecting uses track circuits.

b) The characteristic of sand applied to the track. The sanding characteristics currently specified in GB specifications are a solution rather than a definition of the interface. GB representatives are actively pursuing a working group to resolve this problem for the next revision of the TSI.

c) ‘Minimum wheel diameter’ and ‘minimum axle distance’ for speeds greater than 350 km/h. The GB position is to engage with the ERA when there is visibility of further work being undertaken. It is anticipated that work in GB to close these open points will be needed only if it is required to support the HS2 project.

d) ‘Vehicle metal mass’ and ‘metal & inductive components – free space between wheels’. The GB position is to wait for the open point to be closed by the ERA because it has no interest in this area.

e) Use of magnetic and eddy current brakes. The GB position is to engage with the ERA when there is visibility of further work being undertaken.

f) ‘Electromagnetic compatibility (EMC) (see below), arising from:

i) AC traction current.

ii) Electromagnetic fields.

iii) DC and low frequency components of traction current.
3.10.4.3 The following European Committee for Electrotechnical Standard (CENELEC) technical specifications are relevant to closing the EMC open points in the CCS TSI:


c) For new track circuit types: BS EN 50617-1:2015 Railways applications – Technical parameters of train detection systems for the interoperability of the trans-European railway system. Track circuits.


3.10.4.4 Further information about the publication status of EN 50617 is available on the CENELEC website (search SC9XA).

3.10.4.5 In addition, RGSs GERT8270 and GERT8015 set out the existing requirements applicable to the EMC of the GB mainline railway vehicles and infrastructure. Both RGSs are subject to revision with the objective of publishing an updated set of EMC requirements. However, it is not the intention that these will close the open points in the CCS TSI Index 77.
# Part 4 Frequently Asked Questions

## 4.1 Frequently asked questions

Table 2 *Frequently asked questions* on page 32 is a list of frequently asked questions with the associated reference to the part of the document that answers each question.

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Table 2: Frequently asked questions
Definitions

Applicant
An applicant [Rail Interoperability Act] is the party responsible for seeking an authorisation from the Office of Rail and Road (ORR), to place new, upgraded or renewed infrastructure or vehicle into service.

CCS system
The CCS system is made up of the CCS structural subsystem as defined in the CCS TSI and the national systems in GB that are necessary to ensure the safety and the command and control of movements of trains.

Control Command and Signalling Technical Specification for Interoperability (CCS TSI)
No definition.

Control, Command and Signalling (CCS)
No definition.

Interoperability
Interoperability is a European initiative enabling the railway to compete more effectively with other forms of transport, particularly road transport. It can contribute to reducing costs and provide safe and uninterrupted movement of trains across Europe. It does this through establishing common checking and authorisation processes.

Interoperability constituents
An elementary component, group of components, subassembly or complete assembly of equipment incorporated or intended to be incorporated into a subsystem. Interoperability constituents are placed on the market with an intended area of use and are assessed for conformity independently of the subsystem.

Legacy national system
Legacy national systems are CCS systems and functions, which include requirements for Class B train protection systems, lineside signalling systems, train detection systems, train radio systems and other CCS systems associated with train operations.

National Technical Rule (NTR)
A technical rule used for implementing the essential requirements in the circumstances listed in Article 17(3) of the Railway Interoperability Directive 2008/57/EC.

Operation and Traffic Management Technical Specification for Interoperability (OPE TSI)
No definition.

Proposer
Proposer means the railway undertakings or the infrastructure managers in the framework of the risk control measures they have to implement in accordance with Article 4 of Directive 2004/49/EC, the contracting entities or the manufacturers when they invite a notified body to apply the "EC" verification procedure in accordance with Article

**Technical compatibility**

Technical compatibility means an ability of two or more structural subsystems or parts of them which have at least one common interface, to interact with each other while maintaining their individual design operating state and their expected level of performance. 2014/897/EU

**Technical Specification for Interoperability (TSI)**

A TSI is a specification adopted in accordance with the Railway Interoperability Directive 2008/57/EC by which each subsystem or part subsystem is covered in order to meet the essential requirements and ensure the interoperability of the rail system.

**Trans-European Transport Network (TEN-T)**

No definition.
References

The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from www.rssb.co.uk/railway-group-standards

RGSC 01 Railway Group Standards Code
RGSC 02 Standards Manual

Documents referenced in the text

Railway Group Standards

GERT8015 Electromagnetic Compatibility between Railway Infrastructure and Trains
GERT8270 Assessment of Route Compatibility of Vehicles and Infrastructure
GERT8402 ERTMS/ETCS DMI National Requirements
GMRT2461 Sanding Equipment

RSSB documents

GEGN8640 Guidance on Planning an Application of the Common Safety Method on Risk Evaluation and Assessment
GEGN8641 Guidance on System Definition
GEGN8642 Guidance on Hazard Identification and Classification
GEGN8643 Guidance on Risk Evaluation and Risk Acceptance
GEGN8644 Guidance on Safety Requirements and Hazard Management
GEGN8645 Guidance on Independent Assessment
RIS-0728-CCS Infrastructure Based Train Detection Systems

Other references

BS EN 50617-1:2015 Railways applications. Technical parameters of train detection systems for the interoperability of the trans-European railway system. Track circuits
BS EN 50617-2:2015 Railways applications. Technical parameters of train detection systems for the interoperability of the trans-European railway system. Axle counters
CCS TSI Control, Command and Signalling TSI. The revised TSI for the onboard and trackside CCS subsystems was adopted by the Commission Regulation (EU) 2016/919 published in the Official Journal of the European Union on 15 June 2016
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