

**EMC Management Plan for
The Fairfax
(Electronic Uncontrolled Copy)
for
RG Group**

EY Document N°: Y5776CR1
EY Project N°: Y3684

Author:
M R Tyndall MPhys, PhD, CEng, MIET, MInstP
Senior EMC Engineer

Checked:
T Konefal BSc, DPhil
Senior EMC Engineer

Approved:
R Armstrong, BSc (Hons), MSc (Research), PhD, MIET
Expert Services Manager

Issue	Description	Issued by	Date
1	First issue	MRT	29 th January 2025

Disclaimers:

This report contains commercially confidential information and shall not be reproduced, except in full, without the prior written approval of Eurofins E&E UK.

Users should satisfy themselves that they are in possession of the most up to date version of this report by calling

+44 (0) 330 430 3456 or emailing: EEinfoUK@eurofins.com

ES Rail EMC Management Plan Template Issue 3

EEUK v1.4



Instrumentation, Expert
Services and Training

Registered Address
Eurofins Electrical and Electronic UK Ltd
i54 Business Park, Valiant Way
Wolverhampton, WV9 5GB, UK

Registered in England and Wales
Company Reg. No. 6048589
VAT Reg. No. GB 887 1276 83

CHANGE HISTORY SHEET

Date	Issue	Section	Description
29.01.2025	1	-	First issue

EXECUTIVE SUMMARY

This document is the EMC Management Plan for The Fairfax project. It sets out the activities and documentation required to ensure electromagnetic compatibility (EMC) for this project, for RG Group and its subcontractors.

The activities required are listed in Section 2.4 and the documentation required is listed in Section 7.1. Should the activities or documentation required change (either due to a change in the project requirements, or due to emergent issues), these will be reflected in an update to this document and summarised in the final EMC Documentation for the project.

In particular, the following actions are highlighted, which can be broadly split into actions that have a possibility of affecting TfGM's assets, and those that have a possibility of affecting the design of the project.

For protection of neighbours including TfGM:

- A review of the EMC documentation for installed electrical/electronic systems should be undertaken;
- If the review of EMC documentation reveals gaps that cannot be closed with documentation, on-site EMC surveys **may** be required.

For protection of the project from external influences:

- A request for Manchester Metrolink's Stray Current Strategy and maintenance records should be made;
- If the Stray Current documentation is not available, a stray current measurement will need to be undertaken.

CONTENTS

Change History Sheet	2
Executive Summary.....	3
List of Terms and Abbreviations.....	5
Abbreviations:.....	5
Terms:.....	6
1 Introduction.....	7
1.1 The Fairfax project background	7
1.2 EMC background.....	7
1.3 Relevant EMC Phenomena.....	7
1.4 Relevant EMF phenomena.....	8
2 Project Overview.....	9
2.1 List of Apparatus.....	10
2.2 List of existing apparatus to be considered	10
2.3 List of 3 rd parties to be considered.....	10
2.4 EMC activities to be undertaken.....	11
3 EMC Management and Organisation.....	12
4 Management of EMC interfaces.....	13
4.1 EMC Environments - General.....	13
4.2 EMC Environment for this project.....	13
4.3 EMC Interfaces.....	14
5 Legislation and Standards	15
5.1 EMC Regulations applied to this project	15
5.2 Overall EMC requirements for Apparatus	17
5.3 CEMFAW Regulations.....	18
6 EMC testing and commissioning arrangements	19
6.1 Survey of Buried Structure Potential.....	19
6.2 EMC surveys	19
6.3 EMF surveys	20
7 Deliverables schedule	21
7.1 Documentation.....	21
7.2 Dates for Deliverables	22
References	23

LIST OF TERMS AND ABBREVIATIONS

Abbreviations:

AC	Alternating Current
AIMD	Active Implantable Medical Device
BMS	Building Management System
BT	British Telecom
CCTV	Closed-Circuit Television
DALI	Digital Addressable Lighting Interface
DBT	Department for Business and Trade
DC	Direct Current
DoC	Declaration of Conformity
DX	Direct Expansion
EMC	Electromagnetic Compatibility
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EU	European Union
EY	Eurofins E&E UK
FTN	Fixed Telephone Network
GSM	Global System for Mobile Communications
HAZID	Hazard Identification
HV	high voltage
HVAC	Heating, Ventilation, & Air Conditioning
ICNIRP	International Commission on Non-Ionising Radiation Protection
kVA	kilo Volt Ampere
LV	low voltage
MVA	Mega Volt-Amps [unit of apparent power]
MVHR	Mechanical Ventilation with Heat Recovery
OPSS	Office for Product Safety and Standards
RCLI	Residential Commercial and Light Industrial
RF	Radio Frequency
SI	Statutory Instrument
SSI	Solid State Interlocking
TfGM	Transport for Greater Manchester
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus

Terms:

Apparatus	Any finished appliance or combination thereof 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 disturbance.
Designated standard	A standard recognised as such by the OPSS (published in formal notices at https://www.gov.uk/guidance/designated-standards), with respect to UKCA-marking regulations. This provides a presumption of conformity for Apparatus within the scope of the standard.
EMC Documentation	Documentation to demonstrate the compliance of a Fixed Installation with the EMC Regulations.
Equipment	Any Apparatus or Fixed Installation.
Fixed Installation	A particular combination of several types of Apparatus and, where applicable, other devices, which are assembled, installed, and intended to be used permanently at a predefined location.
Inherently benign equipment	Equipment which inherently meets the protection requirements of the EMC Regulations and is thus excluded from its scope. Examples include HV transformers, cables and circuit breakers (without active electronic components).
Presumption of Conformity	Apparatus meeting the requirements of a designated standard is presumed to meet the essential requirements of the Regulations (covered by the scope of the standard).
Technical Documentation	Documentation to demonstrate the compliance of Apparatus with the EMC Regulations.

1 INTRODUCTION

This document is the EMC Management Plan for The Fairfax project. It forms part of a suite of EMC documentation designed to demonstrate that The Fairfax project is compliant with the EMC Regulations SI 2016 N° 1091.

1.1 The Fairfax project background

The Fairfax project involves erection of a multiple storey building for 488 apartments with communal areas on the ground floor and parking, plant, workshops, and stores in the basement. The building is being constructed near to the Manchester Metrolink tram line from Manchester Piccadilly to Ashton-under-Lyne.

Further details can be found in the Project Overview in Section 2 and the EMC Management and Organisation in Section 3.

1.2 EMC background

1.2.1 EMC Regulations

Statutory Instrument 2016 N° 1091 “The EMC Regulations” [1], requires that EMC Documentation be prepared as part of the works for a Fixed Installation. The completed Fairfax project will be a Fixed Installation.

The Documentation should demonstrate *“that good engineering practice has been used and the information on the intended use of its components has been respected”*. Essentially the EMC Regulations require that The Fairfax project should not be a source of EMI, nor should it be susceptible to electromagnetic disturbances expected in the installation environment. As far as practical the Documentation will demonstrate that this is the case.

1.3 Relevant EMC Phenomena

1.3.1 DC Stray Current

The Fairfax may be susceptible to Stray DC Current Disturbance caused by Manchester Metrolink line. Evidence of suitable stray current control measures including maintenance records should be sought from Manchester Metrolink. If this is not available, or if the evidence shows that there is a potential issue with stray current, measurements should be carried out and the issue will need to be mitigated.

1.3.2 Induced voltages

Manchester Metrolink uses a 750 V DC electrification scheme. Assuming defined cable separations (e.g. IEC 61000-5-2 [2], EN 50174-2 [3], EN 50174-3 [4], BS 7671¹ [5]) are respected, combined with the separation of the Fairfax site from the railway and the short length (~100m) of parallelism, it is not credible that any stretches of parallel running cable will be long enough to induce excessive voltage onto neighbouring cables, or to pick up excessive induced voltage from the Metrolink line. Cabling requirements are considered in Section 5.1.1.1.

1.3.3 RF and transient disturbances

Electronic equipment installed as part of this project must be appropriately immune to RF and transient disturbances. Similarly, it must not be a source of RF disturbances above prescribed levels. The actions needed to appropriately control these phenomena are described in Section 2.

1.4 Relevant EMF phenomena

1.4.1 Fields around current carrying cables

For any cables throughout the Fairfax project carrying more than 100A/phase at 50 Hz specific consideration of the magnetic fields needs to be made to ensure exposures are within the general public limits of ICNIRP 1998 [6]. This protects all people, particularly those with active implantable medical devices (AIMD), such as pacemakers.

Significant magnetic fields (in excess of the ICNIRP general public reference levels) will exist some distance (of the order of tens of centimetres) away from the cables; this distance will increase where the cables are not in a radially symmetric “trefoil” arrangement. EMF measurements should be made along with the EMC measurements to ensure the ICNIRP guidelines are met. See Section 5.3 for more details.

¹ Although primarily concerned with electrical safety, the 18th edition includes cable separation requirements to address EMC concerns.

2 PROJECT OVERVIEW

The Fairfax project is a residential development, with two blocks (one 29 storeys, the other 23 storeys) containing one and two-bedroom apartments. The ground floor contains communal spaces, building administration/maintenance, a substation and LV room. The basement contains a car park, stores, and plant rooms.

The Fairfax project is located adjacent to Heyrod Street, Manchester (see Figure 1). There is a Metrolink tram line to the northwest of the site; the closest approach is around 10 m. The line is at ground level past the Fairfax site (it grades down to pass under Great Ancoats Street).

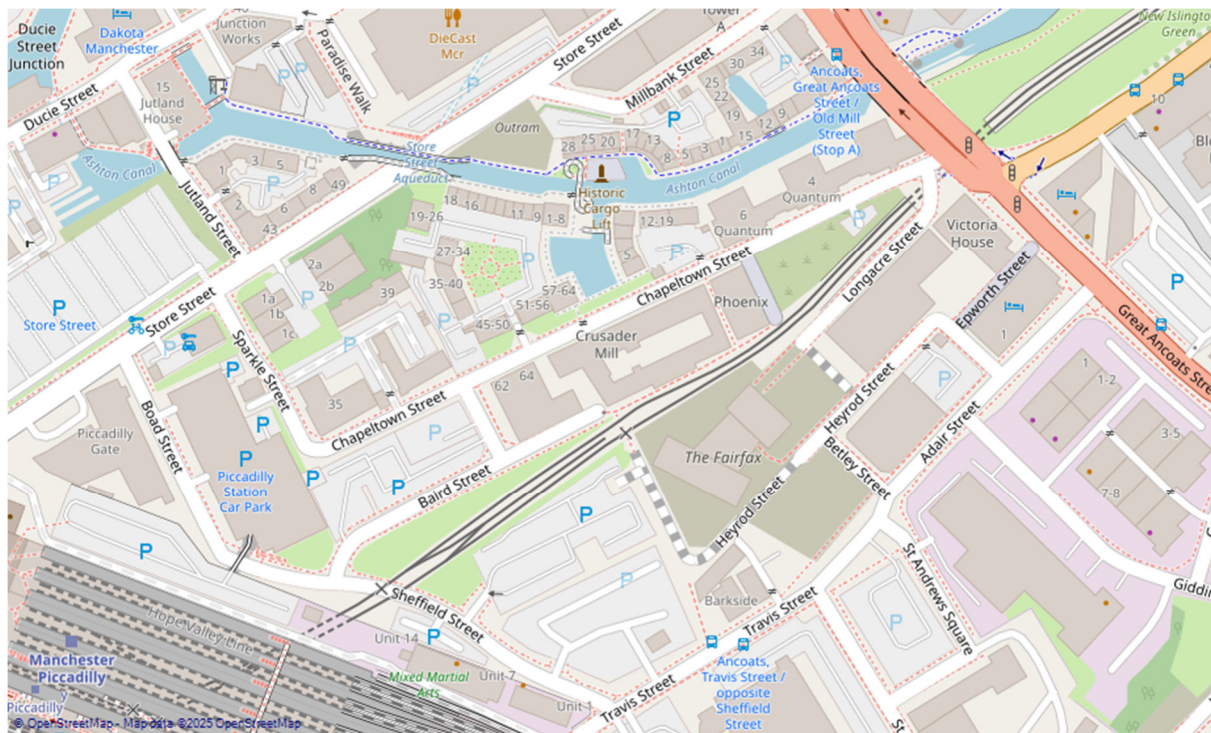


Figure 1: Map showing the surroundings of the Fairfax site.

2.1 List of Apparatus

The following apparatus is to be installed as part of the project.

Apparatus	ID
Lighting	1
Emergency lighting	2
External lighting	3
Lighting control	4
LV switchgear	5
Panel boards, distribution boards, consumer units	6
Fire alarm panel	7
Fire alarm devices	8
TV distribution system	9
BT Openreach network	10
CCTV system	11
Electronic access control system	12
Intercom system	13
Disabled alarm system	14
Emergency Voice Communication system	15
Hearing loops	16
Power outlets with integral USB power	17
Water pumps and drives	18
Air source heat pumps	19
DX heating/cooling	20
Mechanical ventilation with heat recovery (MVHR)	21
Ventilation (commercial)	22
Ventilation (residential)	23
Lifts	24
Secondary supply (diesel generator)	25
Substations (2MVA total)	26

Table 1: Apparatus to be installed as part of the project.

2.2 List of existing apparatus to be considered

The Fairfax project is a new building; there is therefore no existing apparatus to consider.

2.3 List of 3rd parties to be considered

The tram line is approximately 10 m from the site at the closest point, at ground level. The nearest tram stops are Manchester Piccadilly to the southwest (~210 m) and New Islington to the northeast (~360 m).

2.4 EMC activities to be undertaken

The following EMC activities should be carried out to demonstrate compliance with the relevant EMC standards, providing a presumption of conformity to the EMC Regulations:

- Verification that apparatus EMC evidence is in line with project requirements;
- EMC testing of radiated RF emissions, EMF, and other relevant phenomena (only required if the apparatus evidence is insufficient);
- Consideration of stray current. Evidence of suitable stray current control measures, including maintenance records, should be sought from Manchester Metrolink. If this is not available, or the evidence shows that there is a potential issue with stray current, then a pre-construction survey of buried structure potential shall be performed, according to EN 50162 [7] and EN 13509 [8]

3 EMC MANAGEMENT AND ORGANISATION

RG Group have contracted Eurofins E&E UK to provide this EMC Management Plan for the project. The plan will be distributed to a nominated 'responsible person'. The responsible person must hold the completed EMC Documentation for the lifetime of the installation.

The principal staff dealing with EMC in the project are:

- RG Group – Josh Hooley – responsible for overseeing the Fairfax project (including EMC aspects).
- Eurofins E&E UK – Mark Tyndall – responsible for providing this EMC Management Plan to RG Group.

4 MANAGEMENT OF EMC INTERFACES

4.1 EMC Environments - General

EMC standards are normally written for specified EMC environments. Some examples of common EMC environments are shown in Table 2. As the table shows, the emission and immunity requirements vary depending on the expected EMC environment.

EMC environment	Emission requirement	Immunity requirements
Residential, Commercial and Light Industrial (RCLI)	Most Stringent	Least Stringent
Industrial	Medium	Medium
Railway	Medium/Least Stringent	Most Stringent

Table 2: Some common EMC environments

The product specific and generic EMC standards have many tests in common but depending on the intended EMC environment the test levels differ from standard to standard, with more onerous immunity requirements imposed for harsher environments.

4.2 EMC Environment for this project

With reference to TfGM requirements, the zoning of a railway electromagnetic environment is set out in Figure 2, which specifies zones based on distance from the centre line of the nearest track, and from traction substations. Typically, the three zones (i.e., railway, buffer, and commercial/light industrial) are associated with the railway, industrial, and RCLI environments of Table 2, respectively. However, for light metro (tram) systems, RCLI zones can be expected much closer to the rail route. The Fairfax site is approximately 10m from the track and will therefore be classed as an RCLI EMC environment.

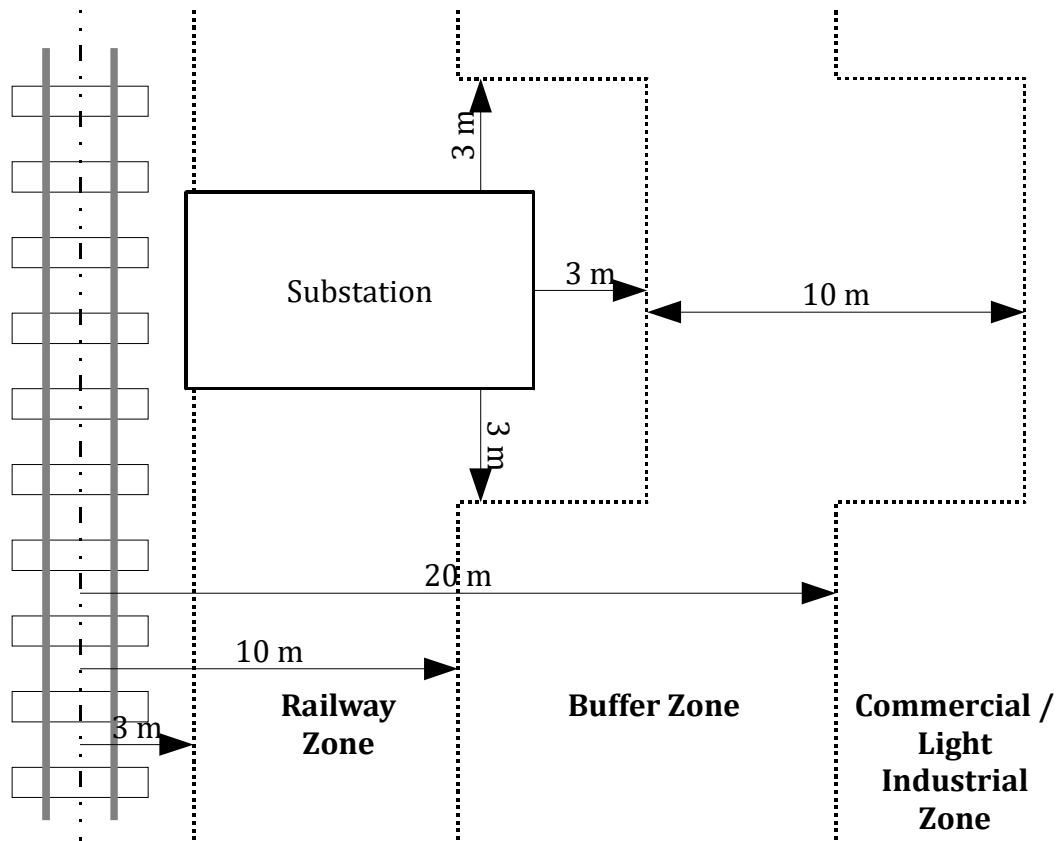


Figure 2: EMC zoning principle from NR/L2/RSE/30041 Issue 2 [9].

4.3 EMC Interfaces

Fixed Installations comprise a number of different apparatus and systems. It is necessary to consider the interface between each apparatus and its neighbours. This is sub-divided into various classes of interface:

- Intra-system EMC, between apparatus supplied within the scope of this project. This is demonstrated by ensuring apparatus is correctly procured and cabling correctly segregated/separated.
- Inter-system EMC, between existing customer assets and the apparatus supplied as part of this project. As a new build, there are no existing assets.
- Extra-system EMC, between third-party systems and the apparatus supplied as part of this project. The Metrolink system has been identified and addressed in this document.

5 LEGISLATION AND STANDARDS

It is the primary purpose of this plan to ensure that this project meets the requirements of the EMC Regulations 2016 [1]. The essential requirements of the EMC Regulations are quoted below:

Equipment shall be so designed and manufactured, having regard to the state of the art, as to ensure that:

- a) *the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended;*
- b) *it has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use.*

Meeting these essential requirements will satisfy all other EMC requirements for the project. This Plan sets out how the essential requirements are to be met.

As well as meeting the requirements of the EMC Regulations, it is also necessary to consider the EMC requirements of Transport for Greater Manchester (TfGM) for the Metrolink tram system (stations, lines, and M5000 trams) located near to the Fairfax site.

5.1 EMC Regulations applied to this project

The EMC Regulations apply to both *Apparatus* and *Fixed Installations*.

Apparatus is an electrical/electronic appliance made commercially available in the UK. The original purpose of the EMC Regulations was to enable the free movement of goods throughout the EU. Therefore, any electrical/electronic equipment or system (within the scope of the EMC Regulations) that can be used in more than one place is classed as *Apparatus*.

An electrical/electronic system is termed a *Fixed Installation* if it is constructed so that it can only be used in one place

5.1.1 The Fairfax as a Fixed Installation

The Fairfax project will be a Fixed Installation. As such RG Group are responsible [10] for ensuring the installation

- Is in conformity with the relevant essential requirements;

- Has documentation available to the relevant national authorities demonstrating the good engineering practices used to ensure conformity of the installation.

Meeting the essential requirements of the EMC Regulations will cover the EMC requirements of TfGM.

Manchester Council and TfGM require that the documentation be supplied to them to ensure EMC. The documentation will include this EMC Control Plan and the further EMC documentation listed in Section 7. The EMC Documentation will demonstrate with respect to EMC that:

- 1) Good engineering practices have been used in the construction of the installation (see Table 5, Section 7).
- 2) The information on the intended use of “apparatus” has been respected (see Table 5, Section 7).

In this manner the EMC Documentation will demonstrate that The Fairfax project meets the essential requirements of the EMC Regulations.

5.1.1.1 Cabling standards for this project

Cabling, particularly (but not exclusively) the HV (33/11 kV) cabling and high current LV (400 V) cabling shall meet the requirements of

- IEC 61000-5-2 [2]
- EN 50174-2 [3]
- EN 50174-3 [4]
- BS 7671 [5]

regarding separation from other cables and use of cable trays.

5.1.2 Apparatus for The Fairfax project

It is important for the project to verify that the items procured to form the Fixed Installation meet the appropriate EMC emission and immunity requirements. Appropriate certification is described in Section 5.1.2.1 and the method of recording the certification for the project is described in Section 7.1.2.

5.1.2.1 Expected EMC evidence for supplied apparatus

Apparatus has a presumption of conformity if the correct application of designated standards is made. Expected designated EMC standards are set out in Section 5.2. Where

designated standards have not been used, or do not match the zoning principles of Section 4.2, further evidence will be required, and further actions may need to be undertaken.

Electrical equipment containing no electronics (e.g. transformers or passive filters) will be classed as *inherently benign*. A statement from the supplier confirming the benign status should be obtained.

5.2 Overall EMC requirements for Apparatus

Given the EMC environment, the overall EMC requirements are listed in Table 3. The standards are listed undated: any current version of a standard (i.e., listed in [11]) will provide a presumption of conformity.

Item	Emission	Immunity
Lighting (all types)	EN 55015 [12]	EN 61547 [13]
Lighting control (DALI)	EN 61000-6-3* [14] EN 61000-6-4 [15]	EN 61000-6-1 [16] EN 61000-6-2** [17]
LV switchgear	EN 61439-1 [18] + relevant part of EN 61439	
Small power (i.e. LV sockets)	n/a (benign, assuming no USB ports)	
	EN 61000-6-3	EN 61000-6-1
Access Control System	EN 61000-6-3* EN 61000-6-4	EN 50130-4 [19]
Fire Alarm System		
CCTV		
Disabled Alarm System		
TV distribution	EN 50083-2 [20]	
Emergency Voice Communication System	EN 55032 [21]	EN 55035 [22]
Intercom System		
BT Openreach		
MVHR	EN 61000-6-3* EN 61000-6-4	EN 61000-6-1 EN 61000-6-2
Ventilation (including extract fans)		
Air source heat pumps		
DX heating/cooling		
UPS	EN 62040-2 [23]	
Lifts	EN 12015 [24]	EN 12016 [25]
Water pumps	EN 61000-6-3* EN 61000-6-4	EN 61000-6-1 EN 61000-6-2
Drives for water pumps	EN 61800-3 [26]	
*EN 61000-6-3 will be required for apparatus in residential areas.		
**EN 61000-6-2 may be required for apparatus in heavy plant areas.		

Table 3: Expected standards for Apparatus supplied to the project.

5.2.1 Overall EMC requirements for suppliers

Apparatus supplied to the project shall be accompanied by documentation demonstrating its EMC with the defined project environment. Expected documentation is listed in Table 4.

Item	Notes
Declaration of Conformity	For benign apparatus, a statement from the supplier of this exclusion is expected.
Installation, use and maintenance instructions	If required to ensure EMC in the defined environment
Technical Justification	If the designated standards listed above have not been applied.

Table 4: Expected documentation for Apparatus supplied to the project.

5.3 CEMFAW Regulations

In July 2016, the CEMFAW Regulations 2016 [27] came into force, requiring employers to ensure their employees workplace(s) meet the exposure limits set out in the regulations; these limits are largely based on the International Commission on Non-Ionising Radiation Protection (ICNIRP) guidance [6, 28, 29, 30].

The project may contain cables rated to carry >100 Amperes. Significant magnetic fields (in excess of the ICNIRP 1998 general public limits) will exist some distance (of the order of tens of centimetres) away from the cables; this distance will increase where the cables are not in a radially symmetric “trefoil” arrangement, as will be the case at their connection to switchboard and transformer.

The ICNIRP 1998 General Public levels are considered to provide a safe level for workers at particular risk (including pregnant workers and those with medical implants or body-worn devices), as well as being appropriate for residential zones.

6 EMC TESTING AND COMMISSIONING ARRANGEMENTS

EMC and EMF site Surveys shall be made where a risk assessment reveals a requirement. The surveys will be made in two stages: a pre-construction survey and a post-construction survey. Note that some surveys are only needed before (Stray current) and some are only needed after (EMF).

If there is no requirement for surveys flagged as a result of the EMC documentation review, then no surveys will be undertaken.

The Stray Current survey (buried structure potential) is for the protection of the project from Manchester Metro.

The EMC survey is to demonstrate that the project does not generate excessive emissions and ensures that there is no effect on Manchester Metro.

The EMF survey is to inform protection requirements for workers and the general public and has no interface with Manchester Metro.

6.1 Survey of Buried Structure Potential

Due to the Metrolink tram line in vicinity, pre-construction survey of buried structure potential based on EN 50162 and EN 13509 may need to be performed to assess the effects of stray currents.

This will only be needed if evidence of suitable stray current control measures including maintenance records is not available from Manchester Metrolink.

This will only need to be carried out once, and it would be required before the build is started in order to inform the design.

6.2 EMC surveys

Standard EN50121-2:2017 [31] provides limits of emission, which are designed to protect radio services from unintentional RF emissions from fixed installations. Application of these limits will also protect the Metrolink Tram System.

If needed, measurements should be made at a number of positions at the site. The positions will be at the discretion of the EMC test engineer and will be fully detailed in a test report. These test locations will be also agreed with Metrolink before they are finalised, and Metrolink would be invited to attend the tests.

Measurements should be made both before and after The Fairfax project is energised.

6.2.1 Pre-construction survey

Measurements will be made to indicate the existing EMC environment at the locations. The results will provide comparative data for the post-energisation measurements.

6.2.2 Post-energisation survey

The measurement procedure and positions used for the pre-energisation survey will be repeated with The Fairfax project apparatus energised. These measurements will be compared with pre-energisation ones with the object of demonstrating that emissions from The Fairfax project apparatus do not increase RF emissions above those prescribed in the standard.

6.3 EMF surveys

The main purpose of these surveys is to ensure that identified locations (e.g. switchrooms, LV rooms) meet the requirements of the ICNIRP 1998 guidelines, to protect workers at particular risk (with implanted/body-worn medical devices, and pregnant workers).

A pre-energisation survey is not required.

In conjunction with the EMC survey, measurements will be made at The Fairfax project. The object is to provide zoning requirements for the completed building with respect to magnetic field strengths that may be above the ICNIRP general public limits.

7 DELIVERABLES SCHEDULE

The EMC Documentation should demonstrate *“that good engineering practice has been used and the information on the intended use of its components has been respected”*. For a small installation this could be demonstrated in a single document but for a large installation such as The Fairfax project it is more convenient to break the task into a number of documents as described below.

A summary of the purpose of the documents with regard to the requirements of the EMC Regulations and Metrolink requirements is given in Table 5.

Document	To Demonstrate		
	Good engineering practice	Intended use of components respected	Meeting Metrolink requirements
EMC Management Plan	✓		✓
EMC Procurement Review		✓	✓
Site Measurement Reports (if needed)	✓		✓
EMC Project File	✓	✓	✓

Table 5: Purpose of the documentation with respect to the requirements of the EMC Regulations.

7.1 Documentation

The following sub-sections describe the purpose and expected contents of each document to be produced.

7.1.1 EMC Management Plan

This document constitutes the EMC Management Plan.

7.1.2 EMC Procurement Review

This document will list the systems that are to be supplied by all sub-contractors for The Fairfax project, and will examine the collated documentary evidence that individual items of equipment and systems provided comply with the EMC Regulations. The documentation collated for the Procurement Review (sometimes referred to as a Compliance Report) will consist of Declarations of Conformity (DoCs), and where appropriate, additional Technical Documentation (TD) or other additional evidence. The documentation collated will be presented as Appendices in the report. A summary table will be presented showing each provided system's EMC evidence.

Where EMC Installation instructions are given, these will also be recorded in an appendix of the Review.

7.1.3 Site Measurement reports

7.1.3.1 EMC Test Plan

The EMC test plan will describe the arrangements for the two phases of on-site EMC testing as described in Section 6. The test plan will describe:

- The purpose of the tests.
- The tests to be performed, and the duration of the measurements.
- The locations of the tests.

7.1.3.2 Pre-energisation EMC Test Report

The pre-energisation survey will obtain the existing field levels at the location. The pre-energisation test report will describe the results of this survey.

7.1.3.3 Post-energisation EMC Test Report

The results of the post-energisation EM survey will be described in this report. They will be compared with the results of the pre-energisation survey with the object of demonstrating compliance of The Fairfax project with EN 50121-2.

7.1.4 EMC Project File

A whole installation EMC assurance document (the EMC Project File) will be produced. It will summarise the activities and findings of the previous documents.

7.2 Dates for Deliverables

The schedule of dates for submitting the deliverables described above are to be confirmed by RG Group as the project progresses. Note that post energisation measurements will need to be carried out once the project is energised.

Metrolink will require a 6-month Operational Review period which will allow them to capture any issues that may arise on the Metrolink Tram System post commissioning that can be attributed to the development.

REFERENCES

- 1 Statutory Instrument 2016 No. 1091, The Electromagnetic Compatibility Regulations 2016, November 2016.
- 2 IEC 61000-5-2, "Electromagnetic compatibility. Installation and mitigation guidelines. Earthing and cabling", IEC, November 1997
- 3 EN 50174-2: 2018, "Information technology. Cabling installation. Installation planning and practices inside buildings", CENELEC, June 2018.
- 4 EN 50174-3:2013 +A1:2017, "Information technology. Cabling installation. Installation planning and practices outside buildings", CENELEC, May 2017.
- 5 BS 7671 – 18th Edition, "The IET Wiring Regulations", The Institution of Engineering and Technology, 2018.
- 6 ICNIRP, "Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)", Health Physics **Vol 74** No 4, pp 494-522, April 1998.
- 7 EN 50162, "Protection against corrosion by stray current from direct current systems", CENELEC, August 2004.
- 8 EN 13509, "Cathodic protection measurement techniques", CEN, May 2003.
- 9 NR/L2/RSE/30041, "Electromagnetic compatibility (EMC) assurance process", Network Rail, Issue 2, June 2012.
- 10 Regulation 37 of [1]
- 11 Notice 0071/22, "The Department for Business, Energy & Industrial Strategy Notice of Publication references to standards for electromagnetic compatibility in support of the Electromagnetic Compatibility Regulations 2016 (SI 2016/1091)",
<https://www.gov.uk/government/publications/designated-standards-emc>, October 2022.
- 12 EN 55015:2019, "Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment", CENELEC, August 2019.
- 13 EN 61547:2009, "Equipment for general lighting purposes. EMC immunity requirements", CENELEC, August 2009.
- 14 EN 61000-6-3:2007+A1:2011, "Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light- industrial environments", CENELEC, March 2011.
- 15 EN 61000-6-4: 2007+A1:2011, "Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments", CENELEC, February 2011.
- 16 EN 61000-6-1:2007, Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments, CENELEC, January 2007.

- 17 EN 61000-6-2:2005, "Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments", CENELEC, August 2005.
- 18 EN 61439-1:2011, "Low-voltage switchgear and controlgear assemblies – General rules", CENELEC, October 2011.
- 19 EN 50130-4:2011, "Alarm systems. Electromagnetic compatibility. Product family standard: Immunity requirements for components of fire, intruder and social alarm systems", CENELEC, June 2011.
- 20 EN 50083-2: 2012/A1:2015, "Cable networks for television signals, sound signals and interactive services - Part 2: Electromagnetic compatibility for equipment", CENELEC, November 2015.
- 21 EN 55032: 2015/A11:2020, Electromagnetic compatibility of multimedia equipment - Emission Requirements, CENELEC, March 2020.
- 22 EN 55035:2017/A11:2020, Electromagnetic compatibility of multimedia equipment - Immunity requirements, CENELEC, May 2020.
- 23 EN 62040-2:2006, Uninterruptible power systems (UPS) - Part 2: Electromagnetic compatibility (EMC) requirements, CENELEC, March 2006.
- 24 EN 12015:2014 "Electromagnetic compatibility. Product family standard for lifts, escalators and moving walks. Emission", CEN, March 2014.
- 25 EN 12016:2013 "Electromagnetic compatibility. Product family standard for lifts, escalators and moving walks - Immunity", CEN, August 2013.
- 26 EN 61800-3: 2004+A1:2012, "Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods", March 2012.
- 27 Statutory Instrument 2016 No. 588, The Control of Electromagnetic Fields at Work Regulations 2016, May 2016.
- 28 ICNIRP, "Guidelines on limits of exposure to static magnetic fields", Health Physics **Vol 96** No 4, pp 504-514, April 2009.
- 29 ICNIRP, "Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 kHz)", Health Physics **Vol 99** No 6, pp 818-836, December 2010.
- 30 ICNIRP, "Guidelines for limiting exposure to electric fields induced by movement of the human body in a static magnetic field and by time-varying magnetic fields below 1 Hz", Health Physics **Vol 106** No 3, pp 418-425, March 2014.
- 31 EN 50121-2: 2017, "Railway applications - Electromagnetic compatibility – Emission of the whole railway system to the outside world", CENELEC, January 2017.