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Level 2

Electromagnetic compatibility (EMC) assurance process

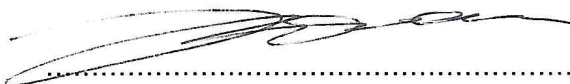
Endorsement and Authorisation

Endorsed by:

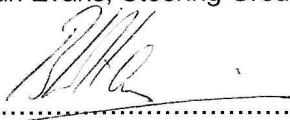


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User information

This Network Rail standard contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *No deviations, could stop the railway*

- **Red requirements shall** always be complied with and achieved.
- Red requirements shall be presented in a red box **with the word “shall” or expressed as a direct instruction**.
- Accountability for the efficacy of red requirements lies with the Professional Head/Standard Owner.
- Red requirements are monitored for compliance.
- Corrective actions shall be enforced if deviations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Amber requirements – *Controlled deviations, approved risk analysis and mitigation*

- **Amber requirements shall** be complied with unless deviation has been approved in advance.
- Amber requirements shall be presented with an amber sidebar **and with the word “shall” or expressed as a direct instruction**.
- Accountability for the efficacy of these requirements lies with the Professional Head/Standard Owner, or their nominated Delegated Authority.
- Amber requirements are monitored for compliance.
- Deviations **may** be permitted. Deviations are approved by the Standard Owner or through existing Delegated Authority arrangements.
- Corrective actions shall be enforced if **non-approved** deviations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Green – *Guidance*

- Guidance is based on good practice. Guidance represents supporting information to help achieve **Red** and **Amber** requirements.
- Guidance shall be presented with a dotted green sidebar **and with the word “should” (usually in notes) or as a direct instruction**.
- Guidance is **not mandatory** and is not monitored for compliance.
- Alternative solutions may be used. Alternative solutions do not need to be formally approved.
- Decisions made by a competent person to use alternative solutions should be backed up by appropriate evidence or documentation.

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Issue record

Issue	Date	Comments
1	August 2008	First issue
2	June 2012	Engineering standards update

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 1 September 2012.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

Reference documentation

1999/95/EC. The Radio Equipment & Telecommunications Terminal Equipment Directive (R&TTE).

2004/108/EC. The Electromagnetic (EMC) Compatibility Directive.

BS EN 50121:2006, Parts 1 – 5. *Railway Applications – Electromagnetic Compatibility. Parts 1 – 5.*

BS EN 50122-1:2011 +A1:2011, *Railway Applications – Fixed Installations – Electrical Safety, earthing and the return circuit – Protective provisions against electric shock.*

BS EN 50388:2005, *Railway Applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability.*

NR/GN/ELP/27010, *Compatibility between Electric trains and electrification systems.*

NR/L1/RSE/30040, *EMC Strategy for Network Rail.*

NR/L1/TEL/30029, *Telecoms Installation.*

NR/L2/ELP/27311, *Engineering Assurance Requirements for Design and Implementation of Electrical Power Engineering Infrastructure Projects.*

NR/L2/INI/02009, *Engineering Management for Projects.*

NR/L2/INI/GRIP/101, *GRIP Project Management.*

NR/L2/RSE/100/02, *Safety Verification.*

NR/L2/RSE/100/03, *Compliance with Interoperability Regulations for Infrastructure Projects.*

NR/L2/RSE/100/04, *New or changed vehicles on Network Rail Infrastructure.*

NR/L2/RSE/100/05, *Product Introduction & Change.*

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NR/L2/RSE/100/06, *How to decide what needs Product Acceptance.*

NR/L2/RSE/100/07, *System Review Panels.*

NR/L2/RSK/00001, *Integrated Risk Management.*

NR/L2/SIG/30014, *Signalling Works Testing Handbook.*

NR/L2/SIG/D110A, *Master Test Certificate MTC (TC1).*

NR/L2/TEL/30003, *Immunity Test Requirements for Lineside Communications Systems.*

NR/L2/TEL/30094, *Installation of Telecommunications Equipment & Systems.*

NR/L2/TEL/31106, *Overview of Electromagnetic Coupling Between Traction Systems and telecommunications Cables.*

NR/L2/TEL/31107, *Limits and Test Methods of Induced Voltages on Telecommunications Cables due to Electrification Systems.*

NR/L3/ELP/27406/MOD A, *Engineering Deliverable Requirements for Electrical Power Design – Module A Generic Requirements.*

NR/L3/ELP/27406/MOD L, *Engineering Deliverable Requirements for Electrical Power Design – Module L AC/DC Traction Power Supply Interfaces.*

NR/SP/TEL/50016, *Methodology for the Demonstration of Compatibility with Telecommunications Systems.*

GE/RT8015, *Electromagnetic Compatibility between Railway Infrastructure and Trains.*

Statutory Instrument 2000 No. 730. The Radio Equipment & Telecommunications Terminal Equipment Regulations 2000 (as amended).

Statutory Instrument 2006 No. 599. The Railways & Other Guided Transport (Safety) Regulations (2006) (as amended).

Statutory Instrument 2006 No. 3418. The Electromagnetic Compatibility (EMC) Regulations (2006) (as amended).

Statutory Instrument 2011 No. 3066. The Railways (Interoperability) Regulations (2011).

Disclaimer

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Supply

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1 Purpose

This standard specifies how Network Rail manages the risks of asset failure associated with known uncontrolled electromagnetic phenomena.

It supports the Network Rail policy requirements as specified in NR/L1/RSE/30040, *Electromagnetic Compatibility (EMC) Strategy for Network Rail*, and its legal obligations under the EMC Regulations (2006).

2 Scope

This Network Rail standard:

- specifies the assurance process for the management and control of EMC to meet the requirements of the EMC Regulations (2006);
- specifies the standards for the acceptance of equipment for integration onto the railway system;
- specifies best practice based on current European and Network Rail EMC engineering standards;
- applies to all new or modified infrastructure, including apparatus, fixed and mobile installations, all types of rail vehicles and rolling stock on the operational railway.

This standard does not specify requirements for equipment that is classified as “inherently benign”. A list of examples of “inherently benign” equipment is in Appendix A.

3 Roles and responsibilities

EMC Responsible Person

The person within a company or organisation who has been identified as the Responsible Person as defined in Interpretation 3(h) of the EMC Regulations (2006).

- In relation to “apparatus”, this means the manufacturer established in the European Community or its authorised representative, or the person who places the apparatus on the market or puts it into service.
- In relation to a fixed installation, the person who, by virtue of their control of the fixed installation, is able to determine that the configuration of the installation is such that when used it complies with the essential requirements of the EMC Regulations.

Within Network Rail, this is the Network Rail Board. The management of these responsibilities are then delegated to the appropriate appointments as specified in this standard. In-service responsibility is discharged via the Route Asset Management Organisation. Any requests from enforcement authorities in respect of EMC are required to be referred to the Head of EMC Engineering, as deemed appropriate. See Table 1 for the responsibility of EMC management.

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Designated Body

DeBo

A Designated Body is a person appointed under the provisions of Regulation 31 of the Railways (Interoperability) Regulations (2011).

Designated Project Engineer

DPE

For the purposes of this standard, the Designated Project Engineer acts as the EMC Responsible Person under delegated authority during time of alterations to the infrastructure unless an alternative appointment is made and recorded.

Director, Route Asset Management

DRAM

For the purposes of this standard and for compliance with the EMC Regulations (2006), the DRAM or their delegated representative is responsible for maintaining the equipment and/or installation as identified in the relevant Operations & Maintenance Manual (O&MM).

Within Network Rail, the Asset Manager is the individual with the formally delegated responsibility for the management of an asset in a geographical area or at a specific location.

Network Rail Board

Executive and non-executive Directors, responsible for the day-to-day running of the company.

Notified Body

NoBo

Notification is an act whereby a Member State informs the Commission and the other Member States that a body, which fulfils the relevant requirements, has been designated to carry out conformity assessment according to a directive. Notification of Notified Bodies and their withdrawal are the responsibility of the notifying Member State.

The Member States, EFTA countries (EEA members) and other countries with which the EC has concluded Mutual Recognition Agreements (MRAs) and Protocols to the Europe Agreements on Conformity Assessment and Acceptance of Industrial Products (PECAAs) have designated Notified Bodies, established per directive.

A Notified Body is defined in Regulation 30 of the Railways (Interoperability) Regulations (2011). It is a body appointed by an EC member government to review Declarations of Conformity submissions, etc. The involvement of a Notified Body is not a requirement of the new EMC Directive but is an option for manufacturers and suppliers who wish to seek third party endorsements of their Declarations of Conformity.

NOTE There are different NoBos dealing with different Directives.

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Project Manager

Within Network Rail, the Project Manager is the person appointed by Network Rail with overall responsibility for the management of a Project to deliver the Remit.

The Project Manager is responsible for checking that the completed Project is acceptable to the Sponsor and Maintenance Engineer responsible for managing the asset.

The EMC National Specialist Team

EMC-NST

The EMC-NST is the centre of technical expertise within Network Rail. It advises on matters concerning EMC and to assist Projects and Routes to meet Network Rail's legal obligations under the EMC Regulations (2006).

It is also able to help Network Rail, routes, functions, projects or departments, to minimise operational difficulties caused by potential EMC phenomena and to close out EMC mitigation issues.

The mission statement of the EMC-NST is specified in NR/L1/RSE/30040.

The EMC-NST may be used to act as a mentor to the nominated EMC Responsible Person, where there is more limited EMC experience.

4 Definitions

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

apparatus

finished appliance or combination of appliances made commercially available as a single functional unit, intended for the end user and liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbances

NOTE This includes components or sub-assemblies intended for incorporation into an apparatus that are liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbance.

NOTE Trains are regarded as mobile installations, with respect to the EMC Regulations (2006).

Boundary Safety Case

part of the overall system safety case, which considers exported risk to third party/outside parties and neighbouring railways

component

item that is intended for incorporation into an apparatus that is liable to generate electromagnetic disturbance, or whose performance is liable to be affected by such disturbance

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electromagnetic compatibility

ability of equipment to function satisfactorily in its electromagnetic environment, without introducing intolerable electromagnetic disturbances into that environment.

Electromagnetism is associated with alternating currents and voltages which can reach the victim device by:

- conduction;
- electromagnetic field radiation;
- inductive and capacitive coupling

electromagnetic disturbance or interference

electromagnetic phenomenon that can degrade the performance of equipment

An electromagnetic disturbance can include:

- electromagnetic noise;
- an unwanted signal;
- a change in the propagation medium itself;

i.e. undesirable voltages or currents are present, to adversely influence the performance of a device.

NOTE These voltages or currents can reach the victim device by conduction or by electromagnetic field radiation, inductive and capacitive coupling.

electromagnetic environment

electromagnetic phenomena observable at a given location

emission(s)

electrical, magnetic and/or electromagnetic fields, voltages or current generated by an apparatus, or installation (fixed or mobile)

fixed installation

particular combination of one or more types of apparatus and, where applicable, other devices, which are assembled, installed and intended to be used permanently at a pre-defined location

immunity

ability of equipment to perform as intended without degradation in the presence of an electromagnetic disturbance

inherently benign equipment

equipment that:

- a) has inherent physical characteristics such that it is incapable of generating or contributing to electromagnetic emissions that exceed a level allowing radio and telecommunications equipment and other equipment to operate as intended; and

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- b) will operate without unacceptable degradation in the presence of the electromagnetic disturbance normally present in its intended environment

NOTE Equipment that is inherently benign in terms of electromagnetic compatibility is excluded from the scope of the EMC Directive. Appendix A gives examples of the types of equipment that comes within the scope of this category.

mobile installation

combination of apparatus and, where applicable, other devices, intended to be moved and operated in a range of locations

NOTE Within Network Rail, this applies to trains and road–rail vehicles. Mobile installations are treated as apparatus in the context of the EMC Regulations (2006).

so far as is reasonably practicable

SFAIRP

Railway duty holders are required to go through a process of risk assessment which results in them making a decision about whether they consider that their safety measures are adequate to reduce risks SFAIRP. To demonstrate that an employer has complied with Health & Safety Law to ensure “so far as is reasonably practicable” that the duties to ensure the health, safety and welfare at work of their employees and those affected by their undertakings are met.

Network Rail’s policy in this regard is detailed in the Health & Safety Management System.

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5 Abbreviations

AC	Alternating Current
APA	Asset Protection Agreement
CE	Mandatory conformity mark on products placed on the single market in the European Economic Area, denoting compliance to relevant standards
CENELEC	European Committee for Electro-technical Standardisation
DC	Direct Current
DeBo	Designated Body
DEL	A series of Delivery Manuals contained within the GRIP Process
DoC	Declaration of Conformity
DPE	Designated Project Engineer
DRAM	Director, Route Asset Management
E&P	Electrification & Plant
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Normalised (Norm) Standard
ESC	Electrical Systems Compatibility
EU	European Union
GRIP	Governance of Railway Investment Projects
HAZID	Hazard Identification
HMRI	Her Majesty's Railway Inspectorate
H&SMS	Health and Safety Management System
NNTR	National Notified Technical Rules
NANDO	New Approach Notified & Designated Organisations Information Systems
NoBo	Notified Body
NR	Network Rail
NRAP	Network Rail Acceptance Panel
NST	National Specialist Team
OMM	Operations Maintenance Manual
ORR	Office of Rail Regulation
PADS	Parts & Drawing System
PM	Project Manager
PMF	Project Management Framework
RGS	Railway Group Standard
RIR	The Railways (Interoperability) Regulations (2006)
ROEP	Rise of Earth Potential
ROGS	The Rail and Other Guided Transport Systems (Safety) Regulations (2006)
ROTS	The Railway and Other Transport Systems (Approval of Works, Plant & Equipment) Regulations 1994
RST	Rolling Stock
R&TTE	Radio & Telecommunications Terminal Equipment
SFAIRP	So far as is reasonably practicable
SRP	System Review Panel
TSI	Technical Specifications for Interoperability
VAB	Vehicle Acceptance Body
WSF	Wrong Side Failure

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6 Requirements of the EMC Regulations (2006)

The EMC Regulations (2006) cover both apparatus and fixed installations.

The important change concerning the railways was that fixed installations (which cover most railway assets) were brought within the scope of the EMC Regulations.

A “fixed installation” shall be installed with regard to the information on the intended use of its constituent parts and by applying good engineering practices, with a view to meeting the essential protection requirements of the EMC Regulations.

Engineering practices shall be documented. The documentation shall be held by the person responsible for the installation for as long as it is in operation.

The EMC Directive introduces a requirement that all products must be delivered with EMC “instructions for use”. The instructions for use define the intended operational environment that the certification (CE marking) applies to, including any maintenance and operating instructions to be applied, in order to maintain the qualification level of the EMC performance throughout the operational life of the product.

Radio and telecommunications terminal equipment (e.g. radios and modems) are subject to the Radio & Telecommunications Terminal Equipment (R&TTE)

Regulations implementing the R&TTE Directive 1999/5/EC. These regulations specify requirements for radio and the telecommunications aspects of equipment in addition to the essential requirements of the EMC Regulations. Their effect upon an established installation is considered as a source of EMI.

Products intended for a specific application, i.e. not CE-marked, are subject to the same requirements.