Publish Date

PRE‑APPOINTMENT BIM EXECUTION PLAN (BEP)

Company Name

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| 8068-ORG-XX-XX-SP-X-5320 |

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| Project Information | |
| Lead Appointed Party Name | Lead Appointed Party Name |
| Company Name | Company Name |
| Company Address | Company Address |
| Originator Code | ORG |
| Client Name | Client Name |

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| --- | --- |
| Project Details | |
| Project Name | Project Name |
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# Abbreviations

The list below includes standard BIM-related abbreviations.

|  |  |
| --- | --- |
| 2D | 2-dimensional |
| 3D | 3-dimensional |
| 4D | Time implication |
| 5D | Cost implication |
| 6D | Lifecycle and Facilities Management |
| AIM | Asset Information Model |
| AM | Asset Management |
| BCF | BIM Collaboration Format |
| BEP | BIM Execution Plan |
| BIM | Building Information Modelling/Model / Management |
| BCM | BIM Coordination Meeting |
| BMS | Building Management System |
| CAD | Computer-Aided Design |
| CAFM | Computer Aided Facilities Management |
| CAM | Computer-Aided Manufacture |
| CDE | Common Data Environment |
| COBie | Construction Operations Building information exchange |
| CSD | Combined Service Drawing |
| CPI | Coordinated Project Information |
| DfMA | Design for Manufacture and Assembly |
| EIR | Exchange Information Requirements |
| FM | Facilities Management |
| gbXML | Green Building Extensible Modelling Language |
| GIS | Geographical Information System |
| GSL | Government Soft Landings |
| GUID | Globally Unique Identifier |
| IFC | Industry Foundation Classes |
| IPD | Integrated Project Delivery |
| ISO | International Organisation for Standardization |
| KPI | Key Performance Indicator |
| LOD | Level of Detail / Level of Definition - although superseded by Level of information need general term the Level of Detail phrase is used on this project regarding NBS Toolkit |
| LOI | Level of Information - although superseded by Level of information need general term the Level of Information phrase is used on this project regarding NBS Toolkit |
| MIDP | Master Information Delivery Plan |
| MEP | Mechanical, Electrical and Public Health |
| NRM | New Rules of Measurement |
| O&M | Operations and Maintenance |
| OIR | Organization Information Requirement |
| PAS | Publicly Available Specification |
| PIM | Project Information Model |
| PIP  PIR | Project Implementation Plan  Project Information Requirements |
| QS | Quantity Surveyor |
| QTO | Quantity Take Off |
| RFI | Request for Information |
| SAP | Standard Assessment Procedure |
| SMP | Standard Methods and Procedures |
| TIDP | Task Information Delivery Plan |
| Uniclass | Unified Classification System |
| VDC | Virtual Design and Construction |
| WIP | Work in Progress |
| XML | extensible Markup Language |
| X-REF | Cross Reference |

# Overview

## Purpose of the BEP

The purpose of this BIM Execution Plan (BEP) is to clearly define the actions required of each member of the project team in order to successfully deliver the BIM workflows on the Project Name project.

This BEP provides the required project information at both a strategic level, to satisfy the pre-appointment BEP requirements as defined by BS EN ISO 19650-2:2018, and at a technical level to meet the post-appointment BEP requirements as defined by BS EN ISO 19650-2:2018.

At the Strategic level, it *responds to the EIR.* In addition, it defines the BIM strategic requirements for the project and the methodology for delivering the project using BIM.

At a technical level, this BEP provides the technical requirements for delivering the project using BIM and defines the specific workflows required to do so.

This document will be used at the tender stage to confirm our offer to the client and to form the basis for tendering the BIM requirements from our delivery team. Post tender it will provide a clear guide that informs and directs consultants, contractors, and appointed parties as to the BIM workflows, standards, and deliverables of the project, and will be included in the trade contractor and consultant agreements.

Throughout the project, this document will be continually developed, monitored, and updated by the Lead Appointed Party Name - Company Name BIM Manager as consultants and subcontractors are appointed. The document will be submitted as part of our tender bid and will represent our baseline offer for BIM deliverables, which will not change during these iterations unless instructed or negotiated otherwise.

All appointed parties are to refer to this BEP to understand the requirements and their specific obligations to deliver the BIM workflows.

All task teams must have completed the Lead Appointed Party Name - Company Name BIM Capability & Capacity Assessment in due course. The responses will be assessed against the project requirements. Where further upskilling/training is required to fulfil the appointment requirements, Lead Appointed Party Name - Company Name will assist in organizing training where required. Lead Appointed Party Name - Company Name, can provide advice and guidance BIM team; these requirements will be discussed and agreed with the relevant party and recorded in the Training, Hardware, and Software Requirements schedule in BEP Appendix.

The latest version of the BEP and referenced information containers shall be stored on the project CDE, and each project team member must ensure they are working to the latest revision.

## Executive Summary

BIM at Maturity Stage 2 according to the ISO 19650 Series is “the use of a shared digital representation of a built asset to facilitate design, construction and operation workflows to form a reliable basis for decisions” (ISO 19650-1, 2018). The concept of sharing information in a BIM workflow allows project parties to have access and use digital information to simulate and display a project at different stages of development throughout its lifecycle, facilitating the decision-making process while taking into consideration the input and feedback of the parties involved. BIM documentation plays a crucial function in the success of implementation on organizational and project levels. This BIM Execution Plan (BEP) contributes to the success of BIM implementation on a project level as it explains how the delivery team will answer to the appointing party’s information requirements which are outlined in the Exchange Information Requirements (EIR).

It is within the responsibilities of the lead appointed party to coordinate with the appointed parties within the delivery team to produce a BEP which comprehensively defines the delivery’s team approach to information management.

The BEP defines how the geometrical and non-geometrical modelling requirements of the appointment will be carried out as it answers the following points:

How the information is created, managed, and delivered?

Why is the information created defining its BIM uses in the project?

By whom is the information created stating who is the originator of each information container?

When is the information created and how it is managed and shared?

The project BEP confirms the names of individuals within the delivery team who have information management functions, the information management strategy which will be followed and the supporting IT infrastructure, software, and hardware the team will use. Additionally, the BEP include a responsibility matrix as well as project-specific production methods and procedures.

Moreover, the BEP clarifies the federation strategy of the delivery team and defines the key deliverables to each element stipulated by appointment. The BEP also allows the delivery team to propose additions and amendments to methods and procedures required for effective project information products as well as amendments related to the project information standard the team intends to adopt.

The BEP is a live document that is frequently updated through the project lifecycle and responding to trigger events. A copy of the BEP is kept accessible for project parties in the Common Data Environment (CDE).

Developing an effective BEP plays a considerable role in the success of implementing BIM on a project. An effective Pre-appointment BEP is part of the tender response of the prospective lead appointed party and will communicate their approach to addressing the EIR and could be a reason for the appointment. A Post-appointment BEP supports the delivery team in answering to the EIR and achieving effective production and information management in the project, contributing directly to their success.

## Project Description

The Project Name project consists of the Project Description.

Table 1 - Project Information

|  |  |
| --- | --- |
| Project Details | |
| Lead Appointed Party Name | Lead Appointed Party Name |
| Project Name | Project Name |
| Project Address | Project Address |
| Project Number | Project Number |
| Project Value | Project Value |
| Document Reference | 8068-ORG-XX-XX-SP-X-5320 |
| Sector | Sector |
| Appointment Type | Appointment Type |
| Floor Area (main building) | Floor Area |

## Key Dates

Key dates for the project’s BIM milestones have been extracted from the Design & Construction Programme and recorded below for information purposes only.

Reference should always be made to the current revision of the Lead Appointed Party Name - Company Name Design & Construction Programme for validation of any dates identified in this document.

Table 2 - Key dates

|  |  |
| --- | --- |
| Key BIM Milestone description | Date |
| (For consideration as specific line items in the project programme) | |
| BIM Start-Up Meeting | Date |
| Main Appointment Commencement | Date |
| Start on Site | Date |
| Project handover | Date |

## Strategic Objectives

*Regarding the EIR’s,* the following Strategic Objectives for the project have been identified by the client and by Lead Appointed Party Name - Company Name:

* Meet Level 2 BIM compliance, in accordance with the UK Government mandate.
* Integrate BIM workflows into the Client’s Facility Management Systems to support operational tasks.
* Train and educate staff to raise BIM skills and understanding across all parts of the Estate.
* Improve Informed decision making, coordination and H&S.
* Improved tender & procurement.
* Standardise Design workflows.
* Enable Offsite fabrication.
* Provide fully synchronized construction documentation.
* Use active data to enable the Business case study.
* Security & surveillance.
* Use models for Energy Analysis.
* Provide as-built model to improve Maintenance & Repair.
* Enable Assessment & Reuse.
* Enable Impacts & Sustainability.

## Project BIM Objectives for the collaborative production of information

Based on the requirements of the EIR and the pre-appointment BEP, Lead Appointed Party Name - Company Name have identified the following key BIM Deliverables and associated targets for the pre-construction stage appointment and construction stages of the project.

A fundamental goal of BIM implementation for Project Name project is to improve efficiency in communication among different stakeholders throughout the entire building life cycle to reduce cost and time, achieve higher quality results and increase the certainty of project delivery.

To achieve these fundamental goals, the following project-specific BIM objectives are that will be implemented for a BIM project.

### BIM Objectives

* Meet Organizational information requirements (OIR), Project information requirements (PIR), Asset information requirements (AIR) and Exchange information requirements (EIR) and the level of information need requirements.
* Minimise abortive works during the construction stage by resolving the clashes at an early stage.
* To ensure spatial requirements from various stakeholders are achieved.
* To optimize the layout for maintenance operations.
* Shorten the time for commission and handover with an informative as-built model.
* Improve the operation and maintenance efficiency with an accurate as-built model.
* Provide cost information throughout the project life cycle to assist decision making and planning.
* Generate information in line with the respective TIDP and do not exceed the required level of information need in order to avoid waste[[1]](#footnote-2).
* Explore options for prefabrication.
* Visualization of logistics to improve workflows.
* Visualization of design proposals to speed up decision making.
* Communications with the community to avoid delays.
* Collection and provision of Data for FM purposes in COBie format.
* Support health and safety activities on the project.
* Support Government Soft Landing objectives for the scheme.

Table 3 - Table 4 - Project BIM Objectives

|  |  |  |  |
| --- | --- | --- | --- |
| Train and Educate Staff | Target Maturity | Project Stages | Deliverable Lead |
| Communication & Engagement | Models used to present ideas to the client and inform project team through basic visuals and where appropriate advanced photorealistic stills, animations, and walkthroughs | All project stages | Lead appointed party |
| Design Development | Design models are used to develop design by essential consultants and are shared with Lead appointed party regularly, models are used by crucial designers (including subcontract designers) to produce project Appointment information (2D drawings, schedules and specifications) at all stages of the project | Stages 0-4 and design changes during  Stage 5 | All project task teams |
| Design Review | Models used for design analysis and structured clash detection for coordination review meetings. Model audits undertaken to check compliance against BEP and other project requirements.  To prepare and review combined construction BIM model and coordinate design changes | Stages 0-4 and design changes during  Stage 5 | All project task teams |
| Site Logistics Methodology | BIM models used for detailed site layout /phasing plan (including access routes and site welfare) to communicate intent with stakeholders. BIM is used to integrate and review temporary works information. BIM is used to develop a work sequence planning methodology including vehicle /pedestrian movement analysis | Construction Stage 5 | Lead appointed Party |
| 3D Coordination | To coordinate and consolidate BIM models among different trade to resolve clashes before construction employing visual check, clash analysis, etc.  To maintain issue management log to track and manage issues identified during design coordination meeting in compliance with the Lead Appointed party’s BIM standard. | Stages 0-4 and design changes during  Stage 5 | Appointed Party -TAL |
| Programme Validation (4D) | 4D construction model created from design 3D models and linked to actual construction programme to assist in the development of the programme and allow a visual record of progress | Stages 0-4 and design changes during Stage 5 | Lead appointed party |
| Existing Conditions Modelling | To make use of 3D digital survey technology for providing existing condition model and as-built model. | Stages 0-3 | Appointed Party -TAL |
| Health and Safety | Models are used to capture design risks, for health and safety review sessions, site inductions and regular site task briefings | All project stages | Lead appointed party |
| Mobile Field Applications | Digital collection of site data. Digital as-built surveys undertaken to verify as constructed information | Construction Stage 5 | Lead appointed party |
| Cost Estimation& Procurement | To have BIM models created based on Standard Approach of Modelling (SAM), such that to have to prepare required parameters in the BIM to facilitate the quantity take-off.  Quantities extracted from 3D models directly for cost planning and estimating purposes.  To prepare a financial model for a) cashflow forecast; b) interim payment simulation; c) estimate of variations | Stages 0-4 and design changes during Stage 5 | All project task teams |
| Digital Fabrication | Utilise model to identify prefabrication opportunities.  Produce shop drawing and working drawings directly from the model.  For customized mass components which are of large quantities and variety in dimensions, shape, geometries, etc., shall be digitalized the construction details in the BIM model to facilitate the fabrication of construction materials. | Stage 4 and design changes during Stage 5 | All task teams |
| Performance Analysis | Energy Analysis  Structural Analysis  LCA & Carbon Analysis  Lighting Analysis  Pedestrian/Vehicle Analysis  Geotechnical site analysis  Sound and vibrations analysis  Any other innovative solutions | All design Stages | All task teams |
| Digital Handover (6D) | Digital handover for all defined Client asset information.  The owner or operator must then verify, validate, and authorize the contents, including content checks against the AIR, which forms part of the EIRs, then the approved data is then to be published.  The published data should only be held in the published area of the CDE, while any superseded information should be moved into the archive area.  Those verified published data can be linked with enterprise systems such as Building Maintenance System (BMS). (Optional due to final contractual requirement.) | Stage 6 | Lead appointed party |

# Project Team

All parties employed for the project are defined as members of the Project Team. An example of project structure is shown in Figure 1 - Example of Hierarchical Project

Diagram, text

Description automatically generated

Figure 1 - Example of Hierarchical Project

Definitions and responsibilities associated with the project team functions are defined in Section 3.1 below.

Also, each party within the project team responsible for the creation of design information are to appoint a person(s) to undertake the activities of the Task Team functions described in Section 3.1below.

Each function can be fulfilled by either an individual or multiple people throughout the project and function responsibilities can be transferred as the project progresses.

All project team members are responsible for engaging in collaborative working for the project's benefit and aligning themselves with the guidance set out in this document.

A function mapping table has been included in Appendix to identify how the duties assigned to the project functions listed below are mapped to the functions defined in BS EN 19650-2:2018.

Besides, an Information Management Responsibilities Matrix has been included in Appendix*,* which assigns responsibilities across the project team against the duties required to deliver the project in accordance with ISO 19650-2:2018.

## Designated Information Management Functions

Table 4 - Designated Information Management Functions

|  |  |  |
| --- | --- | --- |
| Function | Name | Email |
| Client Team - Client Name | | |
| Appointing Party | Name | Email |
| Lead Appointed Party Name - Company Name | | |
| Project BIM Manager | Name | Email |
| BIM Strategic Lead | Name | Email |
| Project BIM Coordinator | Name | Email |
| Specialist BIM Manager | Name | Email |
| Project Information Manager | Name | Email |
| Information Controller | Name | Email |
| Task Team Architect - Company Name | | |
| T.T Lead Designer | Name | Email |
| T.T Project Information Manager | Name | Email |
| T.T. Information Manager | Name | Email |
| T.T Interface Manager | Name | Email |
| Task Team Structural Engineering - Company Name | | |
| T.T Project Information Manager | Name | Email |
| T.T. Information Manager | Name | Email |
| T.T Interface Manager | Name | Email |
| Task Team Civil Engineering - Company Name | | |
| T.T Project Information Manager | Name | Email |
| T.T. Information Manager | Name | Email |
| T.T Interface Manager | Name | Email |
| Task Team MEP - Jarek Ltd. | | |
| T.T Project Information Manager | Name | Email |
| T.T. Information Manager | Name | Email |
| T.T Interface Manager | Name | Email |
| Task Team FF&E - Company Name | | |
| T.T Project Information Manager | Name | Email |
| T.T. Information Manager | Name | Email |
| T.T Interface Manager | Name | Email |

## Organizational Structure and Commercial Relationships

A diagram of a company

Description automatically generated

Figure 2 - Organisational Structure and Commercial Relationships

## BIM Function Descriptions

Duties of the primary project BIM functions are listed below. Besides, each party within the project team responsible for the creation of design information are to appoint a person(s) to undertake the activities of the Task Team functions

For all consultants and sub-contractors with design responsibility, BIM duties will include:

* Producing 3D design models with embedded asset information in line with the information and protocols set out in the BEP.
* Production of 2D construction drawings derived from the 3D design models in accordance with Appointment scope.
* Regular reviews of the BEP and feedback on amendments as required for specific project needs.
* Fortnightly shared model uploads/initiate to the CDE.
* Feedback to lead designer any design coordination issues.
* Attend regular BIM supported design coordination meetings.

### BIM Strategic Lead

Responsible for project strategic direction from the tender stage, guides project set up and advises on the project when needed.

Regional Lead Appointed Party Name - Company Name BIM staff duties include:

* Development of the BIM Tender Checklists.
* Assist in defining project BIM deliverables.
* Writing the pre-appointment BIM Execution Plan and ensuring it is in line with the EIR requirements.
* Writing BIM specific tender responses.
* Assists in the assessment of costs for BIM implementation for the project.
* Assists in identifying key project challenges and define BIM uses for the scheme.
* Assists with the assessment of delivery team capability.
* Leads BIM Kick-off meeting.
* Attends project BIM strategy meetings and gives advice when needed during the project.
* Undertake BIM Peer Review and Lessons Learnt.

### Project BIM Manager

Responsible for ensuring that the BIM workflow has been established for the project and is adhered to by the team during the implementation stages of the project.

[Appointment*:* Lead Appointed Party Name - Company Name BIM staff. May be involved at tender stage having input into the BEP and interviewing delivery team to assess capability]

Duties include:

* Leads post-appointment BIM Start-Up Meeting, ensuring all team members clearly understand their functions, responsibilities, project challenges, BIM objectives, actions and other requirements stated in the BIM Execution Plan (BEP).
* Further develops the pre-appointment BEP to establish and issue the post-appointment BEP.
* Manages any changes or updates to the BEP during the project period.
* Responsible for quality and compliance assurance, including adherence to information project protocols, workflows, model management, data management, compliance with BEP and Client Requirements (EIRs).
* Assesses and advises on the impact of changes in client requirements on the BIM delivery strategy and timetable and incorporates any agreed changes into the BEP.
* Manages and oversees agreed project BIM uses such as planning and logistics, schedule extraction, KPIs etc.
* Model and data audit analysis for all project 3D models for compliance against the BEP and client deliverables at key project stages.
* Ensure the BIM Co-ordinator meets their duties and provides technical support and assistance where required.
* Ensures a Common Data Environment (CDE) has been established.

### Project BIM Coordinator

During the design stages, responsible for executing, managing, and running clash detection of the federated Project Information Model (PIM), and federating and QA reviewing the Asset Information Model (AIM) for handover.

This will include, as required, federation and clash detection of models generated by all project model contributors, including, but not limited to, consultants and trade contractors.

[Appointment: Lead Appointed Party Name - Company Name BIM Staff.]

Duties include:

* Audit single discipline/ trade models from consultants and subcontractors when uploaded on to the CDE before federation, provide approval status on the system.
* Federate models and carry out a model review at regular BIM supported design coordination meetings in line with the BEP collaboration workflows and timetables.
* Liaise with the Design Manager and Lead Designer for the identification of design issues and relevant appointments for resolution of the same.
* Attend and enable regular BIM supported design coordination meetings.
* Ensure the model structure is suitable for the data extraction and BIM uses agreed for the project.
* Record all agreed actions and owners in the Clash Review reports and issue to the team via CDE regularly.
* Feedback to BIM Manager for any model, data, or compliance issues.
* Provide technical assistance to the delivery team at BIM. Supported design coordination meetings and remotely as required.
* Ensure model contributors are providing and coordinating all elements listed in the MPDT, including builder’s works holes.
* The central point of contact for BIM contributors for issues associated with production, development, and update of geometrical information.

### Specialist BIM Manager / Coordinator

The Specialist BIM Coordinator duties will reflect those for the Project BIM Coordinator as listed above but will be specific for discipline or trade-specific models and data deliverables. Responsible for checking, reviewing, and approving all information from their organization before allowing information to be moved to the shared environment for other parties to access.

This function is of particular relevance in the production of the MEP model like it in itself involves several contributors and ‘sub-models’ that must be federated, reviewed, and resolved before issue to the Project BIM Coordinator ahead of their cross-discipline federation and checks.

[Appointment: BIM Coordinator contributing to BIM Model and Data delivery.]

Duties include:

* Ensuring elemental model integrity, reliability, and compliance with the BEP.
* Issuing information (models/data) on time.
* Internal QA, model, and data audit prior to issue to Lead Appointed Party Name - Company Name.
* Addressing and resolving model drafting, coordination or data delivery issues as identified through internal QA workflow and raised by the Project BIM Coordinator in the clash and data reports.
* Where there are third party contributors to the single discipline models (e.g. sprinklers, air duct and water supply systems), the Specialist BIM Coordinator (in the example given, the ‘MEP BIM Coordinator’) will federate, clash detect and run the analysis of the MEP models.
* Liaising and assisting the Project BIM Coordinator with the production of the PIM and AIM.
* Coordination with other parties’ project models, data, and information.
* Overseeing and ensuring the resolution of issues associated with their or other’s deliverables if affected by their modelling works.
* Confirming models are developed in line with the compromised level of information need in the various project stage and should comply with the Digital Plan of Work (dPoW).
* Ensure that the model structure and data contained within it are suitable for the implementation of agreed BIM uses for the project.
* Ensuring that single discipline models are site verified at relevant stages, updated accordingly and suitable for integration with the AIM.
* Identifying requirements within their organization and ensuring appropriate attendance at coordination meetings.
* Defining requirements, securing, and incorporating 3D as-built surveys form model verification as required.
* Providing as-built site verified models for the AIM.
* Attend BIM-enabled design coordination meetings.
* Liaise with the Project BIM Coordinator, Building Services Manager, Design Manager and Lead Designer for the identification of design issues and relevant appointments for resolution of the same.

### Project Information Manager

Responsible for extraction, review, coordination, and reporting of data within the native and federated models as well as associated project databases throughout the project stages to ensure client and BEP requirements are met.

[Appointment: Lead Appointed Party Name - Company Name BIM Staff.]

Duties include:

* Data audit of single discipline/ trade models from consultants and subcontractors at agreed data drop milestones and critical project stages.
* Own, manage, updater and ensure the reliability of the project database.
* Execute and issue COBie drops applied to the project (federating data from originators).
* Produce, manage, and issue a Red, Amber Green Data Report (RAG Data Report) noting progress of data deliverables and issues that need to be addressed by each contributor.
* Prepare final data drops to be issued in COBie or other project-specific schema formats for handover.
* Manage data reviews and obtain approvals from relevant parties (Client, Client FM team, Lead Appointed Party Name - Company Name, BIM Manager).
* Review the federated and native models for suitability for data linking, extraction and other data uses as agreed for the project.
* Feedback to BIM Manager for any model, data, or compliance issues.
* Provide technical assistance to the delivery team at data review meetings and remotely as required.
* The central point of contact for BIM data contributors.

### Information Controller

Responsible for setup and management of the Common Data Environment (CDE), document submission, RFI and other project document transaction.

[Appointment: Lead Appointed Party Name - Company Name Information Controller, site-based.]

### Lead Designer

The lead designer is responsible for the traditional coordination of all design disciplines. Please refer to individual appointments and scopes of services.

# PIM Delivery Strategy

## Task Information Delivery Plan (TIDP)

A Task Information Delivery Plan shall be completed by every applicable party utilizing the Lead Appointed Party Name - Company Name standard TIDP template.

Each applicable party is to request a copy of the template for completion from their Lead Appointed Party Name - Company Name Construction contact.

Please follow the below numbering for a consistent model naming shown in Appendix.

## Master Information Delivery Plan (MIDP)

The Master Information Delivery Plan will be completed by Lead Appointed Party Name - Company Name on standard MIDP template, based on the TIDP’s received from all applicable parties.

Where there is a conflict between the Master Design Programme and the MIDP, the Master Design Programme takes precedence.

## Federation Strategy

The proposed overall modelling and coordination strategy for the project has been developed considering the factors listed below; this will be further developed and updated as additional information and model authors are identified:

* Overall project procurement strategy.
* Availability and level of information need of design phase models.
* Trade contractor capability assessments.
* Survey requirements.
* Required project deliverables.
* The agreed BIM Uses.
* The identified unique project challenges.
* Coordination requirements.
* Concurrent working requirements.
* Security considerations.
* Model Information container size.

It is envisaged that elements of the consultants’ models will be retained where the sub-contractors do not provide modelling and that in these instances the design team shall continue to develop the models in line with the requirement of BS EN ISO 19650-1:2018. Where the trade provides modelling, the design team elements will be switched off / superseded and adherence with the model elements that the model maturity should be in line with a specific project delivering stage.

### Information transmission

The models will be split into manageable units in line with functional and spatial breakdown strategy demonstrated in section 4 of this BEP. The breakdown shall be established per discipline during the start of the project to ensure that the information container sizes do not become so large and manageable for coordination.

If the individual models (in required formats including native and IFC) increase in size to over **300Mb** during the design process, then sub-dividing models for the issue to the rest of the project team will be reviewed so that the models can be efficiently managed.

Besides, further sub-division of models may be required if the federated models exceed **300Mb**.

For Revit models, Worksets should be used to assist model management and simplify Information container splitting later.

## Project Identifier

Table 5 - Project Identifier

|  |  |
| --- | --- |
| Code | Project |
| 8068-ORG-XX-XX-SP-X-5320 | Project Name |

This is a single common project identifier, defined at the initiation of the project, to be used by all organizations to identify the project.

## Originator

Table 6 - Originator

|  |  |
| --- | --- |
| Code | Organisation Name |
| XXX | Organisation Name |
| XXX | Organisation Name |
| XXX | Organisation Name |
| XXX | Organisation Name |
| XXX | Organisation Name |

## Project Specified Model Information container naming

Table 7 - Project Specified Model Information Container Naming

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Project No | [1] | Originator | [1] | Functional Breakdown | [1] | Spatial Breakdown | [1] | Form | [1] | Discipline | [1] | Number | [2] | Information Model/container Title/Description |
| 0000 | - | ORG | - | XX | - | XX | - | M3 | - | E | - | 9100 | \_ | Revit Model\_S1\_P01 |
| 0000 | - | ORG | - | XX | - | XX | - | M3 | - | E | - | 9200 | \_ | Navis Model\_S1\_P01 |
| 0000 | - | ORG | - | XX | - | XX | - | M3 | - | E | - | 9300 | \_ | IFC Model\_S1\_P01 |

## General Design and Construction Information

General arrangement drawing, coordination drawing, location drawings and schedules of elements, objects, components, and materials for all work scope that is modelled will be generated from the BIM model as sheet sets (data drops) that are contained in the BIM project model for that discipline. Typical details, assembly and component details, and shop drawings may be created separately from the BIM model depending on the Level of Information Need of a particular stage. The details of drawings generated separately from Construction BIM Models shall be approved by the Lead Appointed Party before being shared to permitted parties for construction use.

## Data Strategy

**Introduction of COBie**

COBie is an acronym for “Construction Operations Building Information exchange.” COBie is an information exchange specification for the life-cycle capture and delivery of information needed by facility managers. It defines the way this information is structured and formats that can be used. COBie is a format of building data for the publication of a subset of building model information and is commonly in the format of excel spreadsheet for delivering construction handover between lifecycles.

COBie exchange format Excel spreadsheets are used to integrate Autodesk Revit project file and the Client’s Facility Management System. The COBie Excel file will contain COBie parameters specified. The COBie parameters requirement is specified in Appendix.

It is the responsibility of each design discipline to ensure the information input into the native models is accurate (validated and verified) and that the data has correctly exported and populated the data (COBie) spreadsheet.

Data entry should be an ongoing process throughout the project; it should be carefully controlled with regular in-house data checks carried out by each discipline. Checks to include:

* Project data parameters have been correctly input.
* Organisation contact details are correct and up to date.
* No data amendments are made once extracted from the 3D models.
* Data has been entered in the correct fields and format (e.g. alphanumeric).
* Data has been entered at the correct type/instance level.
* Model and project protocols have been followed (identification conventions, levels etc.).
* Duplicate objects removed from the models.
* Data (COBie) export settings and parameter mappings are correct.

The integrity of data, included within the data (COBie) scheme, should be ensured as follows:

* Every Component should be assigned to at least one Space.
* Every Component should be assigned to one Type.
* Every 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.

Consultants are asked to supply details of their data (COBie) workflows, data entry and in-house data checking procedures to Lead Appointed Party Name - Company Name.

The following diagram illustrates the workflows of data collection and validation, the platform for all data collection and validation associated with handover is eDocuments. Within this digital handover solution, all relevant information, including H&S file, O&M’s, drawings, models, asset data, etc. will be collated.

A diagram of data integration

Description automatically generated

Figure 3 - Data Strategy

## Exchange Information Requirements

On the agreed dates, all parties will submit their 3D Models and associated data drops. All models are to be entirely clash checked before issue. All data drops are to be thoroughly checked and the information verified before issue.

Lead Appointed Party Name - Company Name will audit the models for data quality/consistency and BEP compliance during and at the end of each project milestone / work-stage. A data audit report will be issued documenting results. Where possible, Lead Appointed Party Name - Company Name will guide data entry, shared parameters and COBie export settings upon request.

Exchange information requirements at each stage or gateway will be made up as follows:

* Native discipline-based 3D model files product is specific for all design and analysis models. Revit (.rvt) files.
* 3D discipline-based models extracted from native files, for collaboration and clash detection. IFC; NWD; NWF.
* COBie-COBie-UK-2012 version 2.4 extracted from native files.
* PDF files (for associated documentation)- no older than version 7.0.
* 2D drawing files in dwg format cut from the submitted models.

The responsibilities for exchange information requirements are as follows:

Table 8 - Responsibilities for EIR

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Reference | Design Stage | Responsibility | Check 1 | Check 2 |
| Pre-Main Contractor Contract | Data Drop 1 | End of Stage 1  [Brief] | Architect | Appointing Party | - |
| Data drop 2 | End-Stage 2  [Concept] | Architect | Appointing Party | - |
| Data Drop 3 | End-Stage 3  [Definition] | Architect | Appointing Party | - |
| Data Drop 4 | End-Stage 4  [Design] | Architect | Appointing Party | - |
| Post-Main Contract | Data Drop 5 | End-Stage 5  [Construct and commission] | Lead appointed Party | Architect | Appointing Party |
| Data Drop 6 | Stage 6  [Handover & Closeout] | Lead appointed Party | Architect | Appointing Party |
| Data Drop 7 | Stage 7  [Operation and End of Life] | Lead appointed Party | Architect | Appointing Party |

## CDM Strategy and PAS 1192-6 Compliance

In our function as Principal Contractor, we shall leverage the project models and BIM Deliverables to address the critical requirements of the CDM regulations 2015 as summarized below.

Table 9 - CDM Strategy

|  |  |  |
| --- | --- | --- |
| CDM General Aims | BIM Support | Relevant BIM Deliverables |
| sensibly plan the work, so the risks involved are managed from start to finish | 4D linking of the programme to the model including logistics models | Communication & Engagement Site Logistics Methodology Programme Validation (4D) |
| have the right people for the right job at the right time | BIM Capability Assessments carried out and any additional training or upskilling needs identified |  |
| cooperate and coordinate your work with others | Design to be fully coordinated ahead of manufacture/installation to avoid unplanned site activities associated with clashes etc. | Design Review |
| have the right information about the risks and how they are being managed | Residual design risks to be embedded in the model-by-model authors | Health & Safety |
| communicate this information effectively to those who need to know | Model-based workforce engagements, safety briefings and site inductions using 4D sequencing, residual risk annotations, etc. Live project information to be available on the CDE at all times | Communication & Engagement Health & Safety |
| consult and engage with workers about the risks and how they are being managed | Collaborative model-based planning sessions carried out with key stakeholders and delivery team | Site Logistics Methodology |
| **Principal Contractors Duties**  Plan, manage, monitor, and coordinate health and safety in the construction phase of a project. This includes: | | |
| liaising with the client and principal designer | Model-based presentation sessions | Communication & Engagement |
| preparing the construction phase plan PDF | Drawings to be extracted from 3D models | Design Development |
| organising cooperation between contractors and coordinating their work | Collaboration workflows and procedures described in this BEP to be stringently adhered to and current information to be available on CDE as required | Design Review |
| Make sure: | | |
| suitable site inductions are provided | Model and 4D sequencing used to familiarise workers with the project and critical activities | Health & Safety |
| reasonable steps are taken to prevent unauthorised access | Hoarding and access and egress routes modelling carried out and incorporated into the project model | Site Logistics Methodology |
| workers are consulted and engaged in securing their health and safety | Collaborative model-based planning sessions carried out with key stakeholders and delivery team | Site Logistics Methodology |
| welfare facilities are provided | Federated model to be used during planning stages to locate appropriate facilities in safe zones and reviewed through construction | Site Logistics Methodology |
| **Principal Designers Duties**  Plan, manage, monitor, and coordinate health and safety in the pre-construction phase of a project. This includes: | | |
| identifying, eliminating, or controlling foreseeable risks | Residual design risks to be embedded in the model-by-model authors | Health & Safety |
| ensuring designers carry out their duties | Stringent adherence to BEP workflows | Design Development |
| Prepare and provide relevant information to other duty holders. | Use of CDE to share required and up to date information | Design Development |
| Liaise with the principal contractor to help in the planning, management, monitoring, and coordination of the construction phase | Use of CDE and collaboration workflows | Design Development |

# PIM Collaboration and Coordination

## Common Data Environment (CDE)

A Common Data Environment (CDE) approach allows information to be shared effectively between all members of the project team, giving early access to information, and avoiding the risk of duplication.

There are four primary environments to CDE:

### WIP (Work in Progress)

A supply-chain management term describing partially finished information awaiting completion. In other words, the Information model is not to be used by any other project party.

Before progression onto the next phase, the respective Key BIM Contact must approve all information. The designated area which stores the as-built geometric, non-geometric and other Project information, relating to as-constructed, has to be checked, reviewed, and approved before it can enter the ‘Shared’ area.

Further checks, including coordination, clash and Information container checking is completed before being transferred to the Client Shared Area.

### Shared

All project Model Authors’ information for the use of the entire project team. The Federated Model Manager will combine all information for checking against the AIR. All team members should be using other parties’ information for their internal coordination checks. To progress to the next stage, the Coordination Manager must authorise all information.

### Published

This information will have been accepted by the nominated party, in which case it will be suitable for tender or construction (2D model output only). Such that the ‘Published’ area should be maintained in two parts: an ‘Information Container Store’ to hold all the published level 2 files (documents, geographic models, and non-geographic structured data Information containers), and a ‘Data Store’ to hold all non-geographic structured data as a data model.

### Archive

History of project information, such that any non-current published information in the published area should move into this area.

New parties to the project will receive an invitation to join the CDE through the project Document Controller once registered User Guides and System Protocols can be accessed via the navigation tree.

Diagram

Description automatically generated

Figure 4 - Collaboration and Coordination

## Model Upload Workflow

3D models shall be synchronized with the central cloud model after daily work is done to ensure the rest of the project team are coordinating with the latest information.

All necessary steps should be taken before upload to ensure effective collaboration and that no misrepresentations of information occur. These include but are not limited to:

* Appropriate Information container name with no revision code.
* Appropriate Status code.
* In house SMP’s compliance and approval.
* Technical content checked.
* Extracted drawings/schedules/other extracted model info is coordinated.
* Removal of all referenced information not related to deliverables/scope.
* Audited, purged, and compressed.
* Not locked in any way to the author.
* All elements are visible and unfiltered.
* Appropriate QA procedures are undertaken.

Each task team will upload their model information to the CDE.

For all models Information containers, start a NEW ITEM. Multiple file formats of the same model are to be uploaded under the same item/instance. The main shared format will be the first upload, along with all other formats.

When uploading, the originator shall ensure that a revision to an existing file is uploaded as a NEW REVISION, and NOT uploaded as a NEW ITEM. This will ensure that the file’s revision history is maintained and will prevent duplicated records.

If a file is to become superseded by another or is uploaded incorrectly, the files should be edited with the ‘Superseded’ Revision Status.

## Software and Information container Formats

Each task team is to confirm their chosen authoring software and version to facilitate compatibility across the project; these are to be recorded in the table below which is to be regularly reviewed and updated as new members of the project team are added:

Table 10 - Software and Information container Formats

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Task Team | Use | Software | Version | Primary shared format | Secondary shared format | Other agreed formats |
| Architect | Model (Design Authoring) | Autodesk Revit | 2019 | IFC | RVT | N/A |
| Design Coordination | Autodesk Navisworks Manage | 2019 | NWD | NWC | N/A |
| Drawings | Autodesk Revit & AutoCAD | 2019 | PDF | DWG | N/A |
| Structural | Model (Design Authoring) | Autodesk Revit | 2019 | IFC | RVT | N/A |
| Design Coordination | Autodesk Navisworks Manage | 2019 | NWD | NDC | N/A |
| Drawings | Autodesk Revit & AutoCAD | 2019 | PDF | RVT | N/A |
| MEP | Model (Design Authoring) | Autodesk Revit | 2019 | IFC | RVT | N/A |
| Design Coordination | Autodesk Navisworks Manage | 2019 | NWD | NWC | N/A |
| Drawings | Autodesk Revit & AutoCAD | 2019 | PDF | DWG | N/A |
| Temporary Works | Model (Design Authoring) | Autodesk Revit | 2019 | IFC | RVT | N/A |
| Design Coordination | Autodesk Navisworks Manage | 2019 | NWD | NWC | N/A |
| Drawings | Autodesk Revit & AutoCAD | 2019 | PDF | DWG | N/A |

BIM Model developed from Autodesk Revit is expected to be Industry Foundation Class (IFC) compliant as supported by all-important BIM authoring tools to allow data interoperability.

All construction BIM modelling and relevant documentation (Combined Services Models and Combined Builder’s Works Models & Drawings) shall be completed in Autodesk Revit, any additional software used for any other purposes shall report and seek approval from the Lead Appointed party, i.e. any software used for fabrication work should be agreed and aligned for the better data interoperability and project workflow.

Components in the BIM models shall be natively created in the design authoring software environment with compliance to BIM standard and requirement outlined in this document. Any component created solely by imported models from other software formats shall not be accepted unless otherwise approved by the Lead Appointed party

Training and upskilling on Lead Appointed Party Name - Company Name name preferred software solutions can be provided on request to delivery and delivery teams.

## Phase Planning (4D Modelling)

Modelling or Phase Planning include simulation model of the construction process to:

* establish relationships between the programme and sequence of construction activities including the delivery of material and equipment to be carried out during the construction.
* demonstrate the Contractor’s works sequences.
* identify potential time and spatial conflicts.
* optimize the use of critical resources.
* enhance safety requirements and construction workflows control.
* minimize disturbance to the operation of the neighbourhood.
* better coordinate with affected parties and resolve interfacing issues at early stages.
* monitor the procurement status of project materials.

4D simulation shall be demonstrated in fortnightly intervals linking all activities in the master programme, and it shall be automatically matched with the activities as shown in the master programme with appropriately Information container format.

A 4D Simulation Report shall be submitted, containing the following but not limited to:

* description of the 4D simulation report, e.g. assumptions, time interval, construction method statement, guide for accessing the Information containers and models, etc.
* Video (s) of the 4D simulation.
* BIM native model(s).
* model(s) for 4D simulation platform.
* linked project programme or equivalent deliverable.

## Coordination of Builders work

It is anticipated that as a minimum, all builders work openings of 50x50mm (or 50mm diameter) or higher will be captured in the model, scheduled from the model, and represented on the 2D drawings derived from the model, including those passing through structural and non-structural fabric elements.

In order to achieve this, the individual MEP trades are to define their builders’ work requirements for their specific service (size and shape), and it will be the task of the Lead MEP Designer to model combined builders work placeholders around the services where they pass through structural or non-structural fabric elements in the federated project model, this will allow openings to be identified during clash detection analysis. Builders work placeholders are to be created and included in the model authors elements library and named ‘Builders work Placeholder,’ these parts will be either cylindrical or cuboid.

The responsibility for coordinating and defining the construction openings (size, shape, structural requirements (e.g. lintels, avoidance of critical stud work, rebar, etc.)), and generating the 2D builders work drawings, will then rest with the model author of the fabric element that the builders work passes through, in situations where a subcontracting model does NOT replace these elements, this responsibility will fall to the design team, this is expected to include reinforced concrete elements (slabs, walls, etc.), blockwork and drylining.

It will be necessary for MEP trade appointment model development to occur early enough in the design programme to inform the fabric elements design ahead of construction on site.

## As Built / Surveys

It will be a requirement of our subcontract agreements that after each element of subcontract work, the relevant subcontractor will prepare a void closure handover pack that will contain:

* Marked-up drawings denoting the extent of handover.
* Red-lined drawings showing as-built locations of installed elements produced from survey data.
* Test certificates.
* Calibration certificates for test equipment.
* Photographic record of installation.
* Signed off snag sheets.

Areas will then be offered up for inspection and signed off before following trades can commence. This will provide a thorough record of the installation as works progress and will allow the models to be progressively updated to as-built status ahead of the exchange information requirements and final handover.

Surveys will be carried out as required to support validation of the as-built models. Refer to the Survey Tracker located in Appendix for a list of required, legacy and completed surveys.

Digital survey data should be delivered in the following formats:

Table 11 - Digital survey

|  |  |  |  |
| --- | --- | --- | --- |
| Survey Method | Delivery Format | Survey Origin | Details, notes |
| Point cloud | .las | TBC | Point cloud files are to be supplied in the following formats for conversion to RCS or RCP for use in Revit and Navisworks. ASC, CL3, CLR, E57, FLS, FWS, ISPROJ, LAS, PCG, PTG, PTS, PTX, RDS, TXT, XYB, XYZ, ZFS |
| Light detecting and ranging (LIDAR) | TBC | TBC | - |
| Global navigation satellite systems (GNSS) | TBC | TBC | - |
| Build Mesh | .tin | TBC | - |
| Export ortho-image | .jpg,.png, .tiff | TBC | - |
| <<others as appropriate>> | TBC | TBC | - |

## Security Requirements

It should be noted that all project information, unless otherwise explicitly agreed, is to be treated as confidential. Information uploaded to the CDE is to adhere to the Information Protocol provided in section 4 of this BEP.

CDE is configured to achieve compliance with the principles of PAS1192-5:2015 Specification for security-minded building information modelling; digital built environments and smart asset management.

Specific information within the information containers which may lead to security issue, classified as confidential is addressed in Information Protocol

Access permissions will be determined and authorized by the Lead Appointed Party. Such information will be stored and shared separately in the CDE in line with Information Protocol.

All model information containers which are issued to the project team will require a model clean-up to reduce the file size and to purge unnecessary items. This includes:

* All items related to the purpose of the issue should be ‘bound in’ to the model Information container (this may apply for example where a single discipline has smaller linked models that are relevant to the purpose of issue, e.g. bathroom pods).
* All items not specifically related to the purpose of the issue should be deleted.
* All drawing sheets must be deleted.
* All views deleted.
* All linked DWGs shall be deleted.
* 'Purge' and 'audit' the information container to remove any unused objects and model corruption issues.

# PIM Model Quality Control

## Overview

All BIM coordinators and project contributors are responsible for maintaining the quality and integrity of respective discipline models as specified in agreed BIM Standard and project-specific BEP. All project contributors must read and understand these Information containers before start working on the model. To ensure model quality and relevant information is adequate for the intended BIM objectives and BIM uses, the following workflow of quality control should be implemented.

## Level of information need

The part 1 & 2 of BS EN ISO 19650:2018 set of standards introduced a new term ‘Level of information need’ which is designed to replace the terms used in PAS1192 such as Level of model definition/level of detail (LOD) and level of information (LOI). Since the PAS1192-2:2013 has been withdrawn[[2]](#footnote-3) and the new BS EN ISO 19650-2:2018 does not define the Maturity Model Progression requirements, such that the trade contractor should propose the suitable model maturity throughout different project stage and should submit to the BIM lead Consultant for review and approve. The BIM Lead Consultant shall have the final right to determine the Level of Information need in any circumstance.

The Maturity Model Progression shall comply with NBS Toolkit definitions Level of Detail and Level of Information stated in dPoW.

The NBS Toolkit can be accessed by the following: <https://toolkit.thenbs.com/definitions>.

## Data Utilization and Ownership

Appointing Party Name needs to own, reuse, and adequately manage building data throughout the facility lifecycle. Appointing Party Name and Lead Appointed Party Name place significant importance on the accurate creation, management, and stewardship of building information during the design and documentation process. The design process shall allow refinements during and after the construction process, with the goal being delivery of project data in support of the owner, and utilization in facility management. The Appointing Party, i.e. Appointing Party Name shall have ownership of all information Containers, i.e. CAD files, BIM Models, and Facility data developed for the Project, Appointing Party name may make use of this data following any deliverable.

1. Reference BS EN ISO 19650‑2:2018, clause 5.6.2 b) [↑](#footnote-ref-2)
2. PAS1192-22013 Figure 20 – Level of Definition [↑](#footnote-ref-3)