# Building Information Modeling (BIM)

# Project Delivery Standards

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THE OHIO STATE UNIVERSITY

## ACKNOWLEDGMENTS

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As the building industry continues to evolve, design and construct firms will deliver more valuable information to The Ohio State University and all owners through the use of BIM-enabled processes. This BIM Project Delivery Standard accomplishes this and has been made possible (and will continue to develop) through the innovation of institutions, organizations, and individuals such as those listed below.

- American Institute of Architects (AIA)
- AIA Technology in Architectural Practice Knowledge Community (TAP KC)
- BIMForum
- Chuck Mies – Business Development Manager - AEC Solutions, Autodesk
- Mark Dietrick –Director of Services, Case Technologies
- National Building Information Model Standard (NBIMS) Project Committee
- Pennsylvania State University – Computer Integrated Construction Research Program
- University of Southern California – Capital Construction and Development and Facilities Management Services
- Texas A&M – Office of Facilities Planning and Construction

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# 1. INTRODUCTION

The Ohio State University's Building Information Model Project Delivery Standard (BIM PDS) is a reference manual for Design and Construct project team members to understand what relevant 3D geometry and data shall be delivered. Project Teams working on BIM-enabled university projects will be responsible for documenting the people, process, and technologies that will ensure adherence to this BIM PDS. The university reserves the right to select any project to utilize BIM.

This standard encompasses the development of the following key BIM Project Deliverables:

- BIM Execution Plan (BIM EP)
- Interim Conformed Design Intent Models
- Conformed Design Intent Models
- Interim and Completed Asset Worksheets

# 2. BIM USE CASES

## 2.1 Definitions & Descriptions

The following BIM Use Cases can be defined as specific BIM-enabled goals, opportunities, and/or processes where BIM will be taken advantage of to complete a project-specific task throughout the Plan > Design > Construct > Operate continuum of a facility's lifecycle. While the university will consistently take advantage of the Plan and Operate phases, the Design and Construct BIM Use Cases are focused on how Architects, Engineers, and Contractors (AEC) project teams will deliver their projects.

This list represents the minimum requirements and options (noted with an *) to leverage BIM on projects. Additional use cases may be utilized and will be agreed upon by the university Project Manager, along with any other project specific exclusions. A complete list of a project's specific BIM Use Cases and their application will be outlined accordingly in section 3. PROJECT BIM GOALS of the university's BIM EP.

Project team members utilizing a BIM for any Use Case, developed to a Level of Development (LOD) for a specific project phase, shall be required to cross-reference the BIM in conjunction with any and all project documentation (including specifications, contract documents, etc.) to account for all relevant project information.

## 2.2. PLAN (University/Internal Use Case)

### 2.2.1. Programming/Planning - Facility Condition Index - Capital Needs

As a significant BIM Use Case, the university's Programming/Planning - Facility Condition Index (FCI) - Capital Needs processes depend upon the quality and accuracy of the information created and turned over at the completion of the Design and Construct phases. The accessibility of this reliable spatial and asset data repository throughout the Operate phase is critical for the university to base strategic growth and capital investment decisions upon.

The knowledge gained from the asset management, preventative maintenance, and model-based technologies will enable the university to better integrate this information into their FCI processes. Through this more holistic approach, there will be a deeper understanding of facilities, thus allowing for better decisions to be made about whether to relocate departments, renovate existing spaces, replace systems, or build new facilities at the most granular or highest strategic levels.

## 2.3. Design

### 2.3.1. Model Authoring – Design Intent BIMs

Model Authoring is a requirement for all projects. The entire Design Team will utilize a BIM authoring platform such as, Autodesk Revit, from the outset of the project to virtually design, simulate, and construct all facilities at The Ohio State University.

If the design team intends to utilize modeling platforms, other than Revit, approval must be obtained from the University Model Manager. These alternative platforms must be capable of meeting the criteria outlined in section 4.3.3. Design and Construct Final Turnover of the BIM PDS.

The creation and use of a BIM will be the basis for collaboration and project deliverables, while its interoperability will facilitate the project's other defined BIM Use Cases. BIM will serve as the foundation for construction documents, leveraging the model geometry for the final two-dimensional (2D) output, which is currently required by the university. When needed, 2D Supplementation should be utilized as an overlay process within the BIM rather than the traditional 2D Standalone documentation typically used to create project documents.

The model's minimum required progression to the LOD as outlined in the LOD Matrix components, assemblies, and systems that will be included in the final Turnover Deliverables will be achieved in accordance with the BIMForum LOD Specification definitions in section 5.2. Model Element Development of the BIM PDS and the Asset Tagging & LOD Matrix of BIM Deliverables. Additional BIM requirements and modeling criteria are outlined in this document, which leverages the accuracy and quality of the model's geometry and intelligence throughout the project's lifecycle.

### 2.3.2. Existing Conditions Documentation/Modeling

For renovation and/or additions projects, the university may provide BIM (where available) of existing campus buildings that have been converted from 2D to 3D in Autodesk Revit Architecture (.RVT format). Each of these models will state that "no guarantee is implied as to the accuracy of dimensions or building features shown and users of the models assume full responsibility for verifying its accuracy." Therefore, the primary Architect/Engineer (A/E) shall define a strategy to field verify all existing building conditions.

The existing conditions documentation may occur via traditional documentation/surveying techniques or by laser scanning. Field verification strategies and integration of any model deviations into the BIM will be outlined in Section 3. PROJECT BIM GOALS of the BIM EP. Where laser scanning is planned to occur, scanning tolerances, file compatibility formats, and transfer methods shall be documented and coordinated with the university and extended project teams within the BIM EP.

### 2.3.3. Program of Requirements (PoR) Validation

All quantifications related to the spatial validation of the PoR should be driven from the BIM. Net and gross building square footages along with any additional program-based requirements (as outlined in the Building & Room Numbering Process document) shall be derived from the Design Intent BIM and exported to an Excel spreadsheet. In accordance with the Building Design Standards, all university room numbering conventions shall be included in the BIM before the Project Stakeholder Document Review.

The accurate documentation of spatial information will serve as a foundation for future model-based project deliverables including the Floor Level Name and Room Number in the Asset Worksheet

deliverables, and will also be a key component of the university's integration of the models and data into the Plan and Operate BIM Use Cases outlined in this document.

2.3.4. Site Design*

The extent of site modeling will be considered as any physical construction that is outside the A/E's scope of work and construction assemblies that are at or below grade. Per the Building Design Standards, the extent of modeling for utilities is defined as 5'-0" outside the building (unless the project is defined otherwise) so there is minimal overlap between the site and building project team members. The LOD Matrix of Deliverables in section 7. MODEL ELEMENT TABLE in the BIM EP will define who is responsible for digitally documenting and/or modeling the hardscape and softscape elements within the project site extents. Site and infrastructure information will facilitate the needed project delivery requirements for integration into the university's Geographic Information System (GIS) technologies as outlined in the GIS BIM Use Case.

2.3.5. Model Based User Group Meetings/Reviews

Model sharing should not be limited to just the AEC team members. During the design process (in addition to the Project Stakeholder Document Review) the project teams should engage key university stakeholders in an ongoing model review process. These model reviews should occur through regularly scheduled model sharing transmissions (via project collaboration websites) and at in-person model-based reviews, similar to the Project Stakeholder Document Review outlined in section 4.3.1. Design of section 4. BIM DELIVERABLES of the BIM PDS. Project Teams will be responsible for documenting how models will be shared with the university in section 5. MODEL COLLABORATION, TRANSMISSION & PERMITTED USE STRATEGIES AND SUPPORTING SOFTWARE in the BIM EP as well as when and where this will occur in conjunction with the overall project schedule in section 6. BIM MEETING PROCEDURES of the BIM EP.

2.3.6. Sustainability (Energy Modeling/Simulation and Performance)/ Design Simulation/Analysis*

In support of the university's Sustainable Design and Construction Policy and the Building Design Standards, where applicable, project teams shall take advantage of the interoperability of the BIM to drive more sustainable outcomes. Taking advantage of gbXML (and other) file format exchanges and simulation/performance technologies, the model can provide valuable insight from early design to final code compliance applications and commissioning. In addition, these models (when available) can be leveraged downstream by the university to benchmark building performance and identify future capital planning opportunities, continuing to reduce energy consumption on campus as defined in the Building Systems/Energy Management Use Case. The BIM EP shall define the A/E team's intent to utilize this BIM Use Case along with an outline of file format exchanges, technologies use and deliverable outcomes.

In addition, taking advantage of the high level of interoperability that can be obtained through the Model Authoring BIM Use Case, the design teams shall leverage the model across a series of different discipline/task centric simulations and analysis outcomes. This may range from structural analysis, airflow calculations/analysis, daylighting simulation, traffic and pedestrian simulations, or wayfinding studies. Where additional simulation and analysis applications are intended to be used by the design teams, they shall be described in the BIM EP.

2.3.7. Clash Prevention

During the design phase, the Design Model Manager and discipline-specific Model Managers are required to coordinate their LOD 300 building components, assemblies, and systems (as defined in section 7. MODEL ELEMENT TABLE of the BIM EP). They shall design to provide assurance that the occupiable space needed by these building systems is adequate and that the systems can be integrated without interfering with one another while maintaining accessibility and serviceability.

The Clash Prevention BIM Use Case should not be confused with item 2.4.3. Clash Detection BIM Use Case that would be led by the construction team. The Clash Prevention process allows for the overall coordination of the spatial relationships of the model's components, assemblies and systems and their final progression as defined in section 5. BIM DELIVERABLE DEVELOPMENT of the BIM PDS and its subsequent sections.

2.3.8 Quantity Schedule*

The Design Model Manager and discipline-specific Model Manager can leverage the quantity schedule ability of the BIM. By extracting accurate quantities from the models, the quantity schedule of key building components can help align the cost estimate and project budget. The types of key building components shall be described in the BIM EP.

## 2.4. CONSTRUCT

2.4.1. Model Authoring – Trade Coordination BIMs

Construct team members shall be responsible for evolving the model elements from the LOD 300 components that were delivered by the design team, to LOD 350 components, in accordance with the BIMForum LOD Specification Fundamental Definitions as outlined in section 5. BIM DELIVERABLE DEVELOPMENT of the BIM PDS. This model progression includes the additional granularity inherent to the respective trade components, assemblies, and systems, such as but not limited to pipe hangers and stud kickers not shown in the Design Intent Model that also take up space. This will ensure that the model will be usable as part of the Clash Detection BIM Use Case before field installation. These models shall be managed by the Construct Model Manager.

2.4.2. Model Authoring – Shop/Fabrication BIMs*

The continued evolution of the Trade Coordination BIMs may progress from LOD 350 elements to LOD 400 elements where available on projects by specific constructors. This progression will be inclusive of any and all additional geometry, information, and model detail that would enable the constructor(s) to create shop drawings and directly fabricate components, assemblies, and systems from the model elements.

Any progression to this LOD should be coordinated back to the Trade Coordination BIMs so it can be included in the Clash Detection process. These models shall be managed by the Construct Model Manager.

2.4.3. Clash Detection

During the design assist and/or construct phase, construct team members shall be expected to coordinate the building components, assemblies, and systems to properly fit in their to-be-installed

condition without interferences or encroachment with any other building assemblies. This Clash Detection process will be based upon the Trade Coordination BIM components which have progressed to an LOD 350 (and potentially LOD 400) representing the final/actual fabricated geometry and unencumbered routing.

The model's development is defined in section 5. BIM DELIVERABLE DEVELOPMENT of the BIM PDS and should be further addressed in the BIM EP. Clash Detection should not be confused with section 2.3.8. Clash Prevention BIM Use Case that is led by the Design Team during the design phase.

2.4.4. Model-based Scheduling (Sequencing/Simulation)*

Modeling-based scheduling allows for the communication of planned construction activities to key project stakeholders in a virtual format by merging linking and associating geometry with project schedule milestones and durations. The ability to visually plan, communicate, and simulate these activities within the context of time and space before the commencement of specific construction activities enables project team members to review and optimize trade coordination, phased construction, site logistics, and installation sequencing.

2.4.5. Model-based Estimating (Quantification/Cost Estimating)*

Taking advantage of the BIM for materials quantification provides the opportunity to bring a greater alignment to the project budget and design/construction process by extracting accurate quantities for their integration with cost estimating applications. When this BIM Use Case is leveraged in the BIM EP, specific modeling requirements in addition to those identified in the BIMForum LOD Specification and section 7. MODEL ELEMENT TABLE of the BIM EP will be addressed to ensure that the MEA is developing content in a way that meets the intended use of the project team member who is relying on those quantifications for estimating purposes.

2.4.6. Site Analysis Planning*

Integrating model-based information to visualize the impact of the construction process on the project site and its surrounding areas is extremely important within the larger context of the campus. Construct team members shall leverage the site and building models captured throughout the design process to plan and visualize the site impacts and strategies, including but not limited to extents of construction barriers, temporary facilities, construction equipment storage, access material delivery, storage space, and assembly areas. Additional consideration should be given to impacts outside the immediate project site, including but not limited to pedestrian and traffic flow, utility tie-ins, and other temporary installations that impact adjacent facilities and building access.

## 2.5. OPERATE (University/Internal Use Case)

The following Operate Use Cases will take advantage of information the design and construct team members have captured and structured throughout the project. This knowledge transfer at the completion of the project will include the Interim and Final Conformed Design Intent BIMs and data (Asset Worksheets) required deliverables that have been outlined in section 4. BIM DELIVERABLES of the BIM PDS, which will be directly integrated into the following University-driven Use Cases.

2.5.1. Asset/Maintenance Management

The university currently leverages Computerized Maintenance Management System (CMMS) applications across multiple campus districts and departments. Taking advantage of the current Asset Descriptions and inventory tagging structure, the university will integrate this information back to the geometry in the building information models it receives. The BIM PDS will ensure that the university is receiving all of the critical maintenance information for their assets and facilities while enabling a connectivity that will provide an accessible/mobile interface for university staff to access the most current information about those assets. In addition, this interoperability will provide integration and improve the ability to share data between multiple user groups on campus as it relates to work orders, access to O&M manuals, preventative maintenance schedules, warranty information, and the development of the FCI.

2.5.2. Space Management

Facilities Information and Technology Services (FITS) is leveraging the building information models that have been developed during the BIM for Existing Buildings phase of the Buckeye BIM Initiative (BBI) as the “single source of truth” for data related to spatial assets and buildings across campus. The Facilities Information and Technology Services (FITS) group is the owner and facilitator of this information. Section 4. BIM DELIVERABLES of the BIM PDS documents the data requirements needed at the turnover of a project. These deliverables will be formatted in the appropriate BIM and Asset data format as outlined in section 5. BIM DELIVERABLE DEVELOPMENT of the BIM PDS. This properly structured information will be consumed by the university’s Space Information and Management System (SIMS) and shared with multiple other departments across campus to leverage a wide range of other BIM Use Cases.

2.5.3. Building Systems/Energy Management

Multiple departments on campus use multiple Building Automation Systems (BAS) and Energy Management Systems (EMS) that rely on the Building Automation and Controls Network (BACnet) as the data communication protocol that speaks to Delta (enteliWEB). Delta serves as the front end system (or window) into the university’s BAS. Additional EMS applications from Energy Services and Sustainability will integrate with the university’s CMMS and BIM applications as well as building simulation tools, electronic billing systems, and energy dashboards. All of these initiatives are focused on the integration of BIM and its data to optimize systems performance while reducing energy consumption across campus.

2.5.4. Geographic Information System (GIS)

In addition to the geometric and data information received about the buildings being designed and constructed on campus, project teams shall also capture the full extent of the assets on campus that extend beyond the exterior walls of a building. While the spatial and asset information about a building may be seen at a micro-level of BIM, the larger geospatial and site information/context should be seen at the macro-level as mentioned in section 2.3.4. Site Design of the BIM PDS. The information to be captured by the design and construct teams will be in accordance with Appendix E: Requirements for Survey Information of the Building Design Standards and section 5.3.1. Facility Information Matrix of the BIM PDS, for use in the university’s GIS applications. This mutual integration of building, site, and GIS data will bring a holistic BIM approach to the Operate and Plan phases. Any additional GIS requirements will be defined in the BIM EP.

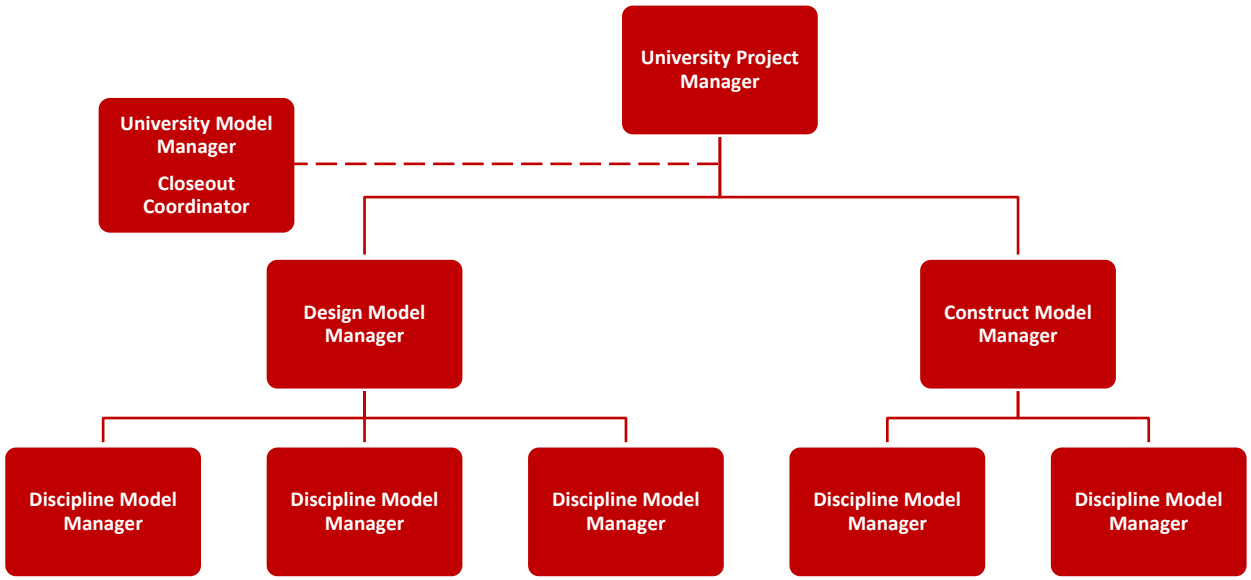
2.5.5. Document Management (Archived Projects)

Project file deliverables and their accessibility within SIMS – Archived Projects website are an important part of the Plan > Design > Construct > Operate continuum. SIMS - Archived Projects website serves as an electronic imaging system containing architectural and engineering drawings of all campus buildings, dating from 1898 to the present. The deliverable file structure is important in allowing for an efficient method of sharing data for building research and subsequent projects, both for internal university staff and for external design and construction consultants. Information on naming conventions and structures will follow the structure outlined in the Electronic Drawing Naming Requirements of the Building Design Standard and in section 5.1. Model Naming Conventions, Formats & Turnover Process of the BIM PDS.

## 3. BIM PROJECT PARTICIPANT ROLES

This section outlines key BIM leadership positions, their roles, responsibilities, and structure (Figure 1). These are focused on the BIM-enabled project delivery and turnover requirements outlined in the BIM PDS and documented in the BIM EP. The responsibilities outlined below will not supersede the overall chain of command that exists on a project. The identification of BIM project-specific leadership roles, such as the university Project Manager, the university Design and Construct Model Managers, and the Discipline Model Managers, will be cited in section 4.2. BIM Project Participants and Model Element Authors of the BIM EP.

**Figure 1 - BIM Project Participant Structure**



## 3.1. University Project Manager

- Serve as the liaison between all design and construct team members to the university for all BIM-related activities.
- Provide specific BIM Use Cases in the project Request For Proposal (RFP) that identify unique project needs that may deviate from the defined minimum requirements.
- Provide oversight and direction to the Design and Construct Model Mangers so they are able to perform their work in accordance with the model requirements and deliverables outlined in the BIM PDS and BIM EP.
- Provide final approval to the project's BIM EP.
- Distribute the BIM project documentation to project teams as outlined in section 4.1 The Ohio State University of the BIM PDS.
- Coordinate and participate with model reviews and the Project Stakeholder Document Review as outlined in sections 2. PROJECT SCHEDULE AND MILESTONES and 6. BIM MEETING PROCEDURES of the BIM EP while delegating meeting documentation to the appropriate design and construct team members.

## 3.2. University Model Manager

- Advise and support the University Project Manager, serving as the technical resource for all BIM-related issues.
- Support the University Project Manager regarding the acceptance of the BIM project deliverables as outlined in the BIM PDS.

## 3.3. Closeout Coordinator

- Directs closeout activities for university projects in support of the University Project Manager. Sets expectations early in the project to ensure effective data and drawing handover.
- Support the University Project Manager regarding the acceptance of the BIM project deliverables as outlined in the BIM PDS.

## 3.4. Design Model Manager

- Author the BIM EP for the design phase of a project.
- Serve as the liaison between University Project Manager and Discipline Model Manager(s) from individual design team members.
- Provide oversight to the design BIM Use Cases as defined in section 3. PROJECT BIM GOALS of the BIM EP in adherence to the BIM PDS.
- Serve as the liaison to the Construct Model Manager regarding the needed information and the prescribed reliability of the Design Intent Models being created.
- Responsible for adherence to the project's BIM deliverables and their submission to the University as outlined in the BIM PDS and section 2. PROJECT SCHEDULE AND MILESTONES of the BIM EP.
- Responsible for creating and managing or contributing to the projects collaboration hub using Autodesk Construction Cloud (ACC)

## 3.5. Construct Model Manager

- Author BIM EP in collaboration with the Design Model Manager. If not part of the project team during the design phase, provide updates for the construct phase.

- Serve as the liaison between University Project Manager and Discipline Model Manager(s) from individual construct team members.
- Provide oversight to the construct BIM Use Cases as defined in section 3. PROJECT BIM GOALS of the BIM EP in adherence to the BIM PDS.
- Serve as the liaison to the Design Model Manager regarding needed information and prescribed reliability of the Design Intent Models being created.
- Responsible for adherence to the project's BIM deliverables and their submission to the University as outlined in the BIM PDS and section 2. PROJECT SCHEDULE AND MILESTONES of the BIM EP.
- Responsible for creating and managing or contributing to the project's collaboration hub using Autodesk Construction Cloud with construction specific information as required by the BIM PDS.

### 3.6. Discipline Model Manager (Design and Construct)

- Manage the day-to-day project activities such as model authoring and development within each project discipline and team.
- Deliver the level of development, accuracy and consistency to models being created by their organization, making sure they are progressing in accordance with the model requirements outlined in the BIM PDS and the BIM EP.

## 4. BIM DELIVERABLES

### 4.1. The Ohio State University

The university may provide the following information (where available) to the project teams in support of the development and delivery of BIM in accordance with the BIM PDS.

- All potential design and construct team members will have access to the University's BIM PDS online as part of the Building Design Standards.
- Relevant project data that will be included in section 1. PROJECT INFORMATION and subsequent sections of the BIM EP.
- Building Information Models (in an .RVT format) of existing facilities will be made accessible from the SIMS – Archived Projects website (where available) along with other models, drawings, and specifications of past projects for renovation, additions, and use in connecting to adjacent facilities.
- For existing buildings only, GIS-referenced Project Base Point Coordinates and Elevations will be shared by the university Project Manager in accordance with and documented in section 8. MODEL COORDINATE SYSTEMS of the BIM EP.
- University Model Manager will assign/coordinate the information in section 10. FLOOR/LEVEL AND ELEVATION NAMING CONVENTIONS of the BIM EP with Design and Construct Model Managers.
- Room numbering conventions will follow the Building & Room Numbering Process as documented in the Building Design Standards.
- Model Validation Rule Set and usage instructions for the Autodesk Revit Model Checker will be made available for AEC team members to assist in validating the compliance of models prior to submitting to the University.
- OSU Asset Exporter Toolkit and instructions on how the AE will utilize the toolkit to turn asset data over to the University.
- Tools noted above are available at https://fod.osu.edu/resources under the *Design Guidelines, Specifications, Standards* section.

All of the above data and information shall be made available for use by the Design and Construct Team members in development of their required BIM Deliverables. The university cannot be held responsible for but shall to be made aware of any discrepancies or issues with the data being made available.

## 4.2. BIM Execution Plan

At the initiation of the project, the university Project Manager will collaborate with the project's primary A/E to identify the Design Model Manager (and Construct Model Manager, if known) and other key discipline-specific Model Managers. These key individuals will be responsible for documenting the collaborative design process and BIM/technology-enabled workflows in the BIM EP to meet the university's project deliverable requirements as outlined in section 4. BIM DELIVERABLES of the BIM PDS.

The BIM EP also will be included with the construction document deliverables at the completion of the Design Phase. If the Construct Model Manager was not under contract until this stage, they shall review the BIM EP and modify as appropriate with information about the Construct Phase.

- The Design Model Manager (Primary A/E) shall submit their BIM EP to the university within 30 days of all design consultants involved in modeling efforts being under contract.
- For Design-Bid-Build projects, the Construct Model Manager shall submit their BIM EP updates to the university for review prior to the start of the trade coordination BIM development process and within 30 days after the Construct team members have been contracted.
- For Design-Build or CM at Risk projects, any subsequent updates by the Construct Model Manager will be due as a part of the delivery of each Guaranteed Maximum Price (GMP).

## 4.3. Design and Construct Team

Project teams will be responsible for submitting the following BIM-based deliverables for key project milestones as identified in section 2. PROJECT SCHEDULE AND MILESTONES of the BIM EP, and in existing submittal requirements defined in the Building Design Standards.

Section 4.3.4. BIM Project Delivery Standards Process Map of the BIM PDS highlights the evolution of models and their components, assemblies, and systems throughout the Design and Construct process. It also shows how they work in conjunction with section 5. BIM DELIVERABLE DEVELOPMENT of the BIM PDS and subsequent sections to define the framework of how the models will be created. Requirements for the file format of BIM deliverables and how the models will be named are outlined in section 5.1. Model Naming Conventions, Formats and Turnover Processes of the BIM PDS.
While the BIM PDS defines the expected processes and required deliverables, the BIM EP will allow the Design and Construct Model Managers to document their project specific methodologies and workflows.

### 4.3.1. Design

- Model Reviews
    - During the Project Stakeholder Document Review, an interactive model review will be led by the Primary Associate and the Design Intent Model Manager as outlined in section 2.3.5. Model Review of the BIM PDS. This interactive presentation will be focused on sharing the model via a live 3-dimensional review where Project Team Members will have the opportunity to ask questions and address concerns that would not be noticed in traditional two-dimensional review processes.
    - Additional Model Reviews may occur at the discretion of the university Project Manager, where in-progress Design Intent Models shall be submitted before or after the Project

Stakeholder Document Review which will be defined in sections 2. PROJECT SCHEDULE AND MILESTONES and 6. BIM MEETING PROCEDURES of the BIM EP.
    - The Design Intent BIMs also shall be made available for on-going review by University project team Members. These model sharing processes will be outlined in section 5. MODEL COLLABORATION, TRANSMISSION & PERMITTED USE STRATEGIES AND SUPPORTING SOFTWARE of the BIM EP.
- Design Intent BIMs
    - In addition to the information outlined in section 2. BIM USE CASES of the BIM PDS, the design teams will be required to make their Design Intent Models for each project discipline available to potential construction teams along with the 2-dimensional Construction Documents for their use in the bidding phase and subsequent project phases. These models must contain rooms (architectural) and spaces (MEP disciplines) that reflect OSU developed and provided room numbers. The use of these models will be subject to the protocols defined in section 5. MODEL COLLABORATION, TRANSMISSION & PERMITTED USE STRATEGIES AND SUPPORTING SOFTWARE of the BIM EP.
- Revit Model Checker OSU Rule Set Results
    - To ensure compliance with this standard, the results of the Revit Model Checker run against the OSU provided rule set shall be submitted at the following stages:
        - Project Stakeholder Document Review (Use the “The Ohio State University BIM Project Delivery Standards Check_Interim” rule set.)
        - Interim Conformed Design Intent Architectural and Structural BIM Submittal (Use the “The Ohio State University BIM Project Delivery Standards Check_Interim” rule set.)
        - Conformed Design Intent BIMs Submittal (Use the “The Ohio State University BIM Project Delivery Standards Check_Final” rule set.)

4.3.2. Construct

- Trade Coordination BIMs and Shop/Fabrication BIMs
    - Clash Detection and additional Model Review sessions throughout the Construct phase will be defined in sections 2. PROJECT SCHEDULE AND MILESTONES and 6. BIM MEETING PROCEDURES of the BIM EP.
- Asset worksheets in accordance with section 5.3. Non-Graphic Building Information (Asset Worksheet).

4.3.3. Design and Construct Final Turnover

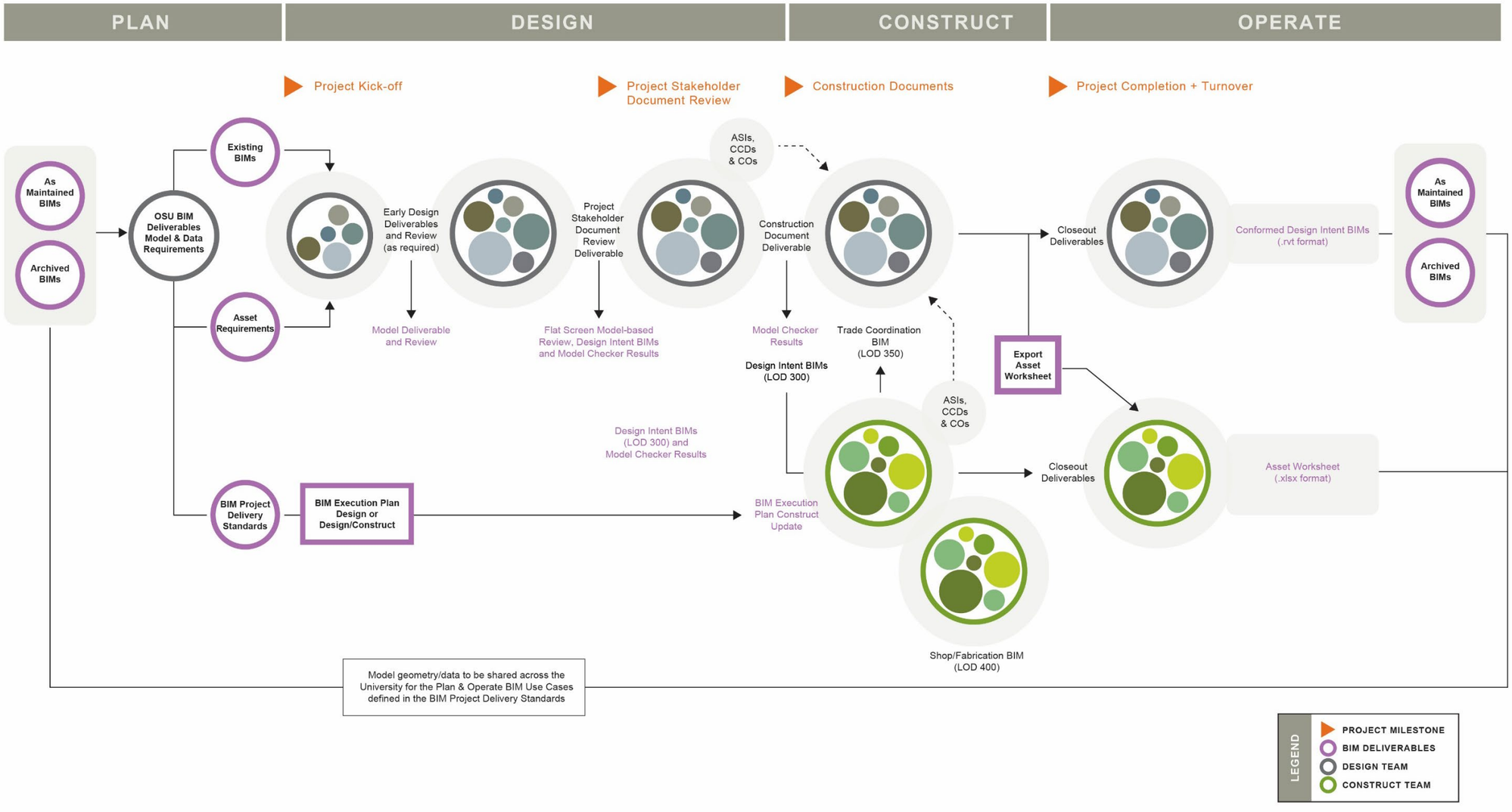
- Two (2) to four (4) months prior to Occupancy (per discussion at Construction BIM Kick Off Meeting), the Interim Conformed Design Intent Architectural BIM and the Interim Conformed Design Intent Structural BIM shall be submitted in RVT format as defined in section 6 (unless previously approved by the University Model Manager per section 2.3.1) and in accordance with section 5.2.4. Conformed Design Intent BIMs Definition. This model will become the university’s As-Maintained/Owner model and shall be conformed to the project’s percent completion at the time of submission. The University understands these models are not the record models.
- At the Interim Conformed Design Intent Models submission, the survey grade Project Base Point (per location identified in the BIM Execution Plan Section 9.2 Building Key plan) coordinates shall be documented in the University’s project management software. The Project Base Point in the models is not required to be updated.
- At the project’s completion (in accordance with section 4.3.4. BIM Project Delivery Standards Process Map of the BIM PDS), final digital project documentation shall be submitted to the university by the Design Team Members within the due date defined in the BIM EP section 2.2 . Deliverable file format

requirements are outlined in section 5.1. Model Naming Conventions, Formats & Turnover Process of the BIM PDS. This includes the following items that will ultimately become the university's As-Maintained and Archived BIMs.

- All Conformed Design Intent BIMs (.rvt). Revit models shall be submitted in the currently available version of Revit, or the current year available minus one or two years, in accordance with section 5.2.4. Conformed Design Intent BIMs Definition. Architectural and Structural Conformed Design Intent BIMs shall be resubmitted at this time with any further changes since the Interim submission above. These models will then serve as the record models.
- Asset Worksheets in accordance with section 5.3. Non-Graphic Building Information (Asset Worksheet).
- Phased projects will perform final turnover at the completion of all phases unless a phase constitutes an entire building or otherwise noted by the University Project Manager.

4.3.4. BIM Project Delivery Standard Process Map

The following process map provides an overview of how both the Design and Construct will move through the lifecycle of typical project and where BIM deliverables (in purple) as outlined in section 4. BIM DELIVERABLES of the BIM PDS will be realized. The various sized bubbles within each stage of the process represent the individual project team members that may change from one project to another, while the larger bubble structure of both the Design and Construct Team members remain consistent as key project participants throughout the project's lifecycle.



4.3.5. BIM Collaboration Hub/Model Sharing Platform

The Design Model Manager shall create a collaboration hub using Autodesk Construction Cloud (ACC), where their models will be maintained in a currently supported version of Revit and made available for the University. Over the course of the project, new software versions may be released, and the project team led by the Design Model Manager will coordinate the effort on when and how models will strategically be upgraded so that the models are no more than two releases behind the current version of the software to optimize the project team's ability to work and collaborate with the project team as well as internal OSU users. Any deviation from this standard should be approved by the University Model Manager.

In ACC a company called "The Ohio State University" shall be created, and that company shall have their permission level set to View + Download allowing them to view documents, add private markups, and create issues. At a minimum Design Team Models shall be published (including current two-dimensional sheet set) on a weekly basis throughout the lifecycle of the project and to meet the established OSU BIM deliverables. The BIM execution plan, section 5 MODEL COLLABORATION, TRANSMISSION & PERMITTED USE STRATEGIES AND SUPPORTING SOFTWARE, shall outline the folder structure, permissions, and responsibilities around the collaborative platform. Each responsible party will be required to bring their own license.

In instances where internal OSU users need to collaborate with project teams, it may be necessary to establish an Autodesk Bridge. The University Model Manager will coordinate with the project team to implement this standard, ensuring seamless integration within ACC and that the owner's requirements are consistently met throughout the project.

## 5. BIM DELIVERABLE DEVELOPMENT

### 5.1. Model Naming Conventions, Formats, and Turnover Process

In addition to the Document Submission and Electronic File Drawings and Specification Naming Requirements outlined in the Building Design Standards, the following lists the acceptable Model Naming Structure Conventions and Deliverable file formats. The specific file names and formats at key project milestones and deliverable will be documented in section 2. PROJECT SCHEDULE AND MILESTONES of the BIM EP.

5.1.1. Model Naming Convention

BIM Deliverable Naming Conventions will at a minimum include the Building Number, OSU Project Number, Deliverable and Model Author per the following:

| Model Naming Conventions | | | | | | |
|---|---|---|---|---|---|---|
| Building Number | | OSU-Project Number | | Model Author | | File Extension |
| XXXX | _ | OSU-XXXXXX | _ | X or XX | . | XXX |

Example:

| | | | | | | |
|---|---|---|---|---|---|---|
| 0242 | _ | OSU-130574 | _ | A | . | RVT |

This example would identify that the model is:

| | | | | | | |
|---|---|---|---|---|---|---|
| 660 Ackerman Rd. | | OSU Project Number OSU-130574 | | Architect | | Autodesk Revit |

Where applicable, models may require additional nomenclature to further break the building down and the Building Floor and/or Building Area may also be included in the file name.

| Model Naming Conventions | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Building Number | | OSU-Project Number | | Model Author | | Floor | | Building Area | | File Extension |
| XXXX | _ | OSU-XXXXXX | _ | X or XX | _ | XX | _ | X | . | XXX |

Example:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0242 | _ | OSU-130574 | _ | A | _ | 01 | _ | B | . | RVT |

This example would identify that the model is:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 660 Ackerman Rd. | | OSU Project Number OSU-130574 | | Architect | | 01 – First Floor | | Area B | | Autodesk Revit |

Building Number - 4 digit number (0000) defined by the University Project Manager then documented in section 1. PROJECT INFORMATION of the BIM EP.

OSU Project Number - University project number (OSU-000000) defined by the University Project Manager then documented in section 1. PROJECT INFOMRATION of the BIM EP.

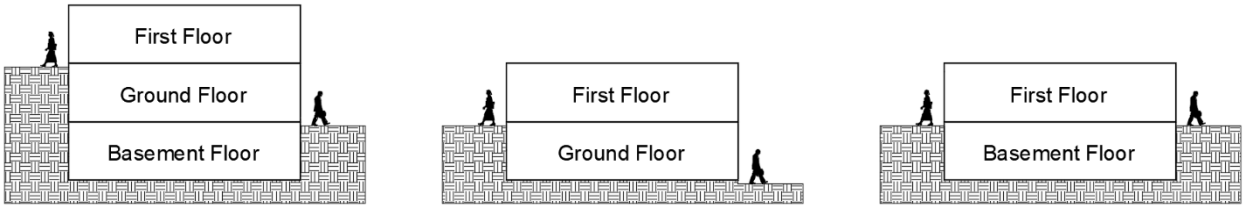
Model Author - Standard Model Author abbreviations are outlined in section 4.1. MODEL AUTHOR DEFINITIONS of the BIM EP and project specific information will be documents in section 4. BIM PROJECT PARTICIPANTS of the BIM EP.

Building Floor - The floor level component should take advantage of the floor level's leading characters (01 for the first floor or 02M for the second floor mezzanine) as outlined below and documented in section 10. FLOOR/LEVEL AND ELEVATION NAMING CONVENTIONS of the BIM EP. Valid floor names include the following and can be extended following this pattern as needed:

TL – Tunnel Level
SB – Sub-Basement
SBM – Sub-Basement Mezzanine
0B – Basement Floor
0BM – Basement Floor Mezzanine
0G – Ground Floor*
0GM – Ground Floor Mezzanine*
01 – First Floor
01M – First Floor Mezzanine
02 – Second Floor
02M – Second Floor Mezzanine
03 – Third Floor

03 – Third Floor Mezzanine
10 – Tenth Floor
10M – Tenth Floor Mezzanine
23 - Twenty-third Floor
23M - Twenty-third Floor Mezzanine
PH - Penthouse
RF – Roof

*Ground Floor is defined as a secondary floor (to the first floor) that also has an exit at grade. It is only permitted to be used in a situation where there already exists first floor.




Building Area - If building areas are required to document the model, a Key plan should be documented to support the model naming conventions in section 9.2. BUILDING KEY PLAN of the BIM EP.

Deliverable Naming Conventions:
For final project deliverables the following deliverable abbreviations will be added as a suffix to the defined naming convention. For example:

- Building Number_OSU-Project Number_Model Author_ Deliverable.xxx
- Building Number_OSU-Project Number_Model Author_Floor_Building Area_Deliverable.xxx

| Abbreviation | Deliverable |
|---|---|
| DIB | Design Intent BIM |
| ICDIB | Interim Conformed Design Intent BIM |
| CDIB | Conformed Design Intent BIM |
| ASSETS | Asset Worksheet |

5.1.2. Turnover Process

With model naming conventions defined, deliverables shall be turned over to the University based upon the schedule and transmission methods defined in the Building Design Standards and the BIM EP.

5.1.3. BIM Project Deliverable File Formats

The Design and Construct Model Managers are responsible for defining when BIM deliverables are scheduled to be submitted to the University along with the project specific “native” and other file formats in section **2. PROJECT SCHEDULE AND MILESTONES** of the BIM EP.

## 5.2. Model Element Development

The BIMForum’s LOD Specification will serve as a framework for defining the progression of model components, assemblies and systems throughout the Design and Construct process. This will enable the models to meet their prescribed reliability as defined by the project’s BIM Use Cases which will be documented in section **3. PROJECT BIM GOALS** of the BIM EP. The LOD defines the relevant model

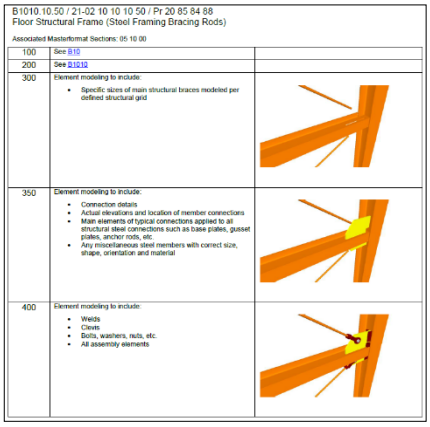
element geometry to be included along with the minimum parametric data to facilitate the on-going use of the BIMs by The Ohio State University.

5.2.1. Fundamental LOD Definitions

| Fundamental LOD Definitions | |
|---|---|
| LOD 100 | AIA Contract Documents Definition: The Model Element may be graphically represented in the Model with a symbol or other generic representation, but does not satisfy the requirements for LOD 200. Information related to the Model Element (e.g., cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.<br>BIMForum Expansion: LOD 100 elements are not necessarily geometric representations. Examples are information attached to other model elements: symbols showing the existence of a component but not its shape, size, or precise location; or space reservation volumes. In essence, if information about an element can be derived from the model but the element is not at LOD 200 it is said to be at LOD 100. Any information derived from LOD 100 elements must be considered approximate. |
| LOD 200 | AIA Contract Documents Definition: The Model Element is generically and graphically represented within the Model with approximate quantity, size, shape, location, and orientation.<br>BIMForum Expansion: LOD 200 elements are generic placeholders but are recognizable as the components they represent (e.g. a pump, a light fixture, a beam, etc.). Any information derived from LOD 200 elements must be considered approximate. |
| LOD 300 | AIA Contract Documents Definition: The Model Element, as designed, is graphically represented within the Model such that its quantity, size, shape, location, and orientation can be measured.<br>BIMForum Expansion: LOD 300 elements are sufficiently developed to fully convey the design intent for the represented item. Note that while neither the LOD definitions nor this Specification specify who models the element, designers rarely generate model elements higher than 300. See interpretation of LOD 350 below. |
| LOD 350 | AIA Contract Documents Definition: The Model Element, as designed, is graphically represented within the Model such that its quantity, size, shape, location, orientation, and interfaces with adjacent or dependent Model Elements can be measured.<br>BIMForum Expansion: LOD 350 is intended to define requirements for model elements that are sufficiently developed to support construction-level coordination. This LOD usually requires craft knowledge, thus the caveat in the LOD 300 interpretation above that designers rarely generate elements at LODs higher than 300. It should be remembered, though, that neither the LOD definitions nor this Specification specify who models the element – if a design team has craft knowledge available they might choose to develop elements to LOD 350 or higher. |
| LOD 400 | AIA Contract Documents Definition: The Model Element is graphically represented within the Model with detail sufficient for fabrication, assembly, and installation.<br>BIMForum Expansion: LOD 400 describes a model element developed to the level of shop drawings – in most cases, if a project's specifications call for shop drawings of an item, the project team might model the item at LOD 400. Thus most models contain few LOD 400 elements |
| LOD 500 | AIA Contract Documents Definition: The Model Element is a graphic representation of an existing or as-constructed condition developed through a combination of observation, field verification, or interpolation. The level of accuracy shall be noted or attached to the Model Element. |

| Fundamental LOD Definitions | |
|---|---|
| | BIMForum Expansion: LOD 500 does not indicate a higher level than LOD 400, rather it indicates that the element's geometry is determined through observation of an existing item rather than design of a future item. The LOD 500 definition requires that the model element's accuracy be specified – BIMForum recommends USIBD's Level of Accuracy (LOA) Specification for this purpose. |

The information above is referenced from the BIMForum's LOD Specification Version 2024. For additional information (similar to the image on the right) please reference the following link - https://bimforum.org/resource/lod-level-of-development-lod-specification/


B1010.10.50 / 21-02 10 10 10 50 / Pr 20 85 84 88
Floor Structural Frame (Steel Framing Bracing Rods)
Associated Masterformat Sections: 05 10 00

| | |
|---|---|
| 100 | See B10 |
| 200 | See B1012 |
| 300 | Element modeling to include:<br>• Specific sizes of main structural braces modeled per defined structural grid |
| 350 | Element modeling to include:<br>• Connection details<br>• Actual elevations and location of member connections<br>• Main elements of typical connections applied to all structural steel connections such as base plates, gusset plates, anchor rods, etc.<br>• Any miscellaneous steel members with correct size, shape, orientation and material |
| 400 | Element modeling to include:<br>• Welds<br>• Clevis<br>• Bolts, washers, nuts, etc.<br>• All assembly elements |

5.2.2. LOD of BIM Deliverables

The Design and Construct Teams are expected to progress their models to the appropriate LOD as defined in section 4.3.4. BIM Project Delivery Standards Process Map and documented this section. This defines both the geometry and non-graphic information to be included in the Design Intent BIMs and Conformed Design Intent BIMs.

Design and Construct Model Managers will be responsible for completing the Asset Tagging & LOD Matrix of BIM Deliverables as defined in section 7. MODEL ELEMENT TABLE of the BIM EP which will define the model element's progression. The MEA columns for the Project Stakeholder Document Review and the Conformed Design Intent BIM must be completed. The LOD column for the Project Stakeholder Document Review must be completed for the Design Phase. The LOD and MEA columns must be completed for the Trade Coordination BIM. The matrix will also be responsible for those specific elements throughout the duration of the project. The project's Design and Construct Model Managers will use the information in section 2. PROJECT SCHEDULE AND MILESTONES of the BIM EP as the basis for outlining the project specific model progression and authoring responsibilities.

While the BIMForum LOD Specification defines the minimum geometric requirements, section 5.2.3. Model Development, Quality and Additional Modeling Requirements of the BIM PDS outlines additional model development and quality requirements for components, systems and assemblies which have been outlined below and in the notes tab of the Asset Tagging & LOD Matrix of BIM Deliverables document. Section 5.3. Non-Graphic Building Information (Asset Worksheets) of the BIM PDS outlines the required spatial and asset information to be included in the project deliverables. Any project specific criteria and deviations should be documented in the project specific BIM EP.

5.2.3. Model Development, Quality and Additional Modeling Requirements

- All rooms/spaces should be hosted to the floor level in which they contribute to the net and/or gross building square footage for, as outlined in section 10. FLOOR/LEVEL AND ELEVATION NAMING CONVENTIONS of the BIM EP. In addition, all rooms/spaces should have their upper limits set to the floor above with a limit offset of 0'-0".

- All assets required to be exported to Asset Worksheet as indicated in the Asset Tagging & LOD Matrix of BIM Deliverables shall be hosted to an approved floor level as outlined in section 10. FLOOR/LEVEL AND ELEVATION NAMING CONVENTIONS of the BIM EP.
- Interior taggable assets must be associated with a room or space location for the OSU Asset Export application, as referenced in the OSU Asset Export User Guide.
- There shall be no unplaced or redundant rooms or spaces.
- All room (net) square footages will be computed from the interior finish face of walls.
- All gross building square footages will be computed from the outside face of the exterior walls of building. For more information refer to the Gross Area definition on the National Center for Education Statistics website: Gross Area Definitions.
- Project Teams will take advantage of the Asset Tagging & LOD Matrix of BIM Deliverables in section 7. MODEL ELEMENT TABLE of the BIM EP to define ownership of Model Elements in order to have only one representation of components, systems or assemblies in the model (i.e. there should not be a light fixture in both the architectural and electrical model).
- All building components, systems and assemblies (required to be modeled per the Asset Tagging & LOD Matrix of BIM Deliverables) shall have every instance modeled and maintained throughout both the Design and Construct phase including, but not limited to, repetitive rooms and conditions. No “typicals” or “prototypes” shall be referenced across the entire building.
- (Required by time of Interim and Final Asset Worksheet submission) All assets required to be exported as indicated in the Asset Tagging & LOD Matrix of BIM Deliverables shall have clear and descriptive family names indicating what the component is, especially those in the generic models category. If using manufacturer’s families where the name is a brand name or model number or some other identifier that is not easily recognizable, edit the family and/or type name to include a descriptive term.
- Avoid using families that were not created in Revit. Geometry that was created in Sketchup, 3D AutoCAD, etc, should not be used inside a Revit model where possible.
- Limit the use of model-in-place families to items that are unique. As a best practice, items that occur more than twice should be loadable families, not model-in-place families. For legitimate model-in-place families, all modeled components (extrusions, sweeps, etc.) for a single item (a custom reception counter, for example) should be created in the same family.
- (For Interim Conformed Design Intent Model deliverables only) When plumbing families (sinks, toilets, urinals, showers, tubs, drinking fountains, or eyewash stations) are nested inside of another family, they should be shared so as to be schedulable.
- (For Interim Conformed Design Intent Model deliverables only) Remove all demolished components from the models.

5.2.4. Conformed Design Intent BIMs Definition

The design team members working in coordination with the construct team members shall conform their Design Intent BIMs with all the information that is released by the design team throughout the course of the bidding and construction processes. This would include but not be limited to all addenda, bulletins/proposal requests, supplemental sketches (ASIs), construction change directives (CCDs), Requests for Information (RFIs), and change orders (COs). Project deliverables shall follow the standards outlined in section 4.3.3. Design and Construct Final Turnover of the BIM PDS and its subsequent sections.

## 5.3. Non-Graphic Building Information (Asset Worksheet)

In addition to the geometric output described as part of the model's progression in section 5. BIM DELIVERABLE DEVELOPMENT of the BIM PDS, there is a significant focus on the capturing of non-graphic information that will be critically important to the application of the BIM by the University during the Operate and Plan phases of their facility's lifecycle. This evolution of data will be realized by recording all spatial and asset information via both the BIMs and the Asset Worksheet (as outlined in section 4.3.4. BIM Project Delivery Standards Process Map of the BIM PDS) providing the needed interoperability to share information across campus.

Information on which building components, assemblies and systems will have information attached to them via the Asset Worksheets are identified in the Asset Tagging & LOD Matrix of BIM Deliverables spreadsheet.

The Interim Asset Worksheet shall be prepared at the conclusion of 3D coordination by the AE. Instructions on how to develop the Asset Worksheet using the OSU Asset Exporter Toolkit are available as part of the OSU BIM PDS Tools. This Asset Worksheet will be turned over to the University and to the Construct Team. Additional information on the Asset Tagging workflow can also be found here.

The Construct Team will then fill in the remaining information (noted in section 5.3.1. Facility Information Matrix). The submission of this Final Asset Worksheet is due to the University by the (Partial or Permanent/Final) Certificate of Occupancy.

The following Facility Information Matrix identifies the specific Property, Building, Floor, Room and Asset parameters required by the University to take advantage of during the Operate Phase of the building Lifecycle.

- Parameters marked with (*) denote that data is expected to be originated from the BIM and is capable of being exported to the Interim Asset Worksheet by the AE
- If the parameter is not marked with (*) it will be populated by the Construct Team in the Final Asset Worksheet.
- The additional columns mark when data is expected to be populated in either the BIM or Asset Worksheet. Subsequent project milestones will require Project Teams to verify, updated and/or provide additional data as it becomes available.

5.3.1. Facility Information Matrix

| Parameter | Project Stakeholder Document Review | Interim Asset Worksheet | Final Asset Worksheet |
|---|---|---|---|
| **Building** | | | |
| Building Number* | X | X | X |
| OSU Project Number* | X | X | X |
| **Floor** | | | |
| Floor Number* | X | X | X |
| **Room** | | | |
| Room Number* | X | X | X |
| Area* | X | X | X |
| **Asset** | | | |
| OSU Asset ID | | | X |
| Revit ExtIdentifier* | | X | X |
| Revit Element ID | | X | X |
| Revit Name | | X | X |
| Asset Description* | | X | X |
| Building Number* | | X | X |
| Floor Number* | | X | X |
| Room Number* | | X | X |
| Serial Number | | | X |
| Manufacturer | | | X |
| Model Number | | | X |
| Warranty Guarantor Parts | | | X |
| Warranty Start Date | | | X |
| Warranty End Date | | | X |
| Spec Section Number | | | X |

## 5.4. Model Ownership and Intellectual Property Rights

5.4.1. Model Ownership

Model Ownership means that in contributing content to the Model, the Model Element Author does not convey any ownership right in the content provided or in the software used to generate the content. Any subsequent Model Element Author's and Model User's right to use, modify, or further transmit the Model is specifically limited to the design and construction of the Project, and nothing else either written or implied conveys any other right to use the Model for another purpose.

5.4.2. Intellectual Property Rights

Upon execution of an Agreement, the Model Author grants to The Ohio State University a nonexclusive license to use the BIM solely and exclusively for purposes of constructing, using, maintaining, altering and adding to the Project. The Model Author shall obtain similar nonexclusive licenses from its sub-consultants consistent with the Agreement. The license granted under this section permits The Ohio State University to authorize the Contractor, Subcontractors, Sub-subcontractors, and material or equipment

suppliers, as well as the University's consultants and separate contractors, to use applicable portions of the BIM solely and exclusively for use in performing services, during the Construct and Operate Phases of the project's lifecycle. The Model Element Author, in turn will not reuse the BIM on other Projects with the exception of the individual Model Elements pre-existing in the Model Element Author's proprietary Model Element Library.

## 6. GLOSSARY, ABBREVIATIONS, ACRONYMS

**2D Supplementation** – The process of adding two-dimensional (2D) overlaid information to the base views created by the BIM authoring application. This process is typically used when paper-based project deliverables are required in a BIM-enabled workflow.

**2D Standalone** – The process in which plans, sections and elevations are developed in a two-dimensional (2D) application without a relationship to the elements derived from a BIM authoring application.

**BACnet –** Building Automation and Control Networks. BACnet is "a data communication protocol for building automation and control networks." A data communication protocol is a set of rules governing the exchange of data over a computer network. The rules take the form of a written specification (in BACnet's case they are also on compact disk) that spells out what is required to conform to the protocol (BACnet ASHRAE SSPC 135).

**BAS** – Building Automation System

**BIM** – (Building Information Model/Models/Modeling) BIM is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life cycle; defined as existing from earliest conception to demolition. A basic premise of BIM is collaboration by different stakeholders at different phases of the life cycle of a facility to insert, extract, update or modify information in the BIM process to support and reflect the roles of those stakeholders. *(National Building Information Model Standard Project Committee)*

**BBI** – The Buckeye BIM Initiative (BBI) comprised of both BIM for Existing Buildings and BIM for Design & Construction.

**BIMForum's Level of Development (LOD) Specification** – https://bimforum.org/resources/.

**BIM PDS** – BIM Project Delivery Standard

**BIM EP** – BIM Execution Plan

**BIM Use Case** – Specific BIM-enabled goals, opportunities and/or processes where BIM will be taken advantage of to complete a project specific task.

**CAD** – AutoCAD

**CAFM** – Computer-Aided Facility Management

**CMMS** – Computerized Maintenance Management System

**Construct** – Refers to the building entity (or lifecycle phase) which can include but is not limited to: Design Builder (DB), Construction Managers at Risk (CMc), General Contractors (GC) or Trade Contractors (TC). At a minimum this should include Sheet Metal Ductwork, Plumbing, HVAC Piping, Electrical, Fire Protection, Kitchen Equipment, Pneumatic Tube, Conveying Equipment, Drywall Framing, Misc Metal, and Steel Fabrication Contractors.

**EMS** – Energy Management Systems

**FCI** – Facility Condition Index (FCI) is the University's method to benchmark the Architectural, Structural and MEP systems of a building for future capital planning investments and deferred maintenance.

**FSS** – File Sharing & Storage

**GIS** – Geographic Information System

**gbXML** – Green Building XML is an open schema that helps facilitate the transfer of building properties stored in 3D building information models (BIM) to engineering analysis tools. (www.gbXML.org)

**Interoperability** – The NIST GCR 04-867 Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry report defines interoperability as the ability to manage and communicate electronic product and project data between collaborating firms' and within individual companies' design, construction, maintenance, and business process systems.

**LOD** – Level of Development is the degree to which the element's geometry and attached information has been thought through – the degree to which project team members may rely on the information when using the model. Not to be confused with Level of Detail which is essentially how much detail is included in the model element. Level of Detail can be thought of as input to the element, while Level of Development is reliable output.

**Model Authoring –** The use of applications for the production of Design Intent BIMs, Trade Coordination BIMs and Shop/Fabrication BIMs rendering a 3D solid model and able to be exported to OSU's Asset Worksheet format. Any deviations from this core BIM Authoring definition need to be approved by the Facilities Operations and Development Project Manager (FOD PM).

**Model Element** – A portion of the BIM representing a component, system, or assembly within the three-dimensional representation in electronic format, which may also include specific information or parametric data that will enable the object to achieve the purpose of its intended use.

**Model Element Author** – A Model Element Author (MEA) is the party responsible for developing the content of a specific Model Element to the Level of Development (LOD) required for a particular phase of the project.

**Model Manager** – Project team members in charge of providing overall adherence to the BIM PDS as cited in the section 4. BIM PROJECT PARTICIPANTS of the BIM EP.

**Model User** – Any individual or entity authorized to use the Model on the project, for such things as analysis, coordination, estimating or scheduling.

**O&M** – Operations & Maintenance

**PM** – Project Manager

**PoR** – Program of Requirements

**.RVT** – An .RVT file should consist of native Autodesk Revit content such as, but not limited to, levels, grids, systems, families and rooms developed to the appropriate Level of Development as outlined in section 5.2.2. LOD of BIM Deliverables of the BIM PDS. Individual geometric elements in the .RVT file should be relational, parametric, schedulable, selectable, editable, and inclusive of data outlined in section 5.3.1. Facility Information Matrix of the BIM PDS.

**SIMS** – Space Information and Management System is a CAFM solution that manages all of the spatial data about buildings on campus. This specific application is EvolveFM.

## FILE CHANGE LOG

| Date | Changes |
|---|---|
| 12.29.2015 | • Updated Author and Contributor job titles<br>• Updated reference to 2015 BIMForum LOD specification from 2013 BIMForum LOD Specification |
| 11.16.2016 (Version 2) | Project Delivery Standard<br>• Clarified that most models should be noted as plural throughout<br>• Clarified the preferred use of Revit at the outset of the project<br>• Terminology cleanup<br>• References added to the newly developed LOD Matrix of BIM Deliverables spreadsheet. This spreadsheet includes some of the requirements that were previously contained in this document (sections 5.2.2, 5.2.3.1 (now section 5.2.3))<br>• Requirements regarding the submission date of the BIM Execution Plan have been added to section 4.2<br>• Requirement regarding the submission date of all digital documentation has been added to section 4.3.3<br>• Clarity on the requirement to submit both Native **and** IFC files and/or Revit **and** IFC files in section 5.1.3<br>• Removal of the use of LOD 500<br>• Removal of original section 5.2.3 Model Quality, as these expectations are already noted in the LOD definitions<br>• Note in section 5.2.3 to preclude the use of typicals or prototypes in the models<br>• Added a column in section 5.2.1 noting which fields are the responsibility of the university<br>• Removal of section 5.3.2 as applicable information has been moved to the LOD Matrix of BIM Deliverables spreadsheet<br>• Updated references to 2016 BIMForum LOD specification from 2015 BIMForum LOD Specification<br>• Full and detailed change log is available upon request<br>BIM Execution Plan<br>• Clarified that most models should be noted as plural throughout<br>• Clarity on the requirement to submit both Native **and** IFC files and/or Revit **and** IFC files in sections 2.2 and 6<br>• Clarity on what is expected in section 3 and 6.2<br>• Cleanup of section 5 to no longer reference specific software version<br>• Addition of section 6.3 Model Collaboration Strategy and Workflow Diagrams<br>• Moved contents of section 8 to LOD Matrix of BIM Deliverables spreadsheet and expanded table to UniFormat level 4<br>• Clarified elevations should be set to above sea level in section 11<br>• Full and detailed change log is available upon request<br>LOD Matrix of BIM Deliverables spreadsheet<br>• New document that simplifies the entry of LOD information. Is required to be submitted along with BIM Execution Plan at each submittal of the document |
| 1.1.2018 (Version 3) | Project Delivery Standard<br>• No longer requiring any drawing deliverables from Construct team<br>• Sustainability and Design Simulation use cases have been combined (2.3.6) |

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| | • CDIBs is not a use case, so that has been moved to a different section<br>• Addition of the Closeout Coordinator position (3.3)<br>• Release of OSU BIM PDS Tools, reflected in updates to 4.1<br>• Significant changes to required deliverables as noted in 4.3 and 5.1.3<br>• Upper limit requirement for spaces added in 5.2.3<br>• COBie and Asset Worksheet process has been reworked as noted in 5.3<br>BIM Execution Plan<br>• Changes to deliverables and use cases noted in PDS reflected in updates throughout BEP<br>• Addition of Closeout Coordinator role in 4.2<br>• Combination of previous sections 5 and 6 for simplification<br>• Requirement regarding the version of Revit required added in section 5<br>• Combination of sections 5 and 6 in EP to simplify and further simplification within new section 5<br>• Clarification and updates to how the model coordinates and elevations should be implemented in the models in sections 8 and 10<br>• Simplification of documentation of naming structure in 9.1<br>LOD Matrix of BIM Deliverables<br>• Add the ability to filter to the locked version of the spreadsheet |
| 3.8.2018 (Version 3) | Changed "(Temporary or Permanent/Final) Certificate of Occupancy" to "(Partial or Permanent/Final) Certificate of Occupancy" to match State of Ohio terminology changes |
| 1.1.2019 (Version 4) | Project Delivery Standard<br>• Updated the timeline for initial and updates to BIM EP deliverable due dates (4.2)<br>• Clarified the 75% construction completion deliverable expectations (4.3.3)<br>• Clarified the acceptable naming conventions for floor names (5.1.1)<br>• Removed the IFC file type deliverables (throughout)<br>• Added two additional requirements in 5.2.3: unplaced/redundant rooms and descriptive family names<br>• Other minor clarifications and edits<br>BIM Execution Plan<br>• Added the Structural BIM to the 75% construction deliverable (2.2)<br>• Moved the BIM Goal required/optional documentation to the RFP/RFQ (Section 3)<br>• Adjusted BIM Goals to handle for less than $4m projects (Section 3)<br>• Added a requirement for the angle to true north not exceeding 180 degrees (Section 8)<br>• Other minor clarifications and edits |
| 1.23.2020 (Version 2020) | Project Delivery Standard<br>• Version numbers changed to years<br>• 75% Construction Conformed Design Intent Models now called Interim Confirmed Design Intent Models and due 2-4 months prior to occupancy (4.3.1, 4.3.3, 5.1.3)<br>• Design Intent BIMs are no longer required to be turned over to OSU, but are required to be made available to the Construct Team (4.3.1)<br>• Project Base Point no longer needs updated in the model with survey grade coordinates, but must be supplied when Interim Design Intent Models are submitted (4.3.3)<br>• Penthouse has been added as valid floor name and clarification on use of ground floor has been added (5.1.1)<br>• Removed Revit Model Checker Results submittal at CD (5.1.3) |

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| | • A number of changes in expectations around Revit modeling requirements, specifically bullet 2 and 8-12. (5.2.3)<br>• The macro to convert COBie spreadsheet to Asset worksheet should now be run by the AE, not OSU (5.3)<br>• Other minor clarifications and edits<br>BIM Execution Plan<br>• Expected Due Dates column added. Modifications to deliverables (2.2)<br>• Project Base Point coordinates no longer required in BEP. Updated instructions on how to handle Project Base Point and model origin (8)<br>• Project Base Point must be noted in Building Key Plan (9.2)<br>LOD Matrix of BIM Deliverables<br>• Removal of project team participants on first tab. Addition of project name/number/primary AE on first tab<br>• Removal of requirement to model sprinkler head placement in LOD Note 4<br>• Addition of Asset Tag and COBie Notes GGG |
| 6.7.2021 (Version 2021) | Project Delivery Standard<br>• Removed references to COBie throughout<br>• Updated references and instructions regarding the new OSU Asset Exporter Toolkit (4.1, 5.3)<br>• Specified which rule set should be used for the Revit Model Checker depending on submittal (4.3.1)<br>• Adjusted where to find when final project documentation should be delivered (4.3.3)<br>• Updated Process Map (4.3.4)<br>• Moved chart in 5.1.3 to the BIM EP<br>• Clarified expectations for use of MEA and LOD columns in the LOD Matrix of BIM Deliverables (5.2.2)<br>• Updated Facility Information Matrix to include changes/additions to Asset Worksheet (5.3.1)<br>• Other minor clarifications and edits<br>BIM Execution Plan<br>• Removed LEED Criteria (1)<br>• Adjustments to rule sets, submittals, and dates in the Project BM Deliverable Schedule (2.2)<br>• Removed references to COBie throughout.<br>• Minor adjustments to BIM Meeting Procedures terminology (6)<br>• Updated links to LOD Matrix (7)<br>LOD Matrix of BIM Deliverables<br>• Added LOD Note 22<br>• Updated Asset Tag Notes N, S, and RR<br>• Removed Asset Tag Note GGG (Fire Extinguishers) |
| 5.1.2022 (Version 2022) | Project Delivery Standard<br>• Updated Design Model Manager to include (ACC) responsibilities (3.4)<br>• Updated Process Map (4.3.4)<br>• Updated to include BIM Collaboration Hub/Model Sharing Platform (4.3.5)<br>• Updated LOD Specification Version (5.2.1,6)<br>• Updated to include room calculation point parameter for all assets (5.2.3)<br>• Other minor clarifications and edits<br>BIM Execution Plan |

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| | • Updated to include ACC addition (5.1)<br>LOD Matrix of BIM Deliverables<br>• Clarification to Asset Tag Notes N, U<br>• Remove asset tag requirement for D1010.10 – Elevators<br>• Removed note GGG from D4030.10 – Fire Protection Cabinets<br>• Add asset tag requirement for D4030.30 – Fire Extinguishers & D5040.10 – Lighting Control<br>• Added model requirement for G2020.40 – Parking Lot Appurtenances<br>• Added LOD Note 23<br>LOD Matrix of BIM Deliverables – Wexner Medical Center<br>• Clarification to Asset Tag Notes BBB, N, SS, U<br>• Removed Asset Tag Note VV<br>• Removed asset tag requirement for D1010.10 – Elevators<br>• Added asset tag requirement for D5040.10 – Lighting Control<br>• Added model requirement for G2020.40 – Parking Lot Appurtenances<br>• Added LOD Note 23 |
| 2.1.2023 (Version 2023) | Project Delivery Standard<br>• Updated naming for Asset Worksheets (1)<br>• Removed LOD 500 (2.3.1)<br>• Updated LOD Matrix of BIM Deliverables to Asset Tagging & LOD Matrix of BIM Deliverables throughout<br>• Updated Sustainable Design Policy (2.3.6)<br>• Added Revit version requirements to be followed throughout the project (4.3.5)<br>• Updated Fundamental LOD Definitions to version 2022 (5.2.1)<br>• Other minor clarifications and edits<br>BIM Execution Plan<br>• Updated Asset Worksheet naming (2.2, 6)<br>• Updated Revit version requirement (5)<br>• Updated LOD Matrix of BIM Deliverables to Asset Tagging & LOD Matrix of BIM Deliverables throughout<br>• Other minor clarifications and edits<br>LOD Matrix of BIM Deliverables<br>• Updated file name to Asset Tagging & LOD Matrix v2023<br>• Updated Fundamental LOD Definitions to version 2022<br>• Added asset tag requirement for D2010.90 - Domestic Water Distribution Supplementary Components<br>• Added asset tag requirement for D2020.30 - Sanitary Sewerage Piping<br>• Added asset tag requirement for D2020.90 - Sanitary Drainage Supplementary Components<br>• Added asset tag requirement for D5040.50 – Lighting Fixtures<br>• Added asset tag requirement for G3010.10 – Site Domestic Water Distribution<br>• Clarification to Asset Tag Notes K, N, W<br>• Added Asset Tag Notes AA, BB, CC, DD<br>• Other minor clarifications and edits<br>LOD Matrix of BIM Deliverables – Wexner Medical Center<br>• Updated file name to Asset Tagging & LOD Matrix v2023-Wexner Medical Center<br>• Updated Fundamental LOD Definitions to version 2022 |

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| | • Remove asset tag requirement for D1010.50 – Dumbwaiters<br>• Added asset tag requirement for D2020.30 - Sanitary Sewerage Piping<br>• Added asset tag requirement for D2020.90 - Sanitary Drainage Supplementary Components<br>• Removed note MM, from D3030.70 – Decentralized Cooling<br>• Clarification to Asset Tag Notes A, D, K, CC, SS, WW<br>• Replaced existing Asset Tag Note MM<br>• Other minor clarifications and edits |
| 1.1.2024 (Version 2024) | Project Delivery Standard<br>• Added approval requirement for design teams intending to utilize modeling platforms other than Revit (2.3.1)<br>• Clarified the functionality requirement of a RVT deliverable (4.3.3)<br>• Updated LOD Specification Version (5.2.1)<br>• Clarified requirement to associate assets with rooms; removed requirement to enable room calculation points.<br>• Removed IFC from the glossary (6)<br>• Other minor clarifications and edits<br>BIM Execution Plan<br>• Removed technology centric object enabler table (5)<br>• Clarified datum reference (8)<br>• Other minor clarifications and edits<br>LOD Matrix of BIM Deliverables<br>• Added asset tagging requirement for C1030.30 – Interior Folding Doors<br>• Added asset tagging note EE for D4030.10 – Fire Protection Cabinets<br>• Clarification to Asset Tag Note A<br>• Added Asset Tag Note EE<br>• Other minor clarifications and edits<br>LOD Matrix of BIM Deliverables – Wexner Medical Center<br>• Added asset tagging requirement for B3060.50 – Vents and Hatches<br>• Added asset tagging requirement for C1030.40 – Interior Coiling Doors<br>• Remove asset tag requirement for D7010.10 – Access Control<br>• Added asset tagging requirement for F1050.20 – Interior Fountains<br>• Added asset tagging requirement for F1050.30 – Interior Water Features<br>• Added asset tagging requirement for G2060.10 – Exterior Fountains<br>• Clarification to Asset Tag Notes A, E, GG<br>• Other minor clarifications and edits |
| 2.1.2025 (Version 2025) | Project Delivery Standard<br>• Clarified collaboration hub requirement (3.4)<br>• Added collaboration hub requirement (3.5)<br>• Updated eBuilder to the University's project management software<br>• Added Autodesk Bridge requirement (4.3.5)<br>• Added BIMForum LOD Expansion (5.2.1)<br>• Other minor clarifications and edits<br>BIM Execution Plan<br>• Updated eBuilder to the University's project management software<br>• Prepopulated OSU contact and role information (4.2)<br>• Added OSU ACC project participants (5.1) |

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| | • Prepopulated Location (6)<br>• Other minor clarifications and edits<br>LOD Matrix of BIM Deliverables<br>• Added BIMForum LOD Expansion<br>• Clarification to Asset Tag Notes A, I, P<br>• Other minor clarifications and edits<br>LOD Matrix of BIM Deliverables – Wexner Medical Center<br>• Added BIMForum LOD Expansion<br>• Clarification to Asset Tag Notes A<br>• Other minor clarifications and edits |