BS EN 16494:2015

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Railway applications — Requirements for ERTMS Trackside Boards

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National foreword

This British Standard is the UK implementation of EN 16494:2015.

The UK participation in its preparation was entrusted to Technical Committee RAE/4/-/7, Railway Applications - Lighting.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Applications ferroviaires - Exigences relatives aux pancartes ERTMS

Bahnanwendungen - Anforderungen an ERTMS-Strecken- und Signaltafeln

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Foreword

This document (EN 16494:2015) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2015 and conflicting national standards shall be withdrawn at the latest by October 2015.

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For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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Introduction

This European Standard was produced for the specification and harmonization of a specific set of ERTMS trackside boards to support ETCS and GSM-R operations.

The existing DMI symbols within the scope of this European Standard were considered for the trackside board designs but were found to be unreadable due to complexity of the designs. For this reason the abstract designs shown in Table 1 were developed.

This European Standard contains colour images for indicational purposes only. The colours are not representative of the specification. The drawings shown in Table 1 and Table 2 are not to scale.

1 Scope

This European Standard defines the requirements for the provision, visibility, readability, maintenance and testing of a specific set of ERTMS trackside boards associated with the following DMI and ETCS track conditions:

- ETCS stop marker;
- ETCS location marker, the trackside ETCS signal to identify a specific location on the line;
- level transition, corresponding to transitions between ETCS levels;
- lower pantograph;
- pantograph lowered;
- raise pantograph;
- neutral section announcement;
- neutral section;
- end of neutral section;
- GSM-R network border marker.

This European Standard includes the arrangement of the boards and their interface with existing systems (track, cab design including cab sight lines, visibility by the driver and train head lamps).

NOTE 1 The ETCS and GSM-R signs are needed when the information normally associated with the DMI symbols is provided at the trackside.

NOTE 2 The application of ERTMS trackside boards is not within the scope of this standard.

Sighting requirements are not included within the scope of this standard. Sighting requirements for the boards may be different according to their level of authority: marker boards ‘End of Authority’ need to be treated with the same level of authority as a signal and may have enhanced sighting requirements; the remaining boards may be sighted as generic signage sighting rules. The sighting process needs to be implemented in accordance with national safety rules.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12899-1:2007, *Fixed, vertical road traffic signs — Part 1: Fixed signs*

EN 15273-1, *Railway applications — Gauges — Part 1: General — Common rules for infrastructure and rolling stock*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
cab sight lines
viewing directions achievable by the driver in the normal driving position

3.2
ETCS track conditions
ETCS operating conditions which include the normal and degraded mode

3.3
ERTMS trackside boards
fixed permanent boards which provide trackside visual information to train drivers operating under ERTMS

3.4
readability
characteristic of a sign by which, when it is viewed under the conditions defined for the sign by a person just meeting the relevant eyesight standard, the message it conveys is understandable

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

DMI	Driver-Machine Interface
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
GSM-R	Global System for Mobile communication — Rail
LT	Level Transition
TSI	Technical Specification for Interoperability

5 Requirements

5.1 General

To assist in readability, the ERTMS trackside boards shall comply with the following:

— physical requirements for the trackside boards, as set out in 5.2;

— optical requirements, as set out in 5.3;

— mechanical performance in environmental conditions, as set out in 5.4;

— maintenance requirements, as set out in 5.5.

The installation of a given trackside board shall require an assessment to determine:

— location, as set out in 5.6;

— selection of the appropriate size from the alternatives given in Tables 3 and 4;

— alignment, as set out in 5.7.

5.2 Physical requirements for ERTMS trackside boards

5.2.1 General

The design and dimensions of the ERTMS trackside boards are specified in 5.2.2 and 5.2.3.

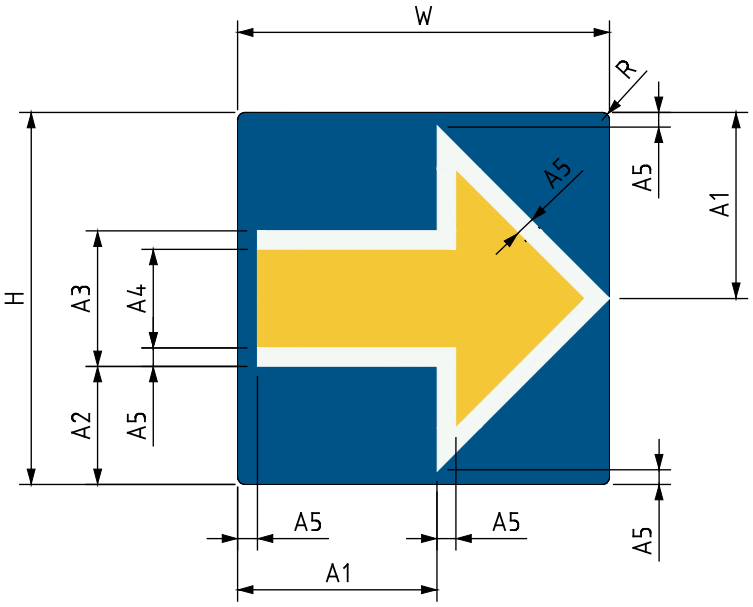
5.2.2 Design

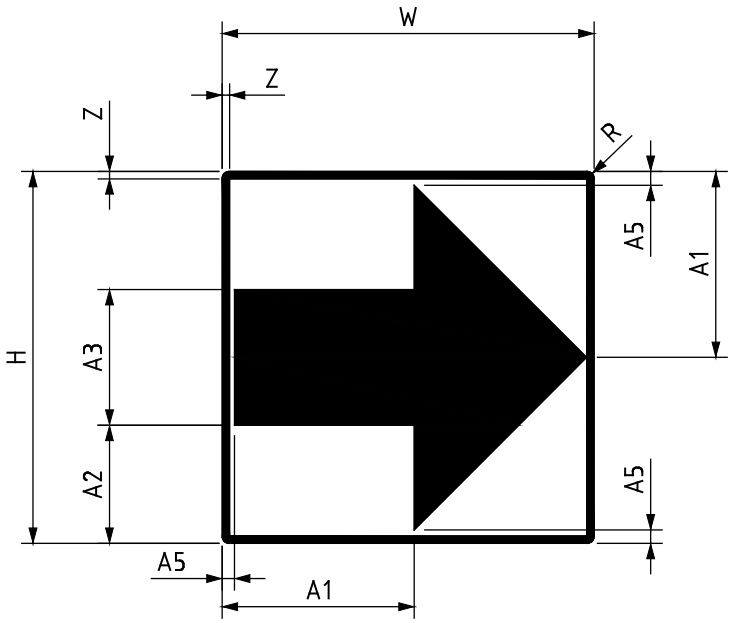
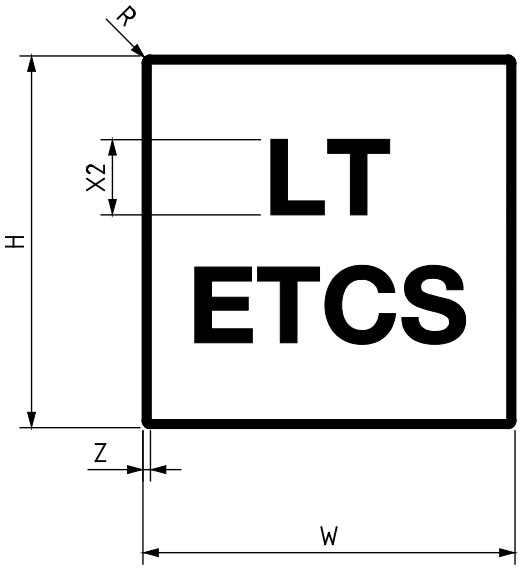
The designs of the ERTMS trackside boards are shown in Table 1 for the ETCS trackside boards and in Table 2 for GSM-R trackside board.

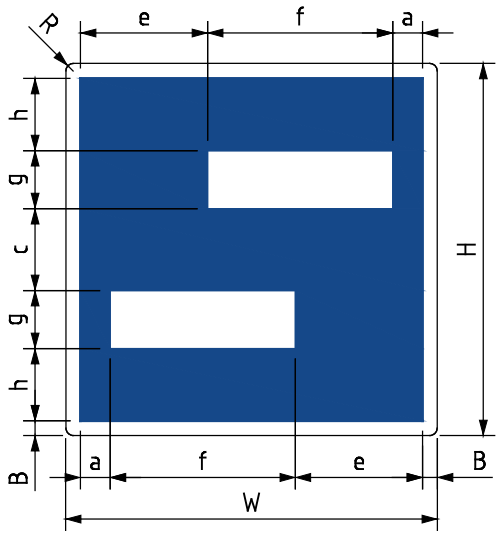
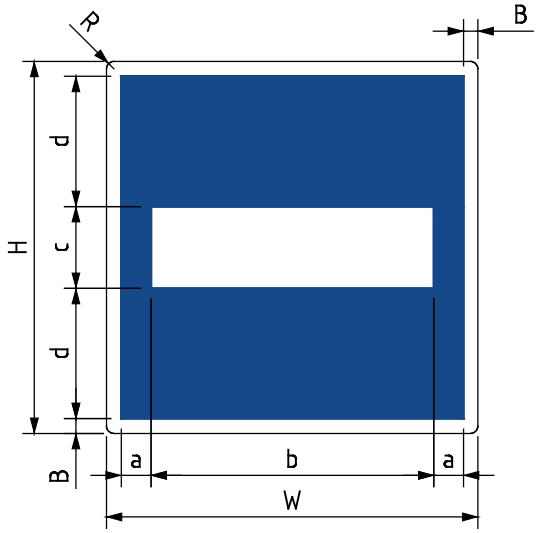
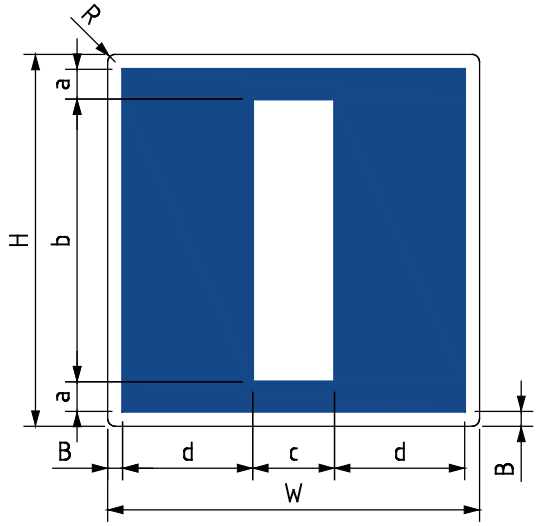
NOTE 1 The colours are not representative of the specification.

NOTE 2 The drawings shown in Tables 1 and 2 are not to scale.

Table 1 — Design of ETCS trackside boards

Description applicable to DMI	Description provided for information only	Symbol
N/A	ETCS Stop Marker	 Note that the arrow may face to the left, down or to the right, according to the line to which it refers. In addition to the symbol given above, an identification plate shall be provided. National rules shall apply to the design and positioning of this identification plate. NOTE For completeness, this symbol is reproduced for information only, and has been developed from EEIG 06E068.

Description applicable to DMI	Description provided for information only	Symbol
N/A	ETCS location marker	 Note that the arrow may face to the left, down or to the right, according to the line to which it refers. In addition to the symbol given above, an identification plate shall normally be provided. National rules shall apply to the design and positioning of this identification plate. Exceptionally, where an on-board geographic positioning function is provided, the identification plate is not required.
N/A	Level transition board	 All characters shall be typeface "Helvetica Neue Bold".

Description applicable to DMI	Description provided for information only	Symbol
Lower pantograph	Lower pantograph Instruction to the driver for the pantograph to be lowered	
Pantograph lowered	Pantograph lowered Start of area to be run with lowered pantograph	
Raise pantograph	Raise pantograph End of the area to be run with lowered pantograph	

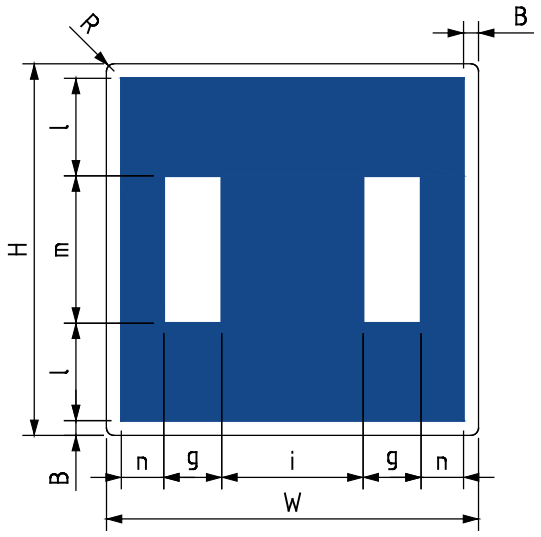
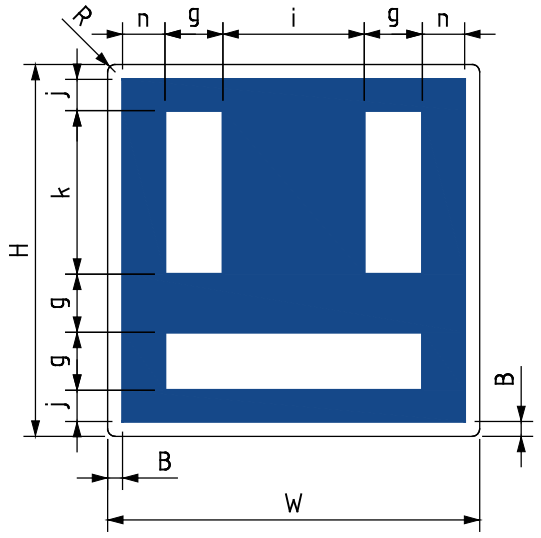
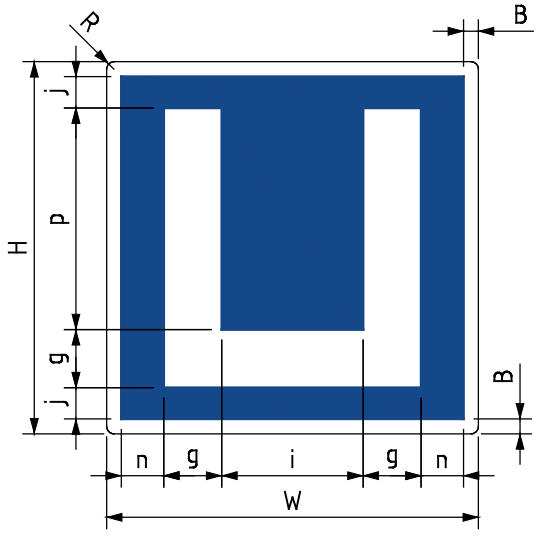
Description applicable to DMI	Description provided for information only	Symbol
Neutral section announcement	Neutral section announcement Instruction for the main power switch to be opened	
Neutral section	Neutral section Start of area in which the main power switch is open	
End of neutral section	End of neutral section Instruction that the main power switch may be closed	
NOTE The thin black edges shown in Table 1 are not part of the signs, but are provided to indicate the edges of the true white borders.		

Table 2 — Design of GSM-R trackside board

Description	Symbol
GSM-R network border marker	
In the GSM-R network border marker, the letter 'D' represents the example of Germany. Other letters should be used according to the country of use.	
NOTE The thin black edge shown in Table 2 is part of the GSM-R network border sign.	

5.2.3 Dimensions

The dimensions of ERTMS trackside boards, with reference to Tables 1 and 2 are specified in Tables 3 and 4 below. The tolerance for each dimension shall be ± 1 % with a minimum of ± 2 mm.

In the case of low line speeds and/or structure gauge constraints, it is permissible to use signs within the scope of this standard with height and width less than 500 mm, provided that the dimensions are proportionally the same as in Table 3. Where these signs are used, readability shall be optimized.

In the case of high line speeds, it is permissible to use signs within the scope of this standard with height and width greater than 900 mm, provided that the dimensions are proportionally the same as in Table 3.

Table 3 — Dimensions of ETCS trackside boards

Board size	Dimensions (mm) for example board sizes, with reference to Table 1				
	500 mm board	600 mm board	700 mm board	800 mm board	900 mm board
H	500	600	700	800	900
W	500	600	700	800	900
R	Minimum 10				
X2[a]	92	110	129	147	165
X3	14	17	20	23	26
Z	10	12	14	16	18
B	20	24	28	32	36
A1	250	300	350	400	450
A2	168	201	235	269	302
A3	164	198	230	262	296
A4	114	138	160	182	206
A5	25	30	35	40	45
a	40	48	56	64	72
b	380	456	532	608	684
c	110	132	154	176	198
d	175	210	245	280	315
e	171	205	239	273	307
f	249	299	349	399	449
g	78	93	109	124	140
h	97	117	136	156	175
i	190	228	266	304	342
j	42	51	59	68	76
k	220	264	308	352	396
l	131	157	183	210	236
m	198	238	278	316	356
n	57	69	80	92	103
p	298	357	417	476	536

[a] Spacing between the characters to be optimized for readability.

Table 4 — Dimensions of GSM-R trackside board

Board size	Dimensions (mm) for example board sizes, with reference to Table 2			
	480 mm board	630 mm board	960 mm board	1 000 mm board
H	480	630	960	1 000
W	337	442	674	700
R	Minimum 10			
r	10	13	20	20
s	19	25	38	40
t	58	76	116	120
v	163	214	326	340
w	77	101	154	160
y	230	302	460	480
The selection of board size to be based on either the degraded mode speed or the maximum speed in the applicable location and operating condition. An *in situ* verification of the appropriate dimensions is required following installation.				

5.3 Optical properties

5.3.1 Optical properties of trackside boards

The ERTMS trackside boards shall comply with the following optical properties:

— white, in accordance with EN 12899-1:2007, colour as contained in Table 2 and minimum values of co-efficients of retro-reflection as Table 4;

— blue, in accordance with EN 12899-1:2007, colour as contained in Table 2 and minimum values of co-efficients of retro-reflection as Table 4;

— yellow, in accordance with EN 12899-1:2007, colour as contained in Table 2 and minimum values of co-efficients of retro-reflection as Table 4;

— non-reflective black, in accordance with EN 12899-1:2007, Table 16.

NOTE The above requirements are compatible with the optical properties of train head lamps manufactured in accordance with EN 15153–1.

5.3.2 Optical properties of the rear of trackside boards

The rear surfaces of ERTMS trackside board shall be specified as agreed between contractors.

A recommended rear surface is uniform, non-reflective grey in accordance with the chromaticity requirements of EN 12899-1:2007 Table 16 and luminance factor $\beta \leq 0{,}4$.

5.4 Mechanical performance in environmental conditions

Trackside boards shall be designed to be durable in railway environments. In order that the boards are fit for purpose, the requirements for ambient temperature, humidity, resistance to atmospheric pollutants (including sand and salt), and wind loading shall be agreed between contractors.

The requirements for environmental conditions may be found in EN 50125-3.

The materials and surface should be resistant to damage through vandalism. This may be achieved for example by the use of removable transparent films, cleaning of the surface or replacement of the sign.

5.5 Maintenance requirements

The maintenance requirements for the trackside boards shall be agreed between contractors. The maintenance interval shall take into account the environmental conditions and positioning of the boards relative to the running rails, such that the performance of the boards remains acceptable, when viewed in normal operational conditions.

5.6 Location of trackside boards

Trackside boards shall be located such that they are visible to the driver.

The lateral clearance between the trackside boards and the running rails shall be determined by available space, kinematic envelope, wind-loading, cab sight lines from all relevant cabs and the head lamp beam. The lateral position of the boards shall be set to ensure visibility over the required range of distances. Where possible, the horizontal distance between the board and the running edge of the nearest rail shall be minimized, subject to maintaining necessary clearances. The minimum distance shall be defined by kinematic profiles according to EN 15273-1.

The location of trackside boards shall take into account the existing infrastructure. Trackside boards shall not detract from the sighting or readability of existing signals, indicators or signs. The risk of clutter shall be minimized.

NOTE There is no specification for the height of trackside boards as this is constrained by fixed infrastructure (overhead lines and structures) and by visibility and readability considerations.

Trackside boards may be mounted on dedicated posts or existing structures.

5.7 Alignment of trackside boards

The alignment of trackside boards shall be suitable for the approach direction taking into account track curves and gradients. The final alignment of trackside boards shall comply with the lateral clearance as defined in 5.6.

The alignment of trackside boards may involve rotation in order to optimize readability for curved approaches.

6 Test methods

The following verification requirements shall apply:

6.1 Test samples

Where testing is required, as a minimum one sample of each design of trackside board from the type-test batch shall be tested as defined in 6.2 and 6.3.

6.2 Test for optical properties

In the case of previously tested materials of the proposed type, where this has been shown by a CE marking process or equivalent to have the required properties, then the CE marking shall be deemed to satisfy the requirements and no test of optical properties is required.

In the case of new materials or previously untested materials, the chromaticities and co-efficients of retro-reflectivity shall be measured according to the methods specified in EN 12899-1:2007.

6.3 Test for environmental properties

In the case of previously tested materials of the proposed type, where this has been shown by a CE marking process or equivalent to have the required properties, then the CE marking shall be deemed to satisfy the requirements and no test of environmental properties is required.

In the case of new materials or previously untested materials, durability shall be tested to ensure adequate performance before and after a set of test conditions consistent with the requirements agreed between contractors as set out in 5.4.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under mandates given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2008/57/EC[1)].

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for CCS TSI confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European standard, the CCS TSI, published in the Official Journal on 23 February 2012 as amended on 6 November 2012, and Directive 2008/57/EC

Clause/subclauses of this European Standard	Chapter/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
The whole standard applies.	4. Characteristics of the subsystem 4.2 Functional and technical specification of the subsystem 4.2.15 Visibility of track-side Control-Command and Signalling objects	Annex III, Essential requirements 1 General requirements 1.1 Safety Clause 1.1.1, 1.1.3 1.5 Technical compatibility 2. Requirements Specific to Subsystem 2.3. Control-command and signalling 2.3.1. Safety 2.6. Operation and traffic management 2.6.3. Technical compatibility	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

1) This Directive 2008/57/EC adopted on 17th June 2008 is a recast of the previous Directives 96/48/EC 'Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and revisions thereof by 2004/50/EC 'Corrigendum to Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system'.

Bibliography

[1] EN 15152, *Railway applications — Front windscreens for train cabs*

[2] EN 15153-1, *Railway applications — External visible and audible warning devices for trains — Part 1: Head, marker and tail lamps*

[3] EN 50125-3, *Railway applications — Environmental conditions for equipment — Part 3: Equipment for signalling and telecommunications*

[4] GI/RT 7033, *Issue 2, Railway Group Standard — Lineside operational safety signs*[2)]

[5] UIC 651, *Layout of driver's cabs in locomotives, railcars, multiple unit trains and driving trailers*

[6] ERTMS, Markerboards — *ERA_ERTMS — 15/04/2010*

[7] CLC/TR 50511, *Railway applications — Communications, signalling and processing systems — ERTMS/ETCS — External signalling for lines equipped with ERTMS/ETCS Level 2*

[8] CCS TSI 2012, *Technical specification for interoperability relating to the control-command and signalling subsystems of the trans-European rail system* (published in the Official Journal L51 on 23th February 2012)

[9] EEIG 06E068 Version 2, *ETCS marker board definition*

2) To be viewed free of charge on the RGS website (www.rgsonline.co.uk).

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