Employer's Information Requirements (EIRs) for University of Cambridge
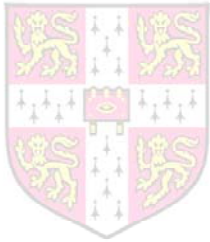
University of Cambridge
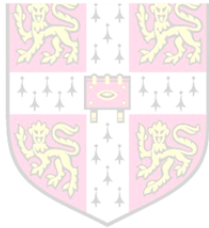Estate Management
Greenwich House
Madingley road

Cambridge
CB3 0TX
United Kingdom

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Insert Project Here

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University of Cambridge

BIM Document Suite

1

Employers Information
Requirements (EIRs) for
University of Cambridge

Originator Name
Title

University of Cambridge
Estate Management
74 Trumpington Street
Cambridge
CB2 1RW
United Kingdom

t: *Insert phone number here*
e: *Insert email address here*
w: *Insert company web details here*

UNIVERSITY OF CAMBRIDGE

Insert Project Name

1: Employer's Information Requirement (EIR):

To provide an outline definition of Employers Information Requirements (EIRs) to support the implementation of Building Information Modelling (BIM)

4

CIC/BIM Pro
Building Information
Model (BIM) Protocol
University of Cambridge

Org/name/name
Title

University of Cambridge
Estate Management
74 Trumpington Street
Cambridge
CB2 1RW
United Kingdom

t: *Insert phone number here*
e: *Insert email address here*
w: *Insert company web details here*

UNIVERSITY OF CAMBRIDGE

Insert Project Here

2: BIM Capability Assessment:

Demonstrate supplier competency to deliver BIM Projects.

2

Capability Assessment
Form
University of Cambridge

Originator Name
Title

University of Cambridge
Estate Management
74 Trumpington Street
Cambridge
CB2 1RW
United Kingdom

t: *Insert phone number here*
e: *Insert email address here*
w: *Insert company web details here*

UNIVERSITY OF CAMBRIDGE

Insert Project Here

4: CIC BIM Protocol:

The Protocol identifies the Building Information Models that are required to be produced by members of the Project Team. To be appended to appointment contracts.

3

BIM Execution Plan
Insert Project Name

Building Information Modelling (BIM)
Execution Plan

For University of Cambridge

University of Cambridge
Estate Management
74 Trumpington Street
Cambridge
CB2 1RW
United Kingdom

t: *Insert phone number here*
e: *Insert email address here*
w: *Insert company web details here*

UNIVERSITY OF CAMBRIDGE

Insert Project Name

3: BIM Execution Plan (BEP):

The Building Information Modelling Execution Plan (BEP) is a core approved document which defines the BIM strategy and processes for the successful completion of a Level 2 BIM project.

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Purpose of document

University of Cambridge require all project stakeholders to work to BIM (Building Information Modelling) Level 2 as defined by PAS-1192-2:2013. The fundamental principles for Level 2 information modelling, defines the process as *"Single source platform software, with a single external relational database, and associated design analysis software that are fully interoperable."*

The intent of this document is to provide an outline definition of Employers Information Requirements (EIRs) to support the implementation of Building Information Modelling (BIM) on *Insert Project Here*.

This document outlines the following to support collaborative processes and produce the information required by **University of Cambridge** during design, construction and handover:

- Responsibilities

- Requirements and processes

- Best practices

- Methods and protocols

- Relevant business processes

- Supporting software requirements

The University requires information to fulfil the following purposes:

- A full registration of assets is required to support accurate auditing and reporting. Every identifiable internal or external space shall be captured within the BIM and/or associated data sets in addition to every distinct floor containing them. Zones shall also be identified within the COBie deliverable.

- Facility, Floors (regions), Zones and Spaces (locations) shall be documented with their net and gross areas. The method of measurement used shall be documented on the Facility sheet of the COBie deliverable. This is to enable accurate space planning and to ensure that the complete asset meets the intended purpose.

- Information necessary for the normal operations of the facility shall be provided to support the facility operators and the **University of Cambridge** to anticipate costs of operations.

This document should be considered for use to support information provided for further consultant and contractor appointments and define requirements for supplier deliverables. For additional project phases and further work stages outside of the scope of this document, this information may be superseded, but fundamental standards and naming / data structures should be continued throughout the project.

No part of this document should be construed as preventing the Consultants, Specialist Subcontracts and Specialist Suppliers from sharing their respective models at any time and in any format if this is to be helpful to project progress and co-ordination.

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Contents

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Rev	Originator	BIM Approved	Date
1.0	C Hinton	BIM Strategy Group	26/06/15
1.1	C Hinton	Amended MPDT	04/09/15
1.2	C Hinton	Amended 4.4	10/12/15
1.2.1	C Hinton	EM Address Change & Remove Omniclass std	03/02/16
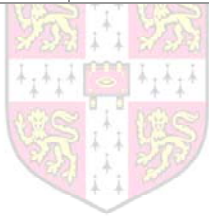
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1   Project information

General
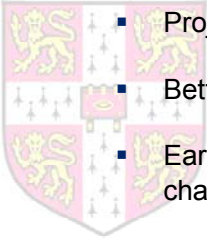
Employer	University of Cambridge
Project name	*Insert Project Here*
Short project description	
Project address	
Correspondence address	
Plan of Work	RIBA Plan of Work 2013

Table 1: General Project Information

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2 Strategic Priorities

It is essential that the project team comply with **University of Cambridge**'s requirements. **University of Cambridge** has identified the following strategy priorities:

- Project delivery of the highest quality

- Better informed decision making by **University of Cambridge**

- Earlier and more efficient reporting of developing design information allowing key changes to the design to be made earlier, at less cost

- Improved multidisciplinary design coordination and reduced variation costs during construction

- Visual communication and optimisation of construction phases

- Visual communication and optimisation of construction sequencing

- Improved cost certainty and predictability

- Improved accuracy and consistency of design information

- Improved health and safety on site and during operation

- Models and information which can be used to support operation and maintenance of the facility beyond practical completion

- Asset information delivery of the highest quality

- More efficient visual communication of the design intent as this develops

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3 Applicable Standards

In order to establish a consistent approach to collaboration, **University of Cambridge** requires the core project team and its associated supply chain to adopt the following standards:

M = Mandatory R = Recommended		Application											
Standards		Guidance	Collaboration	Project stages	File naming	Object naming	Drawing	Classification	LOD	CDE	Costing	COBie	Contracts
	BS1192:2007				M	M	M	M		M			
	PAS1192-2:2013	M	M										
	PAS1192-3:2014	M											
Industry	PAS1192-4:2014	R										M	
	PAS1192-5:2015	R											
	NBS BIM Toolkit Level of Definition and classification	R					R	R	R				
	COBie-UK 2012							M				M	
	Uniclass 2015 (NBS Toolkit)							R					
	BS8541-1:2012					M							
	BS8541-2:2011					M							
	BS8541-3:2012					M							
	BS8541-4:2012					M							
	BS8541-5:2015					M							
	AECUK BIM Protocol				M	M							
	CIC/BIM INS									M			
	CIC BIM protocol		M										R
	RICS NRM1: New Rules of Measurement										M		
Bespoke	BIM Execution Plan (BEP)	M	M	M	M	M			M	M			
	UoC Space Measuring Guide	M					M						
	UoC Space Numbering Convention	M					M						

Table 2: Applicable standards

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Requirements for development of geometry definition and model usability are mapped against project work stages to support the project deliverables and support BIM uses.

These requirements are to be understood by all suppliers and incorporated in the post-contract BEP. Interpretation and meaning of Level of Definition is in accordance with the NBS Toolkit LOD Specification.

4   Technical

This section establishes technical information requirements, including software, data drop contents and Level of Definition.

4.1   Software platforms

The agreed software for the delivery of the BIM requirements will be listed in the Information Exchange Schedule of the Pre-contract BEP. This list should not be viewed as definitive or restrictive. **University of Cambridge** may request software versions to be updated at any point during this project. Any update or change in software versions is to be agreed by **University of Cambridge** and the project team.

University of Cambridge and the BIM leader may define version and software platform for collaboration and facilities management software.

For coordination, clash review and comment it is proposed that the following software is to be implemented:

- Navisworks Manage 2015

- Navisworks Freedom 2015

- Solibri Model Checker

- Solibri Model Viewer

Other systems may be considered but must be approved by **University of Cambridge** and the BIM leader. Post contract BEPs must communicate the software platforms to be implemented and provide an outline of how they will interoperate with the software listed above.

4.2   Data exchange protocols

The use and responsibility, format and frequency of shared information, should be understood by all project team members. It is a key requirement of **University of Cambridge** that asset information developed in the design and construction phases of the programme can be incorporated into a Computer-Aided Facilities Management (CAFM) system.

4.3   Asset Information Model (AIM)

To support the development of an AIM, it is mandatory that for each data exchange and at handover, the following information will be provided from the same dataset:

- Design authoring models to be utilised for design and analytical functions

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- The method of data exchange will be COBie-UK-2012 export v2.4

- 3D Industry Foundation Classes (IFC) 2x3

- PDF files

Any inconsistencies in data are to be addresses by the originating consultant or contractor. Responsibilities for providing this information are to be recorded in the Building Information Modelling Execution Plan (BEP).

For clarity and consistency, Industry Foundation Classes (IFC) export settings are to be recorded in the project Building Information Modelling Execution Plan (BEP) and must be consistent throughout the project.

4.4 Asset Information Requirements (AIR)

At handover, **University of Cambridge** requires asset information to be delivered as part of the information model. Object property sets are to be further defined by the BIM Leader and incorporated in the project Building Information Modelling Execution Plan (BEP).

AIM requirements are defined in **Appendices A, B and C**.

As per BS 1194-4:2014 (Draft) the integrity of data, included within the COBie schema, should be ensured as follows:

- Every hosted component should be assigned to at least one Space.

- Every hosted component should be assigned to one Type.

- Every hosted component should be assigned to at least one System.

- Every Space should be assigned to at least one Zone.

- Every reference to other sheets should be valid.

- Every reference to Pick List enumerations and classifications should be valid.

- Enumerations specified in the Attributes and Pick Lists should be adhered to.

To enable consistency, all COBie deliverables should have continuity with earlier deliverables and shall be developed cumulatively to enable comparison and validation. Deliverables should re-use the unique asset names defined in earlier deliverables and external identifiers, such as Global Unique Identifiers (GUIDs) are to be maintained.

4.5 System performance

To support access and use of information for all parties, the following guidelines must be met:

- Federated models when shared should not exceed 500mb

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- To improve performance, files must be optimised to reduce unnecessary memory usage

It is further suggested that where possible individual models should not exceed 150mb. Suppliers unable to process a file of this size should seek to address this immediately and inform the BIM leader

4.6 Trial

To trial the exchange of BIM data, the Lead Designer will facilitate the initial sharing and linking of project models over Common Data Environment (CDE). This initial process will help identify any unknown and unique issues with collaboratively exchanging information amongst the appointed suppliers, including model location to reduce any errors or wasted time later in the project.

4.7 Coordinates

Base project reference points are to be defined by the Lead Designer.

To keep coordinates consistent, set-out information shall be maintained throughout all models, and to eliminate compatibility issues arising from discrepancies between coordinate systems, all project files should share the same Survey Point and Coordinates.

The project team shall work on the models set up with identical locations and origin coordinates. The following outlines the procedure for establishing Model Location and Origin taking in to account location and weather data to enable energy analysis where required as a deliverable:

- Building and/or site location on the architectural model shall be set at the correct longitude and latitude or defined reference point.

- True north of the building and/or site location on the architectural model shall also be set correctly. This is to be consistent with the existing site model.

- All the models produced in Revit shall use the "shared coordinates" system.

- Consultants will share information in Industry Foundation Classes (IFC) format and 3D coordination exchange formats to ensure that information is correctly and consistently aligned. The agreed process is to be documented in the project Building Information Modelling Execution Plan (BEP) to provide consistency of methodology.

4.8 Building Elements

The elements to be covered by the geometric and non-geometric BIM include but are not limited to those shown in **Appendix D.**

4.9 Level of Definition

Requirements for the development of geometry definition and model usability need to be mapped against project work stages to support the project deliverables and support BIM uses.

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These requirements are to be understood by the project team and appointed suppliers and incorporated in the post contract Building Information Modelling Execution Plan (BEP). Interpretation and meaning of Level of Definition is in accordance with **Appendix E.**

4.10   Geometric Information Requirements

The level of development required at each project work stage (RIBA Plan of Work) and the party responsible for delivering that information is defined in **Appendix F**. This must be strictly adhered to unless explicitly agreed by all relevant parties including the BIM Leader and **University of Cambridge**.

In future work stages, any amendment to Level of Detail (LOD) requirements must be explicitly agreed by all members of the project team to the benefit of the project.

Stakeholders will ensure that the Model Production Delivery Table (MPDT) is in alignment with the project design responsibilities matrix and provide comments to this effect.

4.11   Non-Geometric Information Requirements

The following is defined in **Appendices A, B and C.**

▪   COBie requirements (Matrix)

▪   Basic parameter requirements

It is important that all stakeholders familiarise themselves with the parameter requirements and ensure that BIM object templates and component lists take into consideration the data type required.

4.12   2D Graphical Output

Information cross sectioned from the model will also be shared using traditional drawing conventions. Drawings, renders, reports and schedules must adhere to the following:

▪   Information optimised for the purpose of the intended use

▪   Policy for minimum detailing

▪   Minimise repetition of illustrated details and no duplication of drawings

▪   Standards such as BS1192-2007 should be adhered to.

4.13   Area and Quality Calculation

Standards for accommodation schedules agreed by the designer, cost consultants employer and **University of Cambridge** shall be agreed at the outset. Data shall be extracted from the model directly with no editing of naming and values in other software. Area scheduling shall adhere to the following terms:

▪   GIA - Gross Internal Area

▪ GEA – Gross External Area

▪ NAA – Net Assignable Area

Area data reported from the model should be current, consistent with the design intent and in alignment with the terms above using definitions from the University Space Measuring Guide **(Appendix G)** and Space Numbering Convention **(Appendix H).**

4.14   Model authoring for use with Cost Management software
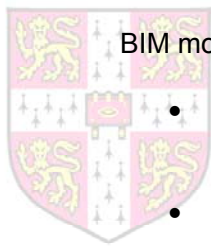
BIM model authors will adhere to the following:

- All items with cost significance must be modelled as an instance of a 3D object.

- Building elements must be authored using the correct building category, or Industry Foundation Classes (IFC) mapping settings to allow accurate Industry Foundation Classes (IFC) type mapping during export processes.

- In order to differentiate between the construction budget and the project budget, equipment should be categorised within the model as below:

  o Group 1 – items supplied and fixed by the main contractor under the building contract, which are funded by the construction budget

  o Group 2 – items free-issued by the University, but installed by the main contractor under the building contract

  o Group 3 – items supplied and installed directly by the University, but which may require space / builderswork / services connections installed by a main contractor under the building contract

  o Group 4 – items supplied and installed directly by the University which do not have any specific requirements for services to be installed by a main contractor under the building contract

- Elements and layered BIM objects must be modelled in accurate locations, with accurate dimensions in alignment with design intent.

- Model error logs should be regularly checked and issues should be resolved (e.g. duplicate objects).

- Layered or composite BIM objects should comprise of correct materials in line with the design intent, or should be indicated as concept or TBC.

- BIM objects are to have the agreed property set associated with them, and parameters should be filled in at the required stage. At later stages cost data must be produced using Level 3 of the NRM 1 measurement codes. Exact details should be discussed and agreed with **University of Cambridge**, the cost manager and other data consumer's in advance.

- Room objects (where applicable) will contain accurate data regarding finishes, room function, name and intended occupancy. See **Appendix I** for space uses.

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- The **published** model shall at all times be an accurate representation of the proposed design. Tolerances to be agreed with the **University of Cambridge** and the BIM Leader and recorded in the post-contract BEP.

4.15   Geometric Quality Assurance and Quality Control

Model files Control

Models will not be considered suitable if not deemed a Virtual Design and Construction (VDC) model that is a computer generated 3D model of the proposed project.

This requires:

- All construction items to be represented in 3D as defined in the Model Production Delivery Table (**Appendix F**).

- Final finishing items, such as skirting's, architraves, grouting and similar may be excluded where construction is not compromised or there is nominal cost significance.

- Drawing sheets shall be created within the modelling environment to ensure accuracy and coordination; all sheets must remain in the BIM.

- The model is to be produced in line with agreed Model Production Delivery Table (**Appendix F**) meeting the Level Of Definition requirements.

General Requirements:

- All project Building Information Models shall comply with this document.

- A Master Delivery Information Plan should cover all BIM work at all stages of the project unless a formal instruction is issued directly by the Employer.

- It is assumed that all stakeholders have an appropriate level of knowledge required to operate all software listed in this document to achieve the Employers requirements. If unsure, please ask the BIM Leader for assistance.

4.16   Spatial Integrity

The following rules shall apply to the model spatial integrity:

- Space Validation – There shall be no space gaps. Bounding boxes used to represent room and zone spaces shall match with architectural requirements and data values.

- All walls shall be properly joined to prevent "space leaks" in areas defined by enclosing walls. Bounding boxes shall not conflict.

- Spatial data shall be generated and associated with bounding elements (walls, doors, windows, floors, columns, ceilings).

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4.17 Material Integrity

Representations of model component's material specifications and scopes shall be modelled correctly and accurately in respect to the actual physical materials of the components to allow for material take-off and accurate design calculations. Additionally:

- Modelling should follow the method of construction e.g. internal walls must not span across structural elements.

- Once models from other disciplines are available they must be used as linked files, the objects rendered obsolete are to be deleted. **Elements must not appear in more than one model.**

4.18 Mechanical, Electrical and Plumbing (MEP) Systems

- MEP systems will comply with the Project's requirements, with no deviations.

- The systems list shall be agreed, and the model template produced and adhered to at all times, and only amended in agreement with all. BIM Leader to discuss with University FM. In the absence of specific requirements, **BISRIA** should be used as guidance.

4.19 BIM Validation Prior to Model Sharing

Checks for validation of the BIM model data prior to sharing:

- All extraneous drawings sheets (i.e. those deemed to not be a deliverable) have been removed from the BIM.

- Model or AutoCAD Xrefs have been audited and purged.

- File format and naming conventions conform to this document and remain constant for the life span of the project.

- Data segregation conforms to project requirements.

- 3D model and 2D drawings are up to date and that the 2D information has been derived from the 3D model.

- All objects in a 3D default view must be made visible.

- Any native model linked reference files should be retained in the central file to allow regeneration of the master model as required. Shared models should have the linked reference files removed. Any other associated data required to load the model file must be made available.

- All ownership of project work sets has been relinquished.

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- All models to be using the sharing coordinate system defined at the outset of the project.

- Check the Area and Volumes Computations:

  Volume Computations is set to 'Areas and Volumes', and Room Area Computation set to 'at wall finish'.

4.20 Data Quality Assurance and Quality Control

The project data QA/QC procedure will be as detailed in BS 1192-4:2014 as per the overview in figure 1.
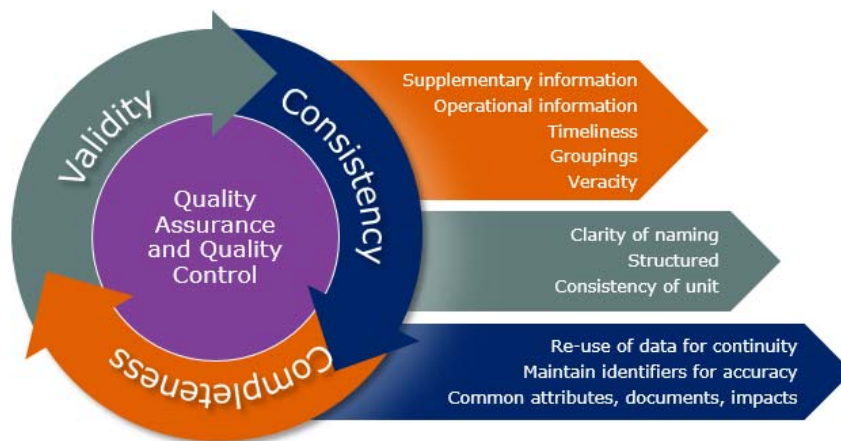
Figure 1: Principles of Quality Assurance and Quality Control

4.21 Training

University of Cambridge are not responsible for providing training with regards to the BIM authoring tools used by suppliers. It is a requirement that all individual parties are fully trained on the authoring tools prior to project engagement.

5 Competence

5.1 BIM specific Capability Assessment for suppliers

Suppliers will be assessed based on their response to the Capability Assessment Form, as well as the submission of proposals to meet the requirements of this Employers Information Requirement (EIR) document.

5.2 Knowledge and Skill Requirements

BIM Objectives and Processes

Suppliers shall demonstrate knowledge of the underlying processes required to support BIM uses. This will involve communicating and recording intended methodology which should be shared with the BIM leader for confirmation prior to implementation.

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All project team members are responsible for procuring training within their own organisation, and are required to undertake sufficient training to efficiently meet the requirements of the project.

Software

Experience, knowledge and skill of the appointed suppliers must be sufficient to competently undertake processes required to achieve the required BIM uses.

If suppliers fail to meet these requirements they will improve skill sets or recruit additional technical staff before implementing processes.

5.3 Resource Requirements

Hardware and Technology

Team members are required to utilise workstations which meet system and software requirements of the BIM software tools required.

BIM Content

If relevant, project team members will provide details of their in-house object library to include the following:

- Level Of Definition management

- Data Property Sets

- Software versions

5.4 Changes to tender documentation

In order to facilitate the effective use of BIM on this project, the CIC BIM protocol may be appended to any appointment documentation.

6 Management

6.1 Planning of work and data segregation

Information should be managed in accordance with the processes described in PAS1192-2:2013, PAS1192-3:2014, BS1192-4:2014 and BS1192:2007. **University of Cambridge** have specified the use of the work stages detailed in the RIBA Plan of Work.

The Lead Designer is to work with **University of Cambridge** and the BIM leader to establish project segregation, e.g. Blocks, zones and phases. The agreed approach is to be documented in the post-contract Building Information Modelling Execution Plan (BEP).

Each originating supplier should develop and fully understand the method for developing BIMs to coordinate and support the outputs required. It is advised that models are segregated into multiple linked models, and the strategy for this is to be incorporated into the project Building Information Modelling Execution Plan (BEP).

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In the first instance, suppliers are advised to author models using generic BIM objects suitable for 3D coordination and clash detection.

The following strategies should be considered to segregate models effectively:

- BIMs shall contain no more than one building, disregarding linked context and container models.

- BIMs shall contain information solely produced by the originating design consultant.

- BIMs shall contain information from no more than one design discipline.

- If a BIM breaches a file size of 200mb consultants should consider segregating the model to reduce individual file sizes. If it is deemed reasonable by the project team (including cost managers and **University of Cambridge)**, this limit may be increased.

6.2   Roles and responsibilities

A Master Information Delivery Plan must be included within the BEP identifying what and when graphical and non-graphical information is required and who is responsible.

Responsibilities of design input within the design team must be defined within the Model Production Delivery Table (MPDT).

General design coordination is the responsibility of the BIM Leader. Should the design team be novated, it will be their responsibility from that point onwards to execute and coordinate the design under a novation agreement, whilst the Main Contractor's responsibility will be to deliver the coordinated design after novation.

BIM roles and responsibilities are described in **Appendix J**. Please refer to the current version of the project execution plan for overall scopes of services.

The project team needs to be aware of the extent of the Facilities Management (FM) measures commissioned by **University of Cambridge** for the design and construction to be relevant and handed over successfully to Facilities Management (FM).

All stakeholders shall utilise BIM information distributed via the Common Data Environment (CDE) to validate the BIM at key project stages. The following should be reported to the BIM Leader immediately upon discovery:

- Discrepancies in the model which may cause inaccuracies

- The validity of the data structure within the model and adherence to the data structure defined in the project Building Information Modelling Execution Plan (BEP). COBie-UK-2012 schema is to be implemented.

- Instances where out of date information is contained within any of the information models.

6.3   Document naming protocol

Model naming conventions should be in accordance with AEC (UK) BIM Protocols v2.0 and BS1192-2007.

6.4 Objects

All newly authored BIM objects will be produced and shared by project team members. Object standards are to be in alignment with BS8541 (applicable section). Object property sets are to be in accordance with the developing project data structure.

6.5 Common data environment (CDE)

Stakeholders are responsible for storing and maintaining a copy of all project information in a secure stable location within their own organisation and will make information available to the project team and **University of Cambridge** over the Common Data Environment (CDE). The Employer will have access to native and exchange BIM files at any point. Models will be issued within three working days of an RFI requesting this information.

The Common Data Environment (CDE) for this project, file naming and location structure will be confirmed within the Building Information Modelling Execution Plan (BEP). The folder structure within the Common Data Environment (CDE) will be in line with that detailed in PAS1192-2:2013.

6.6 Security

All project information is to be treated with confidence unless explicitly agreed with **University of Cambridge**. All supply chain organisations are required to adopt this policy. All BIM information will be exchanged in the Common Data Environment (CDE).

To support security and accessibility of information, folder locations and upload purposes must be strictly adhered to. Any amendments to the naming or structure of the Common Data Environment (CDE) workspace must be explicitly agreed with the project team and **University of Cambridge**, including the Information Manager.

6.7 Building Information Modelling (BIM) uses

BIM uses have been categorised by the client, uses identified as High should be fulfilled for *Insert Project Here*. Moderate and Low uses that are to be implemented on this project should be agreed through team collaboration with **University of Cambridge.**

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High Priority	Moderate Priority	Low Priority
3D design coordination	Assurance and data validation	3D control and planning
Asset management	Bespoke BIM object library authoring	Disaster planning
Building systems analysis	Construction sequencing and simulation	Existing conditions modelling
Cost estimation	Construction system design	Lighting analysis
Cost management	Data classification	Pedestrian simulation for hazard and dwell time
Energy analysis	Design (BIM) authoring	Possessions and permit to work
Planned maintenance	Design reviews	Spatial planning and optimisation
	Digital fabrication	Structural analysis
	Drawing generation	
	Field management tracking	
	Record modelling	
	Site analysis	
	Space management and tracking	
	Sustainability evaluation	
	Visualisation and communication	

Table 3: BIM use priorities

6.8   Process mapping

As a minimum standard, the **University of Cambridge** requires details of collaboration processes that will be undertaken in the production of the BIM, to address required BIM uses. Provision of information from suppliers should be sufficient to demonstrate competence and capability.

- Form of exchange and sharing

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- Extent of proposed model – Level of Definition and ancillary information inclusion.

  Anticipated Level of Definition requirements have been defined in the Model Production Delivery Table (MPDT) (**Appendix F).** Suppliers are to review Level of Definition (**Appendix E)** and geometry specification within the Model Production Delivery Table (MPDT) to confirm that they are sufficient to support their process of carrying out the required BIM uses.
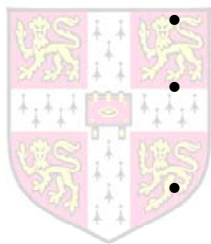
- Frequency of collaboration and information exchange

- Details of proposed model review workshops and other collaborative working practices

- Details of proposed method of collaboration with stakeholders / Employer utilising the model

- Agreed processes will be defined in the Building Information Modelling Execution Plan (BEP).

The post contract BEP shall provide a high level overview of their methodology for collaborating to coordinate BIMs.

6.9 Health and safety and Construction Design Management (CDM) compliance

University of Cambridge requires details of how BIM information will be utilised to support the employer's and supplier's H&S obligations to demonstrate capability and experience. Suppliers are required to submit the following information:

- Overview of key H&S deliverables against each work stage

- Confirmation on how deliverables will be shared and accessed

- Requirements for disaster planning

- Approach to design authoring and model interrogation

Information is to be made available to the Principal Designer (PD) for identifying residual risks at the design stage and monitored throughout the construction stages.

Designers and the appointed PD are obligated to inform of potential hazards/risks etc. This should be communicated within the model where feasible and communicated via the Common Data Environment (CDE).

The main contractor will be responsible for acquiring this information. This list is not exhaustive, further definition will be provided by the PD and defined in the Building Information Modelling Execution Plan (BEP).

6.10 Delivery strategy for asset information

Asset information is to be delivered in COBie-UK-2012 format and 3D Industry Foundation Classes (IFC) 2x3.

As a minimum standard, the Employer requires proposals to be developed and documented in the Building Information Modelling Execution Plan (BEP) setting out how best to deliver asset information into the Computer-Aided Facilities Management (CAFM) system, which is to be defined by the Employer.

Appendix A (COBie Requirements and Responsibilities), **Appendix B** (Data Structure Schedule), **Appendix C** (Asset Type Codes) and **Appendix D** (Level of Definition) requirements identify the data, geometry and associated documentation required to be included as part of the asset management strategy.

These appendices make reference to COBie data requirements, specific dataset requirements for building and engineering systems, health and safety information and operations & maintenance information. All commissioning information should also be included in order to develop a full auditable database of asset information.

The main contractor should also provide a strategy for ensuring that information can be accessed efficiently during operations.

7 Commercial

7.1 Master Programme

The main elements of the Master Programme should be developed to include BIM processes, design, procurement, construction, commissioning and completion. The project team is required to adhere to this programme and commit resource as necessary to achieve the required dates.

Detailed programmes need to be realised within the constraints set by the Master Programme. This includes a design programme, a construction programme, an operation programme and a BIM implementation programme.

7.2 BIM Implementation Programme

The BIM implementation programme must be created by the BIM Leader, to illustrate the main activities associated with initiating and monitoring BIM processes referred to in **Appendix K**.

- Coordinate all technical discipline and trade specific BIM activity within their organisations.

- Manage BIM uses assigned to their organisation

- Coordinate any BIM related issues with the rest of their discipline team

- Support their organisation in the use of BIM tools

- Create discipline specific BIM content

- Coordinate discipline specific clash detection and resolution activities

- Export their own organisation's model for inter-disciplinary clash detection

- Coordinate BIM training as required

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7.3 Information exchange and data drop management

Key data drop dates should be outlined in a master information delivery plan. On the agreed dates all parties will submit the data as per **Appendix L** based on models which will be coordinated by the Lead supplier and clash detected.

University of Cambridge and the Information Manager will use data drops to validate:

- The progression of the design and design information

- Compliance with performance requirements set out in contractual agreements

- The development, completeness and validity of Facilities Management (FM) data and other data as specified

- The Lead Designer will agree protocols with the Information Manager to confirm that the model is current and all parties are working to the latest model.

- Actions will be disseminated by the Lead Designer to all parties via Common Data Environment (CDE) and errors or noncompliance will be corrected as a priority with agreed timescales.

- In addition to the information exchange dates the parties will download the BIM for coordination and formal review.

- Some data drops, as defined in **Figure 2**, will be used as information support for Gateway Employer reviews, leading to the instruction to proceed to the next stage if the information is satisfactory.

- To this end key 'plain language questions' referred to in **Appendix M** will be presented at each data drop to ensure that the requisite data and information is sufficient to answer each question in respect of BIM and Soft Landings.

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Figure 2: Data drops and gateway points through the project lifecycle.
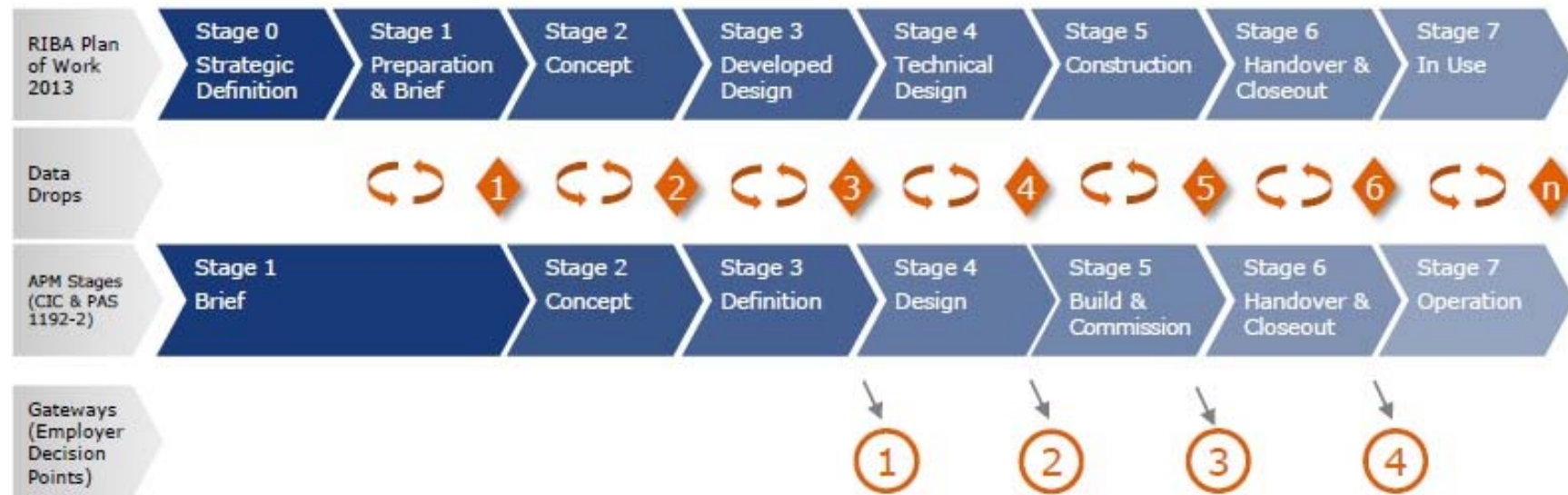
8　Glossary of Abbreviations and Terms

8.1　Abbreviations

BEP　　　BIM Execution Plan

BIM　　　Building Information Modelling

BISRIA　Building Services Research and Information Association

BWM　　BIM workgroup meeting

CDE　　　Common Data Environment

EIR　　　Employer Information Requirement

IFC　　　Industry Foundation Classes

LOD　　　Level Of Detail

LOI　　　Level of Information

MPDT　　Model Production Delivery Table

WIP　　　Work In Progress

8.2 Glossary of Terms

Term	Definition
4D	A 3D representation of an asset with the element of time included to enable simulations.
5D	A 3D representation of an asset with the element of time and cost included to enable simulations, commercial management and earned value tracking to take place.
Building information modelling execution plan (BEP)	Plan prepared by the suppliers, facilitated by the Employer or the Employer's BIM representative to explain how the information modelling aspects of a project will be carried out
Building information modelling (BIM)	Process of designing, constructing or operating a building or infrastructure asset using electronic object-oriented information
CIC Scope of Services	Multi-disciplinary scope of services published by the Construction Industry Council (CIC) for use by members of the project team on major projects
COBie (Construction Operation Building information exchange)	Structured facility information for the commissioning, operation and maintenance of a project often in a neutral spread sheet format that will be used to supply data to the employer or operator to populate decision-making tools, facilities management and asset management systems
Common data environment (CDE)	Single source of information for any given project, used to collect, manage and disseminate all relevant approved project documents for multi-disciplinary teams in a managed process. This is commonly a cloud based SaaS solution synchronised with party servers to host the information model
Data	Information stored but not yet interpreted or analysed
Design intent model	Initial version of the project information model (PIM) developed by the design suppliers

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Document	Information for use in the briefing, design, construction, operation, maintenance or decommissioning of a construction project, including but not limited to correspondence, drawings, schedules, specifications, calculations, spread sheets
Drawing	Static, printed, graphical representation of part or all have a project or asset
Employer	Individual or organization named in an appointment or building contract as the employer
Employer's information requirements (EIR)	Pre-tender document setting out the information to be delivered, and the standards and processes to be adopted by the supplier as part of the project delivery process
Graphical data	Data conveyed using shape and arrangement in space
Level of Definition	Collective term used for and including "level of model detail" and the "level of information detail"
Master information delivery plan (MIDP)	Primary plan for when project information is to be prepared, by whom and using what protocols and procedures, incorporating all relevant task information delivery plans
Pre-contract BEP	The pre-contract BEP is to demonstrate the supplier's proposed approach, capability, capacity and competence to meet the EIR. It is utilised prior to the appointment of any stakeholder.
Post-contract BEP	The post-contract BEP is the document defining standard methods and procedures adopted during the contract in order to meet the objectives and requirements set forth in the EIR. It is utilised following the appointment of project stakeholders and in particular the main contractor.
Project implementation plan (PIP)	Statement relating to the suppliers' IT and human resources capability to deliver the EIR

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Standard method and procedure (SMP)	Set of standard methods and procedures covering the way information is named, expressed and referenced
Volume	Manageable spatial subdivision of a project, defined by the project team as a subdivision of the overall project that allows more than one person to work on the project models simultaneously and consistent with the analysis and design process
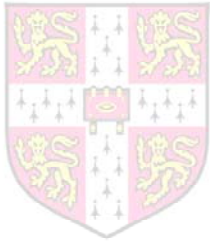
APPENDIX A   COBie requirements and responsibilities

It is the responsibility of all object authors to ensure that the following parameter headings are attributed to the object being authored. This is to be undertaken irrespective if the data for that parameter field is required at that stage or not. This is to enable data to be included at pre-defined stage later in the project cycle.

Parameter Heading	Parameter Heading	Parameter Heading
AccessibilityPerformance	GrossArea	ReplacementCost
AreaMeasurement	Height	RoomTag
AreaUnits	InputRating	SerialNumber
AssetIdentifier	InstallationDate	Shape
AssetTypeCode	LinearUnits	SiteDescription
Barcode	Manufacturer	SiteName
Category	Material	Size
CodePerformance	ModelLabel	SpaceNames
Colour	ModelNumber	SpaceUse
ComponentName	ModelReference	SustainabilityPerformance
Constituents	Name	TagNumber
CurrencyUnits	NetArea	Type
Description	NominalHeight	TypeName
Duration	NominalLength	UsableHeight
Elevation	NominalRotationSpeed	VolumeUnits
ExpectedLife	NominalVoltage	WarrantyDescription
ExtSystem	NominalWidth	WarrantyDurationLabour
ExtObject	OutputRating	WarrantyDurationParts
ExtIdentifier	Phase	WarrantyDurationUnit
Features	PointOfContact	WarrantyGuarantorLabour
Finish	ProjectDescription	WarrantyGuarantorParts
Grade	ProjectName	WarrantyStartDate

The table below illustrates when data for a particular parameter is required. At each data drop it is the duty of the responsible party to validate the data as per the agreed QA/QC procedure. Responsibility for data drops is transferred to the contractor at preferred bidder award.

As per the instructions in the main EIR when activity is sub-contracted it is the responsibility of the sub-contracting organisation to articulate the responsibility set forth in this document.

The data set requirement outlined below should be completed, at each relevant stage, for every element authored in line with the Data Structure Schedule in **Appendix B**. Special care should be taken to ensure that the maximum characters and data type are adhered to, in order for successful cross-mapping from COBie to FM parameters.

Generally, for each work-package or system, and in accordance with the MTDP, data drops are aligned with Level of Definition and RIBA stages.

From RIBA stage 4 onwards the main contractor will be responsible for the integrity and completeness of the COBie data set requirements.

Note: Highlighted fields should be exported automatically from the authoring software.

RIBA 2013 Work stage COBie Data Drop		1 1	2 2	3 3	4 4	5 5	6 6	7 n
Responsibility		ALL	ALL	ALL	CON	CON	CON	FMA
Contact sheet								
COBie field	Type							
Email			✓	✓	✓	✓	✓	✓
CreatedBy			✓	✓	✓	✓	✓	✓
CreatedOn			✓	✓	✓	✓	✓	✓
Category			✓	✓	✓	✓	✓	✓
Company			✓	✓	✓	✓	✓	✓
Phone			✓	✓	✓	✓	✓	✓
ExtSystem			✓	✓	✓	✓	✓	✓
ExtObject			✓	✓	✓	✓	✓	✓
ExtIdentifier			✓	✓	✓	✓	✓	✓
Department			✓	✓	✓	✓	✓	✓
OrganizationCode			✓	✓	✓	✓	✓	✓
GivenName			✓	✓	✓	✓	✓	✓
FamilyName			✓	✓	✓	✓	✓	✓
Street			✓	✓	✓	✓	✓	✓
PostalBox			✓	✓	✓	✓	✓	✓
Town			✓	✓	✓	✓	✓	✓
StateRegion			✓	✓	✓	✓	✓	✓
PostalCode			✓	✓	✓	✓	✓	✓
Country			✓	✓	✓	✓	✓	✓
Faculty sheet								
COBie field	Type							
Name			✓	✓	✓	✓	✓	

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RIBA 2013 Work stage COBie Data Drop		1 1	2 2	3 3	4 4	5 5	6 6	7 n
Responsibility		ALL	ALL	ALL	CON	CON	CON	FMA
CreatedBy			✓	✓	✓	✓	✓	
CreatedOn			✓	✓	✓	✓	✓	
Category			✓	✓	✓	✓	✓	
ProjectName			✓	✓	✓	✓	✓	
SiteName			✓	✓	✓	✓	✓	
LinearUnits			✓	✓	✓	✓	✓	
AreaUnits			✓	✓	✓	✓	✓	
VolumeUnits			✓	✓	✓	✓	✓	
CurrencyUnits								
AreaMeasurement	Geometric		✓	✓	✓	✓	✓	
ExternalSysem			✓	✓	✓	✓	✓	
ExternalProjectObject			✓	✓	✓	✓	✓	
ExternalProjectIdentifier			✓	✓	✓	✓	✓	
ExternalSiteObject			✓	✓	✓	✓	✓	
ExternalSiteIdentifier			✓	✓	✓	✓	✓	
ExternalFacilityObject			✓	✓	✓	✓	✓	
ExternalFacilityIdentifier			✓	✓	✓	✓	✓	
Description			✓	✓	✓	✓	✓	
ProjectDescription			✓	✓	✓	✓	✓	
SiteDescription			✓	✓	✓	✓	✓	
Phase								
Floor sheet								
COBie field	Type							
Name			✓	✓	✓	✓	✓	
CreatedBy			✓	✓	✓	✓	✓	
CreatedOn			✓	✓	✓	✓	✓	
Category			✓	✓	✓	✓	✓	
ExtSystem			✓	✓	✓	✓	✓	
ExtObject			✓	✓	✓	✓	✓	
ExtIdentifier			✓	✓	✓	✓	✓	
Description			✓	✓	✓	✓	✓	
Elevation	Geometric		✓	✓	✓	✓	✓	
Height	Geometric		✓	✓	✓	✓	✓	
Space sheet								
COBie field	Type							
Name			✓	✓	✓	✓	✓	
CreatedBy				✓	✓	✓	✓	
CreatedOn				✓	✓	✓	✓	
Category			✓	✓	✓	✓	✓	

RIBA 2013 Work stage COBie Data Drop		1 1	2 2	3 3	4 4	5 5	6 6	7 n
Responsibility		ALL	ALL	ALL	CON	CON	CON	FMA
FloorName				✓	✓	✓	✓	
Description				✓	✓	✓	✓	
ExtSystem				✓	✓	✓	✓	
ExtObject				✓	✓	✓	✓	
ExtIdentifier				✓	✓	✓	✓	
RoomTag				✓	✓	✓	✓	
UsableHeight				✓	✓	✓	✓	
GrossArea	Geometric		✓	✓	✓	✓	✓	
NetArea	Geometric		✓	✓	✓	✓	✓	
Zone sheet								
COBie field	**Type**							
Name			✓	✓	✓	✓	✓	
CreatedOn			✓	✓	✓	✓	✓	
CreatedBy				✓	✓	✓	✓	
Category			✓	✓	✓	✓	✓	
SpaceName			✓	✓	✓	✓	✓	
ExtSystem				✓	✓	✓	✓	
ExtObject				✓	✓	✓	✓	
ExtIdentifier				✓	✓	✓	✓	
Description				✓	✓	✓	✓	
Type sheet								
COBie field	**Type**							
Name					✓	✓	✓	✓
CreatedBy					✓	✓	✓	✓
CreatedOn					✓	✓	✓	✓
Category					✓	✓	✓	✓
Description					✓	✓	✓	✓
AssetTypeCode					✓	✓	✓	✓
Manufacturer						✓	✓	✓
ModelNumber						✓	✓	✓
WarrantyGuarantorParts						✓	✓	✓
WarrantyDurationParts						✓	✓	✓
WarrantyGuarantorLabour						✓	✓	✓
WarrantyDurationLabour						✓	✓	✓
WarrantyDurationUnit						✓	✓	✓
ExtSystem					✓	✓	✓	✓
ExtObject					✓	✓	✓	✓
ExtIdentifier					✓	✓	✓	✓
ReplacementCost						✓	✓	✓

RIBA 2013 Work stage COBie Data Drop		1 1	2 2	3 3	4 4	5 5	6 6	7 n
Responsibility		ALL	ALL	ALL	CON	CON	CON	FMA
ExpectedLife					✓	✓	✓	
Duration					✓	✓	✓	
WarrantyDescription					✓	✓	✓	
NominalLength	Geometric			✓	✓	✓	✓	
NominalWidth	Geometric			✓	✓	✓	✓	
NominalHeight	Geometric			✓	✓	✓	✓	
ModelReference				✓	✓	✓	✓	
Shape				✓	✓	✓	✓	
Size				✓	✓	✓	✓	
Colour				✓	✓	✓	✓	
Finish				✓	✓	✓	✓	
Grade				✓	✓	✓	✓	
Material				✓	✓	✓	✓	
Constituents				✓	✓	✓	✓	
Features				✓	✓	✓	✓	
AccessibilityPerformance				✓	✓	✓	✓	
CodePerformance				✓	✓	✓	✓	
SustainabilityPerformance				✓	✓	✓	✓	
Component sheet								
COBie field	Type							
Name				✓	✓	✓	✓	
CreatedBy				✓	✓	✓	✓	
CreatedOn				✓	✓	✓	✓	
TypeName				✓	✓	✓	✓	
SpaceName				✓	✓	✓	✓	
Description				✓	✓	✓	✓	
ExtSystem				✓	✓	✓	✓	
ExtObject				✓	✓	✓	✓	
ExtIdentifier				✓	✓	✓	✓	
SerialNumber						✓	✓	
InstallationDate						✓	✓	
WarrantyStartDate						✓	✓	
TagNumber						✓	✓	
Barcode						✓	✓	
AssetIdentifier						✓	✓	
System sheet								
COBie field	Type							
Name				✓	✓	✓	✓	
CreatedBy				✓	✓	✓	✓	
CreatedOn				✓	✓	✓	✓	

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RIBA 2013 Work stage COBie Data Drop			1 1	2 2	3 3	4 4	5 5	6 6	7 n
Responsibility			ALL	ALL	ALL	CON	CON	CON	FMA
Category					✓	✓	✓	✓	
ComponentName					✓	✓	✓	✓	
ExtSystem					✓	✓	✓	✓	
ExtObject					✓	✓	✓	✓	
ExtIdentifier					✓	✓	✓	✓	
Description					✓	✓	✓	✓	
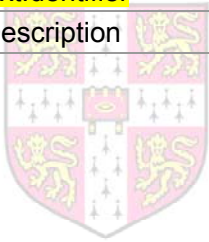
Appendix B Data Structure Schedule FM

APPENDIX B - DATA STRUCTURE SCHEDULE (Basic import parameters - University of Cambridge / Planet FM / COBie cross reference)

Revit Group	COBie Parameters	COBie Definition	FM parameters	FM Description	Maximum Characters	Data Type	Doors	Lighting Fixtures	Speciality Equipment	Windows	Air Terminals	Filter (Revit subcategory)	Electrical Equipment	Electrical Fixtures	Fire Alarm Devices	Lighting Devices	Lighting Fixtures	Mechanical Equipment	Mechanical Equipment (Boiler)	Plumbing Fixtures	Plumbing Fixtures (Pump)	Security Devices	Sprinklers
Other	AssetIdentifier		Asset Code	CAFM system generated to be retropectively supplied and inputted into the model.	10	No	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	AssetTypeCode		Asset Type (See Appendix C)	ASSET DATA FEED WORKBOOK Provides asset details in a format to interface to our Planet maintenance database. The template sets out the information needed for each type of asset.	30	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	CodePerformance	Code (Standards) Compliance requirement(s) which the product satisfies	Set	For boilers enter SEDBUK rating. For ac equipment enter refrigeration type.	30	Text													✓				
Other	Constituents	Optional constituent features, parts or finishes.	General Notes	For split ac units this will include full details of the outdoor condenser unit. Enter any other useful details of the equipment not included elsewhere. Schedules on minor equipment may be included here at added as a separate attachement.	255	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	Grade	Standard grading(s) to which the product corresponds.	Flue Type FF/OF/RS	For combustion equipment classify as: FF - fan-flued OF - open-flued RS - room-sealed	List	Text					✓								✓				
Other	InstallationDate		Date Installed dd/mm/yyyy	Date handed over as ready for service (beginning of warranty).	10	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	Manufacturer	The organization that manufactured or assembled the item.	Manufacturer	Enter the details for the principal equipment (i.e. the fan not the motor). Details of make/mode/serial number of any sub-components should be added under general notes or as an attached schedule.	20	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	ModelLabel	The model number assigned by manufacturer.	Equipment Name (asset label)	Enter the assigned name (as would appear on the equipment label) such a 'Heating Boiler No.1.	30	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	ModelReference	The name used by the manufacturer.	Equipment Ref (asset label)	If used, enter the equipment reference number (as would appear on the equipment label) such a 'Item No 55'.	30	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	NominalRotationSpeed	Nominal Rotation Speed	Speed	Use manufactures or standard units for asset performance.	30	Text			✓		✓							✓				✓	
Other	NominalVoltage	The range of allowed voltage that a device is certified to handle. The upper bound of this value is the maximum.	Voltage Pressure	Use manufactures or standard units for asset performance.	20	Text		✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓		✓	
Other	PointOfContact	The organization that should be contacted for action under the terms of the warranty. Note that the role of the organization (manufacturer, supplier, installer etc.) is determined by the IfcActorRole attribute of IfcOrganization.	Supplier (Financial Ref)	Provide the name of the equipment supplier (for future replacement or parts).	30	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	PressureRating	Nominal pressure rating of the element as rated by the agency having jurisdiction.	Voltage Pressure	Use manaufactures or standard units for asset performance.	20	Text					✓									✓	✓	✓	✓
Other	Reference	Reference ID for this specified type in this project	Model	Enter the details for the principal equipment (i.e. the fan not the motor). Details of make/mode/serial number of any sub-components should be added under general notes or as an attached schedule.	30	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	ReplacementCost	Cost replacing a unit	Initial Value £n.nn	Guide value for replacement	10	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	SerialNumber		Serial No.	Enter the details for the principal equipment (i.e. the fan not the motor).	30	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	ServiceLifeDuration	The length or duration of a service life.	Est. Life	Estimate of date equipment is due for replacment.	5	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	WarrantyDurationParts		Warranty Ends dd/mm/yyyy		10	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	OutputRating		Output Rating	Use manaufactures or standard units for asset performance.	30	Text					✓		✓							✓		✓	
Other	InputRating		Input Rating	Use manaufactures or standard units for asset performance.	30	Text					✓		✓							✓	✓		✓
Other	Building		Building	Use Estate Management building reference number	10	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	Floor		Floor	Use Estate Management building reference number	10	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	Space		Space	Use Estate Management building reference number	10	Text	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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APPENDIX C - CAFM Asset Type Codes

Asset Type	Asset Type Definition	Asset	System
ACCESS LADDER	ACCESS LADDER	☑	☑
ACCESS LANYARD	ACCESS LANYARD	☑	
ACCESS SCAFFOLD	ACCESS SCAFFOLD	☑	
AHU - H&V	AHU - H&V	☑	
AHU - HVAC	AHU - HVAC	☑	
AIR CON	AIR CON COMPACT UNITS & SYSTEMS	☑	☑
AIR CON-AHU	AIR CONDITIONING-AHU LINKED	☑	
AIR CON-COLD ROOM		☑	
AIR CON-DEHUMIDIFIER	AIR CONDITIONING-DEHUMIDIFIER	☑	
AIR CON-HEAT RECOVER	AIR CONDITIONING-HEAT RECOVERY	☑	
AIR CON-HUMIDIFIER	AIR CONDITIONING-HUMIDIFIER	☑	
AIR CON-MULTI	AIR CONDITIONING-MULTI	☑	
AIR CON-SPLIT	AIR CONDITIONING-SPLIT	☑	
AUTOMATIC DOOR	AUTOMATIC DOORS AND ENTRANCES	☑	☑
AV EQUIPMENT	Audio Visual Equipment	☑	
BMS CONTROL	BMS CONTROL	☑	☑
Boiler	Boilers	☑	
BOILER - BioMass	BOILER - BioMass	☑	
BOILER - Gas	BOILER - Gas	☑	
BOILER - Oil	BOILER - Oil	☑	
BOILER - Steam	BOILER - Steam	☑	
CHILLER	WATER CHILLER	☑	☑
COLD WATER	COLD WATER SYSTEM	☑	☑
COLD WATER BOOSTER	Cold Water Booster	☑	☑
COMPRESSOR	AIR COMPRESSOR	☑	☑
COMPRESSOR FILTER	COMPRESSOR FILTER	☑	
COMPRESSOR RECEIVER	COMPRESSOR RECEIVER	☑	
COMPRESSOR SEPERATOR	COMPRESSOR SEPERATOR	☑	
COMPRESSOR VALVE		☑	
DRAINAGE	DRAINAGE and SANITARY FIXTURES	☑	☑
DRAINAGE PUMP	DRAINAGE PUMP	☑	
DRY COOLER	DRY AIR COOLER	☑	
ELECT DISTRIBUTION		☑	☑
ELECTRIC APPLIANCE	ELECTRIC APPLIANCE	☑	☑
ELECTRIC CAPACITOR	ELECTRIC CAPACITOR	☑	
ELECTRIC DOOR	AUTOMATIC ENTRANCE DOORS	☑	☑
ELECTRIC EARTHING	EARTHING and LIGHTNING PROTECTION	☑	
ELECTRIC GENERATOR	ELECTRIC GENERATOR	☑	☑
ELECTRIC HEATING		☑	☑
ELECTRIC HV	ELECTRIC HIGH VOLTAGE EQUIPMENT	☑	☑
ELECTRIC LIGHTING	ELECTRIC LIGHTING	☑	☑
ELECTRIC LV	ELECTRIC WIRING DISTRIBUTION	☑	☑
ELECTRIC UPS	ELECTRIC POWER SUPPLIES	☑	
ELECTRIC WATER HEAT	ELECTRIC WATER HEATER	☑	
EVAC-EVACUATIONCHAIR	Evacuation Equipment-Evacuation Chair	☑	
EVAC-STAIRCLIMBER	Evacuation Equipment-StairClimber	☑	
EVAC-Stairmate	Evacuation Equipment - Stairmate	☑	
FAN COIL UNIT - COOL	FAN COIL UNIT - COOL	☑	
FAN COIL UNIT - H&C	FAN COIL UNIT - HEATING & COOLING	☑	
FAN COIL UNIT - HEAT	FAN COIL UNIT - HEAT	☑	
FIRE - DRY RISER	FIRE - DRY RISER	☑	
FIRE ALARM	FIRE ALARM	☑	☑
FIRE DOOR RETAINER	FIRE DOOR RETAINER	☑	
FIRE HYDRANT	FIRE HYDRANT	☑	
FIRE PATIENT HOIST	FIRE PATIENT HOIST	☑	

Asset Type Definition		Asset	System
FIRE SMOKE VENT	FIRE SMOKE VENT	☑	
FIRE SUPPRESSION SYS	FIRE SUPPRESSION SYSTEM	☑	
GARDEN EQUIPMENT	GARDEN EQUIPMENT	☑	
GAS ALARM	GAS ALARM	☑	
GAS BOILER	GAS BOILER	☑	
GAS BOOSTER	GAS BOOSTER	☑	
GAS COOKER	GAS COOKER	☑	
GAS DISTRIBUTION	GAS DISTRIBUTION SYSTEM		☑
GAS FIRE	GAS FIRE	☑	
GAS HEATER	GAS HEATER	☑	
GAS HOB	GAS HOB	☑	
GAS VALVE	GAS VALVE	☑	
GAS WATER HEATER	GAS WATER HEATER	☑	
H&V	HEATING AND VENTILATION SYSTEM		☑
H&V AHU	H&V AHU	☑	
H&V EXTRACT FANS	Roof Extractors (Flats)	☑	☑
H&V FAN	H&V FAN	☑	
H&V FAN COIL UNIT	H&V FAN COIL UNIT	☑	
H&V FILTER	H&V FILTERS DUCT DIFFUSERS GRILLES	☑	
H&V FUME EXTRACT	FUMECUPBOARD EXTRACT FAN	☑	
H&V RADIATOR		☑	
HOTWATER	HOTWATER SYSTEM		☑
HOTWATER PUMP	HOTWATER PUMP	☑	
HUMIDIFIER	AIR CONDITIONING-HUMIDIFIER	☑	
KITCHEN EXTRACTOR		☑	☑
LIFT	LIFT	☑	☑
OIL ALARM		☑	
OIL BOILER	OIL BOILER	☑	
OIL PUMP		☑	
OIL TANK	OIL TANK	☑	
PAT	Assets which require PAT testing	☑	
PRESSURE UNIT	WATER PRESSURE UNIT	☑	
SECURITY ALARM	SECURITY ALARM	☑	
SECURITY CCTV	SECURITY CCTV	☑	☑
SECURITY ENTRY	SECURITY ENTRY	☑	
STEAM	STEAM SYSTEM		☑
STEAM BOILER	STEAM BOILER	☑	
STEAM VALVE	STEAM DISTRIBUTION VALVE	☑	
STEAM VESSEL	STEAM VESSEL	☑	
THERMAL MIX VALVE		☑	☑
TOOLS-HOIST	LIFTING EQUIPMENT	☑	
VACUUM PUMP	VACUUM PUMP	☑	☑
WATER	Cold water system		☑
WATER ALARM	WATER ALARM	☑	
WATER BOOSTER	WATER BOOSTER	☑	
WATER DOSING	WATER CHEMICAL DOSING	☑	
WATER EXPANSION VESS	WATER EXPANSION VESSEL	☑	
WATER HEAT EXCHANGE	WATER HEAT EXCHANGE	☑	
WATER HEATER - ELECT	WATER HEATER - ELECTRIC	☑	
WATER HEATER - GAS	WATER HEATER - GAS	☑	
WATER IONISER	WATER IONISER	☑	
WATER METER	WATER METER	☑	
WATER PRESSURE UNIT	WATER PRESSURE UNIT	☑	
WATER RO UNIT	WATER RO UNIT	☑	
WATER SOFTENER	WATER SOFTENER	☑	
WATER TANK	WATER TANK	☑	
WATER PUMP	COLD WATER PUMP	☑	

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APPENDIX D - Building Elements

Element
Ceilings
Columns
Curtain Panels
Curtain Systems
Curtain Wall Mullions
Doors
Floors
Furniture
Furniture Systems
Lighting Fixtures
Planting
Railings
Ramps
Roofs
Speciality Equipment
Stairs
Topography
Walls
Windows
Structural Beam Systems
Structural Columns
Structural Foundations
Structural Framing
Structural Path Reinforcement
Structural Trusses
Air Terminals
Cable Trays
Communication Devices
Conduits
Data Devices
Ducts
Duct Accessories (Damper)
Duct Fitting
Filter (Revit subcategory)
Electrical Equipment
Electrical Fixtures
Fire Alarm Devices
Flex Ducts

Element
Flex pipes
Lighting Devices
Lighting Fixtures
Mechanical Equipment
Mechanical Equipment (Boiler)
Pipes
Pipe Fittings
Plumbing Fixtures
Plumbing Fixtures (Pump)
Security Devices
Sprinklers
Telephone Devices

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APPENDIX E   - Level of Definition

Level of Definition comprises of the degree to which the element's geometry (Level of Detail) and attached information (Level of Information) has been considered i.e. the degree to which suppliers can rely on the information when using the model.
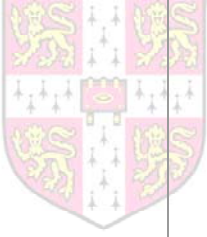
The fundamental LODs and LOIs are in line with the NBS BIM Toolkit.

Specified uses for information at each stage, example geometry and uses and example data is outlined below. Commercial (5D) and programming (4D) uses are also suggested.

Data drop requirements are aligned with the Level of Detail (LOD) and Level of Information (LOI) to enable the project team to understand the data which is required at each stage.

Data drop	5D	4D	LOD	LOI	Definition	Purpose of Information
1	Concept	Milestones	2	2	Overall building massing indicative of area, height, volume, location and orientation may be modelled in three dimensions or represented by other data.	**LOD:** To provide a visual indication of proposals at a Concept stage identifying key requirements such as access and maintenance zones etc. Information to be suitable for spatial coordination of primary systems / elements. **LOI:** Provide an outline description of the deliverable (LOI)

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Data drop	5D	4D	LOD	LOI	Definition	Purpose of Information
2-3	Cost Plan	Outline Project Plan	3	3	Visual information to provide developed principles of the design to a greater level of detail. Developed coordination between all professions. Visual development showing coordination for general size and primary relationships between different elements of the construction. Can form a brief for a specialist sub-contractor or fabricator to progress with their technical design, fabrication and installation. This would be expected to include critical dimensional coordination, performance requirements and qualities of finish. Non-geometric information may also be attached to Model Elements.	**LOD:** To provide a visual representation of proposals, confirming brief for technical Design stage supporting full spatial coordination. **LOI:** Provide an outline description of the deliverable.
4	Target Cost	Design and Procurement Schedule	4	4	Visual information to provide fixed principles of the design supporting procurement. Developed coordination between all professions. Visual representations showing coordination for general size and relationships between different elements of the construction. Graphical representation of system, dimensionally accurate indicating primary performance characteristics. Graphical information represented may alter dependant on visual information to be produced. Non-geometric information may also be attached to the Model Elements.	**LOD:** To provide a visual representation of proposals at a Technical Design stage supporting full spatial coordination. e.g.: Scope of work drawings, setting out, floor loading etc. Typical / Installation details separately produced linked to model element and adjacent constructions. **LOI:** Provide enough information to allow the selection of the manufacturer product to meet requirements. This information may also be used to replace the installed product during the operation stage of the building's lifecycle. Information covering the execution of the deliverable should also be provided in the associated specification.

Data drop	5D	4D	LOD	LOI	Definition	Purpose of Information
5			4	4	As above for Sub-contract design.	As above for sub-contract design.
6	Construction	Phased & zonal simulations	5	5	Visual information to provide full information to support construction / installation. Developed coordination between all professions. Visual representations showing final coordination for size and relationships between different elements of the construction. Graphical representation of system, dimensionally accurate indicating primary performance characteristics and sufficient information to support installation. Typical / Installation details separately produced linked to model element and adjacent constructions Non-geometric information may also be attached to the Model Elements.	**LOD:** To be updated during the construction process to reflect the final design, and to provide a future reference to sit alongside the O&M Manuals. **LOI:** Provide the information specific to the selected manufacturer and product reference. Information covering the execution of the deliverable should also be provided in the associated specification.
7+	As Built costs	As built simulation	5	6	As above.	**LOD:** As above **LOI:** Provide the information specific to the installed deliverable that is required for operation and maintenance. Information covering the detailed maintenance should also be provided in the associated manuals.

APPENDIX F   - Model Production Delivery Table

University of Cambridge	LOD & Model Production Delivery Table	
	Originator	Reference
Core Models		
Architecture		ARC
Structural		CSE
MEP		MEP
Contractor		CON
Additional Models		
Eg. Landscaping		Eg.LAR

The Model Production and Delivery Table (MPDT) is a key document as it both allocates responsibility for preparation of the Models and identifies the Level of Definition that Models need to meet at the project stages or data drops stated in the table.

Model originator and responsible parties, must be named.

Models should be added as required and agreed by the project PIM.

Cost data should be produced at NRM3 for later stages (levels 1 & 2 shown below for clarity).

LOD and LOI are deliverables for each stage. (For LOD and LOI definition, see University of Cambridge EIR, Appendix E.)

University of Cambridge
Insert Project Name
Model Production Delivery Table

	Consult						Implementation & Delivery												Asset Operation	
RIBA 2013 (CIC) Workstage	1			2			3			4			5			6			7	
	Preparation & Brief			Concept			Developed Design			Technical Design			Construction			Handover & Closeout			In Use	
	LOD	LOI	Resp Party	LOD	LOI	Resp Party	LOD	LOI	Resp Party	LOD	LOI	Resp Party	LOD	LOI	Resp Party	LOD	LOI	Resp Party	LOD	Resp Party
Elements, Materials & Components (NRM1)																				
1 Substructure																				
1 Substructure	1	1	CSE	2	2	CSE	3	3	CSE	4	4	CSE	4	4	CON	5	5	CON	TBC	FMA
2 Superstructure																				
1 Frame	1	1	CSE	2	2	CSE	3	3	CSE	4	4	CSE	4	4	CON	5	5	CON	TBC	FMA
2 Upperfloors	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
3 Roof	1	1	CSE	2	2	CSE	3	3	CSE	4	4	CSE	4	4	CON	5	5	CON	TBC	FMA
4 Stairs and ramps	1	1	CSE	2	2	CSE	3	3	CSE	4	4	CSE	4	4	CON	5	5	CON	TBC	FMA
5 External walls	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
6 Windows and external doors	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
7 Internal walls and partitions	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
8 Internal doors	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
3 Internal finishes																				
1 Wall finishes	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	5	4	CON	5	5	CON	TBC	FMA
2 Floor finishes	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	5	4	CON	5	5	CON	TBC	FMA
3 Ceiling finishes	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	5	4	CON	5	5	CON	TBC	FMA
4 Fittings, furnishings and equipment																				
1 Fittings, furnishings and equipment	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
5 Services																				
1 Sanitary installations	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
2 Services equipment	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
3 Disposal installations	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
4 Water installations	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
5 Heat source	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
6 Space heating and air conditioning	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
7 Ventilation	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
8 Electrical installations	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
9 Fuel installations	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
10 Lift and conveyor installations	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
11 Fire and lightning protection	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
12 Communication, security and control systems	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
13 Specialist installations	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
14 Builder's work in connection with services	NA		NA	NA		NA	2	2	MEP	3	3	MEP	3	3	CON	5	5	CON	TBC	FMA
8 External works																				
1 Site preparation works	NA		NA	NA		NA	NA		NA	4	4	ARC	4	4	CON	NA		NA	NA	NA
2 Roads, paths, pavings and surfacings	1	1	ARC	2	2	ARC	3	3	ARC	4	4	ARC	4	4	CON	5	5	CON	TBC	FMA
3 Soft landscaping, planting and irrigation systems	1	1	LAR	2	2	LAR	3	3	LAR	4	4	LAR	4	4	CON	5	5	CON	TBC	FMA
4 Fencing, railings and walls	1	1	LAR	2	2	LAR	3	3	LAR	4	4	LAR	4	4	CON	5	5	CON	TBC	FMA
5 External fixtures	1	1	LAR	2	2	LAR	3	3	LAR	4	4	LAR	4	4	CON	5	5	CON	TBC	FMA
6 External drainage	1	1	CSE	2	2	CSE	3	3	CSE	4	4	CSE	4	4	CON	5	5	CON	TBC	FMA
7 External services	1	1	MEP	2	2	MEP	3	3	MEP	4	4	MEP	4	4	CON	5	5	CON	TBC	FMA
8 Builder's work in connection with external services	NA		NA	NA		NA	2	2	MEP	3	3	MEP	3	3	CON	5	5	CON	TBC	FMA

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Estate Management

Space Measuring Guide

Contents

How do we measure our buildings?

Space at the University of Cambridge is measured using the standard method of building measurement defined in the Code of Measuring Practice, published by the Royal Institution of Chartered Surveyors and the Incorporated Society of Valuers and Auctioneers.

MICAD is the Estate Management's space database which uses CAD drawings of floors within buildings to identify each individual space.

HESA returns allow a different measurement of NIA to be used instead of the RICS terminology. They permit the measurement to be made on a room area basis measuring the internal room area (RA). This method of measuring has been used within MICAD.

Standard Terminology

| Gross External Area (GEA)	The area of a building measured externally at each floor level.
Gross Internal Area (GIA)	The total area of a building measured to the internal face[1] of the perimeter walls at each floor level.
Net Internal Area (NIA)	The useable area within a building, measured to the internal face of the perimeter walls at each floor level, excluding Balance Area (BA).
Room Area (RA) and Total Room Area (TRA)	The area of each individual space and the Total Room Area (TRA) is the sum of all the Room Areas (RA).
Balance Area (BA)	The sum of the area of common or core areas not assigned to a particular user group including:- Common lobbies and foyers • Enclosed plant on the roof • Stairs and escalators • Plant, boiler rooms and service cupboards • Lifts • Columns • Toilet areas and cleaner's rooms • Duct and risers
Net Assignable Area (NAA)	The space that can be assigned to a particular user group, i.e. Total Room Area (RA) minus the Balance Area (BA). This differs from NIA as the NAA does not include internal non-structural walls.
Net Usable Area (NUA)	The area of an open plan office that can actually be used as defined by the British Council of Offices. It excludes those parts of an open plan area that are required for primary circulation. *This area is currently not calculated in Micad.

[1]Internal face – means the brick/block work or plaster coat applied to the brick/block work, not the surface of internal linings installed by the occupier
In each of the drawings the red line represents the appropriate measurement type.

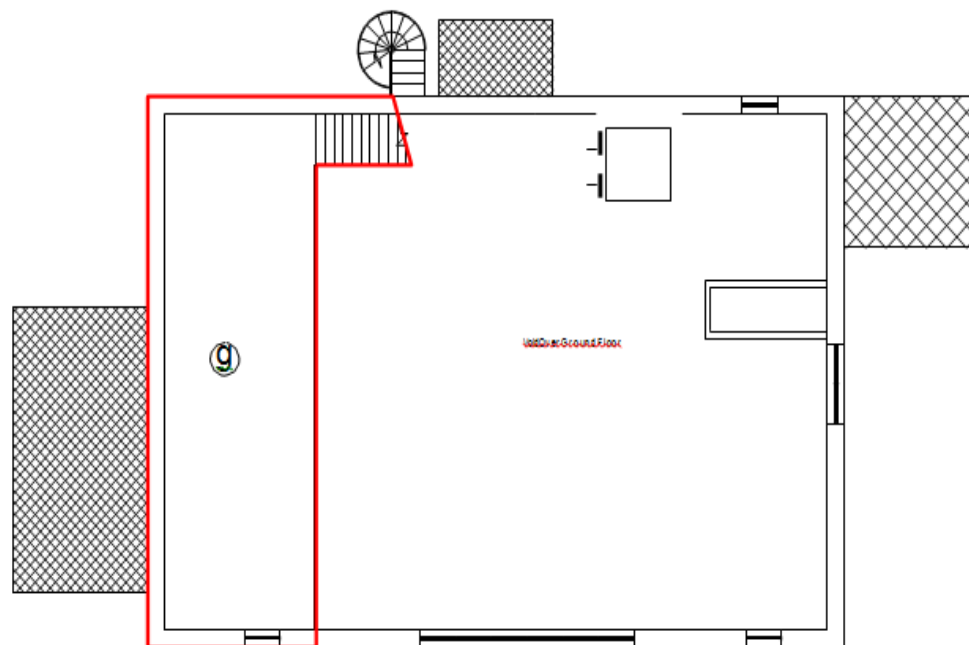Gross External Area (GEA) Inclusions/Exclusions

Measurement	Inclusions	Exclusions
Gross External Area (GEA) Drawings 1.1, 1.2, 1.3, 1.4 and 4.1	a) *Perimeter wall thickness and external projections* b) *Areas occupied by internal walls and partitions* c) *Atria and entrance halls, with clear height above, measured at base level only* d) Columns, piers, chimney breasts, stairwells (and the like) and similar e) Internal balconies f) Structural, raked or stepped floors are to be treated as a level floor measured horizontally g) Mezzanine areas h) Lift rooms, plant rooms, fuel stores which are housed in a covered structure of a permanent nature i) Outbuildings which share at least one wall with main building j) Loading bays k) Pavement vaults l) Garages	m) *External open-sided balconies, covered ways and fire escapes* n) *Canopies* o) *Voids over or under structural, raked or stepped floors*

Gross External Area (GEA Examples)
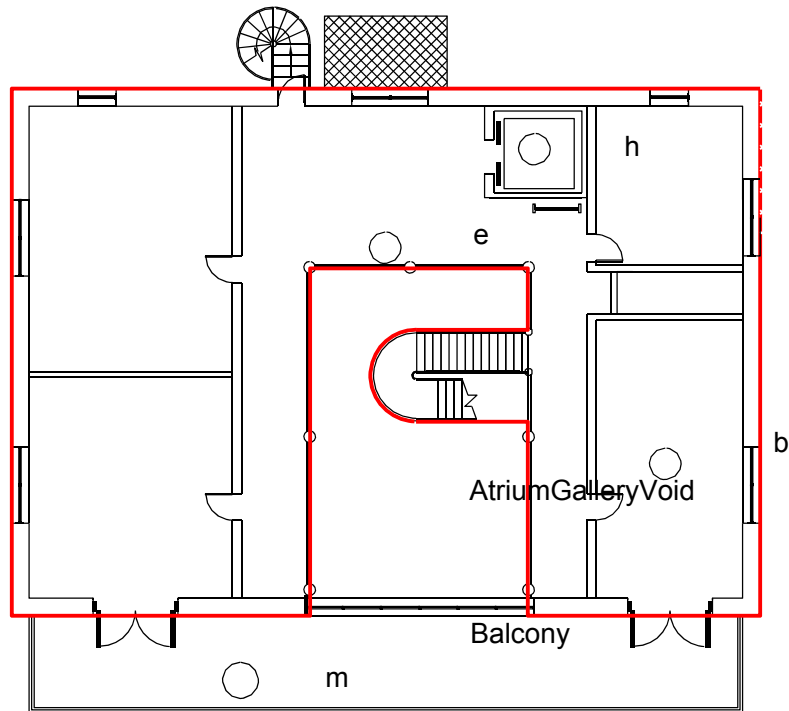
Drawing: 1.1 - Typical Ground Floor
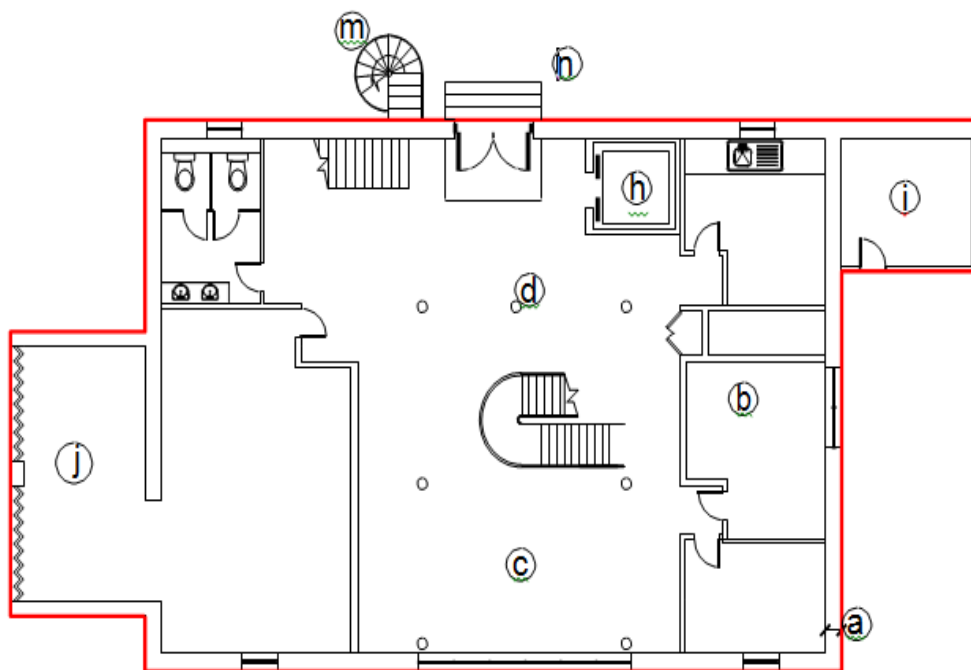
Drawing: 1.2 - Typical Mezzanine Floor

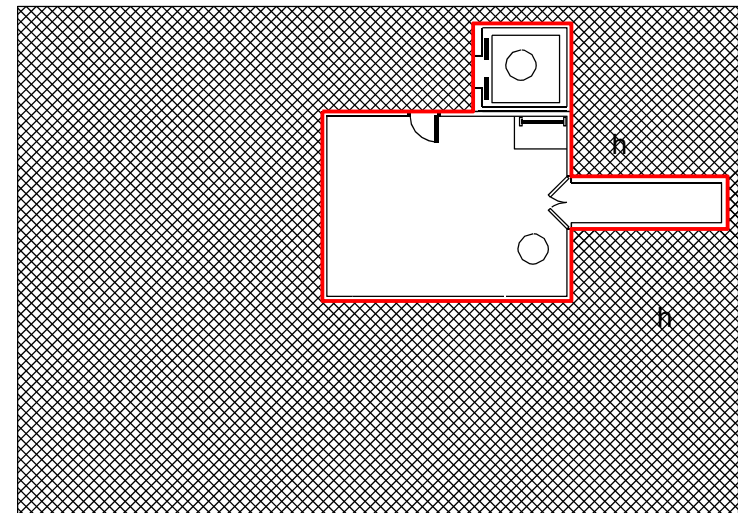Key: Letter codes refer to GEA Inclusions/Exclusions, see page 5.

Gross External Area (GEA Examples)

Drawing: 1.3 – Typical Upper Floor

Drawing: 1.4 – Typical Roof

h

e

b

AtriumGalleryVoid

Balcony

m

h

h

Key: Letter codes refer to GEA Inclusions/Exclusions, see page 5.

Gross Internal Area (GIA) Inclusions/Exclusions

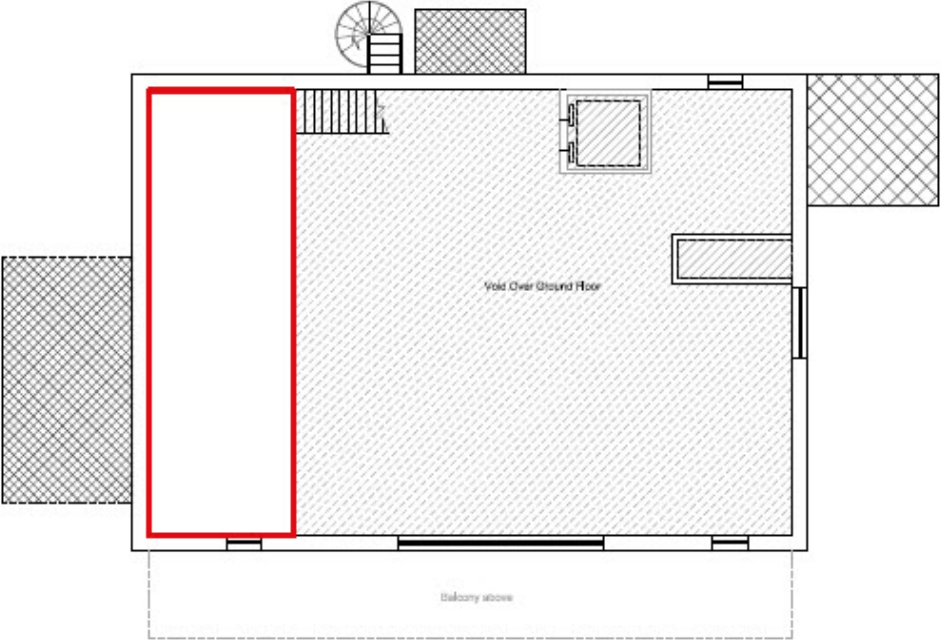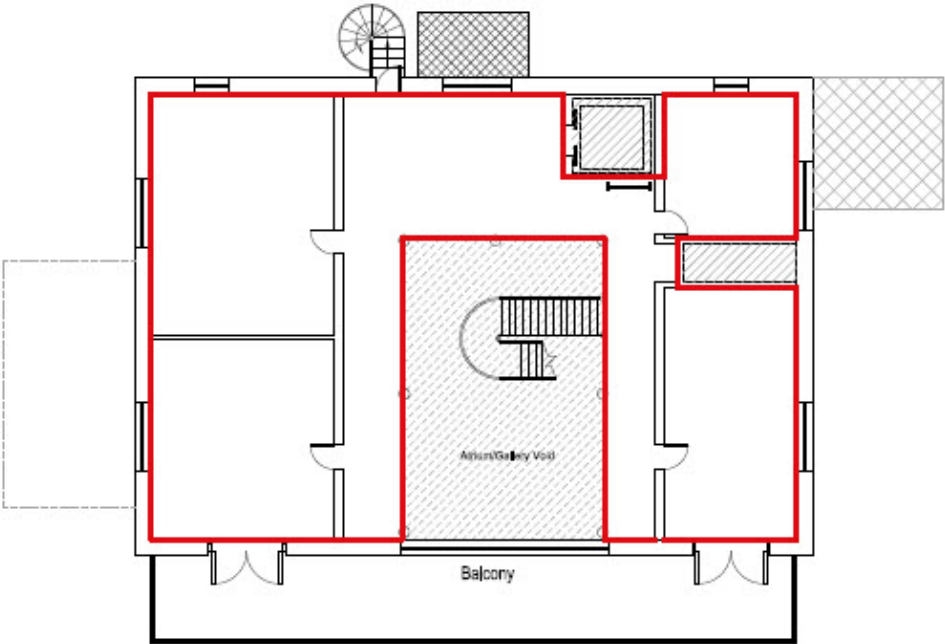| Measurement	Inclusions	Exclusions
Gross Internal Area (GIA) Drawings 2.1, 2.2, 2.3, 2.4 and 4.2	a) Areas occupied by internal walls and partitions b) *Atria and entrance halls, with clear height above, measured at base level only* c) Columns, piers, chimney breasts, stairwells and the like d) Internal balconies e) Corridors of a permanent essential nature f) Structural, raked or stepped floors are to be treated as a level floor measured horizontally g) Mezzanine areas h) Lift rooms, plant rooms, fuel stores which are housed in a covered structure of a permanent nature i) Service accommodation such as toilets and showers etc. j) Projection rooms k) Voids over stairwells and lift shafts on upper floors l) Loading bays (drawing 1.2) m) Pavement vaults n) Garages	o) Perimeter wall thicknesses and external projections p) *External open-sided balconies, covered ways and fire escapes* q) *Canopies* r) *Voids over or under structural, raked or stepped floors*

Net Internal Area (NIA) Examples
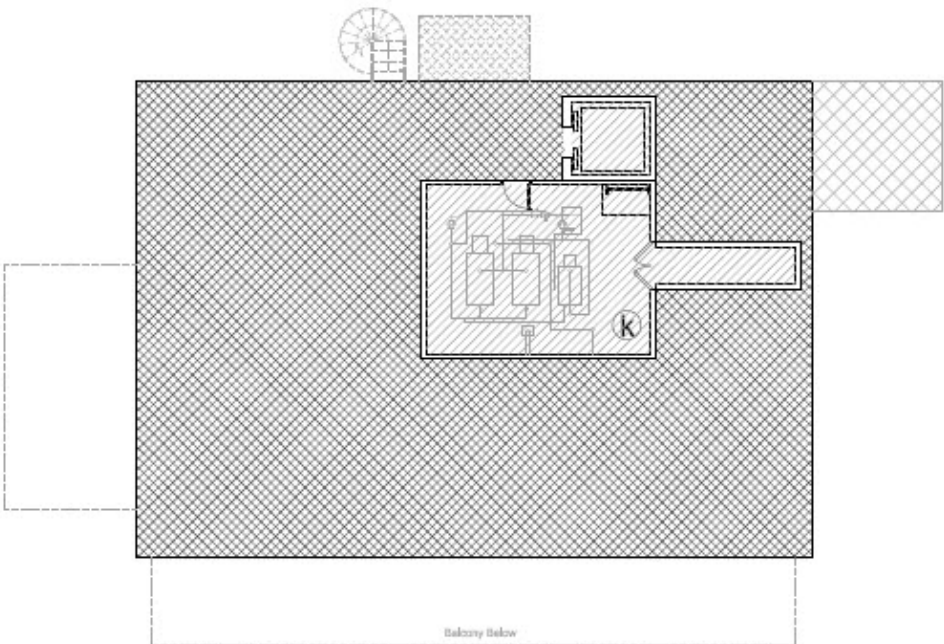
3.1- Typical Ground floor
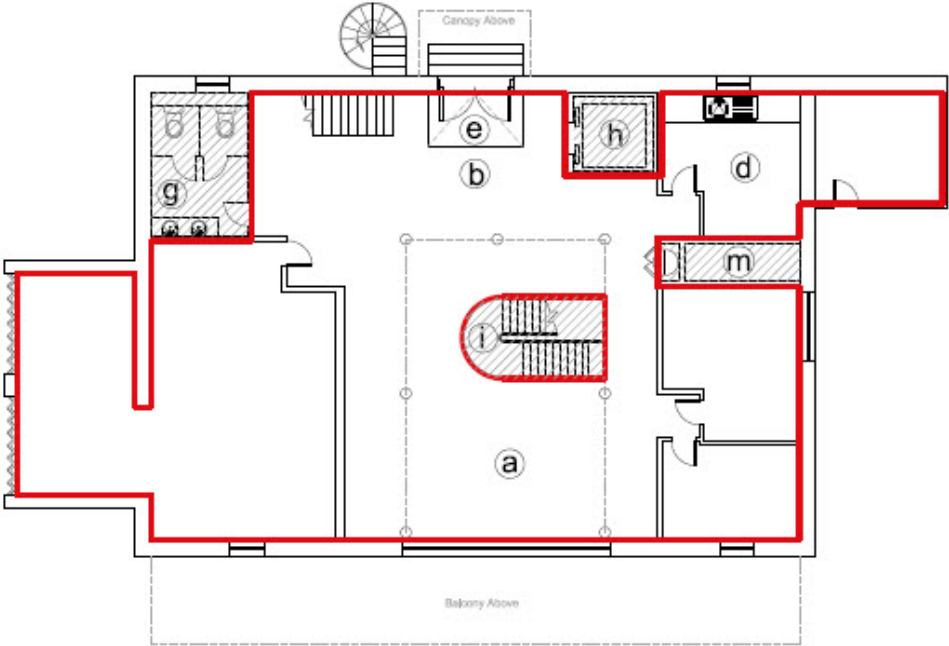
3.2- Typical Mezzanine floor

Net Internal Area (NIA) Examples

3.3 - Typical Upper floor

3.4- Typical Roof

Atrium/Gallery Void

Balcony

Balcony Below

Net Internal Area (NIA) Inclusions/Exclusions

Measurement	Inclusions	Exclusions
Net Internal Area (NIA) Drawings 3.1, 3.2, 3.3, 3.4 and 4.3	a) Atria with clear height above, measured at base level only b) Entrance halls except for exceptions c) Notional lift lobbies and notional fire corridors d) Kitchens e) Ramps, sloping areas and steps	f) Common lobbies and foyers including atria with clear height above, measured at base level only (where function is solely for entry/circulation) g) Toilets, toilet lobbies, bathrooms and cleaner's rooms h) Lift rooms, plant rooms, tank rooms, fuel stores and the like i) Stairs, stairwells and escalators j) Corridors and other circulation areas where used in common with other occupiers k) Enclosed plant on the roof l) Mechanical and electrical service cupboards m) Internal structural walls, columns, piers, chimney breasts and verticals ducts/risers

Net Assignable Area (NAA) Examples

4.1- Typical Ground floor

4.2- Typical Mezzanine floor
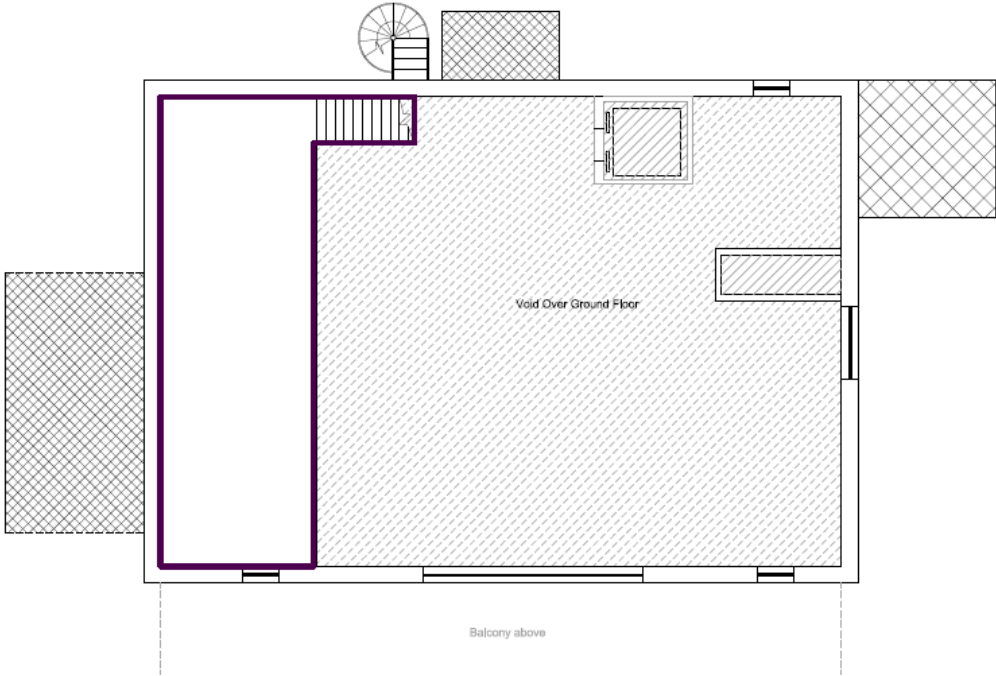
Net Assignable Area (NAA) Examples

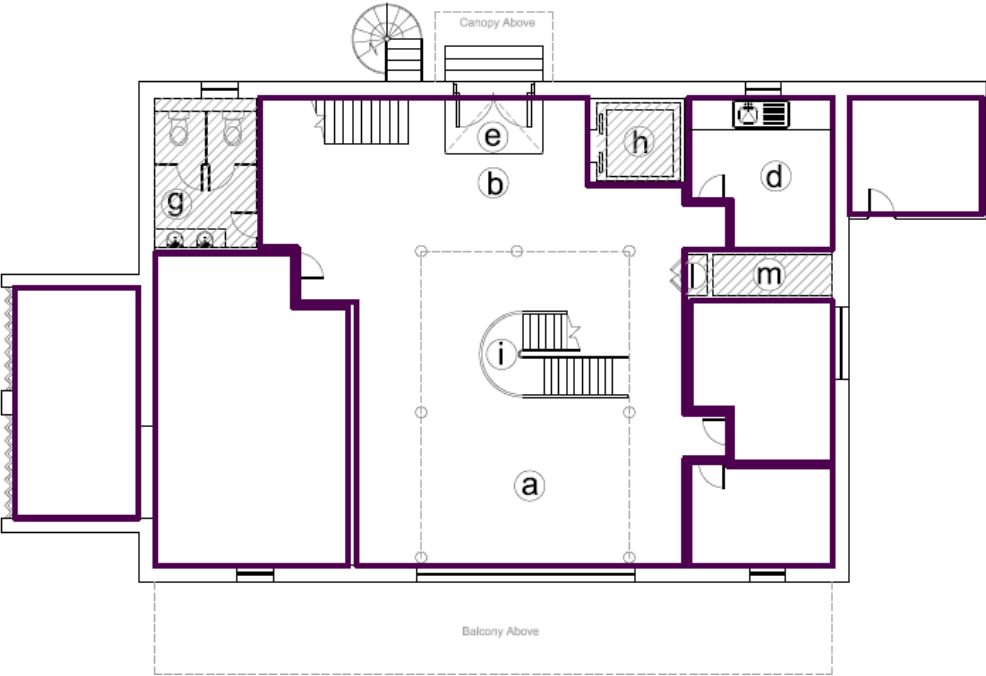4.3 - Typical Upper floor   4.4 - Typical Roof

Atrium\Gallery Void

Balcony

k

Balcony Below
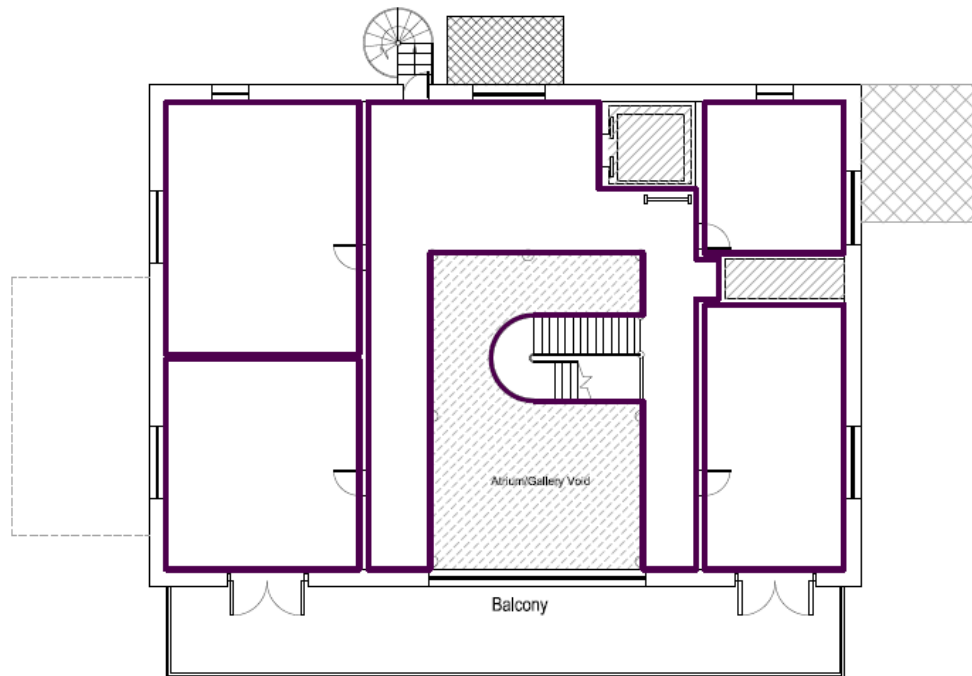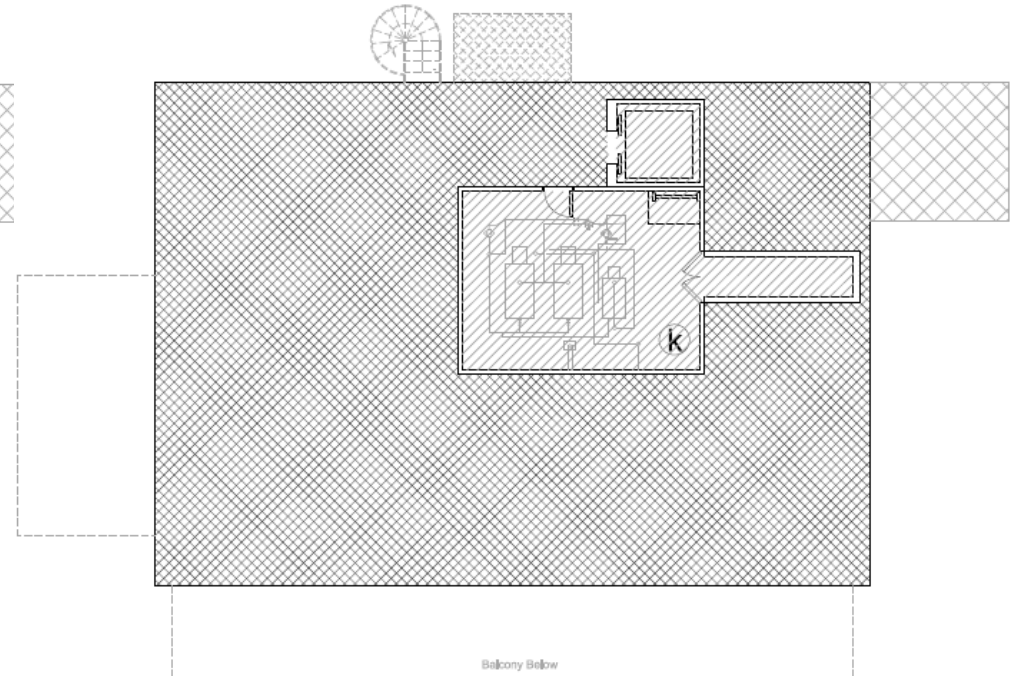
Net Assignable Area (NAA) Inclusions/Exclusions

Measurement	Inclusions	Exclusions
Net Assignable Area (NAA) Drawings 4.1, 4.2, 4.3 and 4.4	a) Atria with clear height above, measured at base level only b) Entrance halls except for exceptions c) Notional lift lobbies and notional fire corridors d) Kitchens e) Ramps, sloping areas and steps	f) Common lobbies and foyers including atria with clear height above, measured at base level only (where function is solely for entry/circulation) g) Toilets, toilet lobbies, bathrooms and cleaner's rooms h) Lift rooms, plant rooms, tank rooms, fuel stores and the like i) Stairs, stairwells and escalators j) Corridors and other circulation areas where used in common with other occupiers k) Enclosed plant on the roof l) Mechanical and electrical service cupboards m) Internal structural walls, columns, piers, chimney breasts and verticals ducts n) Internal non-structural walls

Measurement of Lecture Theatres

8.1 Gross Internal Area

Section

Plan
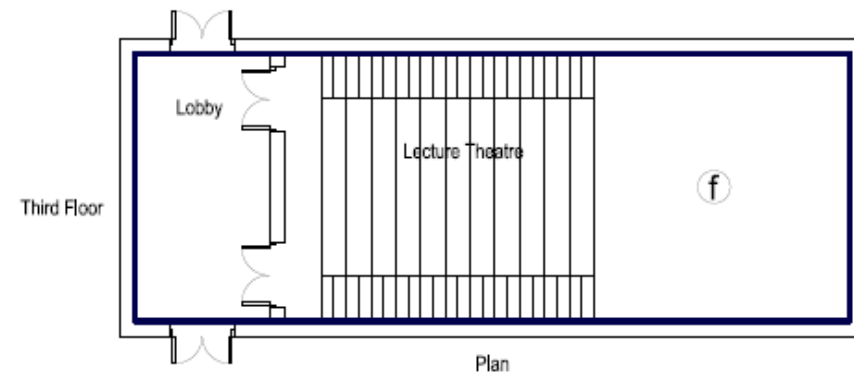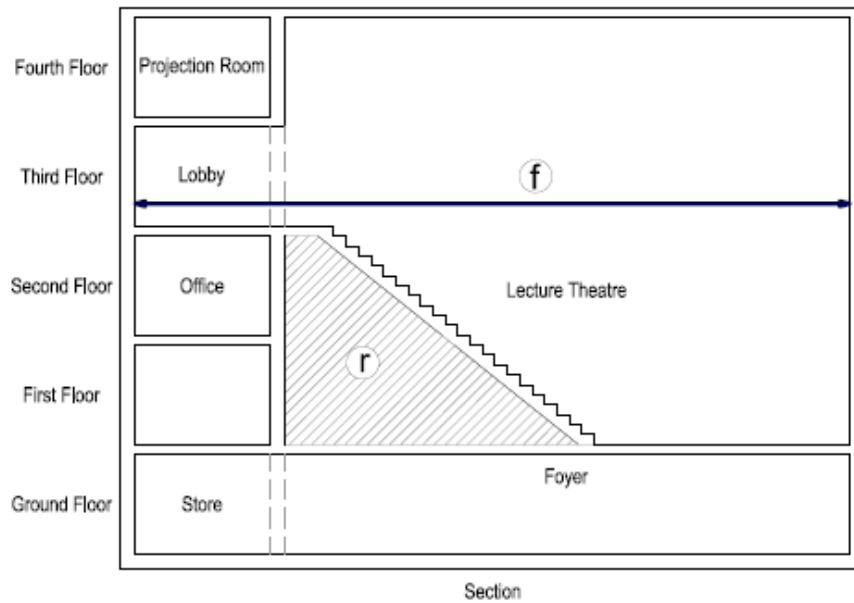
5.2 Net Assignable Area

Section

Plan

60
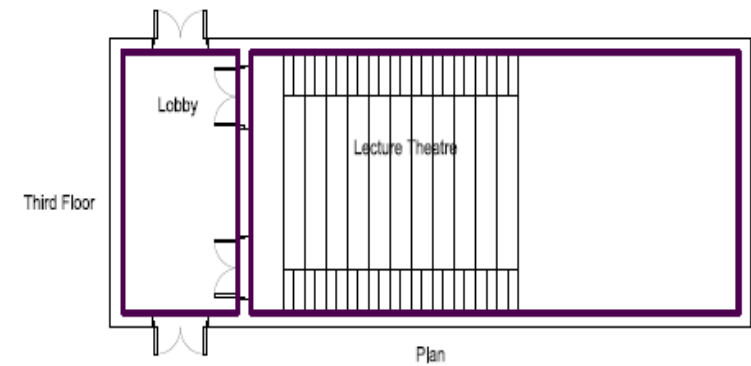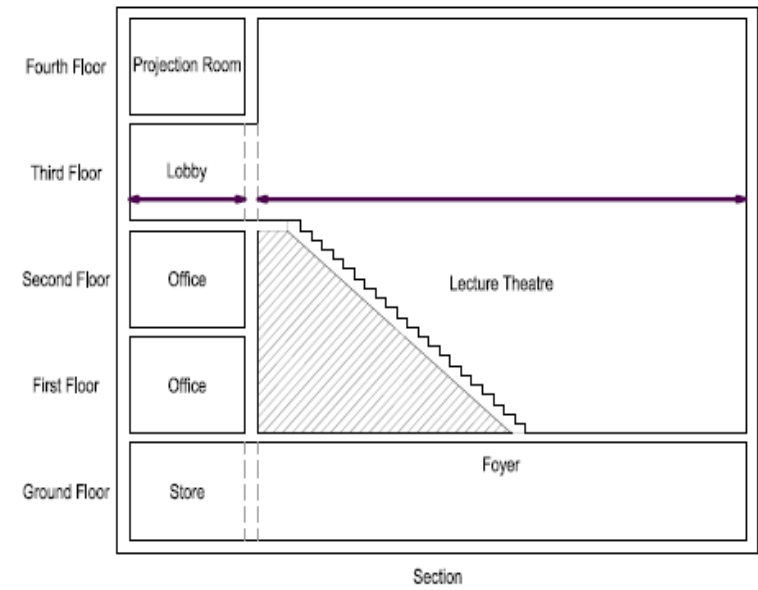
APPENDIX H UoC Space Numbering Convention

Floor Level Naming Protocol

Roof	R06				
Fifth Floor	05	R05			
Fourth Floor	04		R04		
Third Floor	03			R03	
Second Floor	02				R02
First Floor	01					R01
Ground Floor	00				
Lower Ground Floor	LG				
Basement	B0				
Sub-Basement	B1				
	B2				

Second Floor	02	
Mezzanine on First Floor		M1
First Floor	01	
Mezzanine on Ground		M0
Ground Floor	00	

Level	Level Description
XX	No Level Applicable
LG	Lower Ground
00	Ground Floor
UG	Upper Ground
01	First Floor
02	Second Floor
03	Third Floor
04	Fourth Floor
05	Fifth Floor
06	Sixth Floor
07	Seventh Floor
08	Eighth Floor
09	Ninth Floor
10	Tenth Floor
11	Eleventh Floor
12	Twelfth Floor
13	Thirteenth Floor
14	Fourteenth Floor
15	Fifteenth Floor
16	Sixteenth Floor
17	Seventeenth Floor
R01	Roof on First Floor
R02	Roof on Second Floor

R03	Roof on Third Floor

Level	Level Description
R04	Roof on Fourth Floor
R05 etc.	Roof on Fifth Floor
M00	Mezzanine above Level 00
M01	Mezzanine above Level 01
M02	Mezzanine above Level 02
M03	Mezzanine above Level 03
M04	Mezzanine above Level 04
M5 etc.	Mezzanine above Level 05
B0	Basement
B1	Sub-Basement
B2 etc.	Sub-Basement
EV	Elevation
SC	Section

Zones References

Zone	Code
Project wide / not zone specific	XX
Zone 1	Z1
Zone 2	Z2
Zone 3	Z3
Zone 4	Z4
Zone 5	Z5
Zone 6	Z6
Zone 7	Z7
Zone 8	Z8

Space coding

Spaces should be numbered sequentially using 4 numeric characters starting at the main entrance and resetting at each floor change.

Example: 00 Ground Floor, Room 0001, Room 0002

01 First Floor, Room 0001, Room 0002 etc.

APPENDIX I   Room/Space Uses Parameter

Use Group	Use
Laboratory	Aquarium
	Clean Room
	Cold Room
	Dark Room
	Environ/Temp Controlled Room
	Fume Cupboard
	Greenhouse - Heated
	Home Office Designated (Highly Serviced)
	Home Office Designated (Low Serviced)
	Laboratory
	Laboratory - Dry
	Laboratory - Wet
	Microscope Room
	Tissue Culture/Growth Room
	Wash Room
	X-Ray Room
Social	Catering Facility – central/main
	Common Room - Staff
	Common Room - Student
	Dining/Snacking Area
	Kitchen/Food Prep area
	Social Area
	Sports Facility - Indoor

Use Group	Use
Lecture Theatre	Lecture Theatre - Raked
Ancillary	Ancillary Support Space - General
	Archive/File Room
	AV Room
	Changing Room/Showers
	Cupboard - General
	Drawing Room
	First Aid Room
	Greenhouse - Unheated
	Nursery - Child
	Outbuilding
	Photocopier/Print Room
	Prayer Room
	Reception
	Sports Facility - Outdoor
	Store - Chemical
	Store - Cycle
	Store - Fuel
	Store - Gardeners External
	Store - Gas
	Store - General
	Store - General Waste
	Store - General Waste External
	Store - Hazardous Waste

Use Group	Use
Ancillary (Cont.)	Store - Hazardous Waste External
	Store - Radioactive
	Store - Sports External
	Store - Sports Internal
	Store - Stock Room
	Studio
	Workshop
	Lecture Theatre - Projection Room
Balance	Atrium
	Balcony
	Bathroom
	Corridor
	Cupboard - Cleaners
	Cupboard - Service
	Duct
	Entrance Hall/Foyer/Lobby
	Lift
	Lift Lobby
	Lift Motor Room
	Loading Bay
	Plant Room
	Shower
	Stairs/Stairwell
	Store - Tank Room
	Toilet - Disabled

Use Group	Use
Balance (Cont.)	Toilet - Female
	Toilet - Male
	Toilet - Unisex
	Toilet - lobby
Class/Seminar Room	Class/Seminar Room
	Examination Hall
	Meeting Room
Computer	Computer/Server Room - Highly Serviced
	Computer/Server Room - Lightly Serviced
	Computing Facility
Library	Library
	Map Room
	Study/Reading Room
	Library - Dept Affiliated - Space General
Museum/Gallery	Museum - Central - Environ/Temp Controlled
	Museum - Central - Exhibition/Gallery Area
	Museum - Central - Office/Store/General
	Museum - Dept Affiliated - Environ/Temp Controlled
	Museum - Dept Affiliated - Exhibition/Gallery Area
	Museum - Dept Affiliated - Store
Office	Office
Performance	Performance Practice Room
	Performance Theatre
Commercial	Commercial
Derelict	Derelict

Use Group	Use
Residential	Residential

APPENDIX J   - ROLES AND RESPONSIBILITIES

BIM roles and responsibilities are described in this section. Please refer to the current version of the project execution plan for overall scopes of services.

R = Responsible (Undertaking task)

A = Approving Authority (Delegating tasks and validating compliance)

C = Consulted (Providing input to achieve the task)

I = Informed (Kept informed about the tasks and/or outputs)

- • = as required

Responsibilities	Employer	Project Manager	Cost manager	Design team	Lead Designer	BIM Leader	Information Manager	Main Contractor	CDM-C	Facilities manager	Specialist Contractor
CDE											
Advise on a CDE	A	I				C	R				
Provide a CDE	R	I	I	I	I	I	I	I	I	I	
Set up the CDE	A	C	C	C	C	C	R	C	C	C	
Maintain the CDE		C		I	C	C	R	C			
Download/upload all project information from/to the CDE	R	R		R	R	R	R	R	R	R	
Resources											
Appoint consultants, including Information Manager	R					C					
Ensure that the necessary software and hardware are in place within the organisation to support efficient delivery of the project	R	R	R	R	R	R	R	R	R	R	R
Assess all sub-contracted organisations (design or construct) according to the BIM assessment criteria contained in the Capability Assessment	I	I	R	R	R	R		R			R
Report any emerging skill gaps within the team		I		R	R			R			
Provide guidance to assist in procuring the right type of training from credible industry professionals	I	I	I	I	I	R	I	I	I	I	I
Co-ordinate training for your own organisation	R	R	R	R	R	R	R	R	R	R	R
Project strategy											
Establish BIM requirements for the project, long term	C	I				R					

Responsibilities	Employer	Project Manager	Cost manager	Design team	Lead Designer	BIM Leader	Information Manager	Main Contractor	CDM-C	Facilities manager	Specialist Contractor
Develop, implement and update as necessary the post-contract BEP, which all project team members need to agree to and use	A	I		C	C	R					
Agree and implement the data structure and maintenance standards for the information models	C	I	C	C	C	C	R			C	
Acquire and update as necessary the post-contract BEP to include construction responsibilities	I	I				I	I	R			I
Develop and implement the information delivery plan, sufficient to ensure all deliverables are accounted for		C				I	I	R			I
Acquire and update the MPDT indicating model progression in respect of work packages including Level Of Definition with dates of delivery								R			
Develop and implement the BIM implementation programme	A	R				C					
Develop and implement the information exchange protocol		I				C	R				
BIM guidance and monitoring of the project team	I	C				I	R				
Responsible for ensuring that all sub-contracted organisations (design or construct) meet the requirements set forth in the EIR		C		R	R			R			
Provide any existing information including historical data and existing conditions models.	R		R						I		
Geometry											
Create a site set-up model with coordinated, measurements and bearings to be used disseminated to all design team members				I	R			I			
Provide a virtual model according to the Levels of Development, the MPDT and the non-geometric requirements				R	R			R			R
Share information models for coordination				R	R			R			R

| Responsibilities	Employer	Project Manager	Cost manager	Design team	Lead Designer	BIM Leader	Information Manager	Main Contractor	CDM-C	Facilities manager	Specialist Contractor
Implement the BEP within the organisation		R	R	R	R	R	R	R	R	R	R
Full coordination of the design and design team				C	R						
Provide energy analysis model(s) for evaluation by the project team				R	R						
Provide structural analysis model(s) for evaluation by the project team				R							
Create clash detection reports of the federated models					R						
Ensure the implementation of BIM acknowledges Facilities Management (FM) and operation and maintenance deliverables	I	I				I		R		C	C
Incorporate sub-contract (design and construct) models				R	R			R			R
Ensure that all drawings are derived from the information models		I		R	R			R			R
Export and publish files according to file data exchange schedule		I		R	R			R			R
Data											
Specify data requirements including the purpose for the information required and the timing of its delivery	A	I	C	C	C	R	I	C	C	C	C
Provide data about facility in both its spatial and physical aspects according to the COBie requirements of the EIR		I		R	R			R		I	R
Provide data specific to a particular system or component in line with individual scope of works								R			C
Delegate aspect of the EIR downwards to the next tier		I		R	R			R			R
Create, acquire and store required information				R	R		R	R	R	R	R
Review and approve the data deliverable prior to submission		I		R	R	C	R	R			R
Construction management											
Provide 4D construction phasing		I						R			C
Provide 4D construction sequencing		I						R	I		C
Provide 4D logistics simulations including crane strategy		I						R	I		R

Responsibilities	Employer	Project Manager	Cost manager	Design team	Lead Designer	BIM Leader	Information Manager	Main Contractor	CDM-C	Facilities manager	Specialist Contractor
Update all 4D simulated models to reflect current project conditions and to illustrated progress		I						R	I		C
Report on residual risks within the model space and share via the CDE	I	I		C	C		I	C	R		C
Compile a digital health and safety file as per the instructions in 3.9	I	C		R	R		C	R	I	C	R
Quality assurance and control											
Adhere to the QA/QC procedure contained within the EIR				R	R			R			R
Ensure all dataset requirements are completed in full according to the Level Of Definition stage for use in CAFM		C		R	R		I	R			R
Report on changes to budget, cost and design	A		R					R			
Audit and coordinate virtual models, including full intermittent clash detection according to the BIM programme		I		C	R			C			C
Report on general model quality in terms of geometry, materiality and metadata		I					R				
Report on adherence to the project BEP with regards to model Level Of Definition, model completeness and BIM standards compliancy		I				I	R				
Report on functionality of the model for 4D and 5D use by other consultants		I	C					R	C		
Review of received data against the EIR data requirements				R	R		R	R			R
Support the Lead Designer by undertaking third party 3D coordination and clash detection processes to assist design coordination reviews		I		C	R			C			C
Meetings											
Make use of information models during design team and the Employers team meetings					R			R			
Hold BIM workgroup meetings		C	C*	C	R	I	I				

Responsibilities	Employer	Project Manager	Cost manager	Design team	Lead Designer	BIM Leader	Information Manager	Main Contractor	CDM-C	Facilities manager	Specialist Contractor
Hold key work stage BIM steer meetings	C	C	C	C	C	R	R	C		C	
Hold lessons learned meeting following completion of phases	I	R	R	R	R	R	R	R	R	R	R
Reporting and Governance											
Provide monthly status reports of BIM development using project pro-forma	I	C	R	R	R	R	R	R	C	C	R
Provide monthly procurement model highlighting work packages which have been let and/or procured	I	I						R			C
Provide monthly model showing actual programme progress against planned	I	I						R			C
Report on supply chain performance during construction	I	I						R			C

Table 4: Roles and Responsibilities

APPENDIX K   - BIM Processes

The BIM implementation sequence shows the critical path which governs BIM implementation. This sequence should be aligned with the Master Programme.
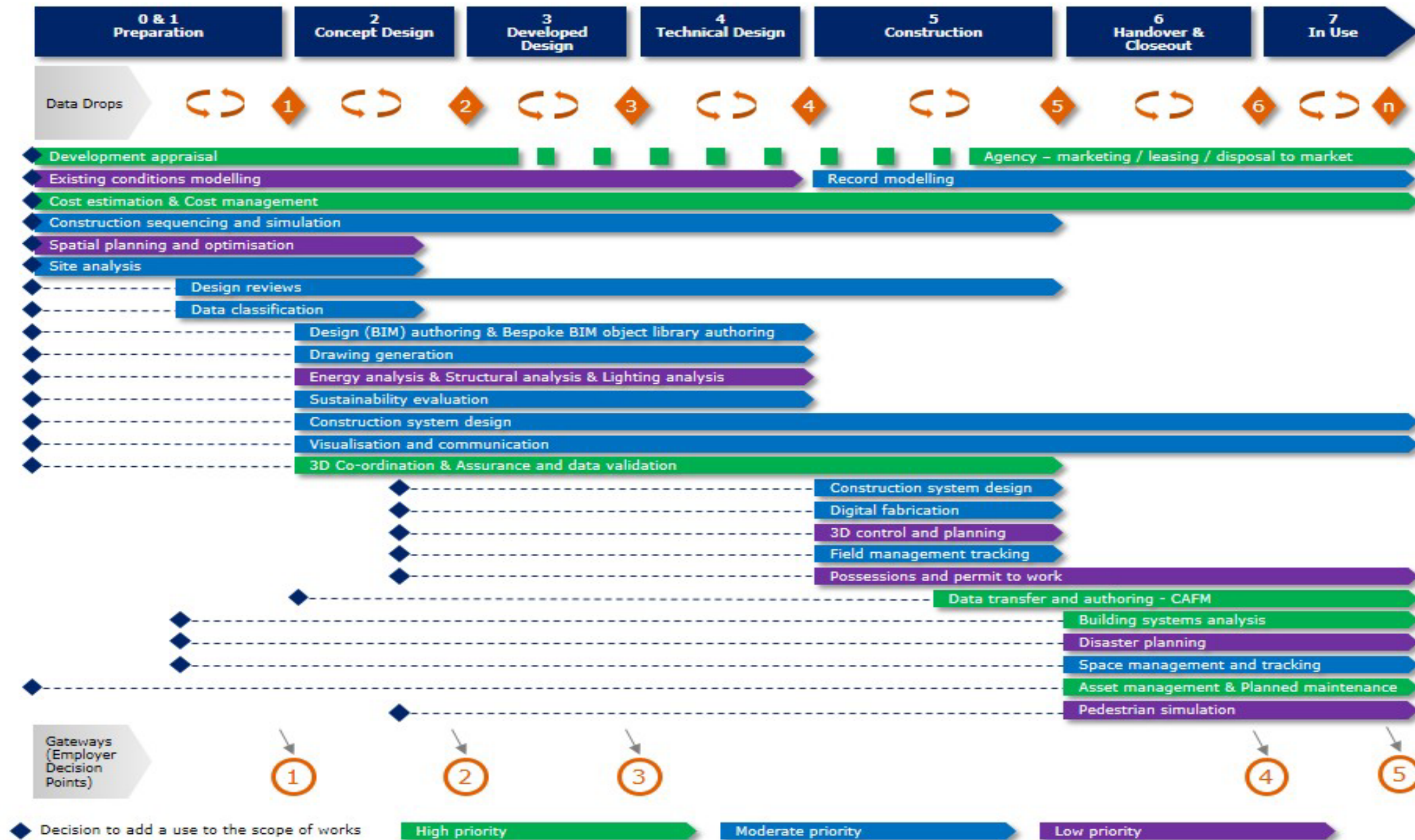
APPENDIX L - Data Drop Specification

Key data drops are outlined below. On the agreed dates, to be defined in the BIM Execution Plan, all parties will submit the following data based on models which will be coordinated by the lead designer:

* design responsibility novated to contactor upon contact award.

Data drop type	File submitted	Format(s)	Responsible party*
Monthly upload	Shared Model	.IFC, Native	ARC
	Shared Model	.IFC, Native	STR
	Shared Model	.IFC, Native	MEP
	Shared Model	.IFC, Native	LAR
Data drop	FM Data Schema drop	.XLS	ARC
	Shared Model	.IFC, Native	ARC
	Shared Model	.IFC, Native	CSE
	Shared Model	.IFC, Native	MEP
	Shared Model	.IFC, Native	LAR
	Cost report	.XLS	CMA

ARC = Architect

CSE = Civil & Structural Engineer

INT = Interior Designer

LAR = Landscape Architect

MEP = Mechanical & Electrical Engineer

CON = Main Contractor

FMA = Facilities Manager

APPENDIX M - Plain language questions

RIBA stage 3 - developed design

This stage requires the following:

Data drop: 3

LOD (generally):   3

LOI (generally):   3

The following questions are to be answered at the end of this stage:

1. What is the pre-design solution? In particular what are the layouts?

2. Does the architecture represented within the model meet the vision?

3. Does the design's performance meet the design brief?

4. What is the outline proposal for structural design?

5. What are the output requirements from services systems?

6. What is the commissioning strategy and how can it be tested?

7. Can the designers show the project can be delivered safely?

8. What is the preliminary cost estimate?

9. Is the architectural, MEP and structural design coordinated?

10. What is the initial FM strategy?

Information sufficient in answering the aforementioned questions should be presented to the client to inform a decision to progress to the next work stage.

RIBA stage 4 - technical design

This stage requires the following:

Data drop: 4

LOD (generally): 4

LOI (generally): 4

The following questions are to be answered at the end of this stage:

1. Is the model developed to demonstrate detailed proposals for planning and spatial arrangements?

2. Is the design model developed to demonstrate detailed proposals for elevation treatments?

3. Is the design model developed to demonstrate detailed proposals for environmental systems?

4. Is the design model developed to demonstrate detailed proposals for buildability?

5. Is the architectural, structural and MEP design coordinated?

6. How is the asset built and what are the task durations?

7. Is the model and supplementary information complete enough to procure the package contractor – (Build only)?

8. How has health and safety been considered?

9. Do the proposed tenderers have the required BIM capabilities?

10. Does the design meet the FM's needs e.g. COBie data completeness and validity

Information sufficient in answering the aforementioned questions should be presented to the client to inform a decision to progress to the next work stage.

RIBA stage 5 - construction

This stage requires the following:

Data drop: 5

LOD (generally):   5

LOI (generally):   5

The following questions are to be answered during this stage:

1. How will the construction site be managed safely?

2. How will the client be consulted with respect to changes and variations?

3. How will the contractor ensure that commissioning is transparent?

4. How will changes be recorded and stored for auditing?

5. How will soft landings be managed?

Information sufficient in answering the aforementioned questions should be presented to the client to inform a decision to progress to the next work stage.

End RIBA stage 6 - handover

This stage requires the following:

Data drop: 6

LOD (generally):   5

LOI (generally):   5

The following questions are to be answered at the end of this stage:

1. Does the project meet the brief?

2. What changes have been incorporated?

3. What has been built?

4. How does a specific product/element perform?

5. How will the asset be operated?

6. How is the asset to be maintained?

7. Does the as-built BIM accurately represent the building?

8. Is all data integrated as per the EIR and do all datasets adhere to the correct structure and classification?

9. Has the digital health and safety file been created?

10. Has the digital project quality file been created?

Information sufficient in answering the aforementioned questions should be presented to the client to inform a decision to progress to the next work stage.