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**AS ISO 19650 Aligned**

V1.0 – April 2024

**Pre-appointment BIM Execution Plan (BEP) Template - Combined**

|  |  |
| --- | --- |
| Project reference: |  |
| Project name: |  |
| Project address/location: |  |
| Brief project description: |  |
| Appointing party: |  |

|  |  |
| --- | --- |
| Version: |  |
| Date: |  |

**NATSPEC Pre-appointment BIM Execution Plan (BEP) Template - Combined**

April 2024

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**Document references**

In this document:

* The ‘*BEP Template*’ or ‘*Template*’ means the *NATSPEC Pre-appointment BIM Execution Plan (BEP) Template*.
* The ‘*BEP*’ means the *BIM Execution Plan* for the nominated project.
* The ‘*EIR Template’* or ‘*Template*’ means the *NATSPEC Exchange Information Requirements (EIR) Template*.
* The ‘EIR’means theexchange information requirements for the nominated project.
* The *‘PBB Template’* or *‘Template’* means the *NATSPEC Project BIM Brief Template.*
* The *‘PBB’* means the *Project BIM Brief* for the nominated project.
* The ‘*National BIM Guide’, ‘NBG’* or ‘*Guide*’ means the *NATSPEC National BIM Guide*.

**Acknowledgements**

NATSPEC thanks the numerous individuals and organisations who contributed to the development of this document through material they provided and/or comments they made on drafts.

**Comments**

NATSPEC welcomes comments or suggestions for improvements to this document and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. NATSPEC also encourages users to share their experiences of applying it on projects with us. The input of industry stakeholders helps keep NATSPEC documents relevant to current practice and useful.

Contact us via email at [bim@natspec.com.au](mailto:bim@natspec.com.au).

**Pre-appointment BIM Execution Plan (BEP)**

**Document control**

This table is for listing the contacts who worked on the development of the BEP, and who can be contacted to answer queries about them. Indicate responsibilities for the development of the BEP in the ‘RACI’ column.

| Title/Role | Name | Company/  Organisation | Email | Tel. No. | RACI |
| --- | --- | --- | --- | --- | --- |
| Author |  |  |  |  |  |
| Owner |  |  |  |  |  |
| Appointing party representative |  |  |  |  |  |
| BIM Manager |  |  |  |  |  |
| Information Manager |  |  |  |  |  |

**Key to responsibilities for developing the Pre-appointment BEP**

R Responsible for undertaking activity

A Accountable for activity completion

C Consulted during activity

I Informed following activity completion

Add or amend roles in the table as required. Those shown are examples only – customise to suit the project.

Note that AS ISO 19650.2 (2019) never uses the term ‘Information Manager’ but instead always refers to an “*individual or individuals nominated by the appointing party to undertake the information management function*” for a project. The intent is that the information management function is embedded into existing roles, and independent of an individual’s contractual role.

Information Manager is used in the interests of brevity. If there is more than one individual undertaking this function responsible for developing the BEP, add more rows and details as required.

Role responsible for maintaining and updating the Pre-appointment BEP:

Enter the role or individual/s responsible. Refer to required procedures for consultation, notification, review, approval, etc in **TECHNICAL**, **Proposed amendments to project information production methods and procedures table**.

**Version history**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Version | Date | Amended by | Approved by | Comments |
|  |  |  |  |  |
|  |  |  |  |  |
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**BIM Execution Plans (BEP)**

A BEP describes how the information the appointing party requires will be delivered and how the project will be executed, monitored and controlled with regard to BIM – who does what, when and how. It is crucial to the success of a project.

There are two types:

* The pre-appointment BEP which is prepared by prospective lead appointed party in response to the appointing party’s exchange information requirements (EIR) and supporting invitation to tender information. See AS ISO 19650.2 (2019) clause 5.3.2.
* Delivery team’s BEP: Following the appointment of the successful tenderer, the lead appointed party – in agreement with appointed parties – should update and confirm any changes required to the pre-appointment BEP. This appointment BEP is known as the delivery team’s BEP. See AS ISO 19650.2 (2019) clause 5.4.1.

**Pre-appointment BEP Template**

This Template can be used for projects where the client or appointing party do not have their own. It only includes content for pre-appointment BEPs. Use the other NATSPEC BEP Template for delivery team BEPs.

The Template must be edited to reflect project-specific requirements. In doing so, the party/parties assume responsibility for its content.

**Using this Template**

This Template includes prompts for eliciting BEP content and provides a structure for organising it effectively.

See *Appendix E – Planning information delivery* for an explanation of its structure and instructions for its use.

# Pre-appointment BIM Execution Plan (BEP) document

## AS ISO 19650 alignment

This document is aligned with the requirements of the AS ISO 19650 series of standards and uses the terminology from them throughout. Refer to them for details of the requirements and definitions of terms.

Definitions of terms can also be found on the ISO Online Browsing Platform (OBP): <https://www.iso.org/obp/ui>

A basic understanding of the concepts, principles and terminology found in the AS ISO 19650 series is crucial for making effective use of this Template. See the *NATSPEC National BIM Guide* for an introduction to the subject.

## Purpose

Apart from demonstrating to the appointing party that due consideration has been given to planning the information delivery process for their project, the BEP is essential for informing all members of the delivery team about the organisation of the process and their place in it.

This BEP describes the proposed approach by the prospective lead appointed party to the execution, monitoring and control of BIM for this project in response to the appointing party’s requirements.

## Application

Applicable project phases:

Examples of options – adjust wording to suit the project:

* This Pre-appointment BIM Execution Plan applies to the design phases of the project only, up to and including the handover of the project information model (PIM) and asset information model (AIM) from the design team to the construction team.
* This Pre-appointment BIM Execution Plan applies to the construction phases of the project only, from the handover of the PIM and AIM from the design team to the construction team and up to and including the handover of the AIM from the construction team to the operators of the completed building.
* This Pre-appointment BIM Execution Plan applies to the design and construction phases of the project, up to and including the handover of the AIM from the design and construction teams to the operators of the completed building.

The last option offers the most opportunities to realise the potential benefits of BIM.

Design status:

* A brief description of the point design development has reached at the time invitations to tender are issued, (e.g. functional brief, Conceptual design, Schematic design, Design development, Contract documentation) will also give a clearer picture of the scope of the project, without having to infer it from the details included in the BEP alone.
* Include any additional details that provide useful contextual information for the BEP.

Development sequence: Always create a Design BEP (DBEP) prior to developing a Construction BEP (CBEP).

## Updates and revisions

Recording updates and revisions: When updating or revising the pre-appointment BEP, edit it using a word processing application with track changes turned on to highlight any changes. Once agreed by the appointing party, accept changes and record a summary of them in the **Version history** table on the page before the Table of Contents.

# Project details

## Project description

Outline description:

Insert a brief description of the project and/or refer to documents that describes it in more detail.

## Project goals

The appointing party’s goals for the project are shown in the **Project goals table**.

* + - * 1. Project goals table

|  |  |  |
| --- | --- | --- |
| Priority | Goal description | Measures of success |
|  |  |  |
|  |  |  |
|  |  |  |

Copy project goals from the asset information requirements (AIR), project information requirements (PIR) or EIR to provide overall context for the next sections of the BEP.

**Priority:** e.g. High, Medium, Low, 1, 2, 3, etc. Define numerical designations to make it clear what is meant by each.

**Goal description:** A brief description, e.g. Increase cost certainty. Refer to the goals described in the AIR and PIR when summarising them here.

**Measures of success:** Quantifiable where possible, e.g. reduced number of requests for information.

If goals are documented elsewhere, you may prefer to delete the table and reference the relevant document instead.

# Commercial

## Procurement strategy

The project procurement strategy is shown in the **Project procurement strategy table**.

Project procurement strategy table

|  |  |
| --- | --- |
| Project procurement strategy |  |
| Contractor engagement (indicative date) |  |

Insert the details documented elsewhere, e.g. from the EIR or *Project BIM Brief*. For example, for the procurement strategy: Design Bid Build, Design and Construct, Integrated Project Delivery*.* If unknown, write ‘to be confirmed’. Highlight any amendments made after the issue of the EIR.

The procurement strategy will determine if a single or multiple BEPs are required and when/how the responsibility is handed over. If it involves the designer as part of the contractor engagement, the Design BEP and Construction BEP can be combined in one document.

## Delivery team members

Contact details: The contact details of key stakeholders who will undertake the information management function on behalf of the delivery team are shown in the **Delivery team members table**.

Delivery team members table

| Role | Discipline | Name | Company/  Organisation | Email/Phone |
| --- | --- | --- | --- | --- |
| Quantity Surveyor | Cost Planning |  |  |  |
| BIM Manager |  |  |  |  |
| Architectural BIM Lead | Architecture |  |  |  |
| Civil Engineering BIM Lead | Civil |  |  |  |
| Structural Engineering BIM Lead | Structural |  |  |  |
| Mechanical Engineering BIM Lead | Mechanical |  |  |  |
| Hydraulic Engineering BIM Lead | Hydraulic |  |  |  |
| Electrical Engineering BIM Lead | Electrical |  |  |  |
| Vertical Transportation Engineering BIM Lead | Vertical Transportation |  |  |  |
| Lead Fabrication Modeller | Fabrication |  |  |  |

This table is usually completed by the BIM Manager. Add or amend roles in the table as required. Add extra delivery team members as necessary when known.

As noted in clause 3.1.4 of the National BIM Guide, the AS ISO 19650 series never uses the term ‘Information Manager’ but instead always refers to an “*individual or individuals nominated by the appointing party to undertake the information management function*” for a project. This is typically the BIM Manager, but in instances where this is a dedicated role, add a separate row for ‘Information Manager’ and include their details.

Delivery team résumés: Refer to **ANNEX A – DELIVERY TEAM ROLES AND RESPONSIBILITIES**,**Delivery team members’ résumés** for professional résumés of key delivery team members.

Generally only included in the pre-appointment BEP. See AS ISO 19650.2 (2019) clause 5.3.2 a).

Time allocation: Refer to **ANNEX A – DELIVERY TEAM ROLES AND RESPONSIBILITIES**, **Human resource allocation table** for the proposed allocation of key delivery team members’ time to the project.

Generally only included in the pre-appointment BEP. See AS ISO 19650.2 (2019) clause 5.3.2 a).

## Common data environment (CDE)

Provision of CDE:

A project CDE should have been established by the appointing party in conformance with AS ISO 19650.2 (2019) clause 5.1.7. If this is the case, enter ‘By the appointing party’ at the prompt.

If the appointing party has not established a CDE, specify the proposed technical implementation requirements, management expectations and commercial arrangements regarding ownership and responsibilities during and after project delivery.

CDE access:

Provide a link to the CDE.

Instructions for using the CDE:

Provide a link to the CDE location for instructions.

## BIM coordination facilities

Provision of BIM coordination facilities:

If BIM coordination facilities are required, specify which party/parties will be responsible for providing, maintaining and managing them, including furniture, fixtures and equipment.

BIM coordination facility requirements: Refer to **TECHNICAL**, **BIM coordination facilities**.

## Project information delivery milestones

The estimated dates for major project milestones provided by the appointing party are shown in the **Project schedule table**.

Project schedule table

| Project phase or milestone | Estimated start date | Estimated completion date |
| --- | --- | --- |
| Project planning |  |  |
| Functional design brief |  |  |
| Master plan |  |  |
| Conceptual design |  |  |
| Schematic design |  |  |
| Design development |  |  |
| Tender documentation |  |  |
| Contract documentation |  |  |
| Construction/Fabrication |  |  |
| Commissioning/Handover |  |  |
| Project evaluation |  |  |

This table is for summarising key project dates. They should be based on those provided in the invitation to tender documentation, e.g. EIR, so copy those here or edit the table to align with them. Make sure they do not conflict with anything documented elsewhere. If they are documented elsewhere, e.g. in a program, it is preferable to append it and/or cross reference it rather than use the table.

## Amendments to EIR

EIR amendments: Amendments to the EIR proposed by the prospective lead appointed party are shown in the **EIR amendments table**.

EIR amendments table

| EIR  Clause No. | Clause title | Amendment |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Document proposed amendments to the appointing party’s EIR to address any issues or challenges arising from them, e.g. technical feasibility, capability and/or capacity limitations.

Another column ‘Reason for change’ can be added and details provided if this needs to be made explicit.

Amendments to the appointing party’s EIR during the project life cycle can change the scope of service previously agreed and documented and can have contractual implications. Consider the potential and/or impact of any amendment.

## Additional BIM uses

Additional uses: Additional BIM uses proposed by the prospective lead appointed party are shown in the **Additional BIM uses table**. These are BIM uses not specified in the EIR but are proposed to improve project delivery and outcomes.

Additional BIM uses table

| Project phase | BIM use | Implemented by | Comments |
| --- | --- | --- | --- |
| Preparation and briefing |  |  |  |
| Conceptual design |  |  |  |
| Schematic design |  |  |  |
| Design development/ Detailed design |  |  |  |
| Contract documentation |  |  |  |
| Construction/Fabrication |  |  |  |
| Facility management |  |  |  |

Use this table to identify BIM uses and deliverables that will be created in addition to the appointing party’s stated requirements. Use the Comments column to clearly differentiate any uses that will not be available to them, e.g. Delivery team use only.

## Delivery team structure

Delivery team structure: Organisational relationships between task teams are summarised in the **Task team organisational chart**.

**Task team organisational chart**

AS ISO 19650.2 (2019) clause 5.3.2 b) dot points 3 & 4 requires the prospective lead appointed party to consider the delivery team’s composition and task team organisational structure and commercial relationships.

Edit the hierarchy diagram to illustrate the project team’s organisational relationships. Enter task team details such as discipline, organisation name and the AS ISO 19650 series information management function in each box, e.g. Prospective lead appointed party.

It is recommended that information management function descriptions are used, not contractual descriptions, as contractual relationships are best defined in the contract. Organisational relationships described in the BEP may then be referenced in the annexures of the contract as necessary.

Refer to Microsoft Word Help for guidance on editing the hierarchy diagram. Alternatively, replace it with a diagram created in a graphic authoring application, or use a spreadsheet.

## Roles and responsibilities

Role descriptions: Refer to **ANNEX A – DELIVERY TEAM ROLES AND RESPONSIBILITIES** for descriptions of roles and responsibilities assigned to delivery team members.

This refers to general descriptions of responsibilities associated with roles, i.e. job descriptions. Responsibilities for specific information delivery tasks are documented in the following sections.

## Deliverables

Proposed deliverables: Refer to the appointing party’s EIR for details of the deliverables the prospective lead appointed party proposes to provide.

The appointing party’s EIR or Project BIM Brief should detail the deliverables required including the level of information need for each type of deliverable at each information delivery milestone.

Amendments to the deliverables specified in the EIR:

The prospective lead appointed party may wish to add deliverables based on their own project information purposes when preparing their pre-appointment BEP. They can be documented here. If there are no amendments, delete the prompt.

### Deliverables formats

Formats: In conformance with the appointing party’s EIR.

Amendments to the formats specified in the EIR:

The prospective lead appointed party may wish to add other formats based on their own project information purposes when preparing their pre-appointment BEP. They can be documented here.

If there are no amendments, delete the prompt.

Submission of hard copies: In conformance with the appointing party’s EIR.

# Management – General information

## Delivery team EIR delivery strategy

Approach to meeting EIR:

Include a high-level statement about the proposed approach to meeting the appointing party’s EIR. See AS ISO 19650.2 (2019) clause 5.3.2 b) dot point 1. It should provide a narrative that connects the following sections of the BEP in a meaningful way and demonstrate that the proposed approach is appropriate. Cross referencing relevant sections of the EIR with corresponding sections of the BEP can assist this.

Aspects of the strategy that can be outlined include:

* The federation/information container breakdown structure adopted for collaboration purposes such as organising the Common Data Environment (CDE) and providing a framework for formatting responsibility matrices.
* How information will be created and distributed between virtual 3D models and other locations such as documents and databases, e.g. will schedules be generated wholly or partially from data in the model? Crucially, where will duplication or overlap occur, and how will the risks associated with this be managed?
* What schema will be used to structure information to facilitate its management and exchange between different applications and stakeholders.

For less complex projects, outlining the approach may not be required if it is adequately conveyed by the following clauses.

Objectives for the collaborative production of information:

List the delivery team’s objectives for the collaborative production of information.

See AS ISO 19650.2 (2019) clause 5.3.2 b) dot point 2.

These could include:

* Ensure effective collaborative sharing and coordination of information through the implementation of procedures documented in the BEP.
* Minimise duplications, omissions and contradictions in data through the implementation of quality control measures such as checking procedures documented in the BEP.
* Identify the metrics that will be applied to measure success in meeting objectives, e.g. timeliness and reliability of delivery. This may include benchmarking against similar projects. A similar format to **PROJECT DETAILS**, **Project goals table** can be applied.
* Cross reference objectives to any goals identified by the appointing party.

## Federation strategy and information container breakdown structure

Federation strategy:

See AS ISO 19650.2 (2019) clause 5.3.2 c). Include a brief explanation of how the information model is to be divided into one or more sets of information containers. Conceptual frameworks that can be used for this purpose include ones that are discipline-based, functional, spatial, geometrical, or combinations of them. The federation strategy is a statement of the general approach – the information container breakdown structure represents its implementation.

The information container breakdown structure for the project is summarised in the **Information container breakdown structure diagram**.

Information container breakdown structures set out how information containers are grouped together in a hierarchy. The breakdown structure usually informs the organisation of the **High-level responsibility matrix**, so is best completed before developing it.

The upper levels of the hierarchy are typically based on disciplines, but lower levels can be based on other criteria. Consider how the structure may need to be broken down further in the life cycle of the project and make provision for it.

Typical criteria for organising lower levels of the structure include:

* Work package.
* Work zone (including ones for design stages and/or construction stages).
* Location, e.g. Building 2, Level 5 (coordinate with federation strategy).
* Content type, e.g. design, project management or financial information.
* Content format, e.g. models, drawings, documents, databases.

Security is another consideration that can shape the breakdown structure – decide the best way to segregate information for this purpose.

The upcoming National Annex to AS ISO 19650.2 (2019) includes fields for encoding the functional breakdown structure and spatial breakdown structure in the information container IDs managed in the Common Data Environment (CDE). Defining these breakdown structures first informs the development of codes that express the breakdown hierarchies.

Providing the project team with a clear picture of the breakdown structure facilitates the reliable storage and retrieval of information in the CDE. While the CDE organisation may be based on database management system rather than a file-based folder structure implied by the diagram, a diagram can still be an effective means of communicating the organisation of project information to the team.

**Information container breakdown structure** **diagram**

Information container ID: Refer to **TECHNICAL**, **CDE data standard**.

## High-level responsibility matrix

AS ISO 19650.2 (2019) clause 5.3.2 d) requires the prospective lead appointed party to consider the delivery team’s **High-level responsibility matrix**, containing the allocated responsibility for each element of the information model and the key deliverables associated to each element.

Note that the following responsibility matrices referred to are different to the Information management assignment matrix found in Annex A of AS ISO 19650.2 (2019). The latter is for assigning AS ISO 19650.2 (2019) referenced information management tasks to parties, while the following responsibility matrices are for assigning specific information delivery tasks and/or deliverables to delivery teams.

Prospective appointed party responsibilities: Refer to the **High-level responsibility matrix** in **ANNEX B – HIGH-LEVEL RESPONSIBILITY MATRIX** for details of model element types to be provided by the delivery team and the task team responsible for each.

## Information quality assurance

Proposed quality assurance approach:

If quality assurance requirements have been documented in the EIR or Project BIM Brief, reference them and note any proposed amendments or additions here.

If requirements have not already been specified, describe the measures proposed for assuring the quality of information. Include measures relating to the Common Data Environment (CDE) under **CDE management**.

Quality assurance standards: Conform to the standards documented in **TECHNICAL, Standards and project reference information**.

Model quality assurance: Refer to **MANAGEMENT – 3D MODELLING, Model quality assurance**.

## Information security and privacy

Proposed information security measures:

If security and privacy requirements have been documented in the EIR or Project BIM Brief, reference them and note any proposed amendments or additions here. Reference the relevant sections of the appointing party’s security policies and strategies, security management plans and security breach/incident management plans if available.

If requirements have not already been specified, describe the measures proposed for assuring the security and privacy of information. Include measures relating to the Common Data Environment (CDE) under **CDE management**.

Include governance protocols and responsibilities. This includes but is not limited to technical measures, authorisation processes for access, levels of access, security classification of information, privacy and IP protection measures and procedures in the event of breaches.

AS ISO 19650.5 (2021) specifies the principles and requirements for security-minded information management. It addresses the steps required to create security strategies, security management plans, etc (but does not provide them ready-made).

## CDE management

CDE standards and procedures:

If CDE management requirements have been documented in the EIR or Project BIM Brief, reference them and note any proposed amendments or additions here.

If requirements have not already been specified, describe the measures proposed for maintaining the security and integrity of the CDE. Include applicable standards, procedures and instructions in **TECHNICAL,** **Standards and project reference information**.

CDE technical implementation: Refer to **TECHNICAL, CDE technical implementation**.

## Collaboration arrangements

The following clauses describe the collaboration and communication procedures for local and remote users to access and use BIM for decision making.

### BIM coordination meetings

Requirement: Hold BIM coordination meetings as shown in the **BIM coordination meetings schedule**.

**BIM coordination meetings schedule**

| Meeting type | Timing | Location | Participants |
| --- | --- | --- | --- |
| BIM kick-off meeting |  |  |  |
| BIM execution planning |  |  |  |
| Safety in design workshop |  |  |  |
| 3D coordination/ clash resolution |  |  |  |
| 3D design review / Information review |  |  |  |

The meetings in this table are specifically about BIM-related matters. Coordinate with other project meetings scheduled elsewhere and incorporate them in a consolidated schedule as required.

**Meeting type**: Add or delete meeting types as required.

**Timing**: e.g. 2 weeks after contract award, weekly, fortnightly, monthly, 1st Tuesday of each month. If required, this column can be subdivided into project phases to show different frequencies for each phase.

**Location:** e.g. online, at a specified address. If the physical address of a meeting is not known at the time, enter TBC.

**Participants**: e.g. Project Architect, Design BIM Manager. Indicate who will be chairing the meeting, if known, by inserting (Chair) after the role description.

More detailed information such as the date of the next meeting, its location, agenda, etc can all be organised through agreed project processes. See Penn State *BIM Project Execution Planning Guide* Chapter 6 for suggested agendas for the initial series of meetings.

3D coordination/clash resolution: Refer to **ANNEX E – CLASH DETECTION**.

BIM coordination facilities: Refer to **TECHNICAL, BIM coordination facilities** for details of rooms and equipment required to support BIM coordination meetings.

Delete this subclause if these are not required for the project.

Collaboration procedures: Conform to procedures included in **TECHNICAL, Standards and project reference information**.

### User Group and stakeholder communication

User group and stakeholder communication plan:

Describe the proposed approach to communicating with groups such as occupants, asset users, neighbours and investors to enable their requirements to be taken into consideration.

Details can include:

* Key stakeholder details including their names, organisation, position, roles, responsibilities and contact details.
* Communication protocols including responsibilities for coordination, preferred communication methods, notification of meetings.
* Meeting or workshop schedule including locations. Coordinate with other project meetings scheduled elsewhere and incorporate them in a consolidated schedule as required.
* The use of BIM for visualisations, virtual reality, or augmented reality as a means of communicating design intent.
* Which items are subject to user group and stakeholder influence, the level of influence and how it will be integrated into the design process.

# Management – 3D Modelling

## Project location and set-out

Surveyor responsibility: Establish a Model Geo-reference Point before modelling commences.

BIM Manager responsibility: Nominate a Master coordinates file, a single file which includes all the World and Local Set-out coordinates and location settings.

Master co-ordinates file name:

This file will serve as the source of the project coordinates and for sharing such information.

BIM Lead responsibilities: Align all models with the Model Geo-reference Point shown in the **Model geographic location table**.

A Model Geo-reference Point is a point used to associate locations in the model with those in the real world. It is a generic term for various terms used in different modelling applications, e.g. Project Base Point in Revit.

Model geographic location table

|  |  |  |
| --- | --- | --- |
| **Location** | Longitude |  |
| Latitude |  |
| **Height Reference** | Australian Height Datum |  |
| **Grid datum** | Australian Geodetic Datum (GDA) |  |
| Local Grid Reference |  |
| **Project Datum** | (N/S) |  |
| **Model rotation relative to project north** | (deg) |  |
| **Reference Grid** |  |  |
| **Reference Survey** |  | |

Site set-out point establishment: Define the Model Geo-reference Point’s position relative to a physical Survey Point marked on site. Select locations that can be preserved throughout the construction period.

It is possible the Model Geo-reference Point will be disturbed during construction but its position can be determined relative to the Survey Point.

Amendments to coordinates: Record any changes to the spatial coordination (coordinates) of the master coordinates file established at the beginning of the project. Record the changes and the name of the person responsible for implementing them in the project meeting minutes. Once the design coordinate system is agreed upon, convert any model(s) of existing buildings relevant to the project into the coordinate system used for each designed building.

The BIM Manager is generally responsible for implementing changes to the spatial coordinates.

## Existing conditions modelling

Refer to NBG Appendix C, Clause 2.1. If existing conditions have not been modelled prior to tendering, or existing information needs to be updated, extended or enhanced, use the following prompt. If they have been adequately modelled, delete.

Methods for modelling existing conditions:

e.g. Modelling based on laser scanned point cloud information. Specify the Levels of Development (LOD) of Model Elements required. See *BIMForum LOD Specification* for definitions of LOD for a number of model elements. Reference guidelines and/or standards to be adopted, e.g. GSA *BIM Guide 03,* ASTM E57 3D file format (Refer ASTM E2807-11). Refer to the EIR or *Project BIM Brief* for details of the extent of existing conditions to be modelled, what is to be modelled and the level of detail required. If not already defined in the EIR or *Project BIM Brief*, define them here.

See *National Guidelines for Digital Modelling* clause 3.1.1 and *BIM Project Execution Planning Guide* Appendix B, Item 25.

## Model quality assurance

Describe quality assurance/control procedures; retaining data integrity/accuracy in BIM; and integration approach with cost planning, construction staging/sequencing, Schedule of Accommodation (SoA), space planning including resulting 2D drawing and schedule outputs.

The following clauses outline the model and data quality assurance approach adopted for the project.

### Model quality assurance measures

Strategy for establishing model quality control measures:

Describe the strategy for establishing model quality control measures including modelling standards, project templates and pre-exchange checking, approval and sign-off procedures. Consider how the *Open BIM Object Standard* (OBOS) and <https://bim.natspec.org/documents/open-bim-object-standard>the NATSPEC BIM Properties Generator can be used for this. See <https://bim.natspec.org/documents/open-bim-object-standard>. https://bim.natspec.org/documents/open-bim-object-standardwww.propgen.bim.natspec.com.au/www.propgen.bim.natspec.com.au/

Modelling standards: Conform to the modelling standards included in **TECHNICAL, Standards and project reference information**.

Include any standards specified by the appointing party in the EIR or Project BIM Brief **TECHNICAL** section in **TECHNICAL, Standards and project reference information** of the BEP. Describe any additional standards required. Adopt existing industry standards where possible. Another option is to adopt standards developed by team member organisations.

### Project object library

A project object library is an effective means of establishing modelling standards across a project by embedding them in model objects.

Library establishment strategy:

If it is agreed a project library is to be used, describe how it will be established and hosted, and who will be responsible.

Library management strategy:

Describe how content will be added, updated and managed to maintain object quality. Describe management responsibilities, access rights and permissions*.*

## Model development and sharing

### Model sharing protocols

Model sharing and federation protocol establishment:

Describe the strategy for establishing model sharing and federation protocols for the project which are to be included in **TECHNICAL, Standards and project reference information**.

Model revision management strategy:

Describe the procedures and methods including supporting revision management applications that will be used to manage revisions to models, e.g. red lining, CDE status codes and metadata.

Consider methods for alerting recipients to model amendments to reduce the risk of them being overlooked.

Model Description Document (MDD):

For simpler projects without revision management applications or sophisticated CDEs, a Model description document (MDD) can be used for model exchanges to describe the model’s purpose, any limitations on its use and any changes from previous editions.

If required, reference the location of the MDD Template, e.g. the project’s shared resources, and provide instructions on how and when it is to be used. An example of a MDD Template can be found in **ANNEX D – MODEL DESCRIPTION DOCUMENT (MDD)**. If not required, delete the Prompt.

Model element responsibilities: Refer to **ANNEX B – HIGH-LEVEL RESPONSIBILITY MATRIX**.

Modelling permissions: Refer to **ANNEX C – MODELLING PERMISSIONS**.

## Model exchange

Requirement: Exchange model files with the BIM Manager at the intervals documented in the **Model exchange schedule**.

Edit this clause to refer to the Design BIM Manager, Construction BIM Manager, or Information Manager as appropriate. See *National BIM Guide* clauses 5.1 to 5.3.

Systems to support model exchange: Refer to **TECHNICAL**.

Model exchange schedule

| **Discipline** | Establishment | Schematic Design | Design Development | Contract Documentation | Construction |
| --- | --- | --- | --- | --- | --- |
| Architectural |  |  |  |  |  |
| Structural |  |  |  |  |  |
| Mechanical |  |  |  |  |  |
| QS |  |  |  |  |  |
| Other |  |  |  |  |  |

This table is used for the pre-appointment BEP only. It is superseded by the Master Information Delivery Plan (MIDP) in the delivery team’s BEP.

The **Drawing exchange schedule** gives each discipline an indication of the expected frequency of model exchange at each project phase so they can plan their resources. Add or delete disciplines and/or project phases as required. Identify files being exchanged, e.g. WIP.

Insert the required interval for each exchange, e.g. weekly, fortnightly, monthly, every Monday, on request of BIM Manager.

Edit the project phases to suit the BEP type and scope of service being provided, e.g. for a Design BEP, include only those phases from Establishment to Design development or Contract documentation.

Rather than trying to prescribe fixed intervals between exchanges, you may prefer to decide this on an as-needed basis at regular meetings. Alternatively, you could omit the table from the BEP and include it when available information allows.

## Drawing exchange

Requirement: Exchange drawing files with the BIM Manager at the intervals documented in the **Drawing exchange schedule**.

Edit this clause to refer to the Design BIM Manager or Construction BIM Manager, as appropriate.

Drawing exchange schedule

| **Discipline** | Establishment | Schematic Design | Design Development | Contract Documentation | Construction |
| --- | --- | --- | --- | --- | --- |
| Architectural |  |  |  |  |  |
| Structural |  |  |  |  |  |
| Mechanical |  |  |  |  |  |
| QS |  |  |  |  |  |
| Other |  |  |  |  |  |

This table is used for the pre-appointment BEP only. It is superseded by the Master Information Delivery Plan (MIDP) in the delivery team’s BEP.

The **Model exchange schedule** gives each discipline an indication of the expected frequency of drawing exchange at each project phase so they can plan their resources. Add or delete disciplines and/or project phases as required. Identify files being exchanged, e.g. Work in Progress (WIP).

Insert the required interval for each exchange, e.g. weekly, fortnightly, monthly, every Monday, on request of BIM Manager.

Edit the project phases to suit the BEP type and scope of service being provided, e.g. for a Design BEP, include only those phases from Establishment to Design development or Contract documentation.

Rather than trying to prescribe fixed intervals between exchanges, you may prefer to decide this on an as-needed basis at regular meetings. Alternatively, you could omit the table from the initial BEP and include it when available information allows.

## Model development

Model development protocols:

Conform to project information standards, e.g. *AIA Documents E203, G201, G202*. It is preferable to reference existing standards or standards with agreed amendments than to include purpose-written text in this location.

Describe how the **High -level responsibility matrix** and **Modelling permissions table** will be used.

## 3D coordination

### Coordination strategy

Model coordination strategy:

Describe the overall approach to model coordination. A coordination strategy encompasses more than clash detection alone, e.g. agreeing general zones for services, structure and penetrations before detail design begins. Explain what you are trying to achieve at each stage in the process to advance the development of the design. “Resolve problems, not clashes”.

Describe clash detection procedures including the obligations of those involved, workflows to be used, timing, reporting processes and formats, status tracking (New, Active, Resolved, etc), resolution and sign-off. It is preferable to reference existing standards and formats for these processes, e.g. BIM Collaboration Format(BCF). See https://technical.buildingsmart.org/standards/bcf/

Refer to **ANNEX E – CLASH DETECTION**, **Clash detection schedule** which can be used to specify the order in which items are to be coordinated.

See *National Guidelines for Digital Modelling* clause 3.6 & Appendix 1 and *BIM Project Execution Planning Guide* Appendix B, Item 11.

## Key model handovers

### As-designed model handover

Clauses included in this section assumes an As-designed model including existing conditions will be provided. Existing conditions models include existing site topography, structures, services, buildings and temporary works. If non-BIM methods have been used to deliver the project during the design phase, describe how models are to be developed from available information.

Agree what As-designed model handovers will be required, e.g. to the construction team only, to the construction team and the appointing party as a ‘For Record’ or ‘As-Designed’ model at completion.

Strategy for migrating the model(s) used for design/documentation to those used for construction:

Outline procedures for migration, including handover and sign-off protocols. Identify those responsible. Address how this can be done effectively with minimum effort.

Note any amendments to the procedures described in the Design BIM Execution Plan.

Permissible uses of design models including existing conditions for construction:

Define the status of information in design models including existing conditions. Summarise what they can, and cannot, be relied on for during the construction phases of the project. Reference contract clauses if available, and as appropriate.

Acceptance of design models including existing conditions for construction:

If the permissible uses of design models including existing conditions have been defined, confirm their acceptance and have all parties using the models sign-off on them.

If the permissible uses of design models including existing conditions have not been defined, assess the models and define limitations of their use. Summarise what uses they can, and cannot, be relied on for during the construction phases of the project. Reference contract clauses if available, and as appropriate.

Agree any remedial measures needed to make them conform to the project’s modelling and quality standards.

### As-built model handover

This clause is only applicable to construction or design and construction BEPs. Delete for design only BEPs.

Strategy for updating and coordinating changes during construction into the final as-built model deliverable files:

Describe who will be responsible and how the model is to be updated and coordinated. Outline procedures for capturing changes, incorporating them in the model and verifying their correctness, including sign-off protocols.

Permissible uses of as-built models:

Define the status of information in As-built Models. Summarise what it can, and cannot, be relied on for during the operational phases of the project, e.g. records only, facilities management. Reference contract clauses if available, and as appropriate.

# Technical

## Software

Project software: The buildingSMART IFC-compliant BIM applications to be used on the project are shown in the **Software table**.

AS ISO 19650.2 (2019) clause 5.3.2 g) requires the prospective lead appointed party to consider a proposed schedule of software (including versions), hardware and IT infrastructure the delivery team intend to adopt.

Software IFC version compatibility:

Specify the version of IFC that project software is required to be compatible with, e.g. IFC 2x3, IFC4 ADD2, IFC4 ADD2 TC1.

Software table

|  |  |  |
| --- | --- | --- |
| Discipline | Software (version/ build) | Use |
| Surveying |  | Survey authoring |
| Architecture |  | Design authoring |
| Civil |  | Design authoring |
| Structural |  | Design authoring |
| Mechanical |  | Design authoring |
| Hydraulic |  | Design authoring |
| Electrical |  | Design authoring |
| Fire |  | Design authoring |
| Vertical Transportation |  | Design authoring |
| Cost Planning |  | Quantity take-off and cost management |
| Delivery team coordination |  | Common Data Environment (CDE) |
| Model coordination |  | Clash Detection/avoidance |
| Model revision management |  | Model revision management |

Software versions: Once software versions are agreed by the delivery team, the use of different versions is not permitted without further agreement by them.

Strategy for managing software updates:

Outline policies and procedures for managing software updates including the parties responsible.

## IT infrastructure

Description:

Describe the IT infrastructure proposed for the project including hardware, network, communication and back-up systems in the event of disruptions. Describe the infrastructure’s data storage capacity and its performance regarding data transfer rates and latency. Confirm that capacity and performance is adequate for the information delivery documented in the BEP.

IT management and support:

Describe the provisions to be made for IT management and support including the number of personnel available, and their experience with the proposed software and IT infrastructure.

## Collaboration resources

Requirement: Provide project collaboration resources as shown in the **Collaboration resources table**.

Collaboration resources table

| Collaboration resource | Software solution | Online location/ URL |
| --- | --- | --- |
| Online project collaboration system |  |  |
| Online document management system |  |  |
| Model federation/clash review /revision management system |  |  |
| Common Data Environment (CDE) | See CDE technical implementation |  |

Edit collaboration resource items to reflect project details.

**Software solution:** e.g. Online document management system: Aconex.

**Online location/ URL**: The login address for the system.

Instructions for using collaboration resources:

Describe the location of instructions and procedures for using each collaboration resource, i.e. for the systems, not the collaboration procedures that are documented elsewhere in this Template, e.g. **MANAGEMENT – INFORMATION IN GENERAL** and **MANAGEMENT – 3D MODELLING**.

Collaboration resource migration:

If collaboration resources or their providers will change between design and construction phases, document the changes here, including responsibilities and procedures for migrating information from one system to another.

### CDE technical implementation

CDE technical implementation:

A project CDE should have been established by the appointing party in conformance with AS ISO 19650.2 (2019) clause 5.1.7. In this instance, enter ‘Refer to the Instructions for using the CDE in the EIR’ and provide the link to them in the CDE.

If a CDE has not been established by the appointing party, describe the implementation proposed in response to the requirements specified in the EIR.

CDE management: Refer to **MANAGEMENT – INFORMATION IN GENERAL, CDE management**.

### CDE data standard

Standard: Conform to AS ISO 19650.2 (2019) National Annex for information container identification (ID) and assigning metadata for status, revision and classification to information.

If not conforming to the upcoming National Annex, amend the text and document proposed amendments or alternative standards.

## BIM coordination facilities

Description: Details of the project’s BIM coordination facilities are shown in the **BIM coordination facilities table**.

BIM coordination facilities table

| Item | Details |
| --- | --- |
| Room |  |
| Equipment | Computer:  Software:  Display:  Smartboard/Interactive whiteboard: |

As most coordination now takes place online, this table provides details of a room sometimes provided on-site for this purpose. If not applicable to the project, delete it.

**Room details:** e.g. address, location, room number, dimensions. Consider attaching a location plan and/or a room plan showing the layout of equipment.

**Equipment details:**

* **Computer:** Nominate the manufacturer and model or provide a specification, e.g. processor speed, hard drive size, RAM, graphics card, to run all software required and handle expected file sizes efficiently.
* **Software:** e.g. operating system, BIM authoring software, CAD software, model review software, e.g. Navisworks in versions necessary to open agreed file types.
* **Displays:** e.g. LED monitor, Ultra-short-throw projector. Nominate the manufacturer and model or provide a specification.
* **Smartboard/Interactive whiteboard:** Nominate the manufacturer and model or provide a specification. Include multi-colour pens for mark-ups.

BIM coordination facility relocation:

If coordination facilities or their providers will change between design and construction phases, document the changes here, including responsibilities and procedures for relocation. If relocation is not planned, delete this prompt.

## Data standards

Requirement: The following data standards apply to the project:

If not documented in the EIR or Project BIM Brief, specify the asset data standards to be used on the project below.

Building, floor/level and zoning naming:

Room coding:

e.g. Australasian Health Facilities Guidelines (AusHFG) room coding.

Asset classification:

## BIM object modelling

BIM object modelling standard:

Reference the standard used for the project BIM object library and/or content created for the project, e.g. *Open BIM Object Standard* (OBOS). See <https://bim.natspec.org/documents/open-bim-object-standard>.https://bim.natspec.org/documents/open-bim-object-standard<https://bim.natspec.org/documents/open-bim-object-standard>

BIM object attributes: Refer to **TECHNICAL, Standards and project reference information** in the EIR or Project BIM Brief.

## Standards and project reference information

Standards and project reference information location:

Include a link to an online repository, common data environment (CDE) or a description of a location. Ideally, a CDE or single secure location for these resources should be established prior to invitations to tender. Refer to AS ISO 19650.2 (2019) clause 5.1.7. This is more effective and reliable compared to sending them individually to each prospective appointed party.

### Amendments to information standards

The following tables can be used to highlight proposed amendments and additions to standards and project reference information found in the **TECHNICAL**, **Project information standards directory** of the EIR or Project BIM Brief.

If these items are stored in a CDE or online document management system, a link to it can be provided instead.

See *Appendix D – Defining information requirements* for examples of standards and project reference information.

Proposed amendments or additions to the project’s information standards: Refer to the **Proposed amendments to information standards table**.

AS ISO 19650.2 (2019) clause 5.3.2 f) requires the prospective lead appointed party to consider any proposed additions or amendments to the project’s information standard that the delivery team require.

Proposed amendments to information standards table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Document title | Edition/version | Date | Clause No. | Proposed amendments |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Enter details and add or delete rows as required. If proposed amendments are extensive, it may be simpler to append the subject document with changes made clear by highlighting, strikethroughs, track changes, etc and reference its location.

Proposed additional documents accepted by the appointing party should be included in the CDE and appointed parties notified.

### Amendments to information production methods and procedures

Proposed amendments or additions to the project’s information production methods and procedures: Refer to the **Proposed amendments to information production methods and procedures table**.

AS ISO 19650.2 (2019) clause 5.3.2 e) requires the prospective lead appointed party to consider any proposed additions or amendments to the project’s information production methods and procedures that the delivery team require.

Proposed amendments to information production methods and procedures table

| Document title | Edition/version | Date | Clause No. | Proposed amendments |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Enter details and add or delete rows as required. If proposed amendments are extensive, it may be simpler to append the subject document with changes made clear by highlighting, strikethroughs, track changes, etc and reference its location.

Proposed additional documents accepted by the appointing party should be included in the CDE and appointed parties notified.

### Proposed amendments to reference information

Proposed amendments or additions to the project’s reference information: Refer to the documents listed in the **Proposed amendments to reference information table**.

Proposed amendments to reference information table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Document title | Edition/version | Date | Clause No. | Proposed amendments |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Enter details and add or delete rows as required. If proposed amendments are extensive, it may be simpler to append the subject document with changes made clear by highlighting, strikethroughs, track changes, etc and reference its location.

Proposed additional documents accepted by the appointing party should be included in the CDE and appointed parties notified.

### Proposed amendments to shared resources

Proposed amendments or additions to the project’s shared resources: Refer to the documents listed in the **Proposed amendments to shared resources table**.

Proposed amendments to shared resources table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Document title | Edition/version | Date | Clause No. | Proposed amendments |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Enter details and add or delete rows as required. If proposed amendments are extensive, it may be simpler to append the subject document with changes made clear by highlighting, strikethroughs, track changes, etc and reference its location.

Proposed additional documents accepted by the appointing party should be included in the CDE and appointed parties notified.

# References

Amend the following references to reflect additions or deletions from the BEP Template.

**The following documents are incorporated into this BIM Execution Plan by reference:**

AS ISO 19650.2 NA Pending Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling, Part 2: Delivery phase of the assets - National Annex

COBie Constructions Operations Building Information Exchange

National BIM Guide 2022 NATSPEC

UniFormat 2010 Building Element Classification System

**The following documents are mentioned only in the Guidance text:**

AS ISO 19650.2 2019 Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling, Part 2: Delivery phase of the assets

ASTM E2807-11 2019 Standard Specification for 3D Imaging Data Exchange

BIM Collaboration

Format v3.0 2021

BIM Project Execution

Planning Guide v2.2 2019 Computer Integrated Construction Research Program (CIC) at the Pennsylvania State University (PSU)

The Outline Scope of

Services for the Role

Of Information

Management 2013 Construction Industry Council

GSA BIM Guide 03 2009 3D Laser Scanning v1.0

LOD Specification 2022 BIMForum

National Guidelines

for Digital Modelling 2009 Cooperative Research Centre (CRC) for Construction Innovation

# Annex A – Delivery team roles and responsibilities

## Information Manager

The information management function in conformance with AS ISO 19650.2 (2019) may be assigned to any of the following contractual roles. In the interests of brevity, the individual/s undertaking the role are referred to as the Information Manager/s.

As noted in clause 3.1.4 of the National BIM Guide, the AS ISO 19650 series never uses the term ‘Information Manager’ but instead always refers to an “*individual or individuals nominated by the appointing party to undertake the information management function*” for a project. Relevant clauses of the CIC *The Outline Scope of Services for the Role of Information Management* can be referenced as required.

Edit the following responsibilities for each role as required to suit the project.

Make sure they do not contradict those documented elsewhere.

## Project BIM Manager

Project BIM Manager responsibilities include the following:

1. Negotiating and developing the BIM protocol if provided.
2. Liaising with each contributing task team.
3. Coordinating BIM use on the project, including quality control, access rights and security.
4. Helping manage change control procedures.
5. Coordinating the distribution of digital outputs, data transmission, and archiving.
6. If nominated, managing information in conformance with AS ISO 19650.2 (2019).

## Design BIM Manager

The Design BIM Manager acts as the main point of contact for the appointing party and the design task team for BIM-related issues.

Design BIM Manager responsibilities include the following:

1. Developing, coordinating, and publishing the Design BEP.
2. Coordinating team file/information container management.
3. Coordinating the setup of the common data environment (CDE).
4. Federating composite design models for 3D coordination meetings.
5. Facilitating the use of composite design models in design coordination/clash detection meetings and providing detection reports based on the identification and resolution of hard and soft collisions.
6. Facilitating BIM technical meetings with Discipline BIM Leads.
7. Determining the project BIM Geo-reference point(s) and ensuring ALL technical discipline models are properly referenced to the point(s).
8. Liaising with the appointing party’s facilities management or asset management representatives to determine specific data and file exchange requirements.
9. Confirming that the design deliverables specified in the contract are provided by the milestones or dates specified.
10. Ensuring information for facility management or asset management, as required by the EIR or BIM Project Brief, is provided by the milestones or dates specified.
11. If nominated, managing information in conformance with AS ISO 19650.2 (2019).

## Discipline BIM Leads

All major technical disciplines/trades (architecture, structural, MEP, interior design, etc.) and key trades shall assign an individual to the role of Discipline BIM Lead to coordinate their work with the entire design or construction team, as applicable.

Discipline BIM Lead responsibilities for their discipline, at a minimum, include:

1. Coordinating discipline BIM development, standards, data requirements, etc. as reasonably required with the Design BIM Manager.
2. Leading the discipline BIM team in its documentation and analysis efforts.
3. Coordinating clash detection and resolution activities.

## Construction BIM Manager

Construction BIM Manager responsibilities include:

1. Taking overall responsibility for the construction model and information developed during construction.
2. Establishing software protocols for the construction team for efficient project delivery.
3. Acting as the main point of contact for BIM and related issues between the construction team, subcontractors, the appointing party, the design team and others as required.
4. Where a Contractor’s BIM Coordination Room is required by the EIR or Project BIM Brief, providing specifications for it to the appointing party for approval.
5. Ensuring that the construction team has necessary hardware and BIM software properly installed and accessible for project use.
6. Where using BIM for phase planning/4D modelling has been specified, ensuring construction sequencing and scheduling activities are integrated with the construction model.
7. Facilitating the use of composite Trade models in construction coordination/clash detection meetings and providing detection reports based on the identification and resolution of all hard and soft collisions.
8. Coordinating the data extraction sets required by the construction trades and ensuring that these requests are met.
9. Coordinating with the design team to facilitate the documentation of design changes in the field and updating of the model in a timely manner.
10. Prior to approval and installation, working with Lead Fabrication Modellers to integrate 3D fabrication models with the updated design model to ensure compliance with design intent.
11. Coordinating update of as-built conditions in final model deliverables.
12. Ensuring required facility management or asset management information, where required, is complete.
13. If nominated, managing information in conformance with AS ISO 19650.2 (2019).

## Amendments to roles and responsibilities

Amendments to the roles and responsibilities described in the preceding clauses are shown in the **Roles and responsibilities amendments table**.

Roles and responsibilities amendments table

|  |  |
| --- | --- |
| Role | Amendments |
|  |  |
|  |  |
|  |  |

Record any amendments to roles and responsibilities in this table. Identify the role and clause number. Include the whole revised clause with amendments highlighted. If there are no amendments, delete the table.

## Delivery team members’ résumés

The professional experiences of key project team members referred to in **COMMERCIAL**, **Delivery team members** are summarised below:

Team member name:

Role in project:

Number of years of experience in role:

Projects delivered:

Technical competencies:

Communication skills:

Copy and complete the prompts above for each key delivery team member. Alternatively, append their résumés to the BEP and edit the text to reflect this.

## Human resource allocation

Time allocation: The estimated time allocations for individuals performing BIM and information management roles for the project are shown in the **BIM human resource allocation table**.

BIM human resource allocation table

|  |  |  |  |
| --- | --- | --- | --- |
| Project phase | Team member name | BIM and information management tasks | Time allocation per week (hours) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

# Annex B – High-level responsibility matrix

## Model element responsibilities

Responsibilities: Model Element Authors (MEA) are responsible for the creation, editing and placement of the Model Elements assigned to them in the **High-level responsibility matrix** for the duration of the periods shown.

Note: This clause and the **High-level responsibility matrix** may not be considered necessary, depending on the complexity of the project and preferences of the project team. See *Guidance* associated with the table.

Legend for High-level responsibility matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **MEA discipline** |  |  | **MEA discipline** |
|  | Architecture |  |  | MEP |
|  |  |  |  |  |
|  | Structural |  |  | Other |

**Legend**: Use the colours shown or assign a tone or fill pattern to each discipline who will be a MEA for use with the **High-level responsibility matrix**.

Using the **High-level responsibility matrix**:

Apply the colours representing the MEA discipline to each Model Element row to indicate the period for which they will be responsible for that element. For example, you can indicate that the architect will be responsible for locating loadbearing walls up to the end of Schematic design and that the structural engineer would take prime responsibility for them from that point on by the application of colours in the ‘Walls – loadbearing’ row.

When completed, the matrix gives the appearance of a Gantt chart. Add or delete rows for Model Elements. Edit the project phases to suit the BEP type and scope of service being provided, e.g. for a Design BEP, include only those phases from Conceptual design to Design development or Contract documentation. Add columns for additional project phases or subdivisions of phases, as required.

Note: This matrix can be used as a precursor to the **Modelling permissions table** and/or **Detailed responsibility matrix**. That is, it can be used as an early planning tool to rough out overall team responsibilities before transposing them to these tables which contain more detail. For a simple project, or where the team has worked together on similar projects before, a **High-level responsibility matrix** may be all that is required. Likewise, if the team is familiar with **Modelling permissions tables**, etc, they might start working on the **Detailed responsibility matrix** directly without using this matrix as an intermediate step at all.

This matrix is an example of one possible format. Amend it or choose another format as appropriate to project requirements.

High-level responsibility matrix

| **Model element** | **Project Phase** | | | | | | **Notes** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Conceptual Design | Schematic Design | Design Development | Contract Documentation | Construction | Facility management |
| **CO** | **SD** | **DD** | **CD** | **CN** | **FM** |
| **SPATIAL** |  |  |  |  |  |  |  |
| Site boundaries, setbacks |  |  |  |  |  |  |  |
| Grids |  |  |  |  |  |  |  |
| Levels |  |  |  |  |  |  |  |
| Zones |  |  |  |  |  |  |  |
| Spaces, rooms |  |  |  |  |  |  |  |
| **SITE** |  |  |  |  |  |  |  |
| Topography |  |  |  |  |  |  |  |
| Excavation |  |  |  |  |  |  |  |
| Stormwater |  |  |  |  |  |  |  |
| Services |  |  |  |  |  |  |  |
| Roads |  |  |  |  |  |  |  |
| Parking |  |  |  |  |  |  |  |
| Paths, paving |  |  |  |  |  |  |  |
| Walls, fencing |  |  |  |  |  |  |  |
| Soft landscaping |  |  |  |  |  |  |  |
| **SUBSTRUCTURE** |  |  |  |  |  |  |  |
| Footings |  |  |  |  |  |  |  |
| Retaining walls |  |  |  |  |  |  |  |
| Subsoil drainage |  |  |  |  |  |  |  |
| **STRUCTURE** |  |  |  |  |  |  |  |
| Floor structures |  |  |  |  |  |  |  |
| Beams |  |  |  |  |  |  |  |
| Shaft openings |  |  |  |  |  |  |  |
| Stair & ramp structures |  |  |  |  |  |  |  |
| Walls – load bearing |  |  |  |  |  |  |  |
| Columns |  |  |  |  |  |  |  |
| **ENCLOSURE** |  |  |  |  |  |  |  |
| Roofing |  |  |  |  |  |  |  |
| Cladding |  |  |  |  |  |  |  |
| Column claddings |  |  |  |  |  |  |  |
| Curtain walls |  |  |  |  |  |  |  |
| Windows |  |  |  |  |  |  |  |
| External doors, openings |  |  |  |  |  |  |  |
| **INTERIOR** |  |  |  |  |  |  |  |
| Partitions |  |  |  |  |  |  |  |
| Internal doors, openings |  |  |  |  |  |  |  |
| Ceilings |  |  |  |  |  |  |  |
| Flooring |  |  |  |  |  |  |  |
| Balustrading |  |  |  |  |  |  |  |
| **F, F & E** |  |  |  |  |  |  |  |
| Casework, joinery |  |  |  |  |  |  |  |
| Fixtures |  |  |  |  |  |  |  |
| Fittings |  |  |  |  |  |  |  |
| Equipment (non-service) |  |  |  |  |  |  |  |
| Furniture |  |  |  |  |  |  |  |
| Signage |  |  |  |  |  |  |  |
| **MECHANICAL** |  |  |  |  |  |  |  |
| Plant, equipment & fixtures |  |  |  |  |  |  |  |
| Ductwork |  |  |  |  |  |  |  |
| Pipework |  |  |  |  |  |  |  |
| Sensors and controls |  |  |  |  |  |  |  |
| Mechanical services in risers |  |  |  |  |  |  |  |
| **HYDRAULIC** |  |  |  |  |  |  |  |
| Plant, equipment & fixtures |  |  |  |  |  |  |  |
| Sanitary fixtures & floor wastes |  |  |  |  |  |  |  |
| Pipework – waste |  |  |  |  |  |  |  |
| Pipework – SW, downpipes |  |  |  |  |  |  |  |
| Pipework – supply |  |  |  |  |  |  |  |
| Fire services fixtures (FHR, etc) |  |  |  |  |  |  |  |
| Sprinkler heads |  |  |  |  |  |  |  |
| Pipework – fire services |  |  |  |  |  |  |  |
| Hydraulic services in risers |  |  |  |  |  |  |  |
| **ELECTRICAL** |  |  |  |  |  |  |  |
| Electrical fixtures |  |  |  |  |  |  |  |
| Power outlets |  |  |  |  |  |  |  |
| Switch & distribution boards |  |  |  |  |  |  |  |
| Cable trays, ducts |  |  |  |  |  |  |  |
| Lighting |  |  |  |  |  |  |  |
| Communications |  |  |  |  |  |  |  |
| Security |  |  |  |  |  |  |  |
| Electrical services in risers |  |  |  |  |  |  |  |
| **CONVEYING** |  |  |  |  |  |  |  |
| Lifts, escalators |  |  |  |  |  |  |  |

As an alternative to entering notes in the table, enter a number and add the corresponding note below.

Notes:

# Annex C – Modelling permissions

## Modelling permissions

Rules: Model Element Authors (MEA) are permitted to act on the model elements assigned to them in the **Modelling permissions table**, only to the extent indicated.

Modelling permissions table legend

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Y** | May change | **N** | May not change | **P** | May change with permission from the MEA and BIM Manager. |
| **MEA** | Model Element Author | **C/M** | Copy/monitor | **CHK** | Check for changes (manually only) |

**Legend**: Amend ‘BIM Manager’ to ‘Design BIM Manager’ or ‘Construction BIM Manager’ to suit the project procurement strategy.

Using the **Modelling permissions table**:

**Model element**: Replace ‘**Element**’ with the required Model Element group, e.g. Grids, walls, floors (like those shown in the **High-level responsibility matrix**). Then under each element replace ‘Action’ with the typical model editing actions associated with each element, e.g. change thickness, add openings.

**Arch, Struct, MEP**: Insert ‘MEA’ in the appropriate cell to indicate the Model Element Author responsible for each element at each project phase, For example, insert ‘MEA’ in the cell at the intersection of the ‘Element’ row and the ‘Arch’ columns to indicate that the architect is the MEA for that element. Add C/M or CHK (see the Legend above) in the other cells in the ‘Element’ row, as required, to assign these permissions to other disciplines. Then enter ‘Y’, ‘N’ or ‘P’ (see the Legend above) in the ‘Action’ cells to assign editing permissions to each discipline.

Colour coding cells and/or fonts can make the table easier to read, e.g. green for ‘Y’, red for ‘N’, yellow for ‘P’, blue for ‘MEA’.

Edit the project phases to suit the BEP type and scope of service being provided, e.g. for a Design BEP, include only those phases from Conceptual design to Design development or Contract documentation. Add columns for additional project phases or disciplines, and additional rows for elements and actions, as required.

Note: If the **High-level responsibility matrix** has been completed, transpose the MEA for each element at a given project phase into the **Modelling permissions table** so they are aligned. See the *Guidance* before the **High-level responsibility matrix** which explains how they can be used together.

Modelling permissions table

| **Model element** | **Schematic design** | | | **Design Development** | | | **Contract Documentation** | | | **Notes** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Arch | Struct | MEP | Arch | Struct | MEP | Arch | Struct | MEP |  |
| **SPATIAL** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **SITE** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **SUBSTRUCTURE** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **STRUCTURE** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **ENCLOSURE** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **INTERIOR** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **F, F & E** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **MECHANICAL** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **HYDRAULIC** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **ELECTRICAL** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| **CONVEYING** |  |  |  |  |  |  |  |  |  |  |
| **Element** |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |
| Action |  |  |  |  |  |  |  |  |  |  |

As an alternative to entering notes in the table, enter a number and add the corresponding note below.

Notes:

# Annex D – Model Description Document (MDD)

## MDD Template

If called up as a requirement under **MANAGEMENT – 3D MODELLING, Model sharing protocols**, use the Template below.

Description: A MDD is a document issued with a model to describe what it contains and identify any limitations of use.

Instructions:

Include details of how and when the MDD is to be used, e.g. included as a text file at specified types of model exchanges.

**Model description document**

| **Item** | **Details** |
| --- | --- |
| Project name |  |
| BEP reference and revision |  |
| Model authoring party |  |
| Discipline BIM Lead |  |
| Native file type and version |  |
| Issued file type and version |  |
| Issued date |  |
| Model status |  |
| Model name |  |
| Container/file name |  |
| Linked files |  |
| Inputs |  |
| Model purpose |  |
| Agreed model use |  |
| Comments |  |

Agreed model use: Edit as required, e.g.:

The model has been issued for:

* Aiding coordination during the design process, e.g. noting the specific areas where coordination has been completed.
* Confirming model elements have been created as specified in the BEP, unless otherwise agreed.
* Providing an overall view of the project to supplement the information contained in the drawings and schedules.
* A visualisation aid.
* Assisting in the production of schedules of quantities.
* Assisting in the production of shop or fabrication drawings.
* An input to fabrication, manufacture and/or construction.

# Annex E – Clash detection

## Clash detection objectives

Process objective: The objective of the clash resolution process is to produce a federated model with minimal coordination issues at the completion of each project stage.

## Clash detection responsibilities

Base model: It is the responsibility of the BIM Manager to provide a base model to all Discipline BIM Leads.

Discipline models: It is the responsibility of Discipline BIM Leads to develop all discipline models from the base model provided by the BIM Manager.

Model federation: It is the responsibility of the BIM Manager to organise the federation of discipline models for the purpose of coordination and clash detection.

Clash detection method: The delivery team are to use automated conflict checking/clash detection software during Schematic Design and onwards to identify and resolve geometric clashes within the 3D geometric environment.

Clash detection schedule: The BIM Manager is responsible for developing the **Clash detection schedule** for reference by all Discipline BIM Leads.

These responsibilities can be supplemented with accountabilities if these need to be made clear.

## Clash detection meetings

3D coordination/clash detection meeting schedule: Refer to **MANAGEMENT – INFORMATION IN GENERAL, BIM coordination meetings**.

### Design phases

Requirements:

1. Hold clash detection meetings regularly and at least fortnightly during the last half of Schematic Design and all of Design Development/Detailed Design.
2. The BIM Manager (and Model Managers where applicable) for each discipline are required to attend clash management meetings.
3. The Architect and BIM Manager will chair the meetings, “navigate” the federated model, and document the location and nature of identified issues.
4. The BIM Manager will assign responsibilities for resolving any BIM-related issues that cannot be resolved during the meeting.
5. The outcome sought from meetings is a clear understanding of any BIM-related issues, and the tasks required to rectify them.
6. Clash reports are to be issued to the delivery team and appointing party no later than the next working day after the meeting.

### Construction phase

Responsibility: The Contractor is responsible for arranging clash detection meetings during the construction stages similar to those described for the design phases.

## Clash detection schedule

Clash selection sets: Conduct clash detections between sets of elements in the order shown in the **Clash detection schedule**.

It may not be possible to define all clash detection sets in detail when drafting the pre-appointment BEP. If they cannot be defined in any meaningful way, postpone inclusion of clash detection schedules until a later revision.

Clash detection schedule

|  | Clash Set 1 | | |
| --- | --- | --- | --- |
| **Clash Ref. No.** | Discipline A | vs | Discipline B |
| 1.01 |  |  |
| 1.02 |  |  |
| 1.03 |  |  |

Using the **Clash detection schedule**:

* Substitute the names of the pairs of discipline models to be coordinated for the headings ‘Discipline A’ and’ Discipline B’, e.g. ‘Structural’ and ‘Mechanical’. The abbreviations used for the MEA in the **High-level responsibility matrix** can also be used for this purpose. Provide a legend for the abbreviations adjacent the schedules if considered necessary.
* In each row under these headings enter descriptions of specific Model Elements within the discipline models that are to be checked for clashes, e.g. Beams, Supply air (ducts), All.
* Copy the schedule for each Clash Set as required and renumber, e.g. Clash Set 2, Clash Ref. No. 2.01, 2.02, 2.03, etc.
* The Clash Ref. No. can be cited in reports, or the **Clash detection schedule** can be used for reporting purposes by adding additional columns for results and comments.

Show completion dates for each Clash Set on the project program to place them in context and facilitate reference.

## Clash detection rules

Describe modelling rules for clash detection purposes including hard clashes; construction tolerances; safe working/ maintenance zones and the items described in the following prompts.

Elements excluded from clash detection:

Describe elements excluded from the clash sets, and clashes to be supressed/ignored, e.g. power outlets in walls.

Elements attributes for clash detection:

Describe attributes attached to elements necessary to make clash rules work, e.g. penetrations in partitions, definition of clearance tolerances and service zones.

## Clash tolerances

Clash tolerances by project stage:

Set minimum tolerances for clash detection for project stage deliverables. These tolerances may vary between stages, e.g. moving from a 100 mm tolerance at Schematic Design to a 25 mm during Design Development/Detailed Design.

This information may be better presented as a table showing the tolerances for different groups of elements at each stage.

## Clash resolution priorities

Clash level categories: Clashes are organised into three levels for the purpose of assigning priorities for rectification or resolution.

Priority assignment: Delivery team members are to agree priorities for resolving geometric clashes between sets of elements prior to each clash detection meeting. These priorities will determine which sets of building elements should be included in the **Clash detection schedule** and in what order.

Clash resolution: Where clashes occur, give precedence to resolving those assigned the highest priority over those of lower priority.

Priorities for resolution in descending order:

**Level One Clashes**

Those that are considered critical to the design process. As Level One Clashes are those that are assigned the highest priority, they should be rectified within the model/s as soon as possible, and preferably prior to clash detection meetings.

Examples of the clash components in this category include, but are not limited to:

a) Mechanical ductwork and piping vs. cable trays (electrical and communications)

b) Mechanical ductwork and piping vs. hydraulic systems piping

c) Mechanical ductwork and piping vs. pneumatic tube system

d) Mechanical ductwork and piping vs. ceilings

e) Mechanical ductwork and piping vs. fire and acoustic rated walls (for coordination of dampers and other mechanical equipment needs)

f) Mechanical ductwork and piping vs. structure (columns, beams, framing, load bearing walls, etc.)

g) Mechanical ductwork and piping vs. mechanical ductwork and piping (by individual system, e.g. supply air vs. return air)

h) Mechanical ductwork and piping vs. equipment access clearances

i) All equipment and their applicable clearances vs. walls

j) All equipment and their applicable clearances vs. structure

k) Mechanical equipment and fixtures vs. electrical equipment and fixtures

l) Mechanical ductwork and piping vs. plumbing piping

**Level Two Clashes**

Those that are considered important to the design and construction process. These clashes should be rectified during project coordination meetings.

Examples of the clash components in this category include, but are not limited to:

a) Mechanical ductwork and piping vs. fire sprinkler system piping

b) Mechanical ductwork and piping vs. medical gas piping

c) Mechanical ductwork and piping vs. electrical equipment, fixtures, and devices

d) Mechanical ductwork and piping vs. floors

e) Cable trays (electrical and communications) vs. pneumatic tube system

f) Cable trays (electrical and communications) vs. hydraulic systems piping

g) Cable trays (electrical and communications) vs. fire sprinkler system piping

h) Cable trays (electrical and communications) vs. medical gas piping

i) Cable trays (electrical and communications) vs. ceilings

j) Cable trays (electrical and communications) vs. fire and acoustic rated walls

k) Cable trays (electrical and communications) vs. structure (floors, columns, beams, framing, load bearing walls, etc.)

l) Cable trays (electrical) vs. cable trays (communications)

m) Cable trays (electrical) vs. equipment access clearances

n) Hydraulic systems piping vs. pneumatic tube system

o) Hydraulic systems piping vs. fire sprinkler system piping

p) Hydraulic systems piping vs. medical gas piping

q) Hydraulic systems piping vs. ceilings

r) Hydraulic systems piping vs. fire and acoustic rated walls

s) Hydraulic systems piping vs. structure (floors, columns, beams, framing, load bearing walls, etc.)

t) Hydraulic systems piping vs. hydraulic systems piping (by individual system, e.g. sanitary vs. water supply)

u) Hydraulic systems piping vs. equipment access clearances

v) Fire sprinkler system piping vs. equipment access clearances

w) Pneumatic tube system piping vs. equipment access clearances

x) Joinery vs. electrical fixtures and devices

y) Structure (columns, beams, framing, etc.) vs. specialty equipment

z) Structure (columns, beams, framing, etc.) vs. electrical equipment, fixtures and devices

**Level Three Clashes**

Those that while considered important to the correctness of the model, will generally be changing on a regular basis throughout the design and construction process. While these clashes are those that are assigned a lower priority, they should be rectified before the completion of the project stage deliverable and/or submission of the model/s to the appointing party.

Examples of the clash components in this category include, but are not limited to:

a) Hydraulic piping vs. electrical equipment, fixtures, and devices

b) Hydraulic piping vs. mechanical equipment, fixtures, and devices

c) Joinery vs. walls and ceilings

d) FFE vs. electrical fixtures and devices

e) FFE vs. walls and ceilings

f) Disability Discrimination Act 1992 clear space requirements vs. doors, fixtures, walls, structure

**All Other Clashes**

While the above clashes have been assigned priorities, other clashes will exist within models. These other clashes should not be ignored or discarded.

## Clash detection reports

Clash detection reporting procedures:

Include details such as frequency of reporting, and the parties responsible for creating reports, reviewing, and approving them.

Clash report content: Document any outstanding coordination issues between delivery team members.

Clash detection report format:

Include items such as clash report templates and details such as report identification and file formats, e.g, excel, dashboarding.

Coordination confirmation: The delivery team is to provide a statement that it has addressed all clashes identified.

## Clash detection colours

Requirement: Unless another system has been specified in the EIR or *Project BIM Brief* assign the colours shown in the **Clash detection colour schedule** to Model Elements in models being combined for clash detection:

Clash detection colour schedule

| **Element** | **Colour name**  **(ACI No.)\*** | | **Hexadecimal** | **RGB** | | | **Comments** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **R** | **G** | **B** |
| Architecture |  | White (7) | #FFFFFF | 255 | 255 | 255 |  |
| Structural Steel |  | Maroon | #800000 | 128 | 0 | 0 |  |
| Concrete – load-bearing |  | Gray (ACI Light Gray 9) | #808080 | 128 | 128 | 128 |  |
| Concrete – non load-bearing |  | HTML Light Gray | #D3D3D3 | 211 | 211 | 211 |  |
| HVAC Equipment |  | Gold | #FFD700 | 255 | 215 | 0 |  |
| HVAC Supply Duct/Diffuser |  | Blue (5) | #0000FF | 0 | 0 | 255 |  |
| HVAC Return Duct/Diffuser |  | Magenta (6) | #FF0FF | 255 | 0 | 255 |  |
| HVAC pipe |  | Gold | #FFD700 | 255 | 215 | 0 |  |
| Electrical Equipment |  | Dark Yellow | #DAA520 | 218 | 165 | 32 | HTML Golden Rod shown |
| Electrical Conduits |  | Light Yellow | #FFFFE0 | 255 | 255 | 224 |  |
| Communications Conduit |  | Light Blue | #87CEFA | 135 | 206 | 250 | HTML Light Sky Blue shown |
| Electrical Cable Tray |  | Dark Orange | #FF8C00 | 255 | 140 | 0 |  |
| Electrical Lighting |  | Yellow (2) | #FFFF00 | 255 | 255 | 0 |  |
| Plumbing Water |  | Cyan (Turquoise 4) | #00FFFF | 0 | 255 | 255 | Same as HTML Aqua |
| Plumbing Sewer |  | Magenta (6) | #FF0FF | 255 | 0 | 255 |  |
| Plumbing Storm Drain |  | Green | #008000 | 0 | 128 | 0 |  |
| Fire Protection |  | Red (1) | #FF0000 | 255 | 0 | 0 |  |
| Pneumatic Tube |  | Dark Green | #006400 | 0 | 100 | 0 |  |
| Equipment (Medical) |  | Light Green | #90EE90 | 144 | 238 | 144 |  |
| Medical Gas |  | Light Green | #90EE90 | 144 | 238 | 144 |  |
| Security Systems |  | Orange | #FFA500 | 255 | 165 | 0 |  |
| Fire Alarm |  | Fuchsia | #FF00FF | 255 | 0 | 255 |  |

\* Names or numbers in brackets are AutoCAD Color Index (ACI) names and numbers,

i.e. 1: Red, 2: Yellow, 3: Green, 4: Turquoise, 5: Blue, 6: Magenta, 7: White, 9: Light Gray.

|  |  |  |
| --- | --- | --- |
| Note: |  | ACI 8: Dark Gray (R65-G65-B65) does not appear in this table. |