



BIM Standard and Specifications for San Mateo County Project Development Unit

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A. INTRODUCTION AND GENERAL REQUIREMENTS

The Project Development Unit (PDU) organized under the County Manager's Office provides project management services for all new ground-up capital construction projects for San Mateo County (SMC) properties. PDU incorporates Building Information Modeling (BIM) in the delivery for all its development projects. This document details the uniform BIM quality standards, modeling requirements, and intended BIM uses by SMC with the goal of standardized BIM deliverables across all PDU projects. The PDU BIM Standard and Specifications document is not intended to define the detailed BIM process implemented on each project but rather a tool to convey the intended uses of BIM by the County on its various projects. The standardization of BIM from project inception to facility management allows SMC to effectively monitor and utilize BIM countywide. Each PDU Development Project will have its own specific BIM Execution Plan (BXP) submitted to the County for approval by the project design/construction teams. Based on this PDU BIM Standard and Specifications document, the project BXP will further detail the specific project BIM deliverables and processes to be reviewed and approved by SMC prior to BIM kick-off meeting and modeling inception. The approved BXP will be provided to SMC as a project specific document for each project based on project delivery method, development type, and contractual framework. BXPs for design scope and coordination scope must be coordinated to ensure efficient modeling and BIM workflow/hand-offs.

The entire design and construction team, including the Architect, Engineers and their key sub-consultants ("Design Team") as well as the selected Construction Manager at-Risk ("CM/GC") Team and their sub-contractors/trade partners, shall all be capable of utilizing the BIM to perform the functions assigned to them for the design, construction, documentation and delivery of this Project. The personnel assigned to lead the BIM responsibilities on the projects shall have extensive hands-on experience in successfully delivering complex projects in BIM and possess excellent knowledge in the use of the various BIM software and platforms. Resumes of proposed BIM leads shall be submitted to SMC for review and approval at project commencement. SMC reserves the right to request personnel change as needed.

This BIM Standard and Specifications document is to be used as a framework guide to allow all project participants to fully understand the intent of BIM uses on PDU development projects. All project team members are required to work in a collaborative manner and strive to assist one another, across disciplines, with the use of BIM to provide the best possible design and coordination environment for optimal project delivery. Ultimately, BIM is effective because it reduces waste (both in material and labor costs on design and construction by avoiding unnecessary reworks) and any application of BIM technology or standards that enhances the County's ability to further reduce waste will be highly encouraged.

Templates or processes specifically referenced herein shall be used on PDU development projects to maintain cross project continuity for SMC model use. Any BIM deliverables required on a SMC project must be provided to SMC in concert with the project design and/or construction schedule or as requested by SMC. The furnishing of the BIM deliverables in concert with the project design/construction schedules will be required as a requisite prior to review of monthly payments. BIM activities must be included and linked to their associated design and construction schedule activities. All models must be shared with SMC and posted to secure project file-sharing site (set up by project design/construction team BIM leads) in an orderly and packaged manner with associated narrative of updated information. It is the responsibility of the BIM leads to verify that BIM file postings and associated notifications are accessible to SMC and all project team members with their current systems in use. All design/coordination/construction BIM files posted must be purged of unnecessary/duplicate 2D/3D information to keep the model file size as small as possible while still meeting all model requirements. All origin



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points/grid systems/levels/title blocks must be consistent across disciplines from the start of the design phase through the end of the as-constructed turnover phase.

SMC retains full ownership of all BIM data created by all parties contracted to its development projects. SMC may decide to use this information for any purpose at its discretion including but not limited to model QC/QA, project environment training, quantity take off, cost analysis, schedule analysis, visualization, facility management etc. SMC may request model files on an as-needed basis. All BIM deliverables submitted to SMC must be in their designated native source file format per BXP unless otherwise agreed upon in writing.

The BIM and any portion of the BIM is a work for hire for the benefit of the County and will be provided to the County as a contract deliverable that may be used by the County without restriction for the use on this Project. Architect and CM/GC grant to SMC a license in perpetuity to use and reproduce the BIM and any portion of the BIM for any purpose whatsoever related to the project. All parties shall transfer to SMC the copyrights or licenses necessary for SMC to use the BIM and supporting information. The BIM is not a Construction Document or Contract Document, and does not supplement or supersede the final permitted Drawings or Specifications.

The PDU BIM Standard and Specifications is not meant to limit any BIM processes and all BIM participants shall explore the use of most recent and valuable workflows to achieve optimal value for SMC. All modeled systems must adhere to the projects' applicable codes and requirements.

The intended BIM uses for SMC include, but not limited to, the following applications. Models shall be set up and developed to support these intended uses:

- Visualization
- Phasing Study and Analysis
- Cross-disciplinary Coordination
- Design and Construction Documentation
- Program Verification
- Option Management
- Design analysis e.g. accessibility, traffic, circulation, area, sightline, structural, MEP, energy, daylight, etc.
- Quantity Takeoff and Cost Estimation
- Field BIM
- Change Management
- Facility and Asset Management

B. DEFINITIONS, TERMS, AND DESCRIPTIONS

Design Models – are Models created by the Design Team made up of the Architects, Engineers, and their Sub-Consultants furnishing coordinated design information on the project during the design phases. Design models shall be used as the basis for the production of design and construction documents.

Construction Models – are Models created by the construction team made up of the Construction Manager at-Risk/General Contractor, sub-contractors, and other trade partners during the construction phase of the project. The construction models shall be developed from the content provided in the design models furnished by the Design Team and shall incorporate all applicable modifications made during the coordination process.



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Proposed adjustments relating to the design components (including architectural, structural, FFE, interiors, etc.) shall be coordinated with the Design Team before incorporation.

Federated Model – is the assembly of separate distinct discipline models to create a single overall complete building model. Federated models link a series of individual discipline models together. Each discipline is responsible for the creation and development of its model.

Design Record Models – is the final federated design model including all design disciplines to be provided to the County at project completion that is updated with all design-related changes made during the construction process, based on RFI, marked up prints, drawings and other information provided by the CM/GC.

As-Constructed Models – are final construction models submitted to the County after the completion of construction accurately representing the as-constructed condition of all the materials and systems in the building. As-Constructed Models shall be updated monthly and include accurate constructed representation of detailing, quantity, size and location of all built components. As-Constructed Models shall include all contract scope and added scope constructed/installed through the construction process.

All design/construction/federated model authors and model stewardship shall be clearly identified with the names of responsible personnel and companies in the BXP submitted to SMC.

LOD – The Level of Development (LOD) Specification is a reference that specifies and articulates with a high level of clarity the content and reliability of Building Information Models (BIMs) at various stages in the design and construction process. The LOD Specification utilizes the basic LOD definitions developed by the AIA for the AIA G202-2013 Building Information Modeling Protocol Form and is organized by CSI Uniformat 2010. It defines and illustrates characteristics of model elements of different building systems at different Levels of Development. This clear articulation allows model authors to define what their models can be relied on for, and allows downstream users to clearly understand the usability and the limitations of models they are receiving.

The definition and interpretation of LOD shall be in accordance with the guideline authored by the BIM Forum (<http://bimforum.org/lof/>). The LOD specification shall be collaboratively developed with the Design Team, CM/GC Team and SMC to specify and articulate with a high degree of clarity the intended use, content and reliability of BIM at various stages in the design and construction process, such as elements to be modeled, model element authors, timing for element modeling, precision/details to be included, etc. The LOD for the design model elements will vary by component, system and phase in accordance with the established LOD Specification.

C. BIM KICK-OFF MEETINGS AND BIM EXECUTION PLANS

At the onset of the BIM design model creation process, the project team including the BIM lead(s) will participate in a BIM Kick-Off Meeting. At the BIM Kick-Off meeting, project team will:

- List all intended uses of BIM for design, construction and operations
- Establish project specific standards for BIM to support the intended uses
- Establish project BIM origin points for file setup, sharing and collaboration
- Establish project directory for BIM participants and communication protocol
- Define roles and responsibilities of each BIM participant



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- Secure BIM file transfer/sharing protocol and file management platform
- Define project hardware and software requirements for all members of BIM design/construction teams
- Formulate the BIM coordination meeting frequency (may be adjusted later depending on project schedule and specific needs)
- Identify the file types and naming conventions for the project
- Identify model update/exchange frequency
- Establish model sequence and breakout/workset methods
- Identify federated model creation and management process
- Establish BIM LOD and model turnover matrix indicating the project specific LOD progression, data/attribute type, model element authors and transfer of BIM stewardship method
- Develop list of BIM deliverables including progress, milestones and final package in accordance with Contract requirements
- Establish BIM schedule linked to project activities and deliverables
- Discuss BIM teams previous lessons learned and how previous issues will be avoided on this project

The Design Team shall take the lead in authoring a BIM Execution Plan (BXP) based on the above listed criteria/topics for SMC's review and approval. When the CM/GC Team is selected, the Design Team shall work with the CM/GC Team to develop an integrated BXP to document the project delivery standards and protocols for the BIM uses, processes and deliverables for developing, implementing, reviewing, and exchanging information through the BIM on all project phases that aligns with the requirements outlined in this document and adjusted as needed per project BIM kick-off meeting results. The BXP will be submitted to and approved by SMC prior to distribution to project team members and will include the aforementioned information for record.

Regular coordination meetings shall be held regularly to review BIM usage and make updates as appropriate to maximize the benefits of BIM to support the Project delivery through all project phases. BIM shall be used as design review tool to facilitate project discussions.

During the bidding and GMP phases of the project, the BIM shall be made available to the bidding contractors/sub-contractors along with the approved integrated BXP for reference. The Design Team will be responsible for incorporating any bidding RFI, addendums, clarifications, and the like into the design model for turnover to the construction team. See Section D Model Responsibilities for model turnover requirements.

The construction team shall hold regular BIM coordination meetings and implement the approved integrated BXP processes during the construction phase. During these meetings, the Design Team and SMC shall plan to have personnel involved with the BIM process present. All clash detection reports shall be posted and archived for record in an organized and accessible manner to SMC and all project participants. Through the BIM kick-off meetings and subsequent regular coordination meetings, CM/GC, major sub-contractors and the Design Team will discuss, coordinate, test and adjust their BIM practices, to allow information to be used, to the greatest practical extent, by all parties for their respective purposes.

The construction team BIM lead(s) shall manage the coordination flow in a sequential manner consistent with the needs of the construction schedule. The construction schedule shall be coordinated with BIM tasks to support the scheduled activities such as shop drawings, procurement, and installation. Shop drawings shall only be submitted for approval after the BIM lead(s) has signed off on the BIM coordination being complete. The construction team BIM lead(s) shall sign off on all required BIM deliverables at the completion of each milestone/phase and submit for record.



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D. MODEL RESPONSIBILITIES

The Design Team shall develop a set of BIM for the project design that includes all key disciplines (architectural, structural, interiors, MEP, Fire Protection, etc.) throughout all project phases incorporating all updates/modifications approved by Owner.

During the design phases, the Design Team shall be responsible to author, host, manage and share the BIM that includes without limitation:

- Creating and developing design models of all applicable disciplines
- Collecting, coordinating, and the managing the usability of incoming models from Project participants
- Maintaining record copies of models
- Aggregating incoming models and making the BIM available for use and viewing by Project participants
- Performing and assisting in performing clash detection in the models with all Owner-approved modifications
- Issuing periodic clash detection reports
- Providing and maintaining file sharing of models with Project team
- Managing access rights
- Updating the BIM to reflect current designs and revisions.

The Design Team shall correct and clarify any clashes, coordination or issues resulting from the BIM within the Architect's Basic Services. Coordination and design corrections and clarifications resulting from such further modeling (whether performed by design or construction team) shall be within Architect's Basic Services.

Upon the completion of Final Construction Document, Design Team shall provide a federated BIM that include all applicable design disciplines to the CM/GC. A formal transmittal of design models from the Design Team to the Construction Team shall be made in accordance with the BXP LOD model turnover sequence within 14 days of construction NTP. The design models at turnover shall have incorporated information/changes made during the bidding process and the construction team shall take control of model development and management moving forward from this point. The Design Team shall continue to provide updated BIM information to the Construction Team during the coordination and construction process when design changes are made and approved by SMC. CM/GC will use the BIM to assist in its work to coordinate the design and the implementation of the design during construction. They will also perform/manage clash detection and coordination process during the construction phase and utilize BIM in the preparation of all shop drawings and submittals necessary for construction.

E. MODELING STANDARDS

The BIM scope is to create a set of accurate and highly detailed 3D models including all disciplines of work organized by CSI Unifomat based on the current LOD Template developed by the BIM Forum. BIM shall be used for all disciplines where applicable. The Design Team shall work with the CM/GC Team to implement the approved integrated BXP for all disciplines during all phases of the project. The design model may be used as a cost review tool where associated system information is provided to support cost evaluation. The design model shall be used to verify and confirm program area vs. actual design area, and room data associated with each program space. See Section A for list of intended BIM uses.



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Content by Division

Model components described below shall be provided by each discipline at the LOD required per the approved integrated BXP for the purposes of coordination in collaboration with BIM leads. LOD Specification shall include model element authors for each key building system and identify the model elements that need data attributes associated for facility management. A copy of the LOD template can be downloaded from BIM Forum website at http://bimforum.org/wp-content/uploads/2017/11/LOD-Spec-2017-Part-II_2017-11-07.xlsx

Fig 1 – LOD Specification (Part II) Template

All components, regardless whether they are physically modeled or not, shall be coordinated to avoid conflicts during construction/installation. This includes all special considerations including but not limited to:

- Fire spray
- Access zones
- No fly zones
- Code distance requirements
- Structural areas of influence (such as footing zones underground)
- Maintenance access
- System supports

Additional considerations shall include the following:

- Small diameter (less than 2”) pipe/conduit/etc. shall be grouped, modeled and coordinated together in BIM.



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- Major equipment in all discipline models, regardless of LOD, shall include final installed product data/warranty information as data attribute for facility maintenance.
- All utility offsets, jogs, joints, bends, duct size/shape modification, etc. shall be included to support cost review and coordination. No additional compensation will be provided for uncoordinated work requiring system modification in the field.
- Any building components, regardless of CSI division, that are not specifically excluded from the BIM coordination scope, shall be included.
- Order of precedence for coordination shall be the responsibility of the design/construction team based on the project needs.

F. FILE SHARING AND NAMING

- The design/construction teams shall establish a secure file-sharing platform solution to transfer/exchange project files and updates on a weekly (or as directed by SMC) basis during all project phases.
- The Design Team shall identify, prior to commencement of the design model creation, project model origin points for use through the life of the design and construction model management. This will allow the various design consultants and subsequent contractors/sub-contractors to use the same standardized location of the model so their file sharing process is streamlined and accurate. This project datum must be used by all team members using the models. The established origin point shall be used to create project gridlines and levels in BIM. The gridlines and level files shall be used project wide for all BIM activities to ensure project file-sharing consistency and continuity.
- All project documents shall use Project North for orientation of plan views. All project documents in various sizes/formats shall use the same Title Blocks provided by the Design Team.
- Coordination models shall be organized into sub parts to maximize the efficiency of model navigation during the coordination process and for remote field use. The execution of this model break-up shall be determined on a project by project basis by the BIM coordination lead and agreed upon in the project BXP.
- Project BIM files shall be distributed formally in packages to the entire team on a regular and/or as-needed basis determined in project BXP. Model packages shall also be distributed with progress Drawing Package updates/RFIs/ASIs etc. Model distributions shall be provided with narrative with changes clouded to accurately convey the updates to model recipients saving them time to mine through the models for updates which usually results in coordination gaps.
- BIM Files shall be named based on SMC BIM Standard or Design Team's proposed naming standards and shall be determined on a project by project basis to be distributed in the BXP.
- The Design Team shall lead the model creation and coordination process until GC/CM is provided formal NTP at which point model stewardship will be transferred to the CG/CM for contractor/sub-contractor coordination.