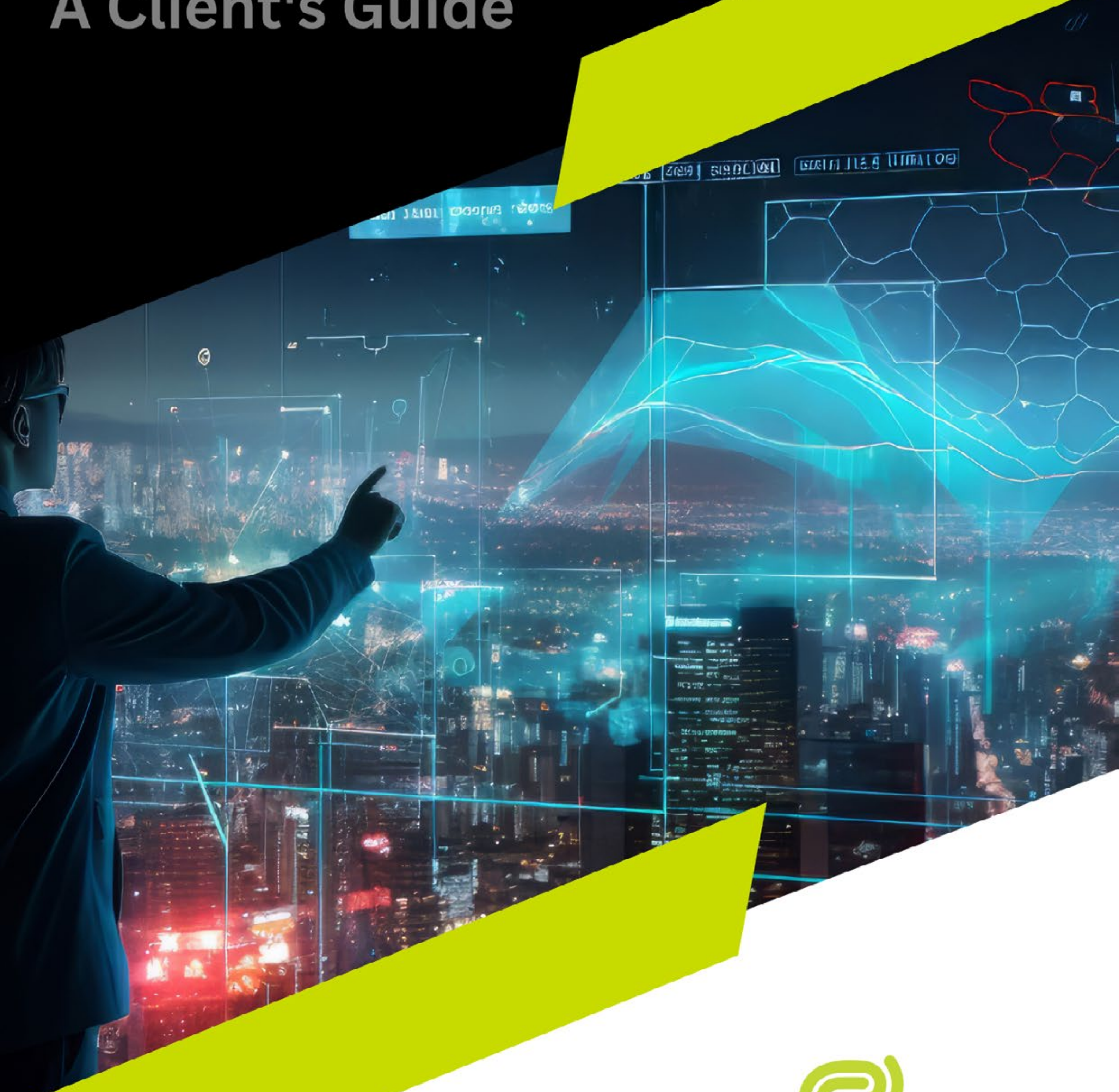
PROCURING BIM SERVICES:
A Client's Guide



PRODESIGN

SUSTAINABILITY & MEP ENGINEERS

About Prodesign

Prodesign is a leading consulting engineering firm in Mauritius, specializing in Mechanical, Electrical, and Public Health (MEP) engineering, BIM consultancy, and green building design. Over the past 27 years, we have partnered with both public and private sector clients, earning recognition for our innovation and commitment to sustainability.

We prioritise client satisfaction and strive to exceed expectations by embracing the latest technology and innovative approaches. Our unmatched reputation for integrity and reliability ensures we handle all aspects of building regulations, making the process seamless for our clients.

With 18 years of experience in BIM management, we guide and support our clients through every project stage, aiming to be a trusted partner. Our expertise has been recognized with the prestigious Building Information Modelling (BIM) Africa Innovation Awards 2021 in 2022 by BIM Africa Initiative.

As Sustainability Consultant, we have completed four LEED-certified projects and are currently working on over twelve more, with three expected to be certified by the end of this year.

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01 INTRODUCTION TO BUILDING INFORMATION MODELING

Building Information Modelling, commonly referred to as BIM, represents a paradigm shift in the construction and design industries. At its core, BIM is a digital representation of the physical and functional characteristics of a facility. This process goes beyond mere drawing, encompassing the creation and management of digital models that integrate a wealth of data pertaining to the building's lifecycle, from conception to demolition. Its adoption is rapidly transforming the way projects are designed, constructed, and managed, heralding a new era of collaboration and efficiency in the construction sector.

The genesis of BIM lies in the need to address inefficiencies and information gaps that have long plagued the construction industry. Traditional methods often led to discrepancies between design intent and actual construction, resulting in cost overruns, delays, and quality issues. BIM, by contrast, facilitates a more integrated and collaborative approach. It enables architects, engineers, contractors, and clients to work on a shared platform, viewing and updating a consistent, real-time model of the project. This collaborative environment drastically reduces the risks of miscommunication and errors, thereby enhancing the efficiency and accuracy of the construction process.

Moreover, BIM's utility extends far beyond the construction phase. It serves as a valuable asset throughout the building's lifecycle, offering insights for facility management and maintenance. The model can be updated and utilised for renovations, expansions, or even demolition planning. The data-rich nature of BIM models provides detailed information about every component of the building, enabling more informed decision-making and efficient management of the facility post-construction.

In essence, BIM is not just a tool or a software application; it is a process that fosters a more transparent, collaborative, and efficient approach to building design and construction. Its ability to integrate information across different stages of the construction lifecycle makes it an invaluable asset in the modern construction landscape. As the industry evolves, BIM is poised to play a pivotal role in shaping the future of construction, driving innovation, and enhancing the quality and sustainability of built environments.

The adoption of BIM in Mauritius's construction industry has been gaining significant momentum, largely driven by the pioneering efforts of Prodesign, who have been at the forefront of BIM implementation since 2008. As one of the leading BIM consultants on the island, Prodesign has played a pivotal role in demonstrating the practical benefits of BIM in a variety of projects, ranging from small-scale ventures to mega projects. Prodesign's expertise as BIM Managers and MEP BIM Consultants has been instrumental in the successful application of BIM methodologies, effectively showcasing its transformative impact on project efficiency, coordination, and overall success. This burgeoning trend reflects a growing awareness and appreciation within the Mauritian construction sector for the myriad advantages that BIM brings. By extending their wealth of experience and knowledge in BIM to other clients, Prodesign is not only enhancing the quality of individual projects but also contributing significantly to the evolution of the broader construction landscape in Mauritius. The firm's commitment to this innovative approach underlines a dedicated effort to usher in a new era of construction excellence, marked by increased collaboration, precision and sustainability.

The purpose of this guidebook is to provide a comprehensive resource for clients looking harness the full potential of BIM in their construction projects, particularly in the context of Mauritius's evolving construction landscape. With Prodesign, a leading BIM consultant in Mauritius, spearheading the adoption of BIM since 2008, their expertise and experience in implementing BIM across a range of projects have been instrumental in the method's success and widespread acceptance. This guidebook aims to distil their knowledge and insights into a practical format, assisting clients in understanding and navigating the complexities of procuring and working with BIM-enabled design and construction teams. It shall offer guidance on how to ensure that all stakeholders, including design consultants, contractors, and suppliers, are well-versed in BIM and capable of collaborating effectively with BIM Managers. Ultimately, this guidebook seeks to empower clients in Mauritius to leverage BIM for enhanced efficiency, quality, and sustainability in their construction projects, thereby contributing to the continued advancement of the industry.

02 PROCURING BIM READY TEAMS

Procuring BIM-ready teams is a critical component for the successful implementation of Building Information Modeling (BIM) in construction projects. This process involves identifying and selecting design consultants, contractors, and suppliers who are not only proficient in BIM but also capable of effectively collaborating within a BIM-driven project environment.

Some of the key aspects of procuring such teams include:

Understanding BIM Competency Levels

A key aspect of procuring BIM-ready teams is assessing their BIM competency levels, which involves evaluating their proficiency in BIM through past project experiences, training certifications, and expertise in using advanced BIM tools. This assessment should also include an evaluation of their collaboration skills, as effective teamwork and communication are crucial in BIM-driven projects.

Portfolio and Experience Evaluation

The evaluation of a team's BIM experience is critical and can be accomplished by reviewing their project portfolio and seeking references or case studies. This review should focus on the role and contribution of the team in BIM projects and their ability to handle BIM-related challenges successfully.

Emphasizing Training and Continuous Learning

Given the rapid evolution of BIM technology, it is essential that the team is committed to ongoing training and education. Ensuring that the team has participated in formal BIM training programs and possesses relevant certifications is a vital part of this process.

Technical Proficiency Assessment

Technical capabilities are a cornerstone of BIM proficiency. This includes assessing the team's familiarity with various BIM software platforms and ensuring they have the necessary hardware and infrastructure to support BIM processes efficiently.

Communication and Collaboration Tools

Effective communication and collaboration tools are essential for the success of BIM projects. Evaluating the team's familiarity with BIM collaboration platforms, such as Revit and Navisworks, and their ability to engage effectively in a BIM-enabled environment is crucial.

Contractual Considerations and BIM Execution Plan

Clear BIM requirements in contracts, including the expected level of detail (LOD), BIM deliverables, and collaboration expectations, should be specified. Including a detailed BIM Execution Plan (BEP) in the contract is also important to define the workflow, roles, and responsibilities in the BIM process.

Assessing Organizational Culture and Adaptability

The assessment should extend to the team's organizational culture, focusing on their adaptability to new processes and technologies, openness to innovation, and the presence of strong leadership in BIM.

Setting Performance Metrics and Accountability

Defining and monitoring Key Performance Indicators (KPIs) related to BIM is essential to ensure accountability and guide the project towards its desired outcomes. Regular reviews and updates on these metrics can significantly contribute to the success of a BIM project.

By addressing these aspects comprehensively, clients can form a team that not only understands BIM technology but can also apply it effectively, thus ensuring the success of their construction projects through enhanced efficiency, accuracy and collaboration.

03 DEFINING BIM REQUIREMENTS IN CONTRACTS

Incorporating a detailed scope of services and deliverables for BIM into contracts for each stage of a construction project is essential. This clarity ensures that designers and contractors are fully aware of their obligations from the outset. By outlining these expectations, professionals can appropriately allocate resources and include necessary provisions in their fee structures, thus avoiding future disputes or misunderstandings. This forward-thinking approach ensures that all parties are adequately prepared and compensated for their BIM-related work, leading to a more seamless integration of these technologies into the project.

3.1 Consistency in scope of services

Ensuring consistency in the scope of services and deliverables for each consultant is crucial for effective collaboration. For instance, maintaining the same Level of Detail (LOD) at various stages across all disciplines facilitates better integration and coordination. This uniformity helps in avoiding conflicts and discrepancies in the BIM model, leading to more accurate and reliable project outcomes. It also ensures that all team members are working from the same set of expectations and standards, thereby enhancing the overall efficiency and cohesiveness of the project team.

3.2 Importance of appointing a BIM Manager early

Appointing a BIM Manager at the very outset of the project is of paramount importance. The BIM Manager plays a crucial role in communicating the Building Execution Plan (BEP) and Employer's Information Requirements (EIR) to all appointed parties. Their early involvement ensures that these essential documents are integrated into the project workflow from the beginning, guiding the project team in accordance with the established BIM strategy and standards. The BIM Manager's oversight from the start is vital for aligning the project's goals and methodologies, thereby ensuring a streamlined and effective BIM process.

3.3 Roles and responsibilities

Defining the roles and responsibilities of each party in relation to BIM is essential. This includes detailing the specific duties of design consultants, contractors, suppliers, and the BIM Manager. Clearly outlined responsibilities prevent task overlaps and ambiguities, promoting accountability and smooth coordination throughout the project.

3.4 Level of detail specifications

The contract should specify the Level of Detail (LOD) required at different project stages. LOD refers to the depth and detail of information in a BIM model, and its specification is crucial for ensuring uniform understanding among all stakeholders. This uniformity prevents misunderstandings and ensures that all parties are working towards the same level of detail and quality at each stage of the project.

3.5 Bim Execution Plan

Including a detailed BIM Execution Plan (BEP) in the contract is pivotal. The BEP should outline the strategy, standards, workflows, and protocols for BIM usage throughout the project. It serves as a comprehensive guide for BIM management and utilization, ensuring that all parties adhere to the agreed-upon processes and standards.

3.6 Software and Platforms

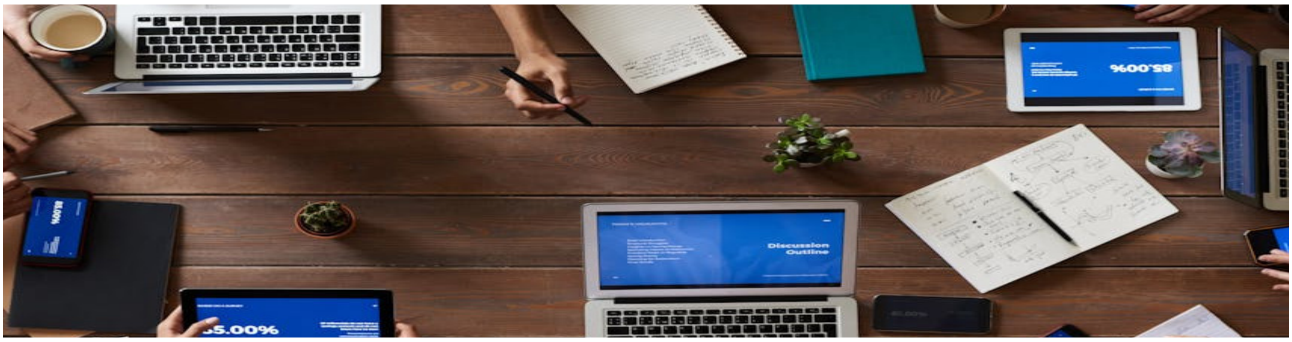
In the contract, specifying the BIM software and platforms is not only about ensuring compatibility among systems but also about aligning these tools with the chosen Common Data Environment (CDE). The importance of this alignment cannot be overstated, as it significantly influences the project's efficiency and success.

The challenge often arises when different BIM software are used by various team members, leading to difficulties in integrating and managing data. For example, conducting clash detection can be problematic when dealing with IFC files generated from different BIM software. IFC files, intended as a universal format to promote interoperability, can sometimes lose critical information or exhibit inconsistencies when exported from different software. This can lead to inaccuracies in clash detection, a critical process for identifying and resolving conflicts in a BIM model.

Another common issue is establishing a common base point among different software. Inconsistencies in base points can lead to misalignments in the project, causing significant delays and errors in construction. It is vital for the client to ensure that the software chosen by the team is not only compatible with each other but also with the CDE platform. This compatibility ensures smooth data transfer, accurate representation of models, and efficient collaboration.

Therefore, clients should mandate or at least strongly recommend the use of software that is known to work smoothly with the CDE. This could involve stipulating the use of specific software versions or configurations known to be compatible or requiring that all parties involved in the project test and confirm interoperability before commencing work.

By addressing these software and platform considerations in the contract, clients can mitigate risks associated with software incompatibility. This proactive approach ensures that technical challenges do not hinder the BIM process, allowing for a smoother, more coordinated workflow and ultimately contributing to the successful delivery of the project.



3.7 Data sharing and collaboration protocols

Guidelines for data sharing and collaboration should be included in the contract. This covers the use of common data environments (CDEs) and collaboration tools, ensuring that all parties have clear protocols for data management and communication. This is vital for maintaining data integrity and facilitating efficient collaboration.

3.8 Change management procedures

Detailing procedures for managing changes in BIM models is important. This includes how revisions shall be tracked, communicated, and implemented. Clear change management procedures help in maintaining the accuracy and reliability of the BIM model throughout the project.

3.9 Quality control and compliance

Outlining quality control measures and compliance requirements for BIM models is crucial. This ensures that models maintain a high standard of accuracy and adhere to industry regulations, which is essential for the integrity and success of the project.

3.10 Intellectual property rights

The contract should address the ownership and usage rights of BIM data and models. Clarifying these rights upfront prevents disputes related to intellectual property, ensuring that all parties understand their rights and limitations regarding the use of BIM data and models.

3.11 Dispute resolution mechanisms

Defining mechanisms for resolving disputes related to BIM usage or interpretation is essential. This ensures that if disagreements arise, there is a clear process for resolution, which helps in maintaining project continuity and reducing the potential for costly delays.

By addressing these key contractual elements, the contract serves as a comprehensive framework that guides the successful integration and utilization of BIM in construction projects. It ensures that all stakeholders are aligned in their understanding and expectations, paving the way for a more efficient, collaborative, and successful project delivery.

04 ROLE AND IMPORTANCE OF BIM MANAGER

The success of Building Information Modeling (BIM) in a construction project is significantly influenced by the presence and expertise of a BIM Manager. This professional plays a central role in orchestrating the BIM process, ensuring its alignment with the project's goals and objectives. The BIM Manager is not just a facilitator but a vital cog in the machinery that drives a project towards efficiency, precision, and success.

One of the key contributions of a BIM Manager is their ability to bridge the gap between different disciplines involved in a construction project. By overseeing the BIM process, they ensure that architects, engineers, contractors, and other stakeholders work in a coordinated manner, with a clear understanding of their roles and responsibilities. The BIM Manager ensures that all parties are not only conversant with BIM technologies but are also utilizing these tools to their full potential.

4.1 Roles and responsibilities of the BIM Manager

The BIM Manager's responsibilities are multifaceted. They are responsible for developing and implementing the BIM Execution Plan (BEP), a document that outlines the strategy, standards, workflows, and protocols for BIM usage throughout the project. This plan is pivotal for maintaining consistency in the BIM process and ensuring that all team members are on the same page.

Moreover, the BIM Manager plays a crucial role in maintaining the integrity and accuracy of the BIM model. They are tasked with ensuring that the model is updated regularly and accurately reflects the project's current status. This involves coordinating with various teams to incorporate changes and updates into the model, thereby preventing discrepancies and misalignments.

Another critical responsibility of the BIM Manager is facilitating communication among various project stakeholders. They act as a central point for information dissemination, ensuring that all parties have access to the latest data and information. This role is essential for preventing misunderstandings and ensuring that decisions are made based on the most current project information.

4.2 Facilitating coordination among different teams

The BIM Manager is instrumental in facilitating coordination among different teams. They ensure that the contributions of various disciplines are harmoniously integrated into the BIM model. This coordination is crucial for identifying potential conflicts and resolving them early in the design process, thus avoiding costly changes during the construction phase. The BIM Manager also oversees the implementation of collaboration tools and technologies, ensuring that all team members can effectively communicate and collaborate, regardless of their location or time zone.

By managing the BIM process from start to finish, the BIM Manager ensures that the project adheres to the established timelines and budgets. Their role in monitoring and updating the BIM model in real-time allows for a more agile response to challenges, ensuring that the project stays on track.

In essence, the BIM Manager is a key proponent of the project's success. They bring a level of expertise and coordination to the project that is indispensable for leveraging the full potential of BIM. Their role in facilitating communication, ensuring data integrity, and coordinating among various teams is critical in realizing the efficiency, accuracy, and cost-effectiveness that BIM promises.

05 GENERAL OBLIGATIONS AND SCOPE OF SERVICES FOR BIM

In the dynamic world of Building Information Modeling (BIM), specifying the scope of services, deliverables, and Level of Development (LOD) information levels is of paramount importance. These elements form the backbone of any successful BIM project, ensuring that all stakeholders are aligned in their objectives and expectations. However, it's crucial to understand that these templates are generic and serve as a starting point for discussions.

Every project is unique, and the scope of services, deliverables, and LOD requirements must align with the client's specific objectives. The process of defining these aspects requires a high level of expertise and careful consideration. Clients should engage with their BIM Manager and leverage past experiences to tailor these templates to their project's needs.

Prodesign has developed these templates based on extensive experience and by drawing insights from BIM standards and best practices worldwide. While they serve as valuable guides, it's important to note that they do not replace any scope of services defined by regulatory bodies governing construction design. Instead, they can complement existing regulations to enhance the achievement of the client's goals.

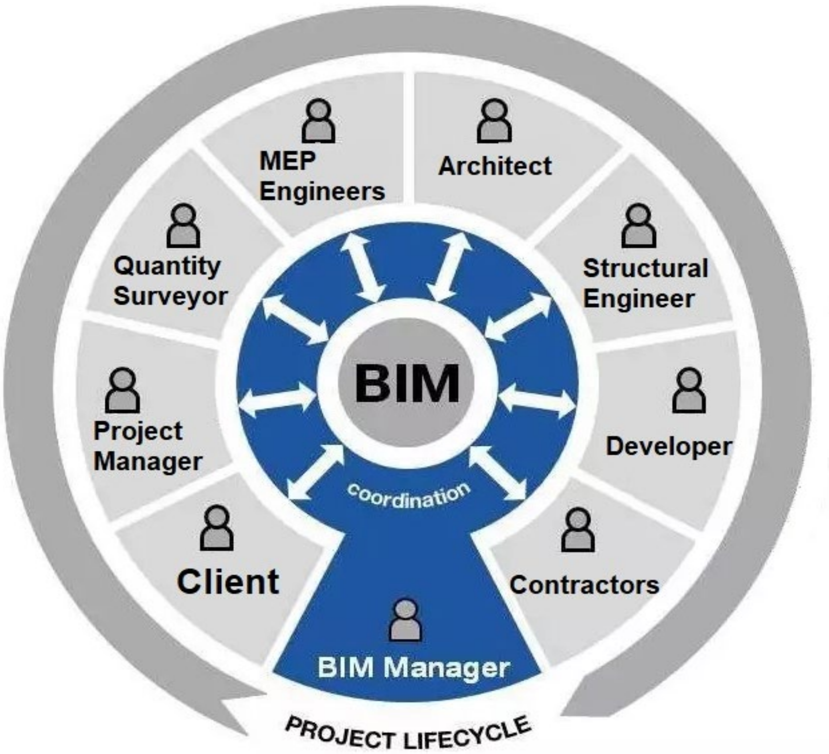


Figure 1: The BIM Team

06 THE ARCHITECT

6.1 General Obligations of the Architect:

1. Regularly, or upon request by the Project Manager/Employer/BIM Manager, deliver, exchange, or publish Models and documents in line with the Information Exchange Protocol outlined.

2. Ensure each Model indicates its appropriate LOD, meeting at least the required standards in alignment with BEP requirements. Before sharing, internally audit and validate models against the BEP, providing validation evidence upon the BIM Manager's request.

3. Designate a representative BIM Lead to communicate and coordinate BIM activities on the project with other stakeholders.

4. Adhere to the CDE management practices as directed by the BIM Manager, including maintaining their work-in-progress folder. [Include only if a CDE is being used]

5. Promptly report identified model clashes, conflicts, or issues to the BIM Manager.

6. Actively attend and contribute to BIM coordination meetings to address design and construction nuances.

7. Comply with any additional BIM obligations as outlined in the BEP or related agreements.

8. Utilize appropriate BIM authoring tools for building elements, ensuring correct "Type" definitions for each element. Follow guidelines on modeling building elements, such as walls, slabs, and other architectural details as per points 10-20 of your provided list.

9. All architectural elements should be mapped correctly to IFC 2x3 parameters for seamless data exchange and integration

6.2 Information Levels for Architects (in line with ISO 19650)

6.2.1 Conceptual Design (Analogous to LOD 100)

Basic project briefs, initial site information, and fundamental space requirements.

Examples:

1. Rough building footprint and orientation on the site.
2. Massing models depicting the overall scale and relationship of the proposed building.
3. Preliminary site analysis including sun path, prevailing winds, and views.
4. Basic circulation diagram showing main entry and exit points.
5. Conceptual space program (list of spaces with approximate sizes).
6. Initial energy analysis based on the building’s form.
7. Preliminary landscaping ideas.
8. Indication of main materials and aesthetic theme.
9. Initial risk analysis or feasibility study
10. Stakeholder feedback integration.

6.2.2 Schematic Design (Analogous to LOD 200)

Preliminary design data with approximate spatial arrangements, functions, and relationships.

Examples:

1. Preliminary floor plans with room names and numbers.
2. Early elevations and sections for understanding building height and depth.
3. Outline of primary structural and MEP systems.
4. Basic interior design themes and mood boards.
5. Preliminary selection of main materials and finishes.
6. Conceptual renderings or visualizations.
7. Early acoustic and lighting analysis.
8. Rough cost estimates based on initial design.
9. Integration of preliminary environmental or sustainability strategies.
10. Updated site plan with main vehicular and pedestrian circulation.

6.2.3 Detailed Design (Analogous to LOD 300)

Detailed design decisions, specific systems selection, and a clear definition of components.

Examples:

1. Detailed architectural floor plans with dimensions.
2. Comprehensive sections and elevations with annotations.
3. Detailed interior elevations and millwork designs.
4. Specification of fixtures, fittings, and equipment (FF&E).
5. Window and door schedules with specifications.
6. Wall type definitions and details.
7. Roofing and foundation details.
8. Interior and exterior material palettes.
9. Advanced energy and thermal performance analysis.
10. Detailed landscaping design.

6.2.4 Documentation Phase (Analogous to LOD 350)

All necessary data to prepare for construction, including integration details and schedules.

Examples:

1. Construction-ready architectural drawings with all annotations.
2. Detailed junction and assembly drawings (e.g., wall-floor, wall-roof junctions).
3. Expanded door and window details and specifications.
4. Integration details with MEP and structural elements.
5. Tiling patterns, carpet layouts, and other finish details.
6. Specification sheets and material data sheets.
7. Accessibility and compliance details.
8. Detailed material take-offs for cost estimation.
9. Phasing plans if construction shall be staged.
10. Safety and evacuation plans.

6.2.5 Construction Phase (Analogous to LOD 400)

Data that supports construction, assembly, and sequencing.

Examples:

1. 4D BIM models that integrate time or scheduling data.
2. Shop or fabrication drawings for specific components.
3. Detailed coordination models with other trades.
4. Site logistics and temporary works modeling.
5. Sequence or method statement visualizations.
6. Clash detection reports.
7. Real-time site progress monitoring using BIM.
8. Integration of building component tracking (barcoding or RFID).
9. Mock-up and sample boards for material finishes.
10. Field verification models or drawings.

6.2.6 Handover & Operation (Analogous to LOD 500)

As-built data, operational information, and maintenance details.

Examples:

1. As-built BIM models reflecting the constructed building accurately.
2. O&M (Operation and Maintenance) manuals integrated into the BIM model.
3. Links to warranty and manufacturer information for components.
4. Building spaces linked to facility management systems.
5. Detailed component lifecycle data (expected lifespan, maintenance schedules).
6. Updated energy performance models based on actual building behavior.
7. Integration with IoT for real-time building data monitoring.
8. Emergency and evacuation plans updated with as-built conditions.
9. Integration of feedback loops for post-occupancy evaluations.
10. Space utilization and occupancy sensors integrated into the model.

07 THE STRUCTURAL ENGINEER

7.1 General Obligations of the Structural Engineer:

1. Comply with sections 1-5 of this agreement.

2. As and when directed by the Project Manager/Employer/BIM Manager, deliver, exchange, or publish Models and associated documents following the Information Exchange Protocol.

3. Specify the LOD for each Model, ensuring alignment with BEP directives. Prior to dissemination, internally audit and validate models against the BEP, submitting validation evidence upon the BIM Manager’s request.

4. Designate an internal BIM Lead to coordinate and communicate BIM activities, acting as the liaison between the project stakeholders and the BIM Manager.

5. Abide by CDE guidelines as outlined by the BIM Manager.

6. Promptly inform the BIM Manager of identified clashes or issues concerning the Models.

7. Actively engage in BIM coordination meetings, addressing structural design and integration concerns.

8. Fulfill any additional BIM roles as highlighted in the BEP or other project agreements.

9. Use appropriate BIM authoring tools for structural components. If tool features are inadequate, employ other objects and correctly define their “Type.”

10. Collaborate with the Architect to establish modeling responsibilities for concrete stairs, landings, roof systems, and other shared components. This ownership should be documented in the BEP.

11. Each structural element should be modeled separately per storey and adhere to their correct IFC 2X3 parameters. Use 2D standard details where necessary, e.g., detailing reinforcement.

7.2 BIM Deliverables from the Structural Engineer:

1. Generate Structural BIM models aligned with BEP and the LOD specifications in section 4.2.3

2. Incorporate the necessary parameters into the model as per section 4.2.2 to cater to the Employer's BIM needs.

3. Address identified clashes by each project stage's conclusion, presenting a BCF report illustrating clash resolution.

4. Adapt and offer structural models and documents for tender purposes upon Employer's instruction.

5. Accompany each milestone model with a BIM validation checklist.

7.3 Clarification on LOD 350 for Structural BIM Model:

LOD 350 in a structural BIM model denotes a stage where the model represents detailed and specific assemblies for construction. This should encompass:

1. Accurate representation of structural components, including thickness, size,connection details, and other nuances.

2. Integration of detailed reinforcement, including rebar sizes, bends, lengths,lap lengths, cover details, and spacing.

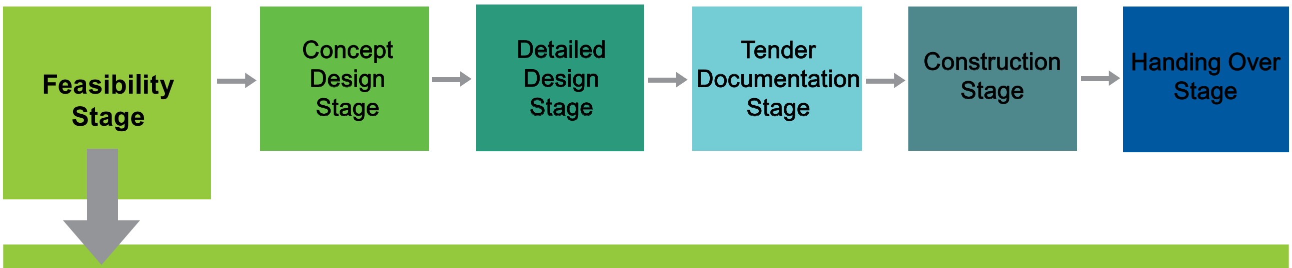
3. Comprehensive details about the material attributes, strengths, and other specifications.

4. Details necessary for fabrication, including welding, bolting, and other connection details.

5. All elements should be correctly annotated and tagged for easy identification and reference.

6. Details of embedded items, anchors, and other components necessary for connecting to other building components.

7.4 Scope of Services & Deliverables for the Structural Engineer in Relation to BIM



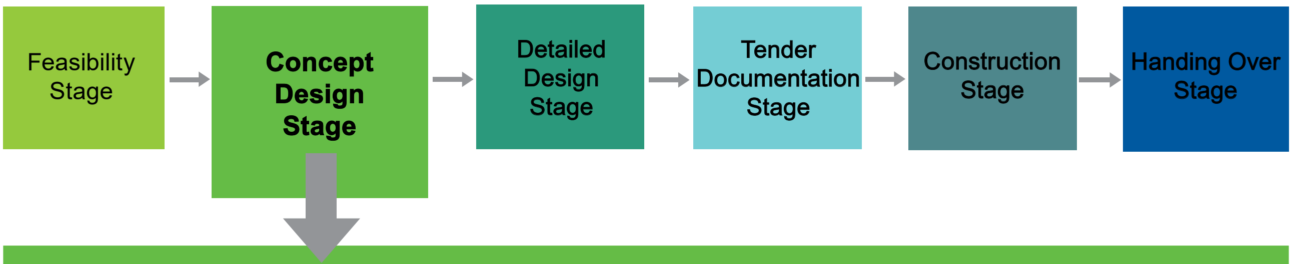
7.4.1 Feasibility Stage:

BIM Scope:

- Create an initial structural BIM model (LOD 100) for basic visualization of structural systems and elements.

Deliverables:

- BIM model at LOD 100 highlighting potential structural systems and primary load-bearing elements.



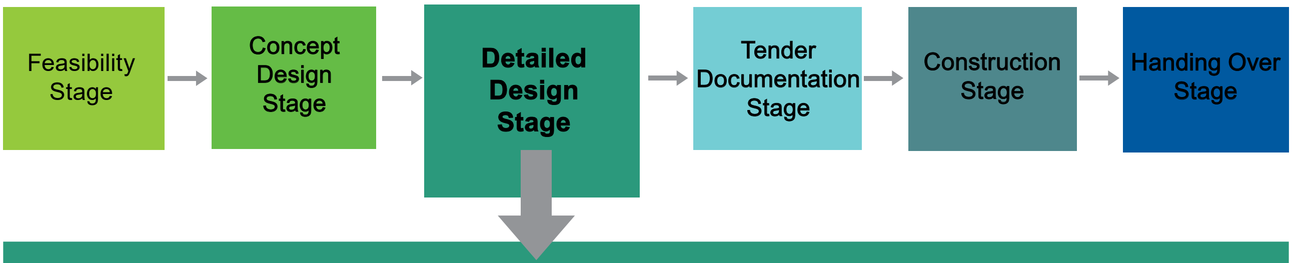
7.4.2 Concept Design Stage:

BIM Scope:

- Develop the BIM model to LOD 200, defining approximate sizes, positions, and orientations of primary structural elements like columns, beams, and slabs.
- Preliminary analysis of structural loads and performance.

Deliverables:

- BIM model at LOD 200 detailing basic structural systems.
- Preliminary load analysis report.



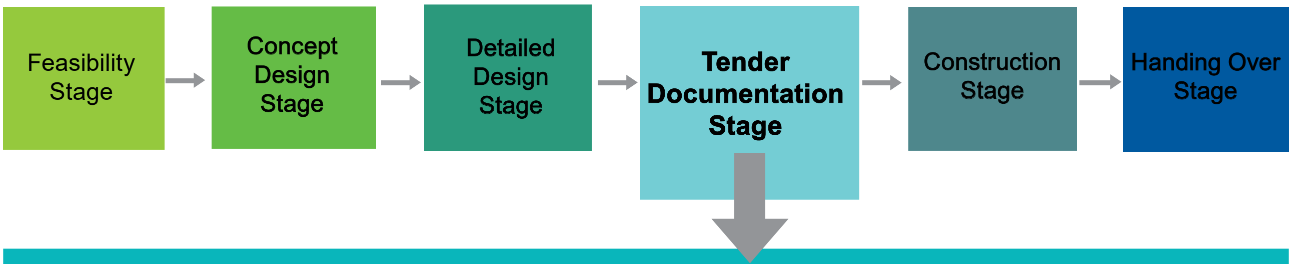
7.4.3 Detailed Design Stage:

BIM Scope:

- Enhance the BIM model to LOD 300, with precise locations, shapes, and size for all structural elements.
- Initiate detailed design calculations and integrate feedback from interdisciplinary coordination.

Deliverables:

- Detailed BIM model at LOD 300 showcasing all structural components.
- Detailed design calculation sheets and reports.



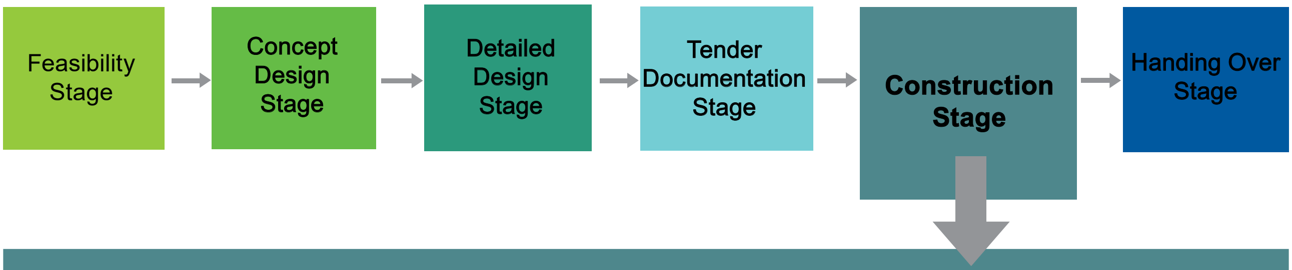
7.4.4 Tender Documentation Stage:

BIM Scope:

- Refine the BIM model to LOD 350. At this level, the model includes all the essential details required for fabrication, such as reinforcement details in concrete members and bolted or welded connections for steel members.
- Extract 2D reinforcement drawings and structural detail sheets from the BIM model.

Deliverables:

- BIM model at LOD 350 with comprehensive detailing suitable for tender submission
- Detailed reinforcement drawings, structural connection details, and other necessary 2D details



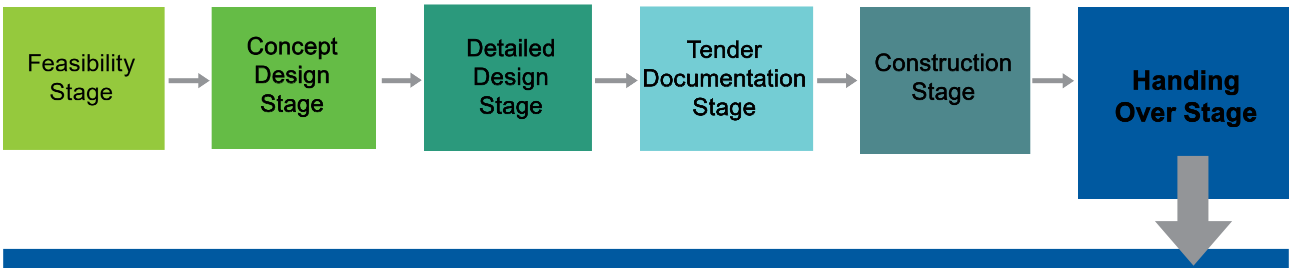
7.4.5 Construction Stage:

BIM Scope:

- Update the BIM model to LOD 400, integrating construction sequencing (4D BIM) if applicable
- Document any changes made during construction, ensuring the model reflects as-constructed conditions.

Deliverables:

- BIM model enhanced to LOD 400, integrating any adjustments or changes made during construction.



7.4.6 HAnding Over Stage:

BIM Scope:

- Finalize the BIM model to LOD 500, representing the structure as built. At this stage, the model should integrate any post-construction changes and include data for facility management, such as load capacities, material strengths, and maintenance schedules.

Deliverables:

- As-built BIM model at LOD 500 with all post-construction changes and relevant structural data for building owners or facility managers.
- This delineation provides a focused guideline for a Structural Engineer using BIM across the stages of a project. Adjustments may be needed based on specific project requirements, the

7.5 Information Levels for Civil/Structural Engineers (in line with ISO 19650)

7.5.1 Feasibility Stage (Analogous to LOD 100)

Basic information about the site's geotechnical conditions, potential structural systems, and load considerations.

Examples:
- Preliminary geotechnical report with basic soil properties.
- Generalized site topography and existing utilities.
- Conceptual foundation types based on preliminary soil analysis.
- Basic load considerations (dead, live, wind, seismic).
- Massing models for potential structural systems (e.g., frame, shear wall).
- Preliminary evaluation of site drainage and potential retention systems.
- Conceptual bridge or retaining wall locations for transportation projects.
- High-level risk and hazard analysis.
- Indicative structural grid or layout.
- Preliminary analysis of required excavation or grading.

7.5.2 Concept Stage (Analogous to LOD 200)

Defined load paths, initial structural system selection, and preliminary sizing of members.

Examples
- Preliminary foundation plan with types and sizes.
- Primary structural frame layout with indicative member sizes.
- Conceptual bridge or retaining wall sections for transportation projects.
- Preliminary analysis results for gravity and lateral systems.
- Broad material considerations (concrete, steel, timber).
- Rough estimate of earthwork volumes.
- Outline of potential construction sequences or phasing.
- Preliminary drainage and stormwater management plans.
- Identification of potential conflict or clash areas.
- Basic connection details (e.g., beam-column junction).

7.5.3 Detailed Design Stage (Analogous to LOD 300)

Detailed design with finalized structural systems, refined member sizes, and thorough analysis results.

Examples:
- Detailed structural plans with finalized member sizes and reinforcements.
- Connection details for the primary structural systems.
- Foundation details, including pile caps, grade beams, and footings.
- Comprehensive analysis results, including deflections, stresses, and load paths.
- Detailed bridge or retaining wall plans and sections with reinforcements.
- tormwater management details, including pits, drains, and retention systems.
- Geotechnical report with detailed soil properties and recommendations.
- Structural specifications and material requirements.
- Earthwork plans with detailed grading and slope considerations.
- Integration of services and utilities within structural elements.

7.5.4 Tender Stage (Analogous to LOD 350)

All data necessary for contractors to provide accurate bids and prepare for construction.

Examples:
- Bill of quantities derived from the detailed BIM model.
- Detailed reinforcement schedules and bar bending details.
- Specification sheets for proprietary structural systems or components.
- Constructability reviews and potential value engineering options.
- Detailed structural sequence or method statements.
- Temporary works and support system details.
- Comprehensive connection and fabrication details.
- Coordination with other disciplines to avoid clashes during construction.
- Structural tolerances and inspection checklists.
- Preliminary construction schedule derived from the BIM model.

7.5.5 Construction Stage (Analogous to LOD 400)

Data that aids construction, sequencing, and fabrication.

Examples:
- Shop drawings for individual structural components.
- 4D BIM models integrating construction scheduling.
- Detailed rebar placement diagrams.
- As-needed or just-in-time fabrication data for offsite manufacturing.
- Coordination models highlighting potential clashes with other trades.
- Site logistics and layout derived from the BIM model.
- Real-time monitoring and feedback loops for construction progress.
- Detailed erection or installation sequences.
- Integration of structural monitoring systems (e.g., sensors for deflection).
- Detailed formwork and falsework plans.

7.5.6 Handover & Operation Stage (Analogous to LOD 500)

As-built data, inspection records, and maintenance details.

Examples:
- As-built BIM model reflecting constructed conditions.
- Integration of structural health monitoring systems and feedback.
- Warranty and material lifespan information.
- Maintenance schedules and recommended practices.
- Inspection and quality assurance records.
- Detailed as-built reinforcement and connection details.
- Load capacity and restriction information for future modifications.
- Structural behavior under actual loads vs. design predictions.
- Lifecycle analysis and end-of-life considerations.
- Emergency response and safety data related to structural systems.

08 THE MEP ENGINEER

8.1 General Obligations of the MEP Engineer:

1. Adhere to the guidelines set forth in sections 1-5 of this document.
2. Regularly or as instructed, exchange Models and other documents according tothe Information Exchange Protocol.
3. Clearly indicate the LOD for each Model, ensuring compliance with the BEP. Models should be internally audited against the BEP before sharing. Submit validation proof upon request.
4. Appoint a BIM Lead to communicate and coordinate BIM implementation with the project team, BIM Manager, and Employer.
5. Manage the CDE according to the BIM Manager’s instructions.
6. Notify the BIM Manager of any clashes, conflicts, or issues with the Models as quickly as possible.
7. Actively participate in meetings to discuss and resolve BIM coordination issues.
8. Fulfill additional roles as outlined by the BIM Execution Plan and other agreements.
9. Ensure that defined spaces and zones align with architectural names and numbers.
10. Collaborate with the Architect to determine the modelling of fixtures like sinks, basins, and sanitary ware, ensuring visibility control through worksets.
11. Create and update MEP schematic diagrams in CAD, ensuring alignment with the BIM model.
12. Represent unavailable objects in BIM software with appropriate placeholders and identification details.
13. Ensure that all MEP elements align with their correct IFC 2X3 parameters.

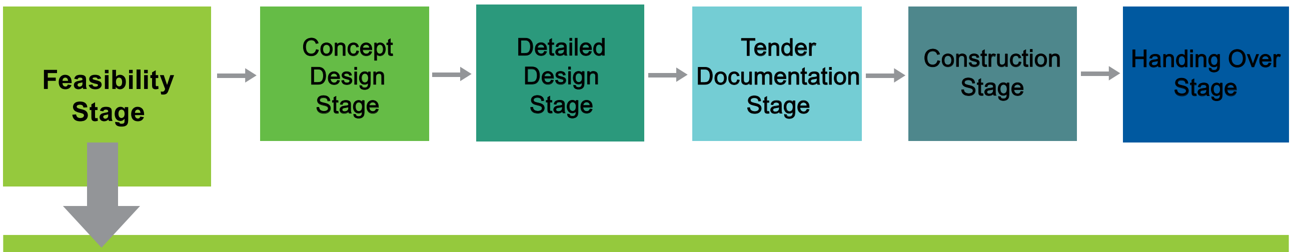
8.2 BIM Deliverables from the MEP Engineer:

- Develop and submit MEP BIM Models according to the BIM Execution Plan for coordination and construction.
- Revise and prepare Models and documents for tender purposes as per the Employer's instructions.
- Ensure that Models comply with LOD requirements specified in section 4.2.3 relative to project stages.
- Incorporate necessary parameters in Models according to section 4.2.2 to meet Employer's BIM requirements.
- Address and resolve clashes at each project stage, providing a BCF report to showcase resolved clashes.
- Submit a BIM validation checklist alongside each model shared at project milestones.

8.1.2Clarifications and Considerations:

- For MEP models, LOD reflects the model's evolution, detailing system components and their specific assemblies as the project advances.
- LOD in MEP modeling typically incorporates detailed and precise object representations, capturing specific component geometries, positions, and orientations within the project.
- In evolving towards higher LODs, the model progresses from conceptual design, incorporating spatial allowances, to a detailed design encapsulating fabrication and assembly details, ultimately facilitating performance analysis and maintenance considerations.

8.4 Scope of Services & Deliverables for the MEP Engineer in Relation to BIM



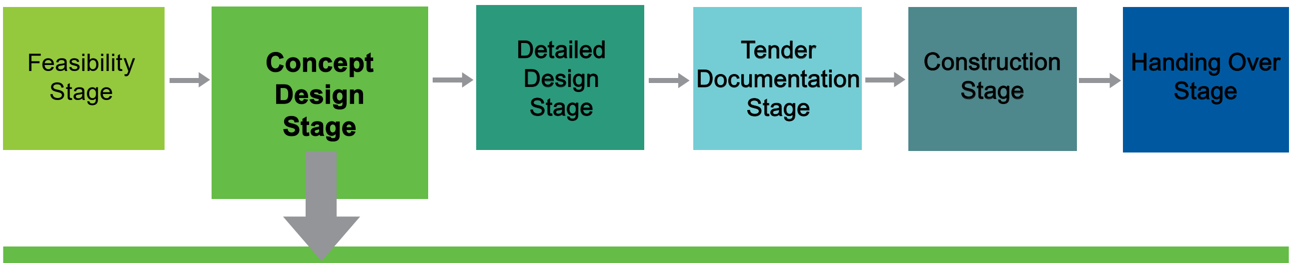
8.4.1 Feasibility Stage:

BIM Scope:

- Develop a rudimentary BIM model (LOD 100) showcasing potential MEP systems and primary routes.

Deliverables:

- Preliminary BIM model at LOD 100 indicating fundamental MEP system pathways and zones.



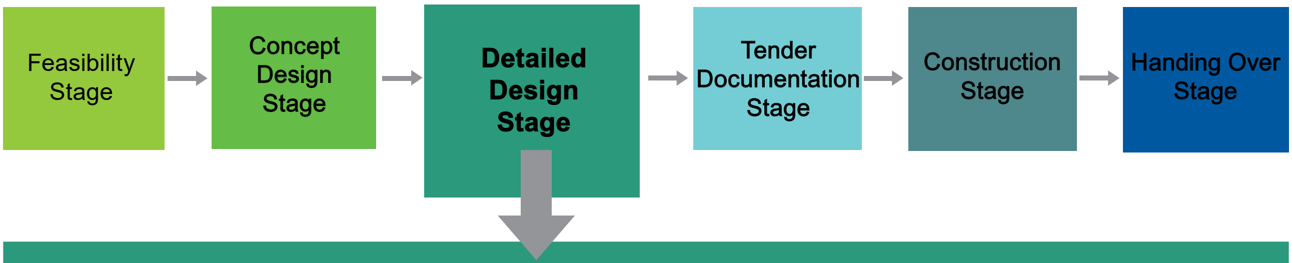
8.4.2 Concept Design Stage:

BIM Scope:

- Enhance the BIM model to LOD 200, illustrating the general placement, paths, and sizes of ducts, pipes, conduits, and equipment.
- Preliminary coordination with architectural and structural elements

Deliverables:

- Conceptual BIM model at LOD 200 highlighting the basic MEP systems and their spatial requirements.



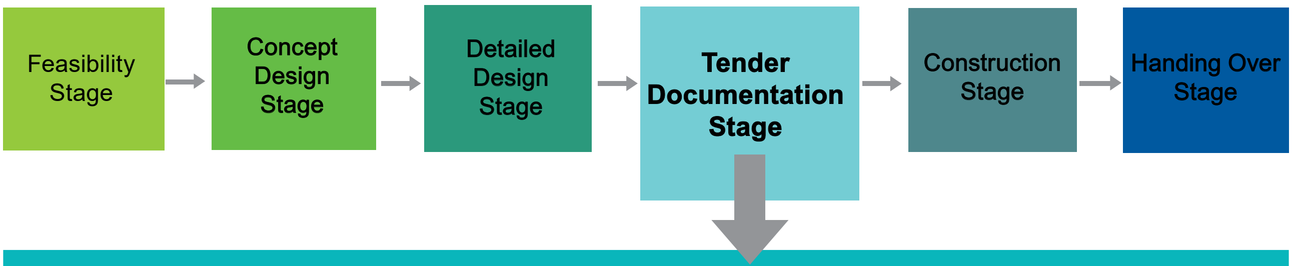
8.4.3 Detailed Design Stage:

BIM Scope:

- Advance the BIM model to LOD 300, detailing specific component sizes, locations, and connections.
- Perform detailed clash detections with other disciplines and resolve any identified issues.

Deliverables:

- Detailed BIM model at LOD 300 for MEP systems, including HVAC, plumbing, electrical layouts, and equipment details.
- Clash detection report and resolution documentation.



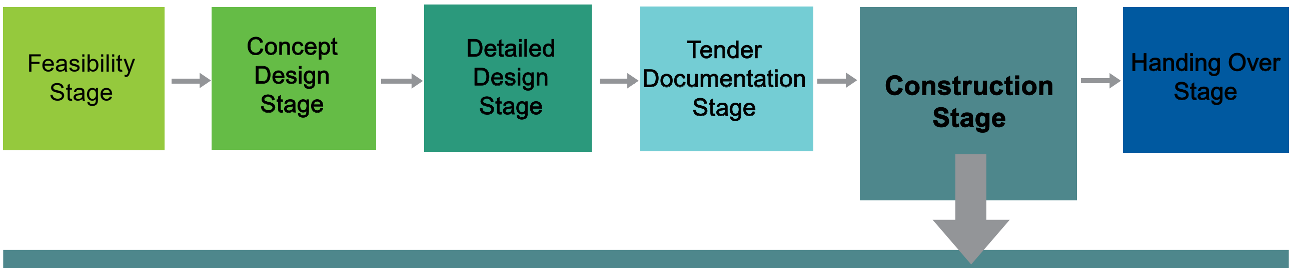
8.4.4 Tender Documentation Stage:

BIM Scope:

- Refine the BIM model to LOD 350, integrating detailed component specifications, fabrication details, connections, supports, and equipment clearances.
- Extract 2D MEP installation drawings from the BIM model for contractors'reference.

Deliverables:

- BIM model at LOD 350, showcasing comprehensive MEP component details and specifications.
- MEP installation drawings, schematics, and other essential 2D details for tender submission.



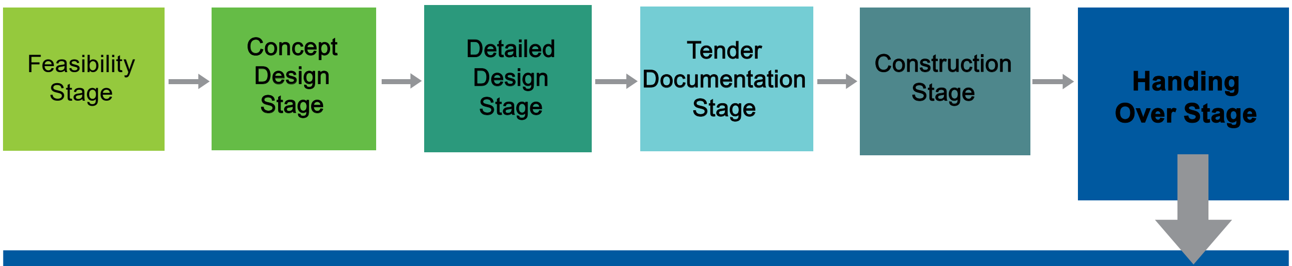
8.4.5 Construction Stage:

BIM Scope:

- Update the BIM model to LOD 400, incorporating construction sequencing (4D BIM) if required
- Document any adjustments made during construction to ensure the model remains a true representation of the installed systems.

Deliverables:

- Enhanced BIM model at LOD 400, reflecting any changes or adjustments made during the construction process.
- Regular updates and documentation detailing any changes, resolutions, or modifications during construction.



8.4.6 Handing Over Stage:

BIM Scope:

- Finalize the BIM model to LOD 500, integrating all post-construction modifications. This model should contain data vital for facility management, such as equipment schedules, maintenance requirements, warranty details, and operational parameters.

Deliverables:

- As-built BIM model at LOD 500 encompassing all post-construction changes andvital MEP data for facility management.

8.5 Information Levels For MEP Engineers (In Line With ISO 19650)

8.5.1 Feasibility Stage (Analogous to LOD 100)

Basic information about the site's existing utilities, potential MEP systems, and general energy considerations.

Examples:

1. Preliminary assessment of existing utilities.
2. Generalized placement of major MEP equipment (e.g., HVAC units, electrical substations).
3. Initial considerations for HVAC systems based on building type.
4. Early-stage energy analysis for building performance.
5. Identification of potential energy sources (e.g., solar, wind).
6. Conceptual layouts of plumbing and drainage systems.
7. Preliminary considerations for lighting and power systems.
8. Initial fire protection and safety systems considerations.
9. Identification of MEP space requirements.
10. Early-stage sustainability and green building considerations.

8.5.2 Concept Stage (Analogous to LOD 200)

Defined MEP systems, initial equipment sizing, and rough layouts of major ducts, pipes, and conduits.

Examples

1. Initial sizing of major HVAC equipment.
2. Rough layout of air distribution ducts and return paths.
3. Preliminary plumbing system layouts (potable water, wastewater).
4. Conceptual lighting layout with indicative fixture types.
5. Broad considerations for electrical power distribution.
6. Rough estimates of cable lengths and conduit runs.
7. Initial design of fire suppression systems.
8. Basic control and automation system considerations.
9. Identification of potential areas of interference with other disciplines.
10. Preliminary calculations for heating, cooling, and electrical loads.

8.5.3 Detailed Design Stage (Analogous to LOD 300)

Detailed MEP system designs, finalized equipment sizes, ductwork, pipework, and conduit routing.

Examples:

1. Detailed HVAC layouts with finalized duct sizes and air terminals.
2. Comprehensive piping diagrams for plumbing and drainage.
3. Detailed electrical circuitry diagrams with final equipment and fixture counts.
4. Lighting simulations and finalized lighting fixture specifications.
5. Detailed fire suppression system layouts with sprinkler head placement.
6. BMS (Building Management System) layout and controls diagram.
7. Finalized equipment schedules (HVAC, electrical panels, pumps).
8. Detailed layouts for specialized systems (e.g., medical gas, IT networking).
9. Acoustic and vibration considerations for MEP systems.
10. Coordination with structural and architectural elements

8.5.4 Tender Stage (Analogous to LOD 350)

All information required for contractors to bid accurately, including detailed specifications, BOQs, and potential value engineering options.

Examples:

1. Bill of quantities derived from detailed MEP BIM models.
2. Detailed equipment and fixture schedules with specifications.
3. MEP system performance criteria and standards.
4. Preliminary maintenance and operational considerations.
5. Coordination drawings showing integration with other trades.
6. Potential alternatives or value engineering suggestions for MEP systems.
7. Details for specialized or non-standard components.
8. Pre-installation requirements for various MEP systems.
9. Integration details for BMS and control systems.
10. Detailed phasing or sequencing for MEP installations.

8.5.5 Construction Stage (Analogous to LOD 400)

Detailed installation diagrams, sequencing data, fabrication-level details, and realtime modifications.

Examples:

1. Shop drawings and fabrication diagrams for custom MEP components.
2. Installation sequences, especially for complex integrated systems.
3. As-built data capture for real-time design modifications.
4. Detailed connection and joint details for MEP systems.
5. Real-time feedback loops for system performance testing (e.g., air balancing).
6. Coordination models for clash detection during installation.
7. Integration details for controls, sensors, and smart devices.
8. Temporary provisions for MEP during construction (e.g., temporary lighting).
9. Detailed labeling and tagging conventions for all MEP components.
10. Integration of testing and commissioning processes.

8.5.6 Handover & Operation Stage (Analogous to LOD 500)

As-built data, operational manuals, maintenance schedules, and system performance data.

Examples:

1. As-built BIM model reflecting exact constructed conditions.
2. Operational manuals and user guides for all MEP systems.
3. Maintenance schedules and protocols for equipment.
4. Energy performance data and comparisons with initial predictions.
5. Calibration and tuning data for BMS and control systems.
6. Replacement and spare parts lists for major equipment.
7. Warranty and service contract details.
8. Training materials and videos for building operators.
9. Emergency response and safety data related to MEP systems.
10. Integration with facility management software for ongoing operations.

09 THE PROJECT MANAGER

9.1 Scope of Services for the Project Manager in Relation to BIM

9.1.1 BIM Strategy Integration:

- Understand the BIM Execution Plan (BEP) and its implications for the project's scope, timeline, and deliverables.
- Ensure BIM goals are incorporated into the overall project objectives and milestones.

9.1.2 Coordination & Monitoring:

- Arrange and lead BIM coordination meetings to ensure project stakeholders are aligned.
- Act on the recommendations and action plans provided by the BIM Manager in the clash detection report. Ensure design conflicts are resolved promptly by the respective teams.
- Regularly review BIM audit and validation reports. Ensure all identified issues are addressed by the relevant parties in a timely manner.

9.1.3 Stakeholder Communication:

- Collaborate with the BIM Manager to receive regular BIM progress reports and communicate these to stakeholders.
- Escalate any BIM-related issues that cannot be resolved at the coordination level to higher management or the client, if necessary.

9.1.4 Quality & Compliance:

- Ensure all teams adhere to the BIM standards and protocols defined in the BEP.
- Collaborate with the BIM Manager to verify that the BIM model and processes comply with contracual obligations and industry standards.

9.1.5 Decision Making:

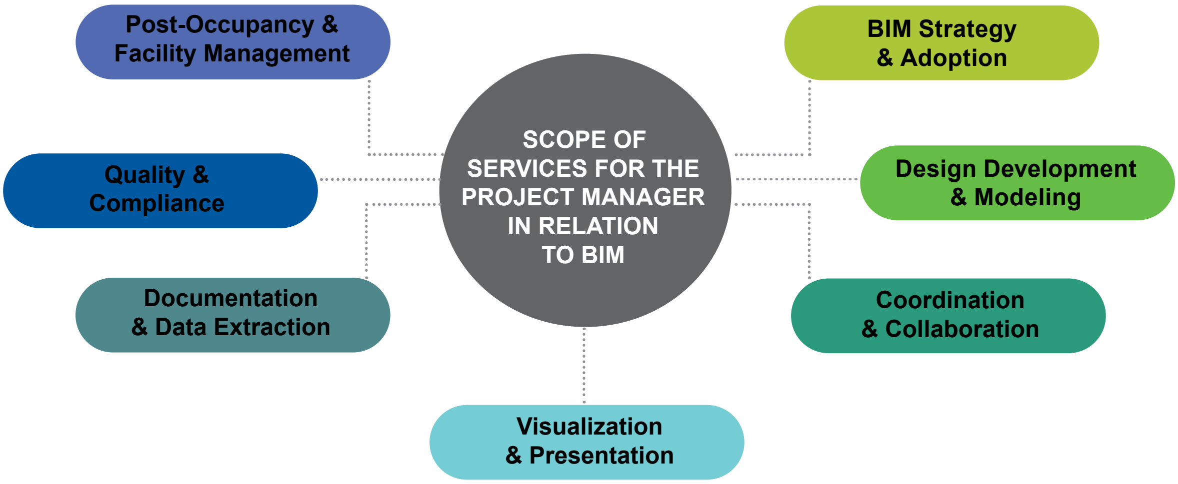
- Utilize BIM data, such as 4D scheduling or 5D costing, to make informed decisions about the project's progress and potential changes.
- Oversee any changes in the project that arise from BIM model iterations and ensure they align with project goals and client expectations.

9.1.6 Responsibility Boundaries:

- Understand and respect the boundary between project management and BIM management. Avoid shifting core PM responsibilities onto the BIM Manager.
- Provide the necessary support to the BIM Manager to ensure that BIM processes run smoothly and efficiently. This includes enforcing compliance from all teams and ensuring adequate resources and training are available.

10 THE INTERIOR DESIGNER

10.1 Scope of Services for the Project Manager in Relation to BIM



10.1.1 BIM Strategy & Adoption:

- Understand and familiarize oneself with the BIM Execution Plan (BEP), especially as it pertains to interior design components.
- Ensure proficiency in relevant BIM software tailored for interior design. Maintain updated knowledge on software updates and best practices.

10.1.2 Design Development & Modeling:

- Develop detailed BIM models for interior spaces, including furnishings, fixtures, finishes, and any specialized equipment.
- Ensure interior models are developed in accordance with the specified Level Of Detail in the BEP or as agreed upon with the project team.
- Ensure that the interior design BIM model seamlessly integrates with the overall architectural BIM model, especially in areas of interface such as partition walls, ceilings, and floors.
- Embed material and finish specifications within the BIM model, allowing for comprehensive data extraction and visualization.

10.1.3 Coordination & Collaboration:

- Work closely with other BIM model contributors (architects, MEP engineers, etc.) to ensure that the interior design model coordinates without clashes.
- Attend and actively participate in BIM coordination meetings to address any challenges or conflicts related to interior design elements.
- Quickly integrate and update changes into the BIM model based on feedback from the project team, client, or as a result of clash detection.

10.1.4 Visualization & Presentation:

- Utilize BIM software capabilities to produce high-quality renderings and walkthroughs of interior spaces for client presentations and approvals.
- If applicable and available, leverage BIM data to provide VR experiences of interior spaces to aid in design visualization and decision-making.

10.1.5 Documentation & Data Extraction:

- Produce detailed interior design documentation directly from the BIM model, ensuring accuracy and consistency.
- Extract schedules, such as furniture or finish schedules, directly from the BIM model to ensure accuracy and to aid in procurement.

10.1.6 Quality & Compliance:

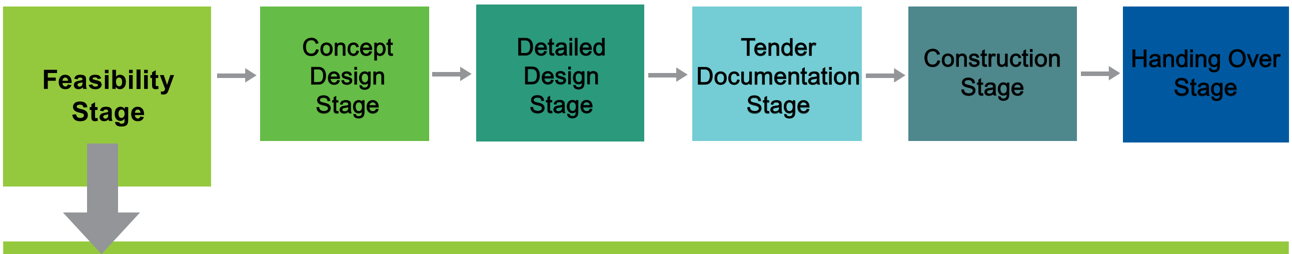
- Ensure that all BIM modeling and documentation adhere to the agreed-upon BIM standards and protocols.
- Ensure that BIM models and related data adhere to relevant building codes, accessibility standards, and any specific client requirements.

10.1.7 Post-Occupancy & Facility Management:

- Ensure that all BIM modeling and documentation adhere to the agreed-upon BIM standards and protocols.
- Ensure that BIM models and related data adhere to relevant building codes, accessibility standards, and any specific client requirements.

11 THE QUANTITY SURVEYOR

11.1 Scope of Services for the Quantity Surveyor in Relation to BIM



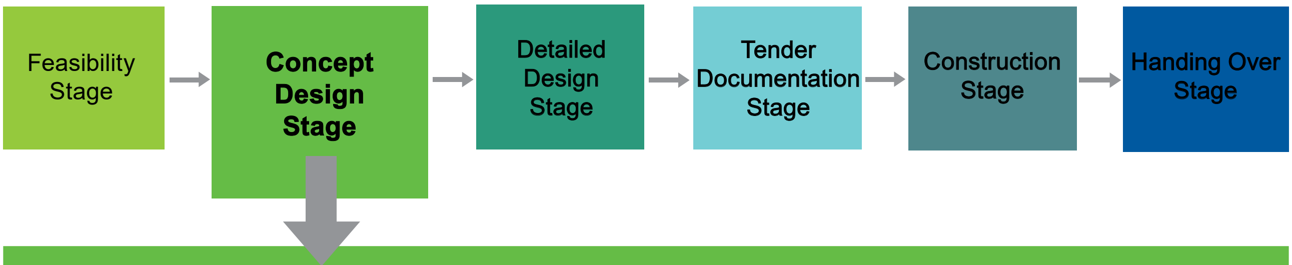
11.1.1 Feasibility Stage:

BIM Scope:

- Utilize the preliminary BIM model (LOD 100) to provide an initial project estimate based on rough quantities and area measurements.

Deliverables:

- Preliminary cost estimate report based on basic BIM model quantities.



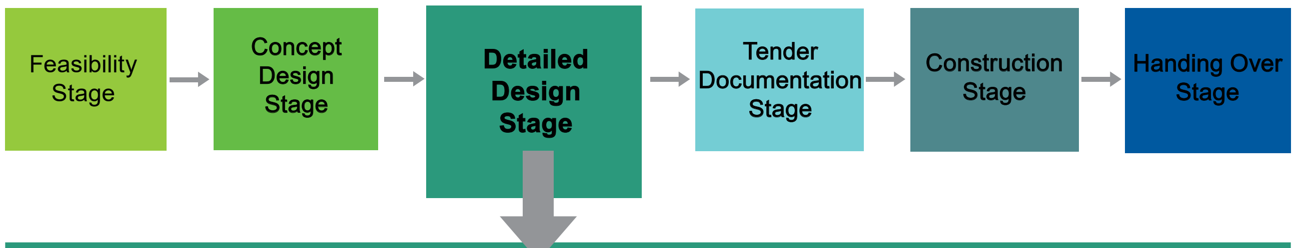
11.1.2 Concept Design Stage:

BIM Scope:

- Utilize the BIM model at LOD 200 to provide more refined cost estimates based on conceptual designs.
- Establish preliminary budget and financial feasibility.

Deliverables:

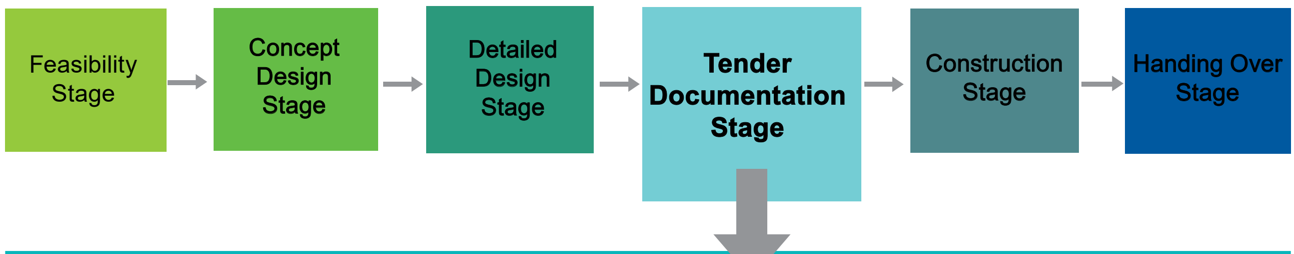
- Detailed cost estimation report based on LOD 200 BIM model.
- Preliminary project budget and financial feasibility report.



11.1.3 Detailed Design Stage:

BIM Scope:
- Extract detailed quantities from the BIM model at LOD 300 for accurate costing.
- Assist in value engineering by identifying cost-saving opportunities using the BIM model.

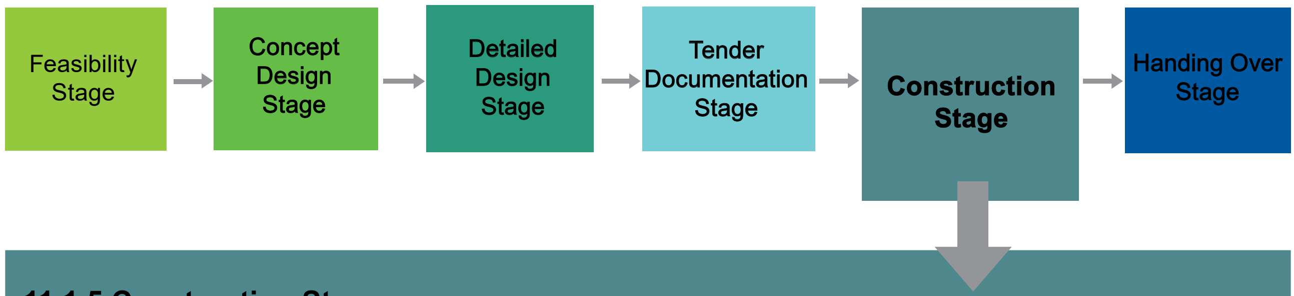
Deliverables:
- Detailed Bill of Quantities (BoQ) from LOD 300 BIM model.
- Value engineering report suggesting cost-saving measures.



11.1.4 Tender Documentation Stage:

BIM Scope:
- Utilize the BIM model at LOD 350 to finalize the BoQ for tender purposes.
- Provide comprehensive tender documentation with detailed cost breakdowns.

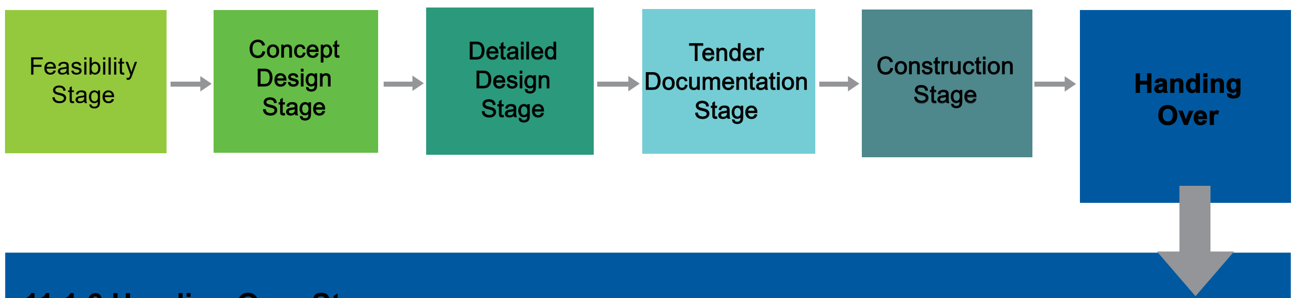
Deliverables:
- Final BoQ from LOD 350 BIM model for tendering.
- Tender documentation with comprehensive cost breakdowns.



11.1.5 Construction Stage:

BIM Scope:
- Monitor and validate construction progress against the BIM model (up to LOD 400) for payment certification.
- Ensure that any changes in construction that have cost implications are documented and updated in the BIM model.

Deliverables:
- Regular progress reports and payment certifications based on the BIM model validation.
- Updated BoQ or cost variations resulting from changes during construction.

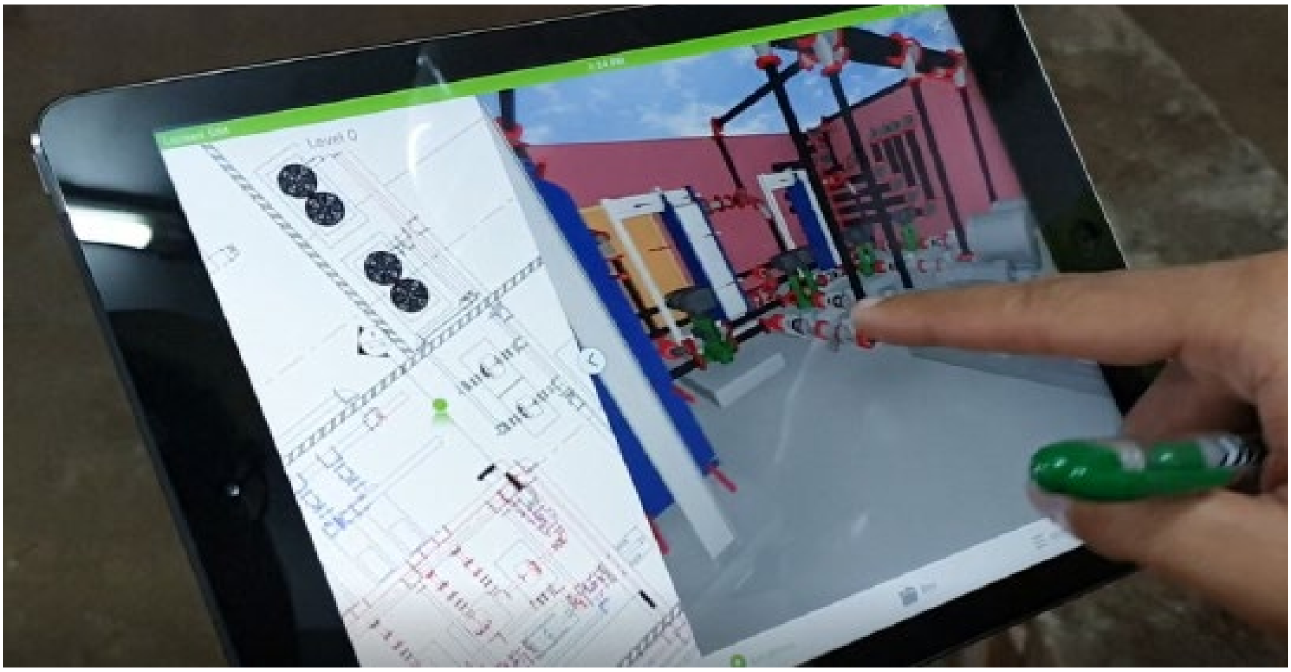


11.1.6 Handing Over Stage:

BIM Scope:
- Utilize the finalized BIM model at LOD 500 to reconcile all quantities and verify final project costs.
- Provide financial closeout and final account for the project.

Deliverables:
- Final account statement reconciled with the BIM model.
- Final cost report detailing all expenditures and variations.

12 GUIDANCE DOCUMENT FOR BIM INTEGRATION IN RFP AND CONTRACTS



12.1 Introduction

Building Information Modelling (BIM) has revolutionized the construction industry. For clients, this provides a plethora of advantages - from design optimization to facilities management.

.

12.2 Why is BIM Important for Clients?

- BIM provides an integrated environment where every detail, from design to construction, is stored in one model.
- Before a brick is laid, clients can walk through their projects, ensuring design accuracy and alignment with their vision.
- Predict costs accurately and avoid unexpected expenses.
- Post-construction, BIM serves as a rich database, enabling efficient building management.

12.3 Broad Objectives for BIM Use:

- Reduction in design discrepancies and iterations.
- BIM facilitates accurate quantity extraction for better budgeting.
- Multiple stakeholders can collaborate seamlessly.

12.4 Importance of Proper BIM Modelling:

Correct BIM modelling is paramount. An accurately developed model ensures design efficiency, cost accuracy, and acts as a trustworthy reference throughout the project's lifecycle.

12.5 BIM for Operations & Maintenance:

A BIM model extends beyond construction. Facilities Management teams use it for maintenance schedules, space management, and asset management, thereby ensuring building longevity and efficiency.

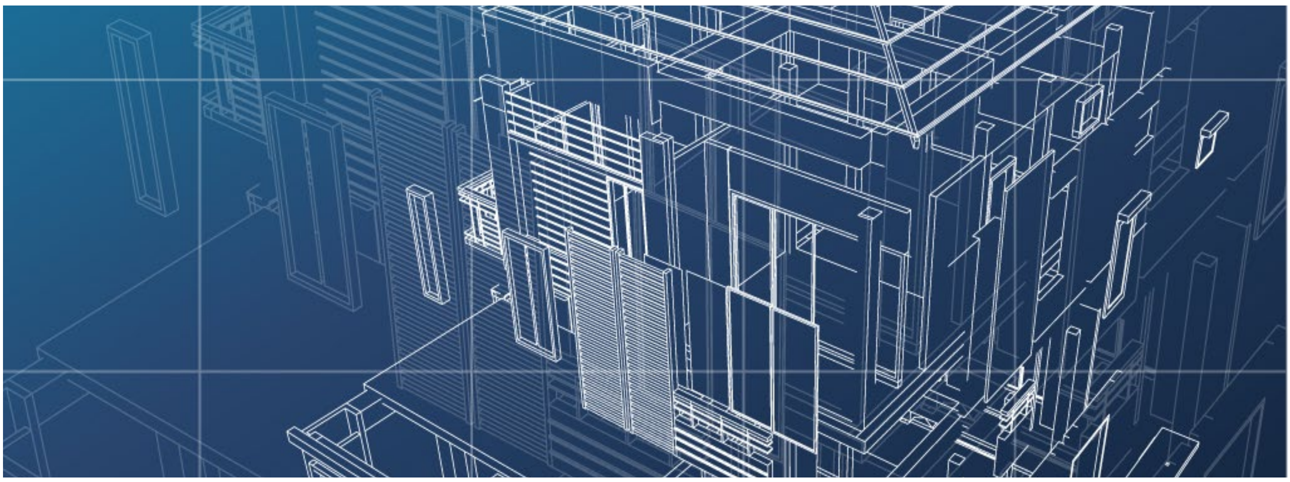
12.6 LOD Requirements in Line with ISO 19650:

Construction Stage	LOD	Expected Details
Feasibility	100	Basic massing, overall building size.
Concept	200	Generic elements with approximate sizes, locations.
Detailed Design	300	Specific assemblies with accurate shapes, locations.
Tender	350	Detailed components for construction.
Construction	400	Constructed model with variations
Handing Over	500	As-built model with actual constructions and deviation

Our Featured Projects using BIM

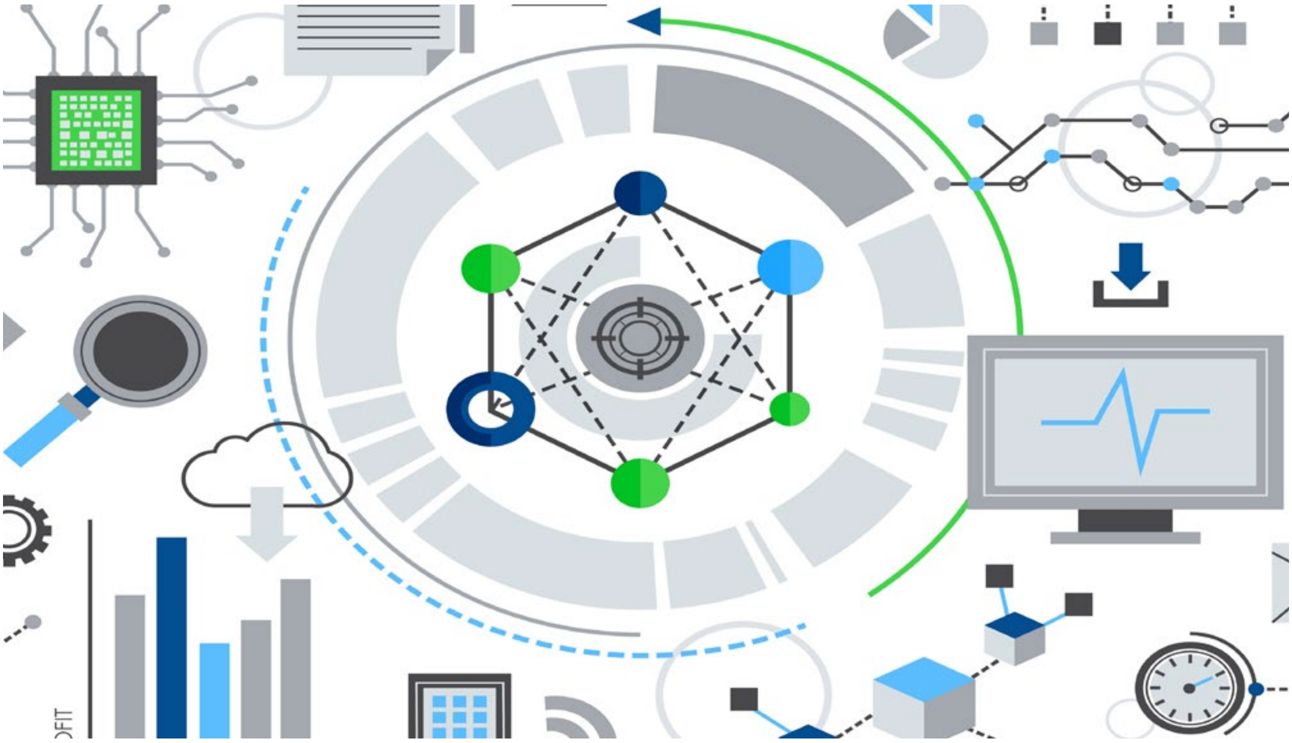
12.7 Expected BIM Deliverables from Various Consultants at Different Stages:

Consultant	Feasibility	Concept	Detailed Design	Tender	Construc-tion	Handing Over
Architect	Site analysis, basic massing	Preliminary design, space planning	Detailed elements, finishes	Finalized design with annotations	Updates as per site conditions	As-built model, docu-mentation
Civil/ Structural Engineer	Basic load assumptions	Primary structural system	Detailed structural elements	Structural details, annotations	Construction changes	Finalized structural model
MEP Engineer	Energy, water analysis	System layout	Detailed elements, connections	MEP specifi-cations, schedules	Installation deviations	Finalized MEP model, testing
Interior Designer	Basic spatial requirements	Mood boards, design language	Furniture, fixtures, finishes	Material specifi-cations, schedules	Interior variations	As-built interiors, warranty docs
Landscape Architect	Site ecology, costraints	Design intent, soft-hard landscaping	Detailed elements, plants	Finalized landscape design	Real-time modifications	As-built landscape model
Quantity Surveyor	Preliminary cost estimates	Budget, cost plan	BoQ, cost reports	Tender documents, contracts	Cost variations, valuations	Final account, reconciliation
Project Managers	Project feasibility, strategy	Project plan, timeline	Resource manage-ment, coordintion	Contractual docs, tender analysis	On-site coordination, progress reports	Project closeout, handover process



12.8 Conclusion:

Incorporating BIM is not merely an addition to the design and construction process; it's a transformative tool, ensuring efficiency, cost savings, and longevity of the built environment. Proper detailing in the RFP and contracts shall ensure smooth integration of BIM, reaping its myriad benefits for all stakeholders.



12.9 Collaboration and Communication in BIM

When drafting a Request for Proposal (RFP) for design and construction services utilizing BIM, it's crucial for clients to clearly define the expected protocols for handling information and communications. This section of the guidebook explains what clients should include in their RFPs and contracts to ensure effective collaboration and communication throughout the BIM process.

12.9.1 Roles and Responsibilities

The RFP should delineate the roles of each party involved, including the BIM Manager, designers, contractors, and other stakeholders. The BIM Manager's role is typically central to managing and coordinating BIM-related communication and information flow. It is important to specify how this role interacts with other team members and the extent of their responsibilities.

One template is given below:

1. General Overview

The designers, (including architects, structural engineers, MEP engineers, and interior designers), shall be responsible for developing and maintaining BIM models for their respective disciplines. These models serve as the foundation for collaborative design, clash detection, and accurate project documentation.

2. Responsibilities

2.1. Development of BIM Models:

- *Designers shall be responsible for creating BIM models that accurately represent their respective design disciplines.*
- *Models should be developed in accordance with the specified Level of Development (LOD) requirements, as outlined in this RFP and the BIM Execution Plan (BEP).*

2.2. Coordination and Clash Detection:

- *Collaborate with other design disciplines to ensure that BIM models are coordinated and free of clashes.*
- *Actively participate in clash detection and resolution processes to identify and address conflicts within the BIM environment.*

2.3. Model Accuracy and Updates:

- *Maintain the accuracy and completeness of BIM models throughout the project lifecycle.*
- *Regularly update BIM models to reflect design changes, revisions, and approvals.*

2.4. Collaboration with BIM Manager:

- *Work closely with the designated BIM Manager to align BIM processes and standards.*
- *Provide necessary data and information to support BIM coordination efforts.*

3. BIM Model Standards and Conventions

Designers are expected to adhere to the following BIM model standards and conventions:

- *Utilize appropriate BIM authoring tools and software for their specific design discipline.*
- *Ensure that BIM models conform to the defined BIM Execution Plan (BEP) and Information Exchange Requirements (IER).*
- *Follow established BIM modeling guidelines, including the use of standard naming conventions, object classifications, and property data.*

> **4. Collaboration and Communication**
>
> *Effective communication and collaboration among designers, as well as with the BIM Manager and other project stakeholders, are essential. Designers should:*
>
> - *Participate in BIM coordination meetings and workshops as scheduled.*
> - *Respond promptly to clash detection reports and coordination requests.*
> - *Share design changes and updates with the project team in a timely manner.*
> - *Collaborate on interdisciplinary issues and conflicts to achieve coordinated solutions.*
>
> **5. Quality Assurance**
>
> *Designers shall be responsible for ensuring the quality and accuracy of BIM models produced. This includes:*
>
> - *Conducting internal audits and validations of BIM models against LOD requirements and project standards.*
> - *Addressing any discrepancies or issues identified during quality assurance processes.*

12.9.2 Communication Channels and Protocols

Clearly define the channels and protocols for communication within the BIM framework. This includes specifying the methods for information sharing, frequency of meetings, use of collaborative tools, and procedures for reporting progress or issues.

> **1. Communication Channels and Protocols**
>
> *In line with our commitment to the effective implementation of Building Information Modelling (BIM) for this project, it is imperative that clear and efficient communication channels and protocols are established. This section outlines the methods and procedures for communication and information exchange within the BIM framework.*
>
> *1.1. Communication Methods:*
>
> *Designated BIM coordination meetings shall be held at scheduled intervals to facilitate information sharing and issue resolution. Meetings may also include progress updates, reviews, and discussions on design and construction matters. Attendance and participation in these meetings are mandatory for all parties involved in the project.*
>
> *1.2. Collaborative Tools:*
>
> *To enhance real-time collaboration and information sharing, we shall utilize collaborative BIM software and tools. These tools shall provide a central platform for accessing BIM models, documents, and project data. Designers and contractors are expected to use these tools for model sharing, clash detection, and collaborative editing.*

1.3. Frequency of Meetings:

Regular BIM coordination meetings shall be held as follows:

- *(Weekly or fortnightly) coordination meetings: These meetings shall occur (weekly or fortnightly) during critical project phases and shall focus on immediate issues, clash detection, and progress updates.*
- *(Bi-weekly or monthly) coordination meetings: During less intensive phases, fortnightly or monthly meetings shall be conducted to discuss ongoing coordination efforts and updates.*
- *Monthly project updates: Monthly meetings shall provide a comprehensive overview of project progress, milestones achieved, and upcoming goals.*

1.4. Reporting Procedures:

- *Regular progress reports should be submitted by each party, detailing the status of their BIM models, design developments, and any issues or conflicts encountered. These reports shall be used to track project advancement and identify areas that require attention.*
- *In the event of clashes, discrepancies, or issues identified within the BIM models, parties are required to promptly report these issues to the BIM Manager. The BIM Manager shall facilitate the coordination and resolution process.*
- *Any proposed design changes must be communicated to the BIM Manager and relevant stakeholders. Designers should submit updated BIM models reflecting these changes for coordination and approval.*

1.5. Documentation Exchange:

Electronic documentation shall be the primary method of information exchange. This includes BIM models, design drawings, specifications, and any relevant project documents. All parties should ensure that documentation is stored, accessed, and shared through the designated collaborative BIM platform.

1.6. Confidentiality and Data Security:

Parties involved in the project shall be expected to adhere to strict confidentiality and data security measures. BIM models and project information should not be shared outside of the project team without prior authorization. Data security protocols, including user access rights and permissions, shall be enforced to protect sensitive project data.

12.9.3 Information Management

Detail the procedures for managing BIM data, including creation, storage, and sharing. The RFP should specify who is responsible for managing different aspects of the BIM data and how this shall be executed.

Template;

1. *Information Management*

   This section outlines the responsibilities and processes for data creation, storage, and sharing within the BIM framework.

   1.1. Data Creation Responsibilities:

   - *Designers, including architects, structural engineers, MEP engineers, and interior designers, shall be primarily responsible for creating and maintaining their respective BIM models. These models should accurately represent the design intent, include all relevant information, and comply with the defined Level of Development (LOD) requirements.*
   - *The general contractor shall be responsible for creating and managing BIM models related to construction sequencing (4D) and cost estimation (5D), if applicable. These models should align with the design models and be used for project planning and management.*

   1.2. Data Storage and Management:

   - *The BIM Manager shall assume a central role in data management. They shall be responsible for overseeing the establishment and maintenance of the Common Data Environment (CDE). The CDE shall serve as the central repository for all project-related BIM data, documents, and models. The BIM Manager shall ensure data integrity, version control, and access permissions within the CDE.*
   - *We shall utilise a collaborative BIM platform to facilitate data storage and sharing. All BIM models, documents, and project data must be stored and accessed through this platform. It is the responsibility of all project stakeholders to upload and maintain their models on this platform, ensuring they are up to date.*

   1.3. Data Sharing Procedures:

   - *Designers shall be responsible for sharing their BIM models on the collaborative BIM platform. Models should be shared according to the defined LOD requirements and updated as necessary to reflect design changes. The BIM Manager shall coordinate model sharing and ensure that models are appropriately linked for clash detection and coordination.*
   - *All project-related documents, including design drawings, specifications, and reports, should be uploaded to the collaborative BIM platform. Designers and contractors must ensure that documents are accessible to relevant team members. The BIM Manager shall oversee document exchange and access control.*

> *1.4. Data Security and Permissions:*
>
> - *The BIM Manager shall establish user access rights and permissions within the collaborative BIM platform. Access to specific BIM models and documents shall be granted based on project roles and responsibilities. It is crucial that team members only access data relevant to their tasks.*
>
> - *All project stakeholders shall be bound by strict confidentiality agreements. BIM data and project information should not be shared or discussed outside of the project team without prior authorization. Data security protocols shall be enforced to safeguard sensitive project data.*

12.9.4 Integrating Communication Strategies in Contracts

In the contract phase, it is essential to formalize the communication strategies outlined in the RFP:

- The contract should establish a clear communication hierarchy and protocols, ensuring that information flows smoothly and efficiently among all parties. This includes defining primary points of contact for different aspects of the project.

- The BEP, as part of the contract, should include detailed communication strategies aligned with the BIM goals. It should outline how information shall be disseminated, the frequency of updates, and the platforms used for communication.

- The contract should mandate the use of standardized tools and formats for BIM data to ensure consistency and compatibility across the project. This includes specifying the software platforms, data formats, and common data environments (CDEs) to be used.

- Assign responsibility for the accuracy of BIM information. The contract should specify the protocols for data verification and the process for rectifying any inaccuracies.

- Detail the procedures for managing changes in the project, including how these changes should be communicated and documented within the BIM framework.

> *1. Primary Points of Contact*
>
> *1.1 For the effective management of communication and collaboration within this project, the Parties involved shall designate primary points of contact.*
>
> *1.2 The primary points of contact shall be responsible for facilitating communication, coordinating information exchange, and serving as the central figures for their respective domains.*
>
> *1.3 Each Party shall appoint its primary point of contact, and such appointment shall be communicated in writing to all Parties involved within [Specify Number] days of the execution of this contract.*

1.4 *The primary points of contact shall be responsible for:*

- *Timely dissemination of relevant project information to their respective teams.*
- *Ensuring the adherence of their team members to the communication and collaboration protocols outlined in this contract.*
- *Coordinating with the BIM Manager and other primary points of contact for conflict resolution, if necessary.*
- *Attending scheduled BIM coordination meetings and reporting progress, issues, or concerns.*

1.5 *In the event of any change in the designated primary point of contact, the Party initiating the change shall promptly inform all other Parties in writing of the new appointment.*

2. Communication protocols

2.1 *The primary points of contact shall abide by the communication protocols defined in this contract, which include but are not limited to:*

- *Regular communication updates and reports to the BIM Manager.*
- *Timely response to communication from other Parties.*
- *Collaboration with the BIM Manager for the resolution of BIM-related issues and conflicts.*
- *Attending BIM coordination meetings as scheduled.*

2.1 Cooperation and Information Exchange

- *The primary points of contact shall cooperate fully with each other and the BIM Manager to ensure efficient information exchange and collaboration throughout the project's duration.*
- *The Parties acknowledge that effective communication and cooperation among primary points of contact are essential for the successful implementation of Building Information Modeling (BIM) on this project.*

2.2 Amendment or Replacement

Any amendment or replacement of the designated primary points of contact shall follow the same procedures as outlined in section 1.1 of this contract.

2.3 BEP Communication Strategies

- *The BIM Execution Plan (BEP) is an integral component of this contract, outlining the strategies and methodologies for effective project management, communication, and collaboration in the context of Building Information Modeling (BIM).*
- *The BEP shall incorporate detailed communication strategies that are closely aligned with the BIM goals and objectives of this project.*

- *The communication strategies within the BEP shall encompass, but not be limited to, the following aspects:*
    - *The methods and channels through which project information shall be disseminated to relevant stakeholders, including Parties involved, regulatory bodies, and any other pertinent entities.*
    - *The predetermined frequency of updates for project information, including schedules, models, documentation, and other critical data. Updates may vary based on project phases and requirements.*
    - *Specification of the digital platforms, software applications, or tools to be employed for efficient communication and collaboration. This may include, but is not limited to, Building Information Modeling (BIM) software, project management platforms, and document sharing systems.*
- *The communication strategies outlined within the BEP shall serve as the foundation for coordinated efforts among all Parties involved in the project.*
- *In the event that the BEP requires adjustments or amendments during the course of the project, all Parties shall collaborate to ensure that the communication strategies remain aligned with the evolving needs and objectives of the project.*
- *The Parties involved shall adhere to the communication strategies delineated in the BEP as an essential component of this contract.*
- *Any disputes or conflicts arising from the interpretation or implementation of the communication strategies within the BEP shall be addressed in accordance with the conflict resolution procedures specified in this contract.*

2.4 Use of Standardized Tools and Formats

To ensure consistency, compatibility, and effective collaboration across the project, all parties involved in the project shall use standardized tools and formats for BIM data.The following specifications shall be adhered to:

- *All BIM authoring and collaboration tools to be used in this project shall be selected from the list of approved software platforms provided in Appendix ... of this contract. Any deviation from the approved list requires prior written consent from the client.*
- *BIM data shall be exchanged and stored in formats compliant with industry standards and best practices. The client shall provide guidance on the specific data formats to be used, which must be followed diligently.*
- *The project shall utilize the specified Common Data Environment (CDE) as outlined in Appendix .... The selected CDE shall serve as the central repository for all project-related BIM data, documents, and information exchange.*
- *It is the responsibility of each party to ensure that their personnel are adequately trained and proficient in the selected software platforms, data formats, and the designated CDE.*

- *Any proposed changes to the list of approved software platforms or data formats must be submitted to the client for review and approval. Changes to the CDE may require formal consultation with the client and all relevant parties.*

3 Responsibility for Accuracy of BIM Information

3.1 All parties involved in the project shall be responsible for the accuracy and integrity of the BIM information they generate, use, or share throughout the project lifecycle.

3.2 Protocols for Data Verification:

3.2.1 Each party shall establish internal protocols and procedures for verifying the accuracy of BIM information before it is incorporated into the project's BIM model or shared with other stakeholders.

3.2.2 Data verification shall include rigorous checks for geometric, spatial, and attribute accuracy, as well as compliance with the project's Information Requirements as defined in the BIM Execution Plan (BEP).

3.2.3 Verification protocols shall be documented and made available to all relevant parties for reference.

3.3 Rectification of Inaccuracies:

3.3.1 In the event of identified inaccuracies in the BIM information, the responsible party shall promptly rectify the inaccuracies and communicate the corrective actions to affected stakeholders.

3.3.2 The process for rectifying inaccuracies shall include:

- *Immediate notification to the BIM Manager and relevant parties upon discovery of inaccuracies.*
- *Investigation to determine the root causes of the inaccuracies.*
- *Implementation of corrective measures in a timely manner.*
- *Verification and validation of the corrected information to ensure its accuracy.*

3.3.3 The BIM Manager shall oversee and coordinate the process of rectifying inaccuracies and ensure that the updated information is integrated into the BIM model.

4 Management of Changes

4.1 Change Procedures

4.1.1 Changes to the project scope, design, or any other aspect that may impact the BIM information shall be subject to a structured change management process.

4.2 Change Initiation

4.2.1 Any party proposing a change to the project shall initiate the process by submitting a Change Request Form to the BIM Manager. The Change Request Form shall include:

- A description of the proposed change.
- Rationale for the change.
- Impact assessment, including potential effects on the BIM information, project schedule, and budget.
- Supporting documentation, such as revised drawings,

4.3 Change Review and Approval

4.3.1 Upon receipt of a Change Request, the BIM Manager shall convene a Change Control Meeting involving relevant parties to assess the proposed change's implications.

4.3.2 The Change Control Meeting shall:

- Evaluate the proposed change's technical feasibility.
- Assess its impact on the project's BIM information and the BIM Execution Plan (BEP).
- Review the schedule and cost implications.
- Determine whether the change aligns with the project's objectives and requirements.

4.3.3 After thorough evaluation, the Change Control Meeting shall decide whether to approve, reject, or request further modifications to the proposed change.

4.3.4 Approved changes shall be documented, and relevant parties shall be informed of the decision.

4.4 Implementation of Approved Changes

4.4.1 If a change is approved, the party responsible for the affected aspect of the project shall execute the change in accordance with the agreed-upon procedures.

4.4.2 The BIM Manager shall oversee the implementation process and ensure that the BIM information is updated accordingly.

4.5 Communication and Documentation

4.5.1 All changes, whether approved or rejected, shall be promptly communicated to relevant project stakeholders, including designers, contractors, and the project owner.

4.5.2 Detailed records of all changes, including their descriptions, approval status, and impacts on the BIM information, shall be maintained within the project's Common Data Environment (CDE).

4.6 Reporting and Monitoring

The BIM Manager shall periodically report on the status of changes, including ongoing, completed, and pending changes, to ensure transparency and accountability throughout the project.

These clauses are provided for guidance purposes only. The client is strongly advised to seek legal counsel and professional advice from contracts and legal experts when drafting the contract to ensure compliance with relevant laws and regulations.

List of approved software platforms for BIM Authoring and Collaborating:

AUTODESK REVIT	Tekla Structures	ALLPLAN A NEMETSCHEK COMPANY
GRAPHISOFT Archicad	SOLIBRI Model Checker	SYNCHRO
AUTOCAD CIVIL 3D	AUTODESK NAVISWORKS	GRAPHISOFT BIMx
Bentley MicroStation	AUTODESK BIM 360	AECOsim Building Designer
Rhinoceros	Trimble Connect	CATIA
SketchUp	BLUEBEAM REVU	SOLIDWORKS

12.9.5 Communicating the Framework in RFP Documents

The RFP document should clearly communicate the framework for collaboration and communication to potential designers and contractors. This includes, as a minimum:

Clear Expectations: The RFP should set clear expectations about the level of collaboration and communication required in the project. This includes expectations regarding BIM meetings, data sharing, and reporting.

Submission Requirements: Specify what potential contractors and designers need to submit in terms of their communication and collaboration plans. This helps assess their capability and readiness to adhere to the project's BIM framework.

By including these details in the RFP and contracts, clients can ensure that all parties involved in the project are aligned with the BIM communication and collaboration framework. This proactive approach not only sets clear guidelines for project execution but also aids in selecting the most suitable teams capable of adhering to to these guidelines.

Sample:

1. Clear Expectations

1.1. The success of this project depends on effective collaboration and communication among all stakeholders. The client expects a high level of coordination and information sharing throughout the project's lifecycle.

1.2. All parties involved in the project, including designers, contractors, and consultants, are required to actively participate in BIM meetings, adhere to established data sharing practices, and provide regular reports on project progress.

1.3. The client emphasizes the importance of transparency and timely communication to address any issues, resolve conflicts, and ensure the project's smooth execution.

2. Submission Requirements

2.1. The designers are required to submit detailed communication and collaboration plans as part of their proposals. These plans should clearly demonstrate their capability and readiness to adhere to the project's BIM framework.

2.2. The submission should include, but is not limited to, the following:

2.2.1. A comprehensive plan outlining how communication shall be managed throughout the project, including roles and responsibilities, communication channels, and schedules for meetings and updates.

2.2.2. Details on how collaboration among project stakeholders shall be facilitated, highlighting strategies for interdisciplinary coordination and cooperation.

> *2.2.3. An overview of data management procedures, ensuring the accuracy, integrity, and security of BIM data.*
>
> *2.2.4. Protocols for identifying and addressing conflicts within the BIM framework, with a focus on minimizing disruptions and delays.*
>
> *2.2.5. Methods and templates for reporting project progress, milestones, and deviations from the project plan.*

12.9.6 Best practices and standards in BIM

For clients preparing RFPs and contracts for construction projects, it is vital to specify the BIM standards to be used. This ensures that all bidding contractors and designers are aware of the expectations and requirements from the outset. Including these standards in the RFPs and contracts offers several benefits:

- Consistency and Compatibility: Specifying a particular set of standards ensures consistency in the approaches and compatibility in the technologies used across the project.
- Quality and Efficiency: Adherence to recognized standards helps in maintaining the quality of BIM processes and improves the overall efficiency of the project.
- Global Best Practices: Utilizing standards like ISO 19650 aligns the project with global best practices, ensuring the project meets international quality benchmarks.

12.9.7 Overview of International and UK BIM Standards

Building Information Modeling (BIM) standards vary globally, with different countries adopting their own frameworks. However, some key standards have gained international recognition:

- ISO 19650 Series: This international standard, originating from the UK BIM Framework, provides guidelines for managing information over the whole life cycle of a built asset.
- ASTM E2500 (USA): A standard mainly used in the United States, focusing on the specification, design, and verification of Pharmaceutical and Biotechnology manufacturing systems and equipment.
- BSI PAS 1192 (UK): Though now largely superseded by ISO 19650, this suite of standards was foundational in the UK BIM strategy.Other Regional Standards: Countries like Germany, Canada, Singapore, and those in the Middle East have developed their own BIM standards, often aligning with or supplementing international standards like ISO 19650.

12.9.8 The UK BIM Framework

The UK BIM Framework is considered among the best in the world due to its comprehensive approach to managing information across the whole life cycle of a built asset. It provides a structured methodology, ensuring clarity, efficiency, and collaboration in construction projects. The transition from PAS 1192 to ISO 19650 marks a significant step in creating a global standard, consolidating the best practices developed in the UK.

ISO 19650 is a global standard that provides guidance on organizing and digitizing information about buildings and civil engineering works, including BIM. It offers a structured approach to information management and has been adopted as a key standard for BIM projects worldwide.

12.9.9 Adoption and Advocacy of UK Standards and ISO 19650 by Prodesign

Prodesign, as a leading BIM Manager, strongly advocates for the adoption of these UK standards and ISO 19650 in BIM projects. The firm recognizes the efficacy of these standards in streamlining BIM processes, enhancing collaboration, and improving project outcomes. By advocating these standards, Prodesign aligns its projects with globally recognized best practices, ensuring high-quality outcomes.

In Mauritius, where Prodesign has been instrumental in implementing BIM, the adoption of these standards has seen a significant uptick. The firm's involvement in various projects has not only helped in the successful execution of these projects but has also elevated the understanding and application of BIM standards among local design professionals and contractors. The consistent application of UK BIM standards and ISO 19650 in projects managed by Prodesign has contributed to a growing familiarity and expertise in these practices within the Mauritian construction industry.

12.9.10 Impact of Standards in Local Projects

The application of these BIM standards in Mauritius has been tried and tested across several projects, demonstrating their suitability and effectiveness in the local context. By adhering to these standards, projects managed by Prodesign have experienced enhanced coordination, reduced errors, and improved efficiency.

The adoption of these standards by Prodesign in Mauritius has had a ripple effect, increasing the overall competence in BIM within the local construction industry. This has led to a situation where many design professionals and contractors are now well-versed in these standards, thanks to their involvement in projects managed by Prodesign. This proficiency has not only elevated the quality of individual projects but also contributed to the broader advancement of the construction industry in Mauritius.

12.9.11 Recommendation for Clients

Clients are advised to explicitly include the preferred BIM standards in their RFPs and contracts. For instance, stating a requirement for compliance with the ISO 19650 series or any other relevant standard shall guide prospective contractors and designers in preparing their responses and project plans. This clarity at the early stages helps in selecting the right partners who are capable of delivering the project in alignment with the specified standards, thus contributing to the project's

13 TRAINING AND SUPPORT IN BIM - BRIDGING THE KNOWLEDGE GAP

13.1 Recognizing the Diverse Levels of BIM Proficiency

In the evolving landscape of Building Information Modeling (BIM), it is recognized that not all designers and contractors possess the same level of BIM expertise. While the proficiency in BIM is growing across the industry, there remains a significant number of professionals who are not yet fully conversant with the intricacies required for successful project execution. This variance in skill levels can pose challenges in maintaining consistency and efficiency in BIM-driven projects.

13.2 Leveraging the Expertise of the BIM Manager for Training

To ensure that all team members are equipped with the necessary skills, the role of the BIM Manager extends beyond coordination and management to include training and support. Clients can leverage the expertise of the BIM Manager to elevate the team's BIM capabilities. Prodesign, with its experience as a BIM Manager, has been instrumental in providing such training and support.

It is important to note that while designers and contractors are expected to have a foundational knowledge of BIM tools, the BIM Manager's role is to bridge the gap between their current knowledge and the level required for the project. This training focuses not on the basics of BIM, which are expected to be known, but on specific project requirements, advanced features, and best practices that align with the project's objectives.

13.3 Training on the Chosen Common Data Environment (CDE)

In addition to enhancing BIM skills, the BIM Manager is also responsible for training the team on the use of the chosen Common Data Environment (CDE). The CDE is a crucial component of BIM projects, serving as the central repository for storing and managing project information. Training on the CDE includes instructing team members on how to upload, access, and manage data, ensuring that everyone can effectively utilize this platform for collaboration and information sharing.

13.4 Methodology of Training

The training provided by the BIM Manager should be tailored to meet the specific needs of the project and the team. This could include:

- Workshops and Seminars: Conducting targeted workshops and seminars focused on specific aspects of BIM and the CDE relevant to the project.
- Hands-On Sessions: Providing hands-on training sessions to allow team members to practically apply their learning in a controlled environment.
- Online Resources and Support: Utilizing online tutorials, webinars, and support materials to supplement in-person training and provide ongoing learning opportunities.
- Regular Updates and Refreshers: Keeping the team updated on the latest BIM trends, tools, and standards, ensuring continuous improvement and adaptation to new methodologies.

To conclude, the provision of training and support by the BIM Manager is crucial for the success of a BIM project. By elevating the team's skills to the required level and ensuring effective use of the CDE, the BIM Manager plays a pivotal role in maximizing the project's potential. Clients should recognize the value of this training in achieving project goals and leverage the BIM Manager's expertise to facilitate a skilled and competent project team.

14 UNDERSTANDING THE ROLE OF TOOLS AND TECHNOLOGIES IN BIM

In the realm of Building Information Modeling (BIM), the selection and specification of the right tools and technologies are crucial. These tools not only facilitate the design and construction phases but also extend their utility to the operations and maintenance stages of a project. For clients, ensuring that they specify tools and technologies that align with their project objectives is a critical step in the RFP process for design and construction services.

14.1 Criteria for Selecting Tools and Technologies

14.1.1 Compatibility and Integration

Tools should be compatible with each other and easily integrable. This ensures smooth data exchange and reduces conflicts between different software platforms.

14.1.2 Scalability and Flexibility

The chosen technologies should be scalable and flexible to adapt to project changes and varying scopes.

14.1.3 User-Friendly Interface

Tools should be user-friendly to accommodate varying levels of expertise among users.

14.1.4 Support and Training Availability

Availability of adequate support and training for the tools is essential for efficient usage.

14.2 Exploiting the BIM Model in Operations and Maintenance

To fully exploit the BIM model during operations and maintenance, clients should focus on tools that offer:

- Facility Management Integration: Tools that integrate with facility management systems to use the BIM model for ongoing building operations.
- Data Analytics Capabilities: Technologies that can analyze building data for predictive maintenance and operational efficiency.
- Mobile Accessibility: Tools that provide mobile access to BIM data for on-site maintenance teams.

14.3 Including Tools and Technology Specifications in the RFP

In the RFP for design and construction services, it is vital to include specific requirements regarding tools and technologies:

- Clearly define the required software, platforms, and technologies. This should include BIM authoring tools, collaboration platforms, and any specialized software for analysis or simulation.
- Ensure that the specified tools and technologies align with the project's objectives, particularly in terms of functionality, data management, and collaboration capabilities
- Specify tools that shall be useful beyond the construction phase

In conclusion, it is essential for clients to collaborate closely with the BIM Manager to determine the most suitable tools and technologies that align with their specific project objectives. The BIM Manager's expertise is invaluable in assessing and recommending tools that not only meet the functional requirements of the project but also consider the cost implications, such as software licenses and training expenses. This collaborative approach ensures that the tools and technologies specified in the RFP are not only technically appropriate but also cost-effective, providing a balanced solution that maximizes the benefits of BIM while adhering to the project's budgetary constraints. By engaging the BIM Manager in this decision-making process, clients can leverage their in-depth knowledge and experience to make informed choices that contribute to the overall success and efficiency of the project.

15 MONITORING AND EVALUATION IN BIM - INCORPORATING INTO RFPS AND SCOPES OF SERVICES

15.1 The Importance of Monitoring and Evaluation

Monitoring and evaluation are critical components of a successful Building Information Modeling (BIM) implementation. These processes ensure that the BIM project adheres to its outlined objectives, stays within budget, and is completed within the designated timeframe. For clients, explicitly incorporating monitoring and evaluation strategies in the RFP and in the scope of services for designers and contractors is vital. It sets clear expectations for performance and provides a mechanism for continuous improvement and accountability throughout the project lifecycle.

15.1.1 Integrating Monitoring and Evaluation in RFPs

Incorporating monitoring and evaluation in Building Information Modeling (BIM) projects is crucial, and it is equally important for the client to collaborate with the BIM Manager to define these criteria effectively. The BIM Manager's expertise is key in identifying the most relevant and impactful criteria and Key Performance Indicators (KPIs) that align with the project's objectives.

When working together, the client and the BIM Manager should consider various common evaluation and monitoring criteria, such as:

- Tracking the number of clashes identified in the BIM model helps in understanding how well different elements of the design are coordinated.
- Monitoring the time taken to resolve these clashes is indicative of the efficiency of the coordination process.
- Keeping a count of how many clashes have been addressed versus those still pending is critical for ensuring model accuracy.

Additionally, other criteria and KPIs can be instrumental in evaluating the success of BIM implementation:

- Assessing the accuracy of the BIM model against the actual constructed facility and its compliance with the initial design specifications.
- Evaluating the quality and integrity of the data within the BIM model, ensuring it is up-to-date and free from errors.
- Adherence to BIM Execution Plan (BEP): Monitoring how closely the project adheres to the strategies and protocols outlined in the BEP.
- Evaluating the level of engagement and collaboration among various stakeholders, including designers, contractors, and other team members.
- Assessing the effectiveness of communication protocols established for the BIM process.
- Monitoring whether the BIM implementation is helping the project to stay on schedule.
- Evaluating the role of BIM in keeping the project within its allocated budget.

Including these monitoring and evaluation criteria in the RFP and the scope of services is essential. It sets clear benchmarks for performance and provides a structured approach for continuous improvement. The collaboration between the client and the BIM Manager in defining these criteria ensures that the monitoring and evaluation process is tailored to the specific needs and goals of the project, leading to a more effective and successful BIM implementation.

16 CONCLUSION

As we conclude this guide on procuring design and construction services using Building Information Modeling (BIM), it is clear that BIM represents more than just a technological advancement; it is a paradigm shift in the construction industry. This guide has navigated through various essential aspects, from understanding BIM and its benefits, selecting and preparing BIM-ready teams, to the intricacies of integrating BIM standards, tools, technologies, and best practices into construction projects.

BIM's ability to foster collaboration, enhance efficiency, and improve accuracy throughout a project's lifecycle is unparalleled. For clients looking to embark on this journey, the key lies in detailed planning and strategic implementation. By outlining specific requirements in RFPs and contracts, and closely working with experienced BIM Managers, clients can ensure that their projects not only align with global best practices but also reflect their unique objectives and needs.

Incorporating BIM into projects is not without its challenges. It requires a concerted effort in training, monitoring, and adapting to new methodologies. However, the long-term benefits, including reduced costs, shortened project timelines, and improved quality of the final product, far outweigh these initial challenges. Moreover, the evolving nature of BIM presents continual opportunities for learning and improvement, positioning it as a critical tool for the future of construction.

Prodesign, with its extensive experience as a BIM Manager, stands as a testament to the transformative power of BIM. Through its commitment to leveraging BIM to its full potential, Prodesign has not only enhanced the quality of individual projects but also contributed significantly to advancing the construction industry's capabilities in Mauritius and beyond.

In summary, this guide aims to empower clients with the knowledge and tools needed to successfully integrate BIM into their projects. The journey to achieving excellence in construction through BIM is ongoing and dynamic. With the right approach, collaboration, and expertise, clients can harness the full potential of BIM, leading to smarter, more efficient, and sustainable construction practices.

17 DETAILING EXAMPLES

Consultant: Architects

STAGE	EXAMPLES OF DETAILING
Feasibility	1. Site analysis 2. Initial massing 3. Preliminary area statements 4. Basic façade treatments 5. Early zoning
Concept	1. Building form refinement 2. Initial room layouts 3. Preliminary façade designs 4. Early interior concepts 5. Landscape proposals
Detailed Design	1. Finalized room layouts 2. Detailed façade designs 3. Window & door schedules 4. Material specifications 5. Structural and MEP integration
Tendering	1. Refinement based on client feedback 2. Detailed landscape design 3. Further material detailing 4. Updated schedules 5. Code compliance checks
Construction	1. On-site coordination 2. Changes based on site conditions 3. Integration with services 4. Coordination with contractors 5. Addressing on-site queries
Handing Over	1. As-built drawings 2. Material and fixture warranties 3. Finalized interior details 4. Building manual 5. Facility management integration

Consultant: Civil/Structural Engineer

STAGE	EXAMPLES OF DETAILING
Feasibility	1. Preliminary soil reports 2. Site grading strategies 3. Early foundation concepts 4. Load analysis 5. Traffic impact analysis
Concept	1. Soil investigations 2. Drainage strategies 3. Preliminary structural layouts 4. Early bridge/tunnel designs 5. Broad earthwork calculations
Detailed Design	1. Foundation designs 2. Structural framing layouts 3. Rebar detailing 4. Connection details 5. Detailed load calculations
Tendering	1. Material specifications 2. Construction methodology 3. Structural safety assessments 4. Refinements based on feedback 5. Bill of quantities
Construction	1. Site inspections 2. On-site modifications 3. Coordination with other services 4. Quality assurance checks 5. Addressing on-site queries
Handing Over	1. As-built structural drawings 2. Structural warranties 3. Finalized reports 4. Certifications 5. Facility management inputs

Consultant: MEP Engineer

STAGE	EXAMPLES OF DETAILING
Feasibility	1. Utility assessments 2. HVAC considerations 3. Energy analysis 4. Plumbing system overview 5. Electrical load estimates
Concept	1. HVAC system proposals 2. Plumbing and drainage layouts 3. Electrical distribution proposals 4. Lighting concepts 5. Fire protection outlines
Detailed Design	1. Detailed HVAC design 2. Plumbing and drainage systems 3. Electrical circuit layouts 4. Lighting designs 5. Fire protection systems
Tendering	1. Material and equipment specifications 2. Integration with architecture and structure 3. Updated calculations 4. System optimizations 5. Bill of quantities
Construction	1. Installation coordination 2. On-site adjustments 3. Testing and commissioning plans 4. Quality assurance 5. Coordination with suppliers
Handing Over	1. As-built MEP drawings 2. System warranties 3. Finalized reports 4. User manuals 5. Facility management integration

Consultant: Interior Designer

STAGE	EXAMPLES OF DETAILING
Feasibility	1. Preliminary space analysis 2. Initial color and material palettes 3. Broad furniture concepts 4. Basic lighting considerations 5. Early space planning
Concept	1. Mood boards 2. Furniture layouts 3. Fixture and fitting proposals 4. Detailed lighting considerations 5. Sample material boards
Detailed Design	1. Finalized furniture designs 2. Detailed fixtures and fittings 3. Material and finish specifications 4. Coordination with MEP 5. Detailed lighting designs
Tendering	1. Detailed drawings for craftsmen 2. Finalized material boards 3. Coordination with suppliers 4. Detailed specifications 5. Integration with architecture
Construction	1. On-site supervision 2. Coordination with other services 3. Addressing on-site queries 4. Quality checks 5. Furniture installation coordination
Handing Over	1. As-installed documentation 2. Furniture and fixture warranties 3. Maintenance guidelines 4. Finalized reports 5. Coordination with facility management

Consultant: Landscape Architect

STAGE	EXAMPLES OF DETAILING
Feasibility	1. Preliminary site analysis 2. Early planting concepts 3. Initial hardscape designs 4. Water feature considerations 5. Early lighting considerations
Concept	1. Planting plans 2. Detailed hardscape designs 3. Water feature designs 4. Lighting concepts 5. Maintenance considerations
Detailed Design	1. Finalized planting designs 2. Irrigation systems 3. Detailed lighting designs 4. Material specifications 5. Coordination with civil works
Tendering	1. Detailed drawings 2. Plant and material specifications 3. Maintenance schedules 4. Bill of quantities 5. Integration with architecture
Construction	1. On-site supervision 2. Planting coordination 3. Hardscape installation 4. Coordination with other services 5. Quality assurance
Handing Over	1. As-installed documentation 2. Plant and material warranties 3. Maintenance guidelines 4. Finalized reports 5. Transition to facility management

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