

IMPERIAL

Property division

Construction Project Production Guidelines for the
Operating & Maintenance Manuals
(Mechanical & Electrical Services)
Guidance for the Technical Author

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Document History

Revision History

Revision Number	Revision Date	Summary of Changes
Rev 10	February 2016	
Rev 10.1	February 2017	<ul style="list-style-type: none"> Updated 5.0 Draft Manuals review process Updated 8.0 Manual format Removed Appendix (ii) Asset Schedule – superseded by appendix iv in document RM09 Changed all references of Supervisor to Compliance Monitor
Rev 10.2	January 2020	<ul style="list-style-type: none"> minor text updates to refer to EIR instead of CAD strategy and updating changes to job titles and division names removed text from Pt1 5.0 which is duplicated in document RM09 updated external hyperlinks
Rev 10.3		<ul style="list-style-type: none"> updates to required format and delivery method of record documents. Restructure of Part 1 schedule to better align with guideline document RM07 Part 1 section 3- Health & Safety Pro-forma updated Part 2 section 2 – Specific Health & Safety Issues. Paragraph added to refer to projects with no building fabric manual Appendices updated
Rev 11		<ul style="list-style-type: none"> Updated references to Imperial in line with the rebrand Updated broken weblinks Minor text updates throughout Minor update to file format requirements in Part 1 section 7.01 Updated specialist manuals' format requirements Updated asset register delivery requirements

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Part 1: Production Guidance

1.0 Introduction

This document provides guidance to produce the Mechanical and Electrical Services' Operating & Maintenance Manuals (O&Ms) for Imperial College London construction projects. The contents of this document are aimed at the Technical Author appointed to produce the manuals.

This should be read in conjunction with [RM09 Record Document Process Guidelines](#) incorporating the Technical Author's Scope of Services, and RM07 Production Guidelines for Building Fabric Manual (including Health & Safety File).

It is the responsibility of the Contractor to deliver all O&Ms and associated Record Drawings as a required deliverable of the works carried out. To enable the manuals to be produced to the standard required, they are to appoint a Technical Author from Imperial's recommended list.

Refer to document [RM09 Record Document Process Guidelines](#) for an outline of individual responsibilities and record document production process.

The intention is to provide a document that meets statutory and operational requirements, whilst being user friendly and compatible with the Imperial's document management system

2.0 Purpose of the Operating & Maintenance Manuals

These guidelines are for the specific use on projects where separate mechanical and electrical Operating and Maintenance manuals are required.¹

The O&Ms offer the personnel concerned with the operation and maintenance of Imperial's infrastructure and services the necessary knowledge and skills to perform their duties.

Specific health and safety information, relating to the mechanical and electrical services is included in [Section 2.00](#) of the O&Ms for the installations involved. These are to be read in conjunction with the full Health and Safety information on the project included within the Building Fabric manual.

The format and style in which the O&Ms are produced is designed to:

- Minimise repeated information from one project to another.
- Minimise the space needed for archiving.
- Ease of referencing of information
- Allow improved use of the manuals.
- Enables electronic access via Imperial's internal O&M database.
- Act as an aide memoir to the project team
- Develop the use of barcode plant labelling.
- Provide an authentic, archival, record of the works carried out.

¹ On projects with minimal mechanical and electrical works, there may be no requirement for a separate set of O&Ms and this information will instead be included in Section 10 of the Building Fabric Manual. Refer to guideline document RM07 for further information on the production of Building Fabric manuals.

Ref: RM08 Production Guidelines for O&M Manuals

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Please ensure you are referring to the latest version: [Resources | Administration and support services | Imperial College London](#)

3.0 Health & Safety Pro forma

This information is specific to the maintenance requirements covered in the O&Ms and not a repeat of general information included in the Building Fabric Manual /Health & Safety File. For works which are solely Mechanical & Electrical, with no Building Fabric manual required, the full H&S file should instead be included in the O&Ms. Refer to [Part 2 Section 2](#) for details

This information is collated by the Principal Designer from the project team and returned to the Technical Author for inclusion in Section 2 of the O&Ms. Refer to the following typical example form produced by the Technical Author or Principal Designer.

Specific Health and Safety Pro Forma

Building Name		
Level(s) and Project Name		
Imperial College London Project Number		
Imperial College London Document Ref. Number		
Information Compiled by	Company Name	Individual's Name
Special Access		
Residual Risks		
Special Maintenance		
Replacement Strategy		

The information on this form is a summary of the unusual issues relating specifically to the building services for this project. For full Health and Safety information reference should be made to the Health and Safety File / Building Fabric Manual for the project.

4.0 Design Criteria Requirement Pro-forma

This information is requested by the Technical Authors from the design team for inclusion within Section 1 of the O&M's. Refer to the following typical example form produced by the Technical Author

Design Criteria Pro Forma

Building Name		
Level(s) and Project Name		
Imperial College London Project Number		
Imperial College London Document Ref. Number		
Information Compiled by	Company Name	Individual's Name
External Conditions	Summer Temperature Winter Temperature Noise Criteria	
Internal Conditions	Name of Space Summer Temperature Winter Temperature Ventilation Rate Noise Criteria Lighting Level Occupants	
	Name of Space Summer Temperature Winter Temperature Ventilation Rate Noise Criteria Lighting Level Occupants	
	Name of Space Summer Temperature Winter Temperature Ventilation Rate Noise Criteria Lighting Level Occupants	

5.0 Asset Registers

The Contractor is responsible for updating an Asset Register spreadsheet as part of the project process and provide photographs of each installed asset. Once completed, this will be included with the final O&M digital issue as a record of the assets removed or installed as part of these works.

Refer to the EIR for details of assets to be documented and file naming, and to this page for further details:

<http://www.imperial.ac.uk/estates-facilities/buildings/procedures/assets/>

6.0 Specialist Stand-alone Manuals

Where practical, all specialist manuals should be incorporated within the relevant O&M, but some services may require the production of a self-contained stand-alone manual.

Examples where a stand-alone manual may be required include:

- New Fire Alarm installations
- Lifts
- Catering Equipment
- BMS – **only** if agreed at the Record Document Strategy meeting that this should be produced as a separate file.
- Fume Cupboards
- CAT3 and CL3 Labs

Refer to Section 7 Specialist Contractors in [RM09 Record Document Guidelines](#) for full details of requirements and responsibilities. This should be determined at the Record Document Strategy Meeting.

7.0 Manual Format

The contents of the O&M manuals will consist of 7 sections (8 Sections for the Mechanical Services Manual) with information arranged as described in Part 2 of these guidelines.

Mechanical and Electrical manuals are to be produced as two separate sets of record documents, unless otherwise agreed in the Record Document Strategy meeting. For example, where one element is minor, it may be agreed to produce a single combined M&E manual.

The typeface to be used is Arial. Other fonts should only be used in specific applications where the use of Arial is not possible or appropriate (e.g. mathematical formulas). When using the Imperial logo, always use the original artwork and completely unaltered. The logo is available from the Imperial Brand Management platform.²

7.01 Digital

The electronic manual is to be issued as a single pdf file. The document must be fully hyperlinked, with all literature inserted within the document, and not link to files or documents contained in external folders. Hyperlinks should include (but not limited to):

²Refer to Imperial's brand management platform for further information, including the "house style":

<https://www.imperial.ac.uk/communications/toolkits/brand/>

- Contents page to each section of the manual
- Each section's index page to each item
- Plant names in the description of the plant data
- Manufacturers' names in the plant data to their contact details
- Model numbers in the plant data to their literature.
- Any reference to an item found elsewhere in the manual.

The document needs to be user friendly, enabling the user to review all sections independently via the hyperlinks and without having to scroll through the entire document.

The electronic manual should be concisely named and include the Imperial project number. Refer to the Estates Records webpage for file naming guidance.

<https://www.imperial.ac.uk/estates-projects/space-management/information-management>

The digital format issue should consist of a folder containing the following items:

- One copy of the manual in an unrestricted pdf format, without password protection or editing restrictions, enabling information to be extracted as required
- A second pdf copy in pdf-A format or with editing restricted, to provide a fixed record of the works.
- A folder of as-built drawings in pdf and dwg format (meeting the project EIR requirements). These are to be fully itemised in the schedule of drawings in Section 6 of the manual.
- Where agreed in the Record Document strategy meeting, a copy of the manual and literature in their native editable format (word format, for example)
- *Asset register and photos are uploaded to the Box project file directly by the main contractor.*

Zip files or password protected files are not to be used.

Any other documents requiring issue as a separate file (for example a specialist contractor stand-alone manual) needs to be agreed and recorded in the minutes of the Record Document Strategy meeting and included on the Tracker. **Unless this has been agreed, all sub-contractor and specialist literature needs to be incorporated within the manual's pdf document.**

Literature which has been issued as a separate file or incorporated within another manual should be cross-referenced in the appropriate section, to aid the user in locating the information.

7.02 Hard copy

A hard copy of each manual, including drawings, is required for the Estates Archive. The hard copy manuals are to be issued in hard cover A4 4-ring binders in the following colours:

- Mechanical – blue
- Electrical – green
- Fire Alarm – red
- Other specialist manuals - white

Where coloured ring binders cannot be obtained, use of the appropriate coloured card for the spine and front cover labels will clearly denote the type of manual. Ensure the coloured card is pale enough for the labelling to be clearly read.

Sections should be clearly denoted using wide subject dividing cards.

For some projects, a digital only issue may be sufficient, where agreed and minuted at the Record Document strategy meeting.

7.03 Cover and Spine

The front cover (and the spine of the hard copy manual) must display the following information so that the user can easily locate the correct manual.

- Imperial's project number
- Imperial/Estates Archive's document reference number
- Project title,
- Building and campus,
- Completion Date
- Type of manual (ie Building Fabric, Mechanical, Electrical etc)
- Contractor's details.

The registered project number, document reference number and title will be confirmed at the record document strategy meeting, or by contacting the Estates Records & Archives Officer

Operating & Maintenance manuals front cover and spine text are to be produced on white card to ensure text is readable against the coloured files. *

Where the hard copy consists of more than one volume the spine label must also include a schedule of information contained within that specific volume ie Section number and headings.

Refer to [Appendix \(i\)](#) for sample cover and spine templates. Editable versions of these templates can be obtained from the Estates Records & Archives Officer upon request.

* refer to exception in Section 8 where coloured ring binders cannot be obtained.

8.0 Draft manuals review process

The compilation of the manual should start during construction and drafts of the documentation are to be issued for review in accordance with the Project Handover Plan and in sufficient time to allow for the final copies to be issued at completion. The drafts should be uploaded to the project file for review, unless otherwise agreed.

Refer to section 4.07 of [RM09 Record Document Process Guidelines](#) for an outline of the review process.

9.0 Production of As-Built Drawings

The O&Ms require all Mechanical, Electrical and Public Health drawings produced as an outcome of the completed works.

All drawings are to be issued by the Contractor as final as-built/as-installed status and produced in accordance with the project-specific Employers Information Requirements (EIR). Electronic format drawings are to be issued in dwg and pdf formats.

Details of the drawing approval process are outlined in the [RM09 Record Document Process Guidelines](#) and should have commenced at Stage 2 Design.

By construction stage, drawings are expected to be produced to the EIR standard, however final sample drawings should be resubmitted at Stage 5 to cadcompliance@imperial.ac.uk to confirm that this has been followed and the room numbering is correct.

Where a hard copy of the manual is required for the archive, this must include a full set of hard copy drawings, printed to the size specified on the drawing scale and folded down to A4 for insertion into the file.

For large quantities of drawings, which may not be practical to deliver in binders, alternative storage is to be agreed with the Estates Records & Archives Officer to ensure they are stored in a manner suitable for long term preservation whilst meeting storage and access requirements.

10.0 Distribution of Manuals and Drawings

The final digital format manual and drawings is to be uploaded to the Imperial project file on Box, unless another delivery method has been agreed with the Estates Records & Archives Officer. This must be accompanied by a completed comments tracker and a sign off letter confirming that the record documents have been checked and reviewed, to represent an accurate record of the works carried out.

Upon receipt of this notification, the Estates Records & Archives Officer will transfer the manuals to the O&M database, sending an Issue Memo to confirm receipt. Any further changes to the record documents once issued must be accompanied by a Revision Record to document the updates.

The hard copy manual and drawings is to be delivered to the Estates Records & Archives Officer, and the content must be an exact copy of the digital version. Any revisions made to the digital copy must also be made to the hard copy – if this has already been delivered to Imperial, arrangements must be made to replace updated pages.

All hard copy and digital copies of the drawings and manuals are to be issued to the Estates Records & Archives Officer without exception. Anything issued directly to any other department cannot be guaranteed as the final issued Record Documents.

Part 2: O&M Manual Standard Contents

The following is the standard index of contents for the Mechanical and Electrical Services O&M manuals.

Any specialist services stand-alone manuals should also follow this layout as far as is practical.

- 1.00 [General Description of the Installation](#)
- 2.00 [Specific Health & Safety Issues](#)
- 3.00 [Plant Data Information](#)
- 4.00 [Test Certificates and Commissioning Data](#)
- 5.00 [Manufacturers' Literature](#)
- 6.00 [Record Drawings](#)
- 7.00 [Specialist Services](#)
- 8.00 [Building Management System and Controls](#)

Detailed Description of Contents:

Refer to the following pages for further details of what is to be included in each section.

1.00 General Description of the Installation

This section provides an overview of the document, file holders responsibility, project, and location details. This section should commence with a Document Revision Record

1.1 Introduction

A brief outline of the regulatory responsibilities that require the production of this file. Reference to any other records which should be viewed in conjunction with this file. Users' responsibilities on acceptance and use of the records.

1.2 Incoming Services Location

Details of incoming services to the project area – for example, mains water, gas, electricity

1.3 Directory of Project Team Members

A schedule of names and contact details of key personnel involved in the Mechanical and Electrical aspects of the project.

1.4 Brief Description of Installation

This section consists of a summary description in layman's terms (as specified in Part L of the Building Regulations) of the mechanical, electrical, and public health services installed.

The section should commence with a basic summary of the scope of works that this file covers, including all rooms/areas affected by the works.

This should then be followed by a detailed breakdown of the services installed, linking to relevant product information in the manual.

Related services referred to in this manual but produced in a standalone manual (for example a Fire Alarm Manual or BMS/Controls system) should be cross-referenced in this section, so that users know where to refer to for the information.

1.5 Design Criteria

The Design Criteria Pro-formas detailed in [Part 1 Section 4](#) of this guideline document are to be included in this section.

2.00 Specific Health & Safety Issues

This section is for the Principal Designer's H&S Pro-forma detailed in [Part 1 Section 3](#) of this guideline document. This should only include information specific to the maintenance requirements covered in this O&M.

Where a project is solely M&E with no building fabric elements, the full health & safety file content, usually located in the Building Fabric manual, should be incorporated in this section, with this section retitled as **Health & Safety**. Deviation from the standard schedule of contents to be agreed at the Record Document Strategy meeting.

3.00 Plant Data Information

This section provides information on the plant detailed in the Asset Register (the asset register itself is not included in the manual but instead is issued as a separate excel document by the contractor).

Information in this section is to include (but not limited to):

- Equipment Data

- Directory of Manufacturers
- Directory of Specialist Sub-contractors
- Recommended Stocked Spares
- Lubricants
- Tools and Equipment

Equipment data must be linked, via internal hyperlinks, to/from relevant literature, certificates, drawing schedules etc located elsewhere within the manual.

4.00 Test Certificates and Commissioning Data

For ease of reference, this section is to commence with an index/table of certificates and commissioning data for each system, hyperlinked to each applicable document(s) which follow within the section.

Where certificates have been incorporated within a specialists' self-contained O&M, it can be referenced and hyperlinked to here instead of extracting it from their documentation.

5.00 Manufacturers Literature

This must include all plant and systems which require maintenance or replacement parts.

This should be set out in a similar manner to the building fabric manual literature, with each manufacturer's sub-section commencing with a "landing page" providing an overview of the literature provided for that manufacturer, which must include cleaning and maintenance information. Refer to [RM07 Building Fabric Manual](#) guidelines for details and a sample page.

Literature specific to the product installed, and not a bulk of generic manufacturer's brochures, is inserted into the document and hyperlinked to the appropriate text on the "landing page" to enable ease of navigation for the user.

This literature must be as minimal as is practical to enable maintenance of the products and reordering of parts, without sole reliance on external web-links which may not be accessible in the future.

Equipment information must be linked, via internal hyperlinks, to any test certificates and commissioning data included in Section 4.

6.00 Record Drawings

This section is for the respective mechanical/electrical drawings produced for the works and includes:

- Schedules of the drawings included in this manual
- Hard copy drawings
- DWG and PDF format drawings in a sub-folder with the digital manual.
- Metering Strategy (refer to the BESPR linked to below)

It is essential that these are the final As-built/As-installed drawings issued by the M&E Contractor and must be produced in accordance with the project EIR, approved by Imperial's Building Information team.

This must include all relevant schematic drawings.

Refer to:

- [Building Information](#) (external link to Imperial website)

- [Building Engineering Services Particular Requirements](#) (BESPR) (external link to Imperial website)

7.00 Specialist Services

This section includes those services for which a specialist maintenance contract may be required or containing specific information for maintenance, cleaning, replacement or dismantling which may not be detailed in generic maintenance and fault-finding documentation e.g. Structured Cabling system, CCTV, Access Control, updates to the Fire Alarm system, Fume Cupboards, Laboratory Gases, Lightning Protection, Lifts etc.

Any new fire alarm installation must have its own separate manual, which should as far as practical, follow the same format as the standard O&M schedule of contents outlined in this document.

Any Imperial procured works consisting mainly of mechanical or electrical services should be included in this section and referenced in Section 8 of the Building Fabric manual. Refer to [RM09 Record Document Guidelines](#) for further details on formatting and responsibilities.

8.00 Building Management system and Controls (Mechanical O&M only)

This will include a general description, control drawings, strategy diagrams etc so that it can be read as a standalone document.

This must be the final document, finalised after commissioning.

In most cases, BMS will be included in the Mechanical Services O&M, however some circumstances may permit this to be produced as a standalone file. For example, if commissioning was scheduled for a later date or for larger projects, to reduce the bulk of the manual. This will be decided at the Record Document Strategy Meeting or final pre-handover meeting should the scope of works change.

Appendix (i) Manual cover and spine (hard copy format) labelling

The front cover and the spine of the manuals must provide easy reference to relevant project information so that the end user can source appropriate information from the correct manual.

Key information for the labels consists of:

- Project Number
- Document Reference Number
- Project Title
- Building Name
- Type of Manual
- Contractor details
- Date of Issue
- Schedule of information contained within that specific volume ie Section Number and Headings (hard copy only)

For the hard copy manual, the front cover and spine text are to be produced on white card to ensure text is readable. Refer overleaf in Figures 1.1, 1.2, 1.3 for sample cover and spine labels

An editable version of the templates in Word format is available upon request from the Estates Records & Archives Officer.

Figure 1.1: Sample Cover

IMPERIAL

Operation and Maintenance Manual

Project Title:

Location: *insert building name and campus*

Electrical Services Manual

Practical Completion	:	insert date
Project Number	:	example RSM2501
Document Reference	:	example B/RSM/018
Volume	:	example One of Two

M&E Contractor

Company Name

Address line 1

Address line 2

Address line 3

Tel: (...)

Figure 1.2 Sample Spine label (hard copy manual only)

IMPERIAL	Electrical Engineering, South Kensington Campus Level 5 Digital Learning Laboratory		Section 1: General Description of Installation Section 2: Health & Safety Information Section 3: Plant Data Schedules Section 4: Test Certificates & Commissioning Data Section 5: Manufacturer's Literature <i>[complete this section for manuals consisting of more than a single volume: to be edited as applicable to the volume contents]</i>	Volume 1 of 2
	Operating and Maintenance Manual Electrical Services Manual	Project Number: EENG2307 Document Reference: B/EENG/041		

O&M | Manual Template