**BUILDING INFORMATION MODELING REQUIREMENTS**

**FOR ARCHITECTS / ENGINEERS / CONSULTANTS / CONTRACTORS**

# PART 1 – GENERAL

* 1. RELATED DOCUMENTS
     1. Attention is specifically directed, but not limited to, the Uniform General Conditions for University of Texas System Building Construction Contracts (UTUGCs) for other requirements related to the completion and submittal of Record Documents.
     2. Attention is specifically directed to Owner’s Design Guidelines Elements (ODGs) issued for the Project for other requirements related to the development, maintenance and exchange of design information, the formatting of design documents, and the completion and submittal of Record Documents. Particular attention should be directed to Owner’s Design Guidelines Elements; Z10, Z2010 and its subsections and Z2035. Additionally, ODG Supplemental Resources; AutoCAD Standards; Building and Room Numbering Guidelines, BIM Project Delivery Standards, and Record Document Edit Log. Additionally, for the BIM Asset Data process, particular attention should be directed to the Supplemental Resources tab, Building Information Modeling Workflow SOPs, Templates and supporting Dynamo Scripts.
     3. Attention is specifically directed to Owner’s Master Construction Specifications for other requirements related to the development, maintenance and exchange of construction project information, and the completion and submittal of Record Documents. Particular attention should be directed to Division 01, General Requirements, specification sections 01 77 00, Project Closeout Procedures, 01 78 39, Project Record Documents and General Commissioning Requirements 01 91 00, section 1.6.
  2. SUMMARY
     1. This document establishes general and administra­tive requirements pertaining to Building Information Modeling/Management (BIM) to meet Facilities Information Management (FIM) expectations for projects of various sizes and delivered under various contracting methodologies.
     2. BIM practices require collaboration and involvement of all parties throughout the project delivery process, regardless of the delivery method being used for a given project. For BIM practices to be successful, collaboration must begin at the onset of the project development and continue throughout the Project until Owner accepts all final record document requirements.
        1. To accomplish this required collaboration and successfully deliver the Project to Owner, it is mandatory that a BIM Execution Plan be generated with involvement of all Project stakeholders, specific for that project. The BEP should incorporate all of the Owner’s BIM language and deliverables as set forth in this document and related MD Anderson BIM supporting documents.
     3. BIM practices encompass and coordinate traditionally separate functions of design (Architect/Engineer) and construction (Contractor) in order to assemble all related building information into the Equipment Matrix for building operation assets. This document will provide the information required to efficiently operate and maintain the facility once Substantial Completion has been achieved and the Project has been turned over to Owner.
     4. It is of primary concern that all building modeling and facility information developed during the design and construction of the Project be timely and efficiently developed, maintained, and exchanged from initiation of the Project through Final Completion in accordance with all Contract Documents and with Owner's operational and maintenance needs. A/E shall produce a coordinated BEP that is project specific that details how, throughout the Project lifecycle, A/E, in collaboration with Contractor expect to systematically demonstrate to Owner that all building graphical and non-graphical information is current to the extent that it can be at the time during the design and construction process. For a Design/Build delivery method, the BEP shall be developed jointly between A/E and the Design/Build Contractor, coordinating with Owner.
     5. It shall be the responsibility of A/E, and each of its consultants, and Contractor and each of its Subcontractors, to have or obtain, at their cost, the trained personnel, hardware, and software necessary to successfully fulfill their respective obligations as set forth in the mutually developed BIM Execution Plan..
  3. DEFINITIONS

Capitalized terms used in this document shall have the meanings as set forth in the applicable contract(s), the UTUGCs, or any combination thereof, unless otherwise defined or modified below. The institution also recognizes some term definitions from the National Institute of Building Sciences. For projects implemented with the construction manager-at-risk delivery method, the term Contractor shall mean Construction Manager. For projects implemented with the design-build delivery method, the term Contractor shall mean Design/Build Contractor. To be consistent with the UTUGCs, A/E is used in lieu of, and as a synonym for, the terms Project Architect, Project Architect/Engineer, and Project A/E that may appear in some standard UT System construction manager-at-risk, design-build, and some design services agreements.

1.3.1. BIM Execution Plan (BEP) – A project specific document that prescribes in detail how Building Information Modeling/Management will be implemented for the Project. BEP to outline the BIM standards, workflows, roles, responsibilities, and procedures throughout project lifecycle. Special attention to be provided to the institution’s primary BIM Uses Case of Asset Data Management and Final Facility Model(s). For a design-build project, Contractor will be involved in the template population of the initial BEP with A/E. Reference section 1.2.2.1 for recommendations on the BEP development.

1.3.2. BIM Level – The extent to which model and information development will be required on a specific project. The BIM Level initially will be determined by Owner but may be adjusted, with Owner’s express approval, by the BIM Team over the course of the Project. The BIM Level will depend upon several factors, including the scope of project, project schedule; project cost; availability of existing BIM models; and availability of existing BIM data, etc.

1.3.2.1. A/E team must provide to Contractor a level of Model that is dimensionally accurate, detailed and contains all required data to be sufficient for Contractor to accurately create and maintain its construction model throughout the construction and project close out processes. Owner is not dictating the means and methods of coordination between A/E and Contractor. However, A/E shall be required to coordinate with Contractor to provide clarifications and additional modeling elements should the initial Design model prove to be insufficient. This shall be detailed, as well as Owner’s interactions in the process, in the BEP created at the beginning of the Project and modified as needed throughout. Refer to additional modeling standards in **MD Anderson BIM Project Delivery Standards** ODG document.

1.3.3. Building Automation System (BAS) – The distributed control system used by Owner to monitor and control infrastructure systems within its facilities.

1.3.4. Building Information Management (BIM) – The acquisition, analysis, retention, retrieval, and distribution of built environment asset information all within an information processing system.

1.3.5. Building Information Model (BIM Model) – Digital representation of physical and functional characteristics of a built environment, facility, or the components or systems thereof that encompass building geometry, spatial relationships and quantities and properties of building components and systems.

1.3.6. Building Information Modeling (BIM Modeling) – Generating and using a shared digital representation of a built asset to facilitate design, construction, and operation processed to form a reliable basis for decisions.

1.3.7. Building Information Modeling Team (BIM Team): Working group made up of representative(s) from A/E, A/E’s consultants, Contractor, Subcontractors and Owner. A/E will provide ad hoc representation of A/E’s consultants on the BIM Team as required for the implementation of the BIM Execution Plan. Contractor will provide ad hoc representation of Subcontractors on the BIM Team as required for implementation of the BIM Execution Plan.

1.3.8. Computerized Maintenance Management System (CMMS) – The computer software package that Owner uses to manage a digital database of information related to its facilities equipment and systems for the purpose of optimizing its maintenance operations.

1.3.9. CMMS Integration Process (CIP) –The prescribed process by which the required asset information generated during Building Information Modeling will be fully integrated into the respective BIM Models, as per ‘Attachment B’, and brought into Owner’s CMMS for mass asset creation. To include but not limited to room metadata or other project specific assets, equipment or other required by Owner meeting operational and compliance standards. The CIP process strives to meet goal of a digital transformation of work, where CMMS data, now digitized, can be filtered, and viewed in the BIM and Digital Twin models. CIP fosters data integrations to FIM systems to provide additional insight to locate, identify, monitor, analyze and maintain the asset through its complete lifecycle.

1.3.10. Construction Documents – Defined in the UTUGC unless otherwise defined herein. The Construction Documents shall also include the Building Models, the Equipment Matrix, also referred to as the **MDA\_Revit Maximo Data Transfer File in this document,** as well as all other documents required within the Specifications, Owners Design Guidelines and the BIM Requirements.

1.3.11. Construction Model – is produced by the Construction Manager and / or subcontractors hired to construct the Project. The Construction Model shall include all major trades (structure, building envelope, mechanical, electrical, plumbing, life safety systems, conveying systems, audio / visual systems, interior partitions / walls, doors, ceilings, casework / millwork) and any additional trades determined necessary by the Owner and or the Construction Manager. The Construction Model shall be based upon the Work, coordination of Work, sequencing of Work, coordination of sub-contractors / trades and suppliers, safety, quality control, inspections, commissioning, means and methods of the Construction Manager / sub-contractors / trades and their work forces, and the actual products and materials to be used in the construction of the project. The Construction Model shall be used to produce the Project’s Shop Drawings to clearly and concisely represent the actual Work including layout, location, orientation, material quantities, components, assemblies, adjacencies and interface / integration with and or connection to other building construction systems, components and assemblies. The Construction Manager’s production of the Construction Model does not imply the Construction Manager has assumed the roles and responsibilities of the Architect / Engineer of Record nor does it alleviate the Construction Manager from any other provisions or requirements of this Agreement. The Construction Manager must work continuously and collaboratively with the Architect / Engineer of Record who is ultimately responsible for the design of the Project. The Construction Manager shall at all times provide the Architect / Engineer of Record and the Owner access to and copies of its BIM including the BIM performed by sub-contractors / trades, at no additional cost regardless of level progress or development to view the BIM, answer RFI’s, develop, analyze or produce change proposals / orders, supplemental instructions and addenda, prepare for and perform inspections, testing and commissioning, or to coordinate work efforts by the Owner’s consultants and 3rd party contractors. Unless Owner specifically agrees otherwise, the Construction Model shall represent a spatially accurate, as-built condition.

1.3.11.1 Coordination model(s) – Typically a derivation of the Construction Model in a Navisworks model used by Contractor and Subcontractors to coordinate the objects and systems to be installed during the course of construction.

1.3.12. Depth of Detail – A measure of the amount of information to be provided for each element within the Building Model. The Building Model and Contract Documents shall be developed so as provide information that aligns with the following tiers:

1.3.12.1. Tier I Data – Information that Owner maintains about its facilities, or any components thereof, that shall reside within Owner’s CMMS and is to be maintained throughout the Project in the **Equipment Matrix**, which is also referred to in this document as the **MDA\_Revit Maximo Data Transfer File.**

1.3.12.2 Tier II Data –This data may or may not physically reside within a model, a table, schedule, list, external spreadsheet/database, submittal, RFI, ASI, drawings or specifications etc. that pertain to final completion of the Project. Tier II data are to be tracked separately from the BIM Models and in the form of a digital document (searchable, vector PDF where applies) and linked to the system or asset in the Facility Digital Twin. This includes but is not limited to the following:

1.3.12.2.1 Fixed equipment data gathered during the course of design and construction (e.g. manufacturer’s information, including maintenance, related to sinks, faucets, emergency showers, light fixtures, life safety items, etc.). To be tracked and provided to Owner per Project Closeout Document spec. Not expected to be captured in the Revit Models, but to be linked to respective system or asset in Digital Facility Twin.

1.3.12.2.2 Fixed architectural and finish features (e.g. manufacturers maintenance information related to doors, hardware, finishes, glazing, etc.). To be tracked and provided to Owner per Project Closeout Document spec. Not expected to be captured in the Revit Models, but to be linked to respective system or asset in Digital Facility Twin.

1.3.12.2.3 Equipment data gathered during the course of design and construction that is not associated with equipment listed in the MDA\_Revit Maximo Data\_Baseline file such as Medical Equipment, Food Service Equipment, that will be maintained by Owner, or owner installed/owner furnished. Refer to requirements stated in specification 01 91 00.

1.3.12.2.4 Data related to all fixed architectural and finish features (e.g. manufacturers maintenance information related to doors, hardware, finishes, glazing, etc.). This data may or may not physically reside within a table or schedule located within the drawings or specifications.

1.3.12.2.5 All information that is contained within a schedule or table located within the drawings that is not captured with CIP process.

1.3.12.2.6 All information contained within a schedule or table within the specifications that is not captured with CIP process.

1.3.12.2.7 O&M Manuals, TAB Reports, Training, Certification, Warranty Information, Final Commissioning Reports, Predictive Maintenance Reports, Sensor Calibration Logs, Digital Twin Management. Compliance & Certification Documentation, Joint Commission, ASHE, FGI Standards, NFPA (101, 80, 99) Compliance, State/Local Building Code Compliance, ICRA (Infection Control Risk Assessment)

1.3.12.2.8 Link OpenSpace 360-degree photo documentation to assets, systems, areas.

1.3.12.3. Tier I and Tier II Data elements must reference to a specific individual, physical space utilizing the appropriate room numbering designation. Reference section 2.2 of this document.

1.3.13. Design Model – A 3-D digital representation of physical and functional characteristics of a facility, or the components or systems thereof, that encompasses building geometry, spatial relationships and quantities and properties of building components and systems and that are developed during the design phase of the Project as detailed in the project BEP. Design Model(s) is produced by the Architect / Engineer of Record for the Project and or their consultants or the Owner’s other consultants. The Design Model is transferred to the Contractor at no additional cost as part of this Project and is to be used by the Construction Manager to further understand the scope, complexities, quantities, constructability, and cost of the of the Project. In addition to the Construction Documents the Design Model(s) shall be used by the Construction Manager to assist in procurement of sub-contractors / trades. The Design Model may be used as appropriate as a starting point for the Contractor to produce its own standalone Construction Model(s). The Construction Manager shall consult with Architect / Engineer of Record regarding static components in the Design Models the must be reflected accurately in the Final Facility Model, with the exception of construction means & methods. Refer to ‘Attachment B’ for the model lifecycle for the institution.

1.3.14. Digital Twin – As part of its digital transformation, MD Anderson is leveraging the transformative power of BIM and Digital Twin technology to drive efficiency and innovation across its facilities management. This is a virtual replica of a physical facility that uses real-time data and simulations to monitor, analyze and optimize its performance throughout its lifecycle. Data integrity is paramount to the MDA Facility Digital Twin Program and builds upon the Asset Data Management BIM Use Case. This is a Descriptive Level Digital Twin for the Owner to take over at Substantial Completion.

1.3.15. Equipment Matrix – In this BIM Exhibit, the MDA\_Revit Maximo Data Transfer File is defined as the Equipment Matrix with added columns for BIM. Equipment Matrix and MDA\_Revit Maximo Data Transfer File will be used interchangeably in this document.

1.3.16. Facilities Information Management (FIM) – The process of gathering, maintaining and distributing data associated with Owner’s facilities for the purposes of operating, maintaining and renovating those facilities.

1.3.17. Final Facility Model(s) – Fully authored Revit model(s) from the Contract Documents that has (have) been professionally electronically generated by A/E reflecting the approved Tier 1 Data, including any additional data set forth in the MDA BIM Delivery Standard document, and as-constructed conditions of the Work, with the exception of the means and methods of construction, based upon the information provided by Contractor as reflected in the Record Documents and Contractor’s construction model. Dimensional accuracy is essential for the long-term maintenance and future renovations of the facility.

1.3.17.1 The Design Team, in coordination with the Construction Team, must ensure that all released information is incorporated into the design model(s) throughout the bidding and construction processes. This includes addenda, bulletins/proposal requests, supplemental sketches (ASIs), construction change directives (CCDs), RFIs, and change orders (COs). Refer to “Attachment A’.

1.3.18. Level of Development – The degree to which information included within the Building Model can be relied upon to be current and accurate

1.3.19. Major Capital Project – Any project that involves the construction of a new facility and that has a total project cost of $10 million or more (Major Capital – New Construction), or any project that involves the renovation (repair and rehabilitation) of an existing facility and that has a total project cost of $10 million or more (Major Capital – Renovation). Major Capital Projects may involve the rehabilitation or upgrading of mechanical, electrical, plumbing, infrastructure technology components or systems or any combination thereof.

1.3.20. Minor Capital Project – Any project that involves the construction of a new facility and that has a total project cost of $100,000 or more but less than $10 million (Minor Capital – New Construction), or any project that involves the renovation (repair and rehabilitation) of an existing facility and that has a total project cost of $100,000 or more but less than $10 million (Minor Capital – Renovation). Minor Capital Projects may involve the rehabilitation or upgrading of mechanical, electrical, plumbing, infrastructure technology components or systems or any combination thereof.

1.3.21. Operations Project – Any project that involves new construction work or the renovation (repair and rehabilitation) of an existing facility and that has a total project cost that is less than $100,000. Operations Projects may involve the rehabilitation or upgrading of mechanical, electrical, plumbing, infrastructure technology components or systems or any combination thereof.

1.3.22. OMIT

1.3.23. BIM Core Team – A working group comprised of Owner personnel from various departments within the Division of Operations and Facilities Management who are facilities system Subject Matter Experts (SME’s). The BIM Core Team will monitor information delivery requirements for project information governance and the application of BIM requirements on projects for design, construction, construction support, professional and non-professional services. A representative of the BIM Core Team will be part of the project team and will report to the BIM Core Team on the status of the project information throughout the lifecycle of the Project.

1.3.24. Record Documents – Defined in the UTUGCs and Owner’s Master Construction Specification Section 01 78 39, Project Record Documents, unless otherwise defined herein. Record Documents shall also include all BIM deliverables as detailed in this document; reference section 2.5 for additional detail.

1.3.25. System – A group or collection of items or equipment that work together or in tandem to function as a whole. Examples of systems include but are not limited to: HVAC systems, bulk gas systems (any gases or vacuum not supplied by a point-of-service device), plumbing, fire-rated assemblies such as doors/frames, glazing, etc. or any items that are commonly known as systems by the design and construction industries. If uncertainty exists, A/E and Contractor are to coordinate with Owner for clarification.

1.3.26. Test, Adjust, and Balance (TAB) Firm: Owner may engage a Test, Adjust, and Balance Firm for the Project under a Separate Contract. When engaged for the Project, the TAB Firm shall be a part of the BIM Team and shall provide services as set forth in the Specifications and its Separate Contract.

1.4 COORDINATION

1.4.1 BIM Team

1.4.1.1. Owner’s Members

1.4.1.1.1 Representatives assigned by Owner’s Designated Representative, including but not limited to, the Owner’s Project Manager, BIM Manager, BIM Core Team member, Operations and Maintenance representative, and other SMEs, as required. Refer to *Team Roles* in document MD Anderson BIM Project Delivery Standards for BIM Project meeting attendees.

1.4.1.1.2 TAB Firm, when engaged for the Project.

1.4.1.1.3 Commissioning Agent, when engaged for the Project.

1.4.1.1.4 Architect / Engineer Members

1.4.1.1.5 A/E, including A/E and its subconsultant BIM manager(s), except for projects implemented with design-build methodology. Team members for design-build projects shall include Contractor’s BIM Team members, as well, with each party’s responsibilities detailed in the joint BEP.

1.4.1.2. Contractor’s Members

1.4.1.2.1 Individuals, each having authority to act on behalf of the entity it represents, explicitly organized to implement all BIM activities through coordinated actions.

1.4.1.2.1.1 Representatives of Contractor, including but not limited to

1.4.1.1.7.1.1 Contractor’s project manager,

1.4.1.1.7.1.2 Contractor’s BIM Manager/Coordinator/Digital Twin Manager

1.4.1.1.7.1.3 A/E, including A/E subconsultant BIM manager(s), (for projects implemented with design-build methodology)

1.4.1.1.7.1.4 Subcontractors, as needed for Contractor to fulfill its BIM obligations, and

1.4.1.1.7.1.5 Equipment suppliers, as needed for Contractor to fulfill its BIM obligations.

1.4.2 Scheduling

1.4.2.1 Design (Preconstruction) Phase

1.4.2.1.1 For projects implemented using the traditional or the construction manager-at-risk contracting methodology, A/E shall integrate all BIM activities into its BEP, Project Work Plan and the design schedule.

1.4.2.1.2 For projects implemented using the design-build methodology or the design assist methodology, A/E and Contractor together shall integrate all BIM activities into the BEP, Baseline Schedule and the Work Progress Schedule and shall ensure that BIM requirements are clearly set forth in all solicitation documents used to select subcontractors or suppliers for the Project. All parties will address scheduling problems and make necessary notifications in a timely manner to expedite all BIM activities.

1.4.2.2 Construction Phase

1.4.2.2.1 At time of contractor selection, A/E shall provide to Contractor A/E’s up-to-date BEP for utilization in creating the comprehensive Project BEP unless the delivery method is design-build, in which case the Project BEP is developed jointly with A/E and Contractor.

1.4.2.2.2 Contractor shall integrate all BIM activities into the BEP, Baseline Schedule and the Work Progress Schedule. A/E, Contractor and all other stakeholders will address scheduling problems and make necessary notifications in a timely manner to expedite all BIM activities.

1.4.2.2.3 Contractor shall provide its initial BEP and schedule of primary BIM activities at the project kick-off meeting. For design-build delivery, prior to the start of Schematic Design, Contractor shall have incorporated and integrated the BEP and all BIM activities into the Baseline Schedule and Work Progress Schedule with appropriately linked predecessors and successors.

1.4.2.2.4 A/E shall receive periodic as-built information from Contractor as detailed in the BEP and make all changes necessary to maintain an up-to-date, accurate as-built model throughout the construction phase of the Project to ensure that the Final Models (authored by Design Team) and set of Construction Documents are available to Owner at time of Substantial Completion.

* 1. ROLES AND RESPONSIBILITIES
     1. Roles and responsibilities of BIM Team members are set forth below to help to clarify Owner’s expectations with respect to the BIM and FIM processes.
     2. Owner’s Role and Responsibilities:
        1. Provide specifications related to the format and content for the Tier II Data. These specifications are to include the identification of Tier II Data required for the Project where available.
        2. Provide specifications related to the format and content for the Equipment Matrix.
        3. Provide initial direction as to the extent the BIM is to be used on the Project, including the BIM Level to be used on the Project.
        4. Approve the BIM Execution Plan and A/E’s and Contractor’s schedules for completing all BIM activities.
        5. Participate in BIM Project Team meetings.
        6. Review and validate adequacy of Building Model development and project data collection and delivery.
        7. Provide initial technical support, demos for the CMMS Integration Process as needed. Provide Digital Twin review and periodic assessment to ensure project meets Owner requirements.
        8. Provide data governance of the non-graphical information requirements.
     3. A/E’s Role and Responsibilities:
        1. Initiate the BIM collaboration proceedings with Owner at time of project award. Contact Owner’s Project Manager to establish the BIM Coordination Kick-Off meeting with all stakeholders, including the Owner’s BIM and BIM Core Team representative(s).
        2. Attend BIM Project meetings.
        3. Incorporate all BIM activities into the BEP, design Work Plan and the design phase schedule.
        4. Produce for Owner’s approval, the initial BEP, prior to or concurrently with the start of the project design, the initial Equipment Matrix of all devices, systems and equipment supplied. It is intended that the initial BEP be coordinated with and contain Owners BIM requirements and processes per ODGs.

1.5.3.4.1 A/E BEP shall also include anticipated interactions with Contractor, Subcontractors and other stakeholders throughout the project lifecycle.

1.5.3.4.2 If the delivery method is design-build, A/E shall work with Contractor to produce a single project BEP incorporating the entire Project from project inception to Final Completion.

* + - 1. Collaborate with Contractor and approve edits to the BEP.
      2. In the A/E Design Models, begin the early population of the MDA\_Revit Maximo Data Transfer file, (which is the Equipment Matrix). The **Columns that are to be populated in the Transfer File are as follows: Columns A-H, K-L & AA**. Column X to be populated after Room Numbering Control Set approved. The Columns above required be populated and approved by Owner by the 100% CDs submission.
      3. A/E required to deliver the Final Facility Model(s) fully authored in Revit.
      4. By the PreFunction Checklist is ready, incorporate any updates to Tier 1 Data in the model to ensure quantity, and any significant location revision(s) of assets to provide as complete and accurate depiction just shy of an as-built model..
    1. Contractor’s Role and Responsibilities:
       1. Receive from A/E and assume lead responsibility for the BEP, Building Model and Equipment Matrix. If the project delivery method is design-build, Contractor shall work with A/E to produce a single project BEP incorporating the entire project from project inception to Final Completion.
       2. Administer updates to the BEP, the Building Model and the Equipment Matrix with the intent that all BIM-FIM Team members will have up-to-date information as the Project progresses, this includes A/E.
       3. It is intended that Contractor will revise and refine the BEP with their responsibilities and requirements prior to the start of construction and coordinate the revised BEP with Owner and A/E by requesting a BIM Kick-Off meeting.
       4. Provide an individual, experienced in Building Information Modeling to document changes to the Building Model and complete the implementation of the BEP. Contractor shall assign this individual to act as the BIM Coordinator, who may have additional duties such as MEP Coordinator, but shall not be Contractor’s project manager or superintendent. Contractor shall submit qualifications demonstrating the BIM Coordinator’s technical expertise and experience to Owner for approval. In the event that Contractor chooses to subcontract its BIM obligations, Contractor must submit the name and qualifications of the proposed subcontractor for Owner’s approval.
       5. Ensure that Building Modeling activities are incorporated into the BEP, Baseline Schedule and the Work Progress Schedule.
       6. Schedule and conduct periodic meetings with Subcontractors and equipment suppliers related to BIM to ensure the Construction Model and the Transfer File (Equipment Matrix) are being routinely and accurately updated and data entry relates to the exact asset in the model, using the stable identifiers in the model (Element ID, UNIT NAME, LOCATION, AND/OR ASSET NUMBER)
       7. Transmit to A/E all as-built project information as it becomes available and as defined in the BEP throughout construction. At a minimum, required to publish models to Owner Autodesk Construction Account every 2 weeks.
       8. Provide an individual, experienced in Digital Twin platform Autodesk Tandem to create project and continually update through construction. Inventory is a critical component to setup to match the Owner Equipment Matrix to provide continuous data quality governance and assurance of assets. See BIM Deliverables section for Digital Twin requirements.
       9. Required to provide a complete and accurate Equipment Matrix, per 01 91 00 and digitally map data populated in the Matrix to individual modeled elements in the Tandem Project via the asset GUID, Element ID, Location and Asset Number.
       10. Responsible to continually audit the Inventory in Tandem if assets that are a part of Tier 1 Data, are added, or removed, during construction. Coordinate with A/E team to ensure an accurate quantity of assets are modeled in the CA models by PreFunction Checklist.

# PART 2- EXECUTION

* 1. BIM EXECUTION PLAN
     1. Throughout its development, efforts shall be made to align the responsibilities set forth in the BEP with the skills customarily contributed by each party associated with the Project. The BEP shall be considered as a “living document” that is to be updated and refined throughout the life of the Project and shall be available for review and verification by Owner at any time.
     2. To the extent practical, the BEP shall minimize redundant efforts in favor of a single, organized approach to all activities required to successfully complete the BIM - FIM process.
     3. The BEP shall include all pertinent Project Information. Reference section 1.2.2.1 for recommendations on the BEP development and organization. It shall also identify and specify;
        1. the extent to which Building Model(s) are to be used on the Project.
        2. the expected timeline for when information will become available for the Equipment Matrix
        3. the information workflow process, which is to include identifying from where the information to be included in the Equipment Matrix will originate, the requirements for transferring information from and to each model and into the Equipment Matrix, the Depth of Detail and the party responsible for authoring and supplying the information at the appropriate time.
        4. A project BIM Responsibility Matrix detailing what parties are responsible for the numerous aspects of the BIM process and their products. Reference Owners sample BIM Responsibility Matrix, Attachment “A”, for baseline, as well as MD Anderson BIM Project Delivery Standards document.
        5. the version of the Autodesk Revit software into to which the project documents will be utilizing for project. Additionally, if project schedule is equal to or greater than 2 years, a plan & process document in BEP to upgrade Revit version for all affected team members in order to stay current with Autodesk product support.
        6. the file structure for the Building Model, RE: MD Anderson BIM Project Delivery Standards document.
        7. all model types, names, content and relationships.
        8. the Level of Development for each element to be included within the Building Model at each stage of the Building Model development.
        9. the Depth of Detail for each element to be included within the Building ­Model.
        10. the drawings to be generated from the Building Model(s) and the process(es) to be used for generating two-dimensional drawings from the Building Model(s) to ensure that all generated drawings adhere to Owner’s CAD Standards, drawing structure, content, data elements and delivery as defined in the ODGs.
        11. the CMMS Integration Process to be used on the Project, including the requisite process for receiving Owner’s CMMS Asset Numbers and for incorporating those numbers into the design documents.
        12. the data transfer protocol.
        13. conventions to be used for naming files.
        14. measures to be taken to ensure that there is no significant loss of drawing entities or data during drawing generation and data extraction.
        15. areas in which 360 photo service type, scope, frequency, storage, access and other related items.
        16. locations and folder/file structures where all working files will be located during the lifecycle of the Project that will be accessible by all members of the BIM Team, including Owner. Coordination between A/E, Contractor and Owner of the location, folders and files to be detailed prior to project design to ensure a seamless transfer of data and models throughout the Project life cycle and for BIM Deliverables. This must include a method for transfer to Owners control at the end of Project that does not require file re-pathing or the breaking of any links within the models and documents.
        17. Agreed upon version of all software that will be utilized to create the models, drawings, etc. This may include, but not be limited to the following: Autodesk REVIT, Autodesk AutoCAD MEP, and Navisworks. Refer to ‘Attachment
     4. Development of the BEP shall be included as an agenda item for all Project Team meetings throughout the Preconstruction (Design) Phase of the Project. When and as appropriate, and as agreed upon by Owner, the discussion items shall include, as a minimum;
        1. the status of the development of the BEP,
        2. the identification of any issues related to the timing for exchanging information between the various Building Models and the timing and the means and methods for entering information Design Models.
        3. the Level of Development of each of the Building Models,
        4. the Depth of Detail for information within the Building Models.
        5. BIM Asset Data Strategy per Owner Requirements, supporting the CMMS Integration Process (CIP)
        6. BEP to be periodically submitted to Project Workspace for review and approval by Owner at a minimum once per month, while being continuously updated throughout project.
     5. Refinement and implementation of the BEP shall be included as an agenda item for all Project Team meetings throughout the Construction Phase of the Project. When and as appropriate, the discussion items shall include, as a minimum;
        1. the status of the refinement of, and any updates to, the BEP,
        2. the identification of any issues related to the timing for exchanging information between the various Building Models and the timing and the means and methods for entering information into the Equipment Matrix, and the impact on the delivery schedule of information as defined in the BEP.
        3. the Level of Development of each of the Building Models,
        4. the Depth of Detail for information contained within the Building Models and for information to be entered into the Equipment Matrix.
        5. Digital Twin Strategy per Owner Requirements. To include but not limited to: Digitizing & monitoring Tier I Data through Substantial Completion, auditing and continuous QAQC of data, coordination with A/E to update CA models for any discrepancies related to Tier I Data (quantities, locations, Asset Number, etc.), and linking Tier II Data to individual assets/areas/systems.
        6. OpenSpace subscription procurement for project.
  2. INTEGRATED DATA

2.1.1. Unless Owner specifically agrees otherwise, all data input into the Revit models or Contract Documents must meet Owner Data Requirements. Data integration ensures facility operators can make informed decisions, streamline operations, enhanced user comfort, maintain building efficiency and regulatory compliance. Data integrations include but not limited to: IWMS, BAS, CMMS, Occupancy, IoT Devices, Access and Control. The Facility Digital Twin leverages data integration, requiring data governance and standardization. The ontology set forth in the MD Anderson Facility Digital Twin is determined by the columns in the Equipment Matrix (i.e. equipment type, location, install date, Asset number, unit name, etc.) Note, AHU, PUMPs and FANs will have additional ontology as O&M has created unique attributes for those pieces of equipment. Complying with Owner data standards is important for stakeholders, current and future, to locate and identify the data of the asset (equipment, space) for the building lifecycle.

* 1. DOCUMENT INDEX
     1. An index shall be included with each document delivery. The document index shall be in the form of a digital transmittal document for record:
        1. Owner’s project number.
        2. Owner’s project name.
        3. File name; if file is a BIM Model that is shared with Owner via Autodesk Construction Cloud, A/E and Contractor to also provide record of the exchange via digital transmittal, to include the Revit Model name, and link to model in the ACC account that can be accessed by Owner for up to 10 years per State Document Retention Guidelines. .
        4. File description.
        5. Identity of the file authoring entity (i.e. who generated the file A/E, consultant, Contractor, Subcontractor).
        6. Cross references to any required support files; include all linked CAD files to BIM models, or similar, created for the construction documents.
  2. 360-DEGREE PHOTO CAPTURE
     1. Unless Owner specifically directs or agrees otherwise, Contractor shall use job site 360-degree photo capture software-as-a-service offered by OpenSpace Labs, Inc. together with its affiliates **OpenSpace**, and such software-as-a-service, **OpenSpace Service** to document the job site throughout the construction period of the Project, including all areas of active construction, including particular attention to the following types of spaces:
        1. Operating rooms.
        2. Intensive care units.
        3. Imaging suites.
        4. Mechanical equipment rooms.
        5. Plenum, above ceiling spaces and walls through which significant mechanical, electrical, plumbing and/or information technology distribution systems are routed.
        6. Spaces and areas located above hard finished ceilings.
        7. 360-degree reality capture, **using Owner approved OpenSpace service,** generated by any project team member including, but not limited to, A/E, its consultants, Contractor or its Subcontractors, or third-party throughout the life span of the Project not specifically detailed above.
     2. Where 360 photos are required, contractor to take 360 photos with OpenSpace service of complete installations prior to covering partitions, ceilings, or similar.
        1. Contractor to provide a clearly defined QAQC scope and implementation plan for reality capture in the project BIM Execution Plan that aligns to project schedule to achieve section 2.4.2.
        2. MD Anderson is not dictating the frequency of capture only requires a plan of action is clear and defined that meets 2.4.2. If more frequent capture to take place for specific areas or elements, Owner to approve prior and has the ability to revise frequency based on project needs.
     3. 360-degree reality capture deliverables to be provided to Owner at substantial completion as described in the BIM-FIM Deliverables section of this document. Contractor will add Owner as Site Administrator to the OpenSpace Services and will not revoke access. Owner may add users on the OpenSpace platform at Owner’s discretion.
     4. For future renovations, existing 360-degree photos located in MD Anderson owned OpenSpace account, can be shared with Contractor. Future renovation documentation to be stored in existing building folder in order to keep files and projects together within the MD Anderson owned OpenSpace account to maintain full historical documentation. Any images or videos taken during construction in patient areas must comply with Policy Regarding Use of Institutional Images #ADM1050; Patient Privacy: Authorization for the Use and Disclosure of Protected Health Information Policy #ADM0396 and Patient Privacy DE-Identification of Protected Health Information (PHI) Policy #ADM1180. Maintaining the confidentiality of patients and their protected health information (PHI) is required.
  3. LASER SCANS
     1. Laser Scans to be reviewed and approved by MD Anderson Project PM and MD Anderson BIM Core Team on an as needed, per project basis, to capture new, renovated and/or existing spaces prior, during or post construction. Use cases that might be applicable include but not limited to: achieve increased level of accuracy required for documentation purposes; documentation of existing structural elements; documentation of existing MEP, or infrastructure; assist with field layout & quality control to assure scopes are installed per the coordinated BIMs. Scope and timing be to scanned to be defined by project and approved by the institution. If required for project, to be clearly defined and documented in project BIM Execution Plan.
     2. Once approved, laser scanning to also be utilized to backcheck what was installed. Contractor to provide Site-Monitoring and deviancy reports at each payapp if using RTS for field layouts.
     3. Laser scan deliverables shall be in the form of three-dimensional models or two-dimensional drawings as set forth in the BIM-FIM Deliverables section of this document and the final point cloud file generated by the laser scan used to validate the models and/or drawings.
        1. Documentation of what scanning hardware and software was used shall be part of the Laser Scan Deliverables and documented in the BIM Execution Plan.
  4. BIM-FIM DELIVERABLES
     1. The BIM-FIM deliverables shall be set forth in the BIM Execution Plan and are based upon the Project requirements. All files delivered in portable document file (pdf) format shall be searchable (i.e. “smart” or “vector” pdf’s). Unless Owner expressly agrees otherwise, the deliverables for each project type shall be as follows:
        1. Project Deliverables
           1. BIM Execution Plan
           2. Autodesk Tandem Facility Digital Twin – Descriptive Digital Twin Level with graphic and non-graphic data; meeting Owner requirements. Project to be changed to Owner’s Tandem account at Substantial Completion.

**Project Setup and Data Integration**:

Contractor must use Chrome browser and have an Autodesk account.

If viewing issues, Go to Viewer Settings > Configuration > WebGPU Graphics & UNCHECK.

Ensure Viewer Settings > Configuration > Selection is set to ‘Last Object’.

Contractor to Use the MDA Facility Template in Tandem to create and establish project.

Contractor to setup an Inventory for each discipline with Tier I Data. The Inventory column structure to match the Owner Equipment Matrix (Transfer File).

Contractor to setup saved views for each building system used in project with associated equipment (Revit Category checked on) to see complete system and locations of equipment.

Contractor to setup and Organize Views with Identifiable Folder Structure for: Fire Safety Inspections, Medical Gas Systems (by gas type), Utility System Checks; Energy Management Systems (Lighting, HVAC Controls), Water Conservation, Waste Management, Carbon Emissions Monitoring

Contractor to utilize Tandem as a data management quality assurance tool, ensuring compliance of Equipment Matrix accuracy, completeness and continuous mapping of data to the modeled element(s) or system.

Dedicated Contractor personnel to create, monitor, populate and track data and systems.

Contractor to use new construction phase when creating project. If multiple phases, it is the Contractors means and methods how to fulfill this deliverable.

**Modeling Standards**:

The Owner recognizes Tandem is not a model authoring tool. The purpose of this Twin is to achieve a Descriptive Twin Level, where Owners Tier Data can be viewed in tandem with modeled elements/systems, and Owner can access all Tier II Data with a single pane of glass.

Cross-check Levels used across all project models are the same, (i.e. LEVEL 01 not Level 1 for example); modify and stack designations so they stack in Twin.

Ensure all LOCATIONS are populating in Inventory (RE: Column X in Matrix) such that Tier I assets are always tied to a location. Extend Rooms above ceiling, below finish flooring, if floor plenum, or other modifications in Tandem to locate the asset at a Room Level. Including exterior spaces per ODGs Room Numbering Guideline document.

Through Construction, coordinate with A/E for any Tier I assets that are added, removed, or other such that the CA Models have the accurate quantities of assets in the authored model. Files to be UPDATED in Tandem from the authored Revit models should be weekly through Substantial Completion.

Maintain consistent level naming standards across all models.

**Asset Documentation and Linking Tier II Data/Documents**:

Link related Tier II Data and all Predictive Maintenance materials, ensuring accessibility for regulatory audits; Add links to OpenSpace construction photos, providing critical access and insights behind walls and above ceilings for Joint Commission compliance and Inspections.

Ensure all Tier 1 Data has Owner required metadata mapped to the individual element. If any discrepancies, to provide a full report to audit quantity and data to Owner at a minimum 1x per month up until Substantial Completion. This is an exported Excel file of the Inventory capturing Tier I.

* + - * 1. Tandem Audit Report, RE: above section.
        2. MDA\_Revit Maximo Data Transfer File at 95% DDs,50 % CDs, 95% CDs and at 100% CDs.

95%DD through 50%CDs to have Columns A-H, K-L and AA populated.

100% CDs to have Columns A-H, K-L, X and AA populated. Column X is the LOCATION. Must be entered prior to creating Asset Numbers.

Once Pre-Action Checklist is ready, the MDA\_Revit Maximo Data Transfer File will continue to be populated by Contractor in the respective columns. After this step, the Transfer File submittal process per specification 01 91 00 section 1.6.

RE: ‘Attachment A’ for additional information

* + - * 1. MDA\_Revit Model Review Checkset (via Model Checker Tool) to be utilized for QAQC at milestones stated in section 2.6.1.1.4 and subsections.
        2. The associated Revit models populating the Transfer File are to be provided to Owner at each Data Transfer File milestone per 2.6.1.1.5.
        3. Final Facility Model(s) – in the version of Autodesk REVIT agreed upon in the BEP. Delivered by the A/E. Refer to Final Facility Definition in this document and ‘Attachments A & B’. Federated REVIT Models shall be pathed and configured in such a manner that they are usable without significant re-pathing. This model(s) to reflect and incorporate all requirements as put forth in MDA BIM Project Delivery Standard, including but not limited to Phasing to be updated to Existing, Model file size requirements, binding of the Architectural and all Interior/Build-Out/Lab, or similar Arch models, such that Architectural Rooms in the project are consolidated into a single Architectural model reflecting the Room Metadata data (MDA Department, MDA Room Types). Final Facility Model(s) to be published to Owner PMIS.

If the consolidation of Architectural Rooms in the project are not possible in the Final Facility Model, AOR to create a new Model at Substantial Completion to house only the Room Metadata for the completed project, for all rooms regardless of scope. Owner is not dictating means & methods.

All BIM Team members (A/E, consultant(s)), Contractor and Subcontractor(s) shall utilize REVIT to generate all as-constructed final models.

The “Record Model” shall be generated by A/E and shall be continuously updated throughout construction of the Project with all significant changes including but not limited to addenda, bulletins, ASIs, CCDs, RFIs, and Cos. Record Models required to have the non-graphical data incorporated and mapped to elements (not dummy tagged, annotation text or other) Must use Picklist process as prescribed by Owner. Columns data A-H, K-L, X and AA in the Matrix and any additional column data at Substantial Completion to be imported to the specific model element in the model(s) supporting the CMMS Integration Process (CIP).

Tier I construction and data elements shall be incorporated within the model structure to the extent specified in the BEP, section 1.3.12 – Depth of Detail, from which Contractor shall integrate the data and place it into the Equipment Matrix and Tandem Project displayed in the Inventory.

A/E and Contractor shall maximize the use of REVIT Spaces and Zones within the models. Each item that is placed within the model will be linked to a room number, space and/or zone. For Spaces in the MEP models, these must be modeled by 95% CDs. Linking in Rooms from the Architectural model(s) is not acceptable by 95% CDs. All room numbers to match across models and to reflect the approved Room Number Control Set.

All mechanical, electrical, plumbing, security, telecommunications and all other items or equipment that are part of a System will be linked to both the space it is located within and the zone (groups of spaces and/or zones) that are served by said items or equipment.

2.6.1.1.7.f.1 Systems and their related zones and spaces shall be scheduled within their respective models.

To the extent identified in the BEP, physical items that are documented in a table, schedule, list, external spreadsheet/database, submittal, RFI, ASI, etc. that pertain to final completion of the Project will be represented within the model as a 3-D object with inherent parameters or as part of a property set, etc.

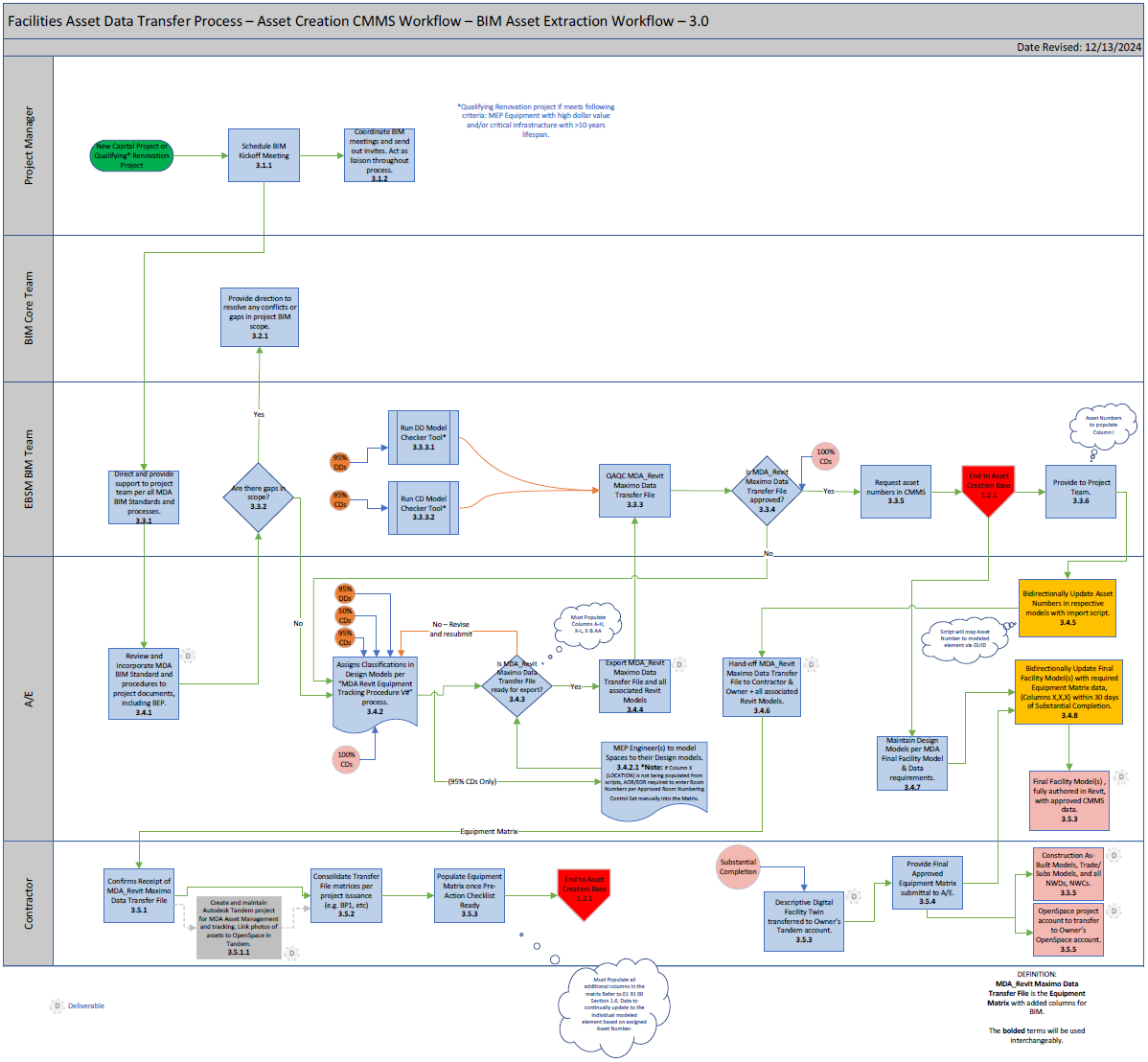
* + - * 1. Design Model(s) – is produced by the Architect / Engineer of Record for the Project and or their consultants or the Owner’s other consultants. To be fully purged to comply with meet Revit model size, naming convention per Owner standards. RE: MDA BIM Delivery Standards.
        2. Construction Model(s) – in the version of Autodesk REVIT agreed upon in the BEP. Reference section 1.3.11. Federated REVIT Models shall be pathed and configured in such a manner that they are usable without significant re-pathing. If the final construction model is federated, ensure all models are properly supplied and linked to the central model utilizing a generic path.
        3. Coordination Model(s) - in the version of Autodesk Navisworks as agreed upon in the BEP. Reference section 1.3.11.1. Final Models will have all Tier 1 data (CMMS equipment) submittals, operational data, etc., hyperlinked within the model to the appropriate information in a manner that will not result in non-functioning hyperlinks when the model is turned over Owner.
        4. Integrated Data - Equipment Matrix containing Tier 1 data as defined in sections 1.3.12 and 2.2.
        5. Laser Scans - Laser Scans as applicable and approved to project, shall be delivered in 3D REVIT models as well as the final Point Cloud file from which the model(s) were generated. Searchable PDF floor plans with scan locations identified and hyperlinked to each scan. PDF’s shall be created in a manner hyperlinked that will not result in non-functioning hyperlinks when the model is turned over to Owner. Reference section 2.5 for additional requirements.
        6. 360-degree reality capture for project, using Owner approved OpenSpace service,to be duplicated to MD Anderson OpenSpace account at Substantial Completion.
        7. Final Documents as specified in Owner’s Master Construction Specification 01 78 39.
        8. Media Type and format - All models, drawings, submittals, RFI’s, Spreadsheets, databases, and any other deliverable shall be provided to Owner through Owner’s Project Management Information System (Owner’s PMIS), unless otherwise agreed upon by Owner prior to the start of design or construction. Owner has the right to bridge MD Anderson Autodesk Construction Cloud account to consultant; and/or be added to project ACC account for the duration of project with permissions that include view and download capabilities as agreed to in project BEP. For Design-Build project delivery, single ACC account for project is required and to be captured in BEP.

OMIT

All appropriate relationships, links, hyperlinks and all other required connections between models, data and documentation must be maintained or updated so that the information or agreed upon alternative is complete, accessible and usable by Owner upon delivery.

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**ATTACHMENT “A”** (1 of 1 page)

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**ATTACHMENT “B”** (1 of 1 page)

