THE OHIO STATE UNIVERSITY

BIM Project Delivery Standard

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ACKNOWLEDGEMENTS

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As the building industry continues to evolve, design and construction 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.

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1. INTRODUCTION

1.1. INTRODUCTION & PURPOSE – BIM PROJECT DELIVERY STANDARDS

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.

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

- BIM Execution Plan (BIM EP)
- Conformed Design Intent Model
- Record Construction Model
- COBie Worksheet

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 (**) 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 BIM Execution Plan (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.

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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 Facility Condition Index (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 BIM*

Model Authoring is a requirement for all projects. The entire Design Team will utilize a BIM authoring platform such as (but not limited to) Autodesk Revit, Bentley AECOsim Building Designer or Graphisoft ArchiCAD to virtually design, simulate and construct all facilities at The Ohio State University.

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 500 components, assemblies and systems, which will be included in the final Turnover Deliverables, will be achieved in accordance with the BIMForum LOD Specification definitions and the LOD Matrix of Deliverables in Section 5.2.2. (LOD of BIM Deliverables of the BIM PDS). 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 Building Information Models (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, Primary A/E shall define a strategy to field verify all existing building conditions.

This 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 prior to the One University Design Review.

The accurate documentation of spatial information will serve as a foundation for future model-based project deliverables including the Facility, Floor and Space data in the COBie 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 Architect and Engineer'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 8. (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 Reviews*

Model Sharing should not be limited to just the AEC team members. During the design process (in addition to the One University Review) the project teams should engage key University stakeholders in an on-going Model Review process. These Model Reviews should occur through regularly scheduled model sharing transmissions (via project collaboration websites) as well as at in-person model-based reviews, similar to the One University Design Review outlined in Section 4. (BIM Deliverables of the BIM PDS) (4.3.1. Design). Project Teams will be responsible for documenting how models will be shared with the University in Section 6. (Model Collaboration, Transmission and Permitted Use Strategies) as well as when and where this will occur in conjunction with the overall project schedule in Section 7. (BIM Meeting Procedures of the BIM EP).

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

In support of the University's Green Build and Energy 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 Energy Services and Sustainability 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.

2.3.7. Design Simulation/Analysis**

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, Dayligting Simulation, Traffic and Pedestrian simulations or Wayfinding studies to name a few. Where additional simulation and analysis applications are intended to be used by the Design Teams, they shall be described in the BIM EP.

2.3.8. 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 8. (Model Element Table in 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.

2.3.9. Conformed Design Intent BIM*

The Design Team members shall conform their Design Intent Models 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, Supplemental Sketches (ASIs), Construction Change Directives (CCDs) and Change Orders (COs). Project Deliverables shall follow the standards outlined in Section 4.3.3. (Design and Construct Final Turnover) and its subsequent sections.

2.4. CONSTRUCT

2.4.1. Model Authoring – Trade Coordination BIM*

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 prior to field installation.

These models shall be managed by the Construct Model Manager and will become part of the Record Construction BIM Deliverables at the end of the project as outlined in Section 4. (BIM Deliverables of the BIM PDS). Additional Model Development requirements and Model Element Author responsibilities will be defined by the Construct Model Manager as identified in Section 8. (Model Element Table of the BIM EP).

2.4.2. Model Authoring – Shop/Fabrication BIM**

The continued evolution of the Trade Coordination BIM 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 BIM so that it can be included in the Clash Detection process. These models shall be managed by the Construct Model Manager and will become part of the Record Construction BIM deliverables at the end of the project, as outlined in Section 4. (BIM Deliverables of the BIM PDS).

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 item 2.3.8. (Clash Prevention) BIM Use Case which 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 model geometry with project schedule milestones and durations. The ability to visually plan, communicate and simulate these activities within the context of time and space prior to 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 8. (Model Element Table of the BIM EP) will be addressed to assure that the Model Element

Author 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, such as 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, such as but not limited to, pedestrian and traffic flow, utility tie-ins and other temporary installations that impact adjacent facilities and building access.

2.4.7. Record Construction BIM*

The Construct Team Members shall record and document all revisions including but not limited to design alterations and/or field modifications that have occurred throughout the course of the Construct process. Project deliverables follow the standards outlined in Section 4.3.3. (Design and Construct Final Turnover of the BIM PDS) and its subsequent sections.

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 model (Conformed Design Intent BIM and Record Construction BIM) and data (COBie Worksheet) 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 (see Section 5.3.2. of the BIM PDS) and inventory tagging structure, the University will integrate this information back to the geometry in the building information models it receives. This 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, as well as 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 Facility Condition Index.

2.5.2. Space Management

Physical Planning and Real Estate (PPARE) 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 Building Information Model format and COBie structure 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 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 and Energy Management Systems (BAS and EMS), which rely on 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 Energy Management System applications from the Office of 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 the Building Information Model and its data to optimize systems performance while reducing energy consumption across campus in support the University's Climate Action Plan.

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 been 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 BIM Use Case). The information to be captured by design and construction team will be in accordance with Appendix E: Requirements for Survey Information of the Building Design Standard 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.

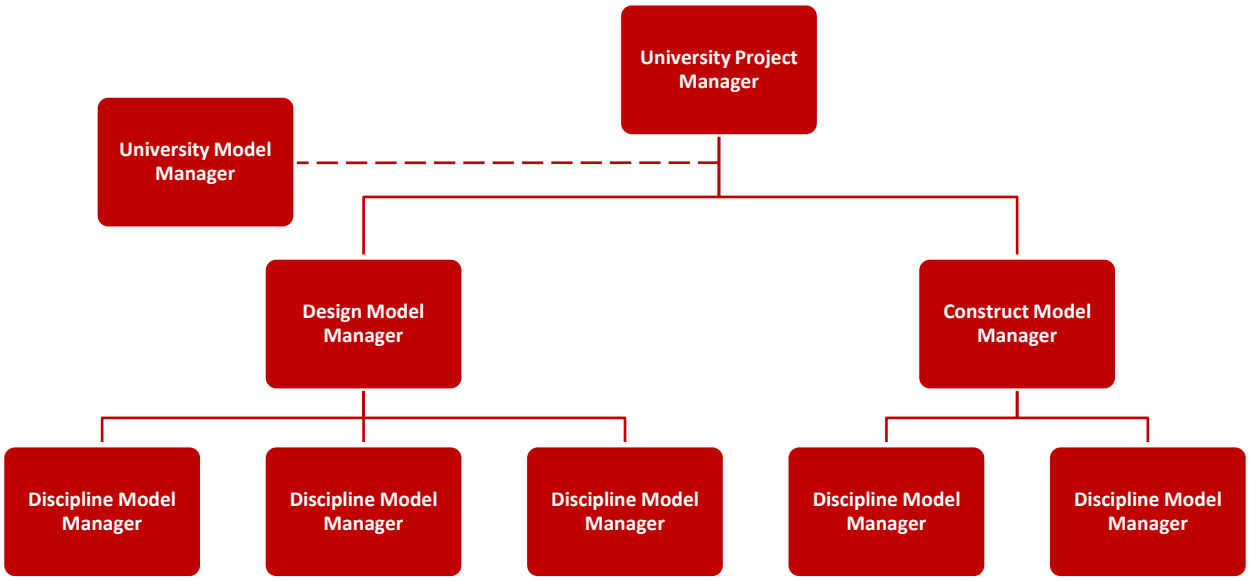
2.5.5. Document Management (Archives)

Project File deliverables and their accessibility within the University's Archives Website is an important part of the Plan > Design > Construct > Operate continuum. The Archives 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, not only for internal University staff, but also 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 as well as in Section 5.1. (Model Naming Conventions, Formats & Turnover Process of this 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 Project Delivery Standard (BIM PDS) and documented in the BIM Execution Plan (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 and the University, Design and Construct Model Managers, along with Discipline Model Managers, will be cited in Section 4. (BIM Project Participants of the BIM EP).

BIM PROJECT PARTICIPANT STRUCTURE *(figure 1)*



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 which 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 One University Design Review as outlined in Section 2. (Project Schedule and Milestones) and Section 7. (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. 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 Managers 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).

3.4. 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 Managers 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).

3.5. 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 Building Information Models (BIM) in accordance with the BIM Project Delivery Standard (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 Project Execution Plan (BIM EP).
- Building Information Models (in an .RVT format) of existing facilities will be made accessible from the University Archives Website (where available) along with other models, drawings and specifications of past projects for renovation, additions and use in connecting to adjacent facilities.
- Geographic Information System (GIS) referenced Project Base Point Coordinates and Elevations will be shared by the University Project Manager in accordance with and documented in Section 9. (Model Coordinate Systems of the BIM EP).
- University Project Manager will assign/coordinate the information in Section 11. (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.
- Building Information Model Template (in an .RVT format) including required COBie Parameters and Schedules
- Building Information Model Template (in an .RVT format) including additional Space and Asset Parameters and Schedules as defined by the University.
- Model Validation Rule Sets and .IFC-based Model Checker rules sets for Solibri Model Checker will be made available for AEC team members to validate the compliance of models prior to submitting to the University.

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) as well as the 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 this BIM PDS).

The BIM EP will also 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.

4.3. DESIGN AND CONSTRUCT TEAM MEMBERS

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), as well as 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 One University 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 three-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 One University Review which will be defined in Section 2. (Project Schedule and Milestones) and Section 7. (BIM Meeting Procedures of the BIM EP).
  - The Design Intent BIMs shall also be made available for on-going review by University Project Team Members. These model sharing processes will be outlined in Section 6. (Model Collaboration, Transmission and Permitted Use Strategies of the BIM EP).
- Design Intent Models
  - In addition to the information outlined in Section 2. (BIM Use Cases of the BIM PDS) the design teams will be required to submit their Design Intent Models for each project discipline to the University as part of their Construction Documents package. These models will be made available to potential construction teams along with the two dimensional Construction Documents for their use in the bidding phase. The use of these models will be subject to the protocols defined in Section 6. (Model Collaboration, Transmission and Permitted Use Strategies of the BIM EP).

4.3.2. Construct

- Trade Coordination BIM and Shop/Fabrication BIM
  - At the completion of the project and as outlined in Section 2: (BIM Use Cases of the BIM PDS), Trade Coordination Models as well as Shop/Fabrication Models from each individual Construct Team Member will be required deliverables.

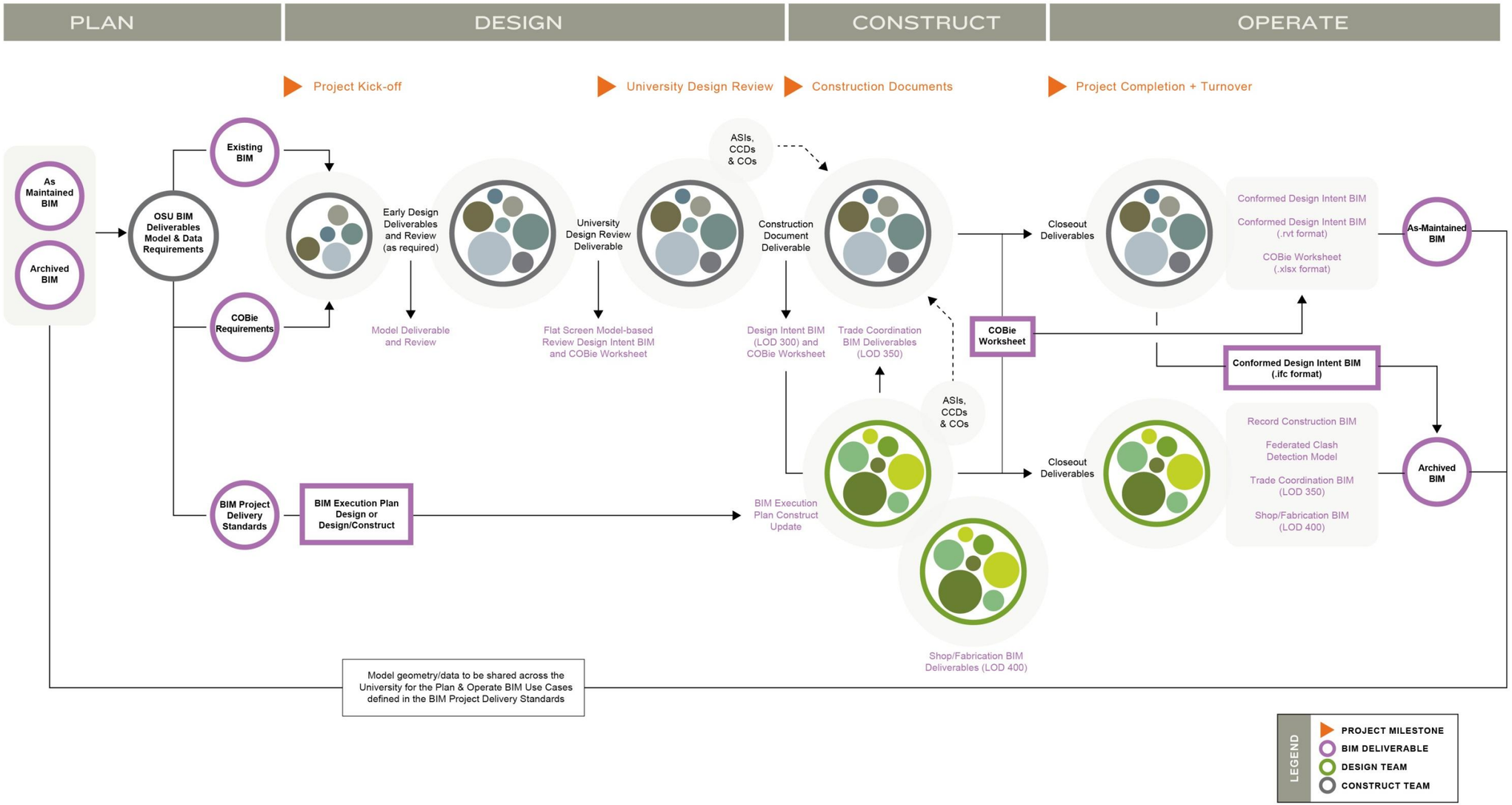
- Clash Detection and additional Model Review sessions throughout the Construct Phase will be defined in Sections 2. (Project Schedule and Milestones) and 7. (BIM Meeting Procedures of the BIM EP).

4.3.3. Design and Construct Final Turnover

- 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 by both the Design and Construct Team Members. 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.
  - Conformed Design Intent BIM
  - Record Construction BIM
  - COBie Worksheet (per Section 5.3. (Non-Graphic Building Information (COBie Worksheet) of the BIM PDS))

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 (which 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.



5. BIM DELIVERABLE DEVELOPMENT

5.1. MODEL NAMING CONVENTIONS, FORMATS & 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 Execution Plan (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 the that 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 the that 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-00000) defined by the University Project Manager then documented in Section 1: Project Information of the BIM EP.

Model Author:

- Standard Model Author abbreviations are outlined in Section 4.1. Model Authors 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 in Section 11. (Floor/Level and Elevation Naming Conventions of the BIM EP).

Building Area:

- If building areas are required to document the model, a Keyplan should be documented to support the model naming conventions in Section 10.2. (Building Keyplan 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
  or
- Building Number_OSU-Project Number_Model Author_Floor_Building Area_Deliverable.xxx

Abbreviation	Deliverable
DIB	Design Intent BIM
TCB	Trade Coordination BIM
SFB	Shop Fabrication BIM
CDIB	Conformed Design Intent BIM
RCB	Record Construction BIM
COBie	COBie 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

Below are the required files formats for project deliverables. 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" file formats in Section 2. Project Schedule and Milestones of the BIM EP.

BIM Deliverable	File Format
BIM Execution Plan – Design or Design/Construct	.docx
Design Intent BIM – Model Reviews	Native, .ifc
Design Intent BIM – Construction Documents	Native, .ifc
BIM Execution Plan – Construct Updates	.docx
Trade Coordination BIM	Native, .ifc
Shop Fabrication BIM	Native, .ifc
Conformed Design Intent BIM	.rvt, .ifc
Record Construction BIM	Native, .ifc
COBie Worksheet	.xlsx

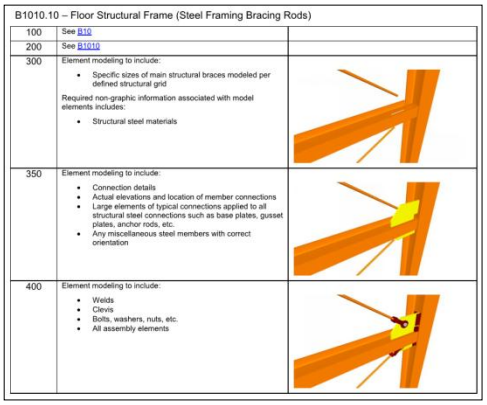
5.2. MODEL ELEMENT DEVELOPMENT

The BIMForum's Level of Development (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 Execution Plan (BIM EP)). The Level of Development 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	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 (i.e. cost per square foot, tonnage of HVAC, etc.) can be derived from other Model Elements.
LOD 200	The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
LOD 300	The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element.
LOD 350	The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the Model Element.
LOD 400	The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element.
LOD 500	The Model Element is a field verified representation in terms of size, shape, location, quantity, and orientation. Non-graphic information may also be attached to the Model Elements. For The Ohio State University the progression of model elements to this state will originate from the LOD 300 components, assemblies and systems developed for the Design Intent Models created by the Design Teams as illustrated in the Section 4.3.4. BIM Project Delivery Standards Process Map of the BIM PDS. The prescribed accuracy and tolerances of items are defined in Section 5.2.3. Model Quality of the BIM PDS while Section 5.3. Non-Graphic Building Information (COBie Worksheet) describes the needed non-graphic (spatial and asset) information that will be generated from the model.

The information above (with the exception of LOD 500 which is specific to The Ohio State University) is referenced from the BIMForum's Level of Development (LOD) Specification Version August 22, 2013. For additional information (similar to the image on the right) please reference the following link - http://bimforum.org/wp-content/uploads/2013/08/2013-LOD-Specification.pdf.



5.2.2. LOD of BIM Deliverables

The Design and Construct Teams are expected to progress their models to the appropriate Level of Development (LOD) as defined in Section 4.3.4. (BIM Project Delivery Standards Process Map) and documented in the LOD Matrix of BIM Deliverables (Section 5.2.2) of the BIM Project Delivery Standard (BIM PDS). This defines both the geometry and non-graphic information to be included in the Design Intent BIM and Conformed Design Intent BIM.

Design and Construct Model Managers will be responsible for completing the matrix in Section 8. (Model Element Table of the BIM EP) which will define the model element's progression. 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.

For simplicity the LOD Matrix of BIM Deliverables defines the appropriate model development as it relates to UniFormat Level 3 Class categories. Any additional Level 4 Classes will be subject to the minimum LOD definitions of their parent Level 3 Class category (i.e. D5080.10 Lightning Protection is a Level 4 Class that would be subject to requirements of its parent Level 3 Class which is D5080 Miscellaneous Electrical Systems). If a project requires additional model development beyond the outlined Level 3 Classes the project will include the additional Level 4 Classes in Section 8. (Model Element Table of the BIM of the BIM EP) and document the appropriate LOD and MEA for those categories.

For more information on UniFormat reference the following link http://www.csinet.org/Home-Page-Category/Formats/UniFormat.aspx

While the BIMForum LOD Specification defines the minimum geometric requirements, Section 5.2.3. (Model Quality of the BIM PDS) outlines the minimum accuracy and tolerance requirements for BIM-based model deliverables. Section 5.3. (Non-Graphical Building Information (COBie Worksheet)) outlines the required spatial and asset information to be included in the project deliverables.

LOD Matrix of BIM Deliverables					
		Design Intent BIM (CDs)		Conformed Design Intent BIM	
		LOD	COBie	LOD	COBie
A: SUBSTRUCTURE					
A10 Foundations					
A1010	Standard Foundations	300		300	
A1020	Special Foundations	300		300	
A20 Subgrade Enclosures					
A2010	Walls for Subgrade Enclosures	300		300	
A40 Slabs-on-Grade					
A4010	Standard Slabs-on-Grade	300		300	
A4020	Structural Slabs-on-Grade	300		300	
B:SHELL					
B10 Superstructure					
B1010	Floor Construction	300	X	500	X
B1020	Roof Construction	300	X	500	X
B1080	Stairs	300		300	

B20 Exterior Vertical Enclosures					
B2010	Exterior Walls	300	X	500	X
B2020	Exterior Windows	300	X	500	X
B2050	Exterior Doors and Grilles	300	X	500	X
B2070	Exterior Louvers and Vents	300		300	
B2080	Exterior Wall Appurtenances	300		300	
B2090	Exterior Wall Specialties	300		300	
B30 Exterior Horizontal Enclosures					
B3010	Roofing	300	X	500	X
B3020	Roof Appurtenances	300		300	
B3040	Traffic Bearing Horizontal Enclosures				
B3060	Horizontal Openings	300		300	
B3080	Overhead Exterior Enclosures	300		300	
C: INTERIORS					
C10 Interior Construction					
C1010	Interior Partitions	300	X	500	X
C1020	Interior Windows	300	X	500	X
C1030	Interior Doors	300	X	500	X
C1040	Interior Grilles and Gates	300		300	
C1060	Raised Floor Construction	300		300	
C1070	Suspended Ceiling Construction	300	X	500	X
C1090	Interior Specialties	300		300	
C20 Interior Finishes					
C2010	Wall Finishes				
C2020	Interior Fabrications				
C2030	Flooring				
C2040	Stair Finishes				
C2050	Ceiling Finishes				
D: SERVICES					
D10 Conveying					
D1010	Vertical Conveying Systems	300		500	X
D1030	Horizontal Conveying	300		500	X
D1050	Material Handling	300		300	
D1080	Operable Access Systems	300		300	
D20 Plumbing					
D2010	Domestic Water Distribution	300		500	X
D2020	Sanitary Drainage	300		300	
D2030	Building Support Plumbing Systems	300		500	X
D2050	General Service Compressed-Air	300		500	X
D2060	Process Support Plumbing Systems	300		300	
D30 HVAC					
D3010	Facility Fuel Systems	300		300	
D3020	Heating Systems	300	X	500	X
D3030	Cooling Systems	300	X	500	X
D3050	Facility HVAC Distribution Systems	300	X	500	X
D3060	Ventilation	300	X	500	X
D3070	Special Purpose HVAC Systems	300		300	

D40 Fire Protection					
D4010	Fire Suppression	300	X	500	X
D4030	Fire Protection Specialties	300	X	500	X
D50 Electrical					
D5010	Facility Power Generation	300	X	500	X
D5020	Electrical Service and Distribution	300	X	500	X
D5030	General Purpose Electrical Power	300	X	500	X
D5040	Lighting	300	X	500	X
D5080	Miscellaneous Electrical Systems	300		300	
D60 Communications					
D6010	Data Communications	300		300	
D6020	Voice Communications	300	X	500	X
D6030	Audio-Video Communication	300		300	
D6060	Distributed Communications and Monitoring	300	X	500	X
D6090	Communications Supplementary Components	300		300	
D70 Electronic Safety and Security					
D7010	Access Control and Intrusion Detection	300		300	
D7030	Electronic Surveillance	300		300	
D7050	Detection and Alarm	300	X	500	X
D7070	Electronic Monitoring and Control	300		300	
D7090	Electronic Safety and Security Supplementary Components	300		300	
D80 Integrated Automation					
D8010	Integrated Automation Facility Controls	300		300	
E: EQUIPMENT & FURNISHINGS					
E10 Equipment					
E1010	Vehicle and Pedestrian Equipment	300		300	
E1030	Commercial Equipment	300	X	500	X
E1040	Institutional Equipment	300	X	500	X
E1060	Residential Equipment	300		300	
E1070	Entertainment and Recreational Equipment	300		300	
E1090	Other Equipment	300		300	
E20 Furnishings					
E2010	Fixed Furnishings	300		300	
E2050	Movable Furnishings	300		300	
F: SPECIAL CONSTRUCTION & DEMOLITION					
F10 Special Construction					
F1010	Integrated Construction	300		300	
F1020	Special Structures	300		300	
F1030	Special Function Construction	300		300	
F1050	Special Facility Components	300	X	500	X

F1060	Athletic and Recreational Special Construction	300		300	
F1080	Special Instrumentation	n/a		n/a	
F20 Facility Remediation					
F2010	Hazardous Materials Remediation	n/a		n/a	
F30 Demolition					
F3010	Structure Demolition	n/a		n/a	
F3030	Selective Demolition	300		300	
F3050	Structure Moving	300		300	
G: BUILDING SITEWORK					
G10 Site Preparation					
G1010	Site Clearing	n/a		n/a	
G1020	Site Elements Demolition	n/a		n/a	
G1030	Site Element Relocations	300		300	
G1050	Site Remediation	n/a		n/a	
G1070	Site Earthwork	300		300	
G20 Site Improvements					
G2010	Roadways	300		300	
G2020	Parking Lots	300		300	
G2030	Pedestrian Plazas and Walkways	300		300	
G2040	Airfields	300		300	
G2050	Athletic, Recreational, and Playfield Areas	300		300	
G2060	Site Development	300		300	
G2080	Landscaping	300		300	
G30 Liquid and Gas Site Utilities					
G3010	Water Utilities	300		300	
G3020	Sanitary Sewerage Utilities	300		300	
G3030	Storm Drainage Utilities	300		300	
G3050	Site Energy Distribution	300		300	
G3060	Site Fuel Distribution	300		300	
G3090	Liquid and Gas Site Utilities Supplementary Components	300		300	
G40 Electrical Site Improvements					
G4010	Site Electric Distribution Systems	300	X	500	X
G4050	Site Lighting	300	X	500	X
G50 Site Communications					
G5010	Site Communications Systems	300		300	
G90 Miscellaneous Site Construction					
G9010	Tunnels	300		300	

5.2.3. Model Quality

The following chart outlines the minimum accuracy and tolerances for the BIM-based model deliverables.

BIM Deliverable	Tolerance (Size and Location)
Design Intent BIM	Accurate to +/- 1/8" of Design Intent Size Accurate to +/- 2" of Design Intent Location
Trade Coordination BIM	Accurate to +/- 1/16" of Design Intent Size Accurate to +/- 1" of Design Intent Location
Conformed Design Intent BIM	Accurate to +/- 1/8" of Design Intent Size Accurate to +/- 2" of Design Intent Location
Record Construction BIM	Accurate to +/- 1/16" of Design Intent Size Accurate to +/- 1" of Design Intent Location

Any project specific criteria and deviations should be documented in the project specific BIM Execution Plan (BIM EP).

5.2.3.1. Model Development and Quality Requirements

In addition to the minimum requirements outlined in the BIM Forum LOD Specification, additional model development and quality requirements for components, systems and assemblies have been outlined below.

UniFormat Section	Description
B20 Exterior Vertical Enclosures C10 Interior Construction	Although standard wall and ceiling individual framing members are not modeled, any atypical framing features required for tiered ceilings, soffits, curved walls, arched ceilings, etc. should be modeled to ensure there is enough available space for the additional framing/bracing for these components.
D30 HVAC	All ducts and air handling equipment shall be modeled to the outside face dimension.
D20 Plumbing D30 HVAC D40 Fire Protection	All piping shall be modeled to the outside diameter of the pipe adding insulation as its own entity where applicable or the pipe insulation, whichever is greater.
D50 Electrical	Conduits larger than ¾", and large groups of conduit ¾" (or less) in a particular location shall be modeled to reflect the overall space requirements.
D60 Communications	For telecommunication systems, at a minimum, all cable tray, wire managements hooks, conduit larger than ¾", and communication racks and cabinets shall be modeled. Large groups of conduit ¾" (or less) in a particular location shall be modeled to reflect the overall space requirements.
D70 Electronic Safety and Security	All components of the fire alarm system shall be modeled including all panels and devices with access zones and conduit larger than ¾". Large groups of conduit ¾" (or less) in a particular location will be modeled to reflect the overall space requirements.

5.2.3.2. 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 11. (Floor/Level and Elevation Naming Conventions of the BIM EP).
- 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: http://nces.ed.gov/pubs2006/ficm/content.asp?ContentType=Section&chapter=3&section=2&subsection=1.
- Project Teams should create geometry that is hosted and constrained to floor levels that define occupiable space. These floor levels will act as the major datums that define the structure and framework of the model/building as outlined in Section 11. (Floor/Level and Elevation Naming Conventions of the BIM EP).
- Project Teams will take advantage of the LOD Matrix of BIM Deliverables in Section 8. (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).

5.3. NON-GRAPHIC BUILDING INFORMATION (COBie WORKSHEET)

In addition to the geometric output described as part of the model's progression in Section 5. (BIM Deliverable Development of the BIM Project Delivery Standard (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 COBie Worksheet (as outlined in the 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 COBie Worksheets as identified in Section 5.2.2. (LOD of BIM Deliverables of the BIM PDS). 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 COBie Worksheet.
- If the parameter is not marked with (*) it can be populated directly in the COBie Worksheet.
- The additional columns mark when data is expected to be populated in either the BIM or COBie 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	One University Review	Design Intent BIM (CDs)	Conformed Design Intent BIM
Property			
Campus Name*	X	X	X
Building			
Building Number*	X	X	X
Building Name*	X	X	X
OSU Project Number*	X	X	X
OSU Utility Project Number*	X	X	X
Address*	X	X	X
City*	X	X	X
State*	X	X	X
Zip*	X	X	X
County*	X	X	X
Gross Area	X	X	X
GPS X Coordinate	X	X	X
GPS Y Coordinate	X	X	X
GPS Z Coordinates	X	X	X
Floor			
Floor Name*	X	X	X
Floor Number*	X	X	X
Floor Gross Area	X	X	X
Room			

Room Number*	X	X	X
Space ID*	X	X	X
Area*	X	X	X
Wall Finishes*		X	X
Ceiling Finishes*		X	X
Floor Finishes*		X	X
Asset			
Asset Tag*		X	X
Asset Description*		X	X
Asset Type*		X	X
Contractor			X
Replacement Tag			X
Serial Number			X
Manufacturer*		X	X
Model Number*		X	X
Model Name*		X	X
Warranty Start Date			X
Warranty End Date			X
Kilowatts*		X	X
Volts*		X	X
Phase*		X	X
O & M Documentation			X

For additional information on COBie, refer to the following link for the Whole Building Design Guide http://www.wbdg.org/resources/cobie.php. Additional resources on the best practices for translating BIM information into a COBie structure can be found on the "buildingSMART alliance information exchanges: Means and Methods" webpage: http://www.nibs.org/?page=bsa_cobiemm

5.3.2. Asset Descriptions & Group Numbers

The following Asset Description Matrix synchronizes the University's Asset Descriptions and Group Numbers with the UniFormat Codes that are referenced in the LOD Matrix of BIM Deliverables in Section 5.2.2. (LOD of BIM Deliverables in the BIM Project Delivery Standard (BIM PDS)). This information is being provided to assist project teams in the delivery of the prescribed model development for key assets being tracked across the University as well as coordinate the Asset Group Numbers and Asset Descriptions defined in Section 5.3. (Non-Graphic Building Information (COBie Worksheet) of the BIM PDS).

Asset Description	Asset Group #	UniFormat Code
Fire & Life Safety Systems	100	
Emergency Phones & Poles	101	D6020
Emergency Egress Light	102	D5040
Emergency Exit	103	D5040
Emergency Egress & Exit	104	
Fire Backflow Preventer	106	D4010
Fire Pump	107	D4010
Fire Air Compressor	109	D4010
Fire Panel	110	
Fire Annunciator/Panel	111	D7050

Fire Monitoring Point/Station	112	D7050
Fire Pull Stations	113	D7050
Fire Strobes & Horns	114	D7050
Fire Smoke Duct Detector	115	D7050
Fire Heat Duct Detector	116	D7050
Fire Smoke Detector	117	D7050
Fire Heat Detector	118	D7050
Fire Suppression (Ansul)	119	D4010
Fire Extinguishers	120	D4030
Fire Sprinkler Heads	121	D4010
Fire Sprinkler Pipe	122	D4010
Fire Stand Pipes	123	D4010
Fire Department Connections	124	D4010
Fire Smoke Evacuation Fans	125	D3060
Fire Stairwell Pressurization Fans	126	D3060
Fire Flow Switch	127	D4010
Fire Control Valve	128	D4010
Fire Inspector's Test Valve	129	D4010
Fume Hoods	130	D3060
Fire Damper	131	D3050
Fire Sprinkler System	132	D4010
Emergency Shower	140	D2010
Emergency Eye Wash	141	D2010
Fall Protection	150	
Fire Doors	160	C1030
Fire Alarm Valve	171	D4010
Fire Dry Valve	172	D4010
Fire Preaction And Deluge Valve	173	D4010
Fire Pressure Reducing Valve	174	D4010
Fire Line Strainer	175	D4010
Fire Hose Cabinet	176	D4010
Air Handler	200	D3050
Fan	201	D3050
Chiller	203	D3030
Condenser	204	D3030
Evaporator	205	D3030
Boiler	206	D3020
Deareator	207	D3020
Cooling Tower	208	D3030
Packaged HVAC Unit	209	D3020
Heat Pump	210	D3020
Plate And Frame Exchanger	211	D3020
Dehumidifier	212	D3050
Control Damper	213	D3050
Control Valve	214	D3050
Heat Recovery Unit	215	D3020
Coil	216	D3020
Radiator	217	D3020
Radiant Ceiling Panel	218	D3020
Desuperheater	219	D3020
Steam Pressure Reducing Valve	220	D3020
Expansion Tank	221	D3020

Humidifier	222	D3050
Ductwork	250	D3060
Electrical Systems	300	D5020
Interior Lighting	301	D5040
Interior Lighting (Special)	302	D5040
Night Light	303	D5040
Exterior Lighting (Non-OSU Label)	304	G4050
Pole Light (OSU Label)	305	G4050
Wall Mount Light (OSU Label)	306	G4050
Pole Light Crosswalk (Non-OSU Label)	307	G4050
Pole Light Street (Non-OSU Label)	308	G4050
Bollard Lighting (OSU Label)	309	G4050
Reserved	311	-
Reserved	312	-
Reserved	313	-
Reserved	314	-
Uninterruptable Power Sup	315	D5010
Oil Filled Transformer	316	D5020
Dry Transformer	317	D5020
Automatic Transfer Switch	319	D5010
Electrical Panelboard	320	D5020
Distribution Panel	321	D5020
Main Switch Board	322	D5020
Variable Frequency Drive	323	D3060
Electrical Disconnect	325	D5020
Relay Panel Board	326	D5020
Lighting Contactor	327	D5020
Emergency Generators	340	D5010
Solar Generators	341	D3020
Turbo Generators	342	
Electrical Conduit Surface Mount	394	D5020/D5030
Low Voltage Cable Tray	395	D5020/D5030
Electrical Cable Tray	396	D5020/D5030
Electrical Buss Duct	397	D5020/D5030
Electrical Conduit Underground	398	G4010
Plumbing Systems	400	D2010
Hot Water Heater	401	D2010
Condensate Return Units	402	D3050
Steam Traps	403	D3050
Water Coolers	404	D2010
Ice Machines	405	E1030
Backflow Preventers	406	D3050
Pump	407	D3050
Valve	408	D3050
Sewage Ejection/Sump	409	D2030
Flash Tank	410	D3050
Air Separator	411	D3050
Flow Meter	412	D2010
Water Filter	413	D2010
Storage Tank	414	D2010
Trap Primer	415	D2010
Water Treatment/Softener	498	D2010

Building Systems	500	
Roof Systems	501	B1020
Windows	502	B2020/C1020
Doors	560	B2050/C1030
Walls	504	B2010/C1010
Interior Ceilings	506	C1070
Floor Systems	507	B1010
Air Compressors	509	D2050
Air Dryers	510	D2050
Overhead Cranes	520	
Elevator/Vertical Trans	521	D1010
Building Clocks	530	D6060
Motor Projection Screen	540	E1040
Custodial	550	
Overhead Door Opener	570	B2050/C1030
Pool Classroom	580	F1050

In conjunction with the Asset Descriptions & Group Numbers listed above the following charts outline the University's Asset Tag Numbering System which should be incorporated into assets listed above in the Asset Tag field defined in Section 5.3. (Non-Graphic Building Information (COBie Worksheet) of the BIM PDS)).

Asset Tag Numbering System						
Identifier		PM Code		Building Number		Asset Number
X	-	XXX	-	XXXX	-	XXX
Identifies asset owner F=FOD, S=Student Life, etc.		Tied to Building Systems Priority Listing & New Asset Standards numbering in AiM System		4 digits allows for expansion up to 9,999 buildings		Can be alpha numerical. Provides for up to 999 pieces of equipment per floor. Each asset to have own number.

Example:

F	-	323	-	0070	-	0001

This Example would identify that the asset is:

FOD Identifier	-	Electrical VFD	-	Physics Research	-	Asset number 1 or in this case VFD 1

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, in construction for the Project and in the life cycle management of the facility. 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 (Version August 22, 2013) - http://bimforum.org/wp-content/uploads/2013/08/2013-LOD-Specification.pdf.

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

COBie – Construction Operations Building Information Exchange. COBie provides a data structure that defines how information will be captured during design and construction to be provided to facility operators.

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)

IFC – Industry Foundation Class is an object-oriented neutral file format for the exchange of building information models.

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 IFC compatible (IFC 2x3 at the time of this publication as defined by the buildingSMART alliance) and able to be exported to a COBie worksheet. 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.

7. APPENDIX

7.1. APPENDIX A: BIM EXECUTION PLAN

Building Information Modeling (BIM) Execution Plan

Version 1.0 – 08.25.2014

for

OSU Project Name

OSU Project Number

Developed by

Primary A/E

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11. **FLOOR/LEVEL AND ELEVATION NAMING CONVENTIONS**

Use of the BIM Execution Plan:

Design and Construct Team Members shall complete the following BIM Execution Plan (BIM EP) in accordance with The Ohio State University's BIM Project Delivery Standard. Individual rows/cells of tables in the BIM EP can be added as needed for specific project requirements, but should not be deleted. If there is information that does not apply (such as the Existing Conditions Documentation/Modeling BIM Use Case on a New Constriction project) it should be marked with a N/A for Not Applicable. Any questions on completing the BIM EP should be directed to the University Project Manager.

1. PROJECT INFORMATION

The project's Primary A/E, Design and Construct Model Manager along with input provided by the University Project Manager shall provide the following overall Project Information and Narrative.

Project Information	
OSU Project Name	
OSU Project Number	OSU-000000
FDC Project Manager	
Primary A/E	
OSU Campus Name	
OSU Building Name	
OSU Building Number	
OSU Building Address	
Project Gross Square Footage	
Number of Floors Above Ground	
Number of Floor Below Ground	
LEED Criteria (Certified, Silver, Gold, Platinum, N/A)	
Total Project Cost	
Project Type (New Construction or Renovation)	
Project Delivery Method	
Project Narrative	
---	

2. PROJECT SCHEDULE AND MILESTONES

2.1. PROJECT PHASE MILESTONES

The project's Primary A/E, along with input from the University Project Manager shall provide the following Project Schedule information, Deliverable Milestones and key Project Stakeholders for the different phases of the project.

Project Milestone	Estimated Start	Estimated Completion	Project Stakeholders (Model Element Authors)
Schematic Design	--/--/----	--/--/----	
Design Development	--/--/----	--/--/----	
Construction Documents	--/--/----	--/--/----	A, SE, HE, PE, EE, CE and LA
Bidding	--/--/----	--/--/----	
Award	--/--/----	--/--/----	
Construction	--/--/----	--/--/----	
Closeout	--/--/----	--/--/----	
Record (As-Built) Documents	--/--/----	--/--/----	

2.2. PROJECT BIM DELIVERABLE SCHEDULE

In addition to the project's overall Design and Construct schedule, the University Project Manager will collaborate with the Design and Construct Model Managers to document when key BIM deliverables will be submitted to the University in accordance with BIM Project Delivery Standard (BIM PDS). The matrix below outlines the typical project deliverables and should be augmented by the Design and Construct Model Managers with the specific project deliverable requirements.

BIM Deliverable	Model Manger	Due Date	Format
BIM Execution Plan – Design or Design/Construct	Design & Construct	--/--/----	.docx
Design Intent BIM – Model Reviews One University	Design	--/--/----	?, .ifc
Design Intent BIM – Construction Documents	Design	--/--/----	?, .ifc
BIM Execution Plan – Construct Updates	Construct	--/--/----	.docx
Trade Coordination BIM	Construct	--/--/----	?, .ifc
Shop Fabrication BIM	Construct	--/--/----	?, .ifc
Conformed Design Intent BIM	Design	--/--/----	.rvt, .ifc
Record Construction BIM	Construct	--/--/----	?, .ifc
COBie Worksheets	Design & Construct	--/--/----	.xlsx

Additional BIM centric meetings and collaborative sessions that occur throughout the project shall be outlined in Section 7. (BIM Meeting Procedures of the BIM Execution Plan (BIM EP)).

3. PROJECT BIM GOALS

Based upon the BIM Use Cases outlined in Section 2. (BIM Use Cases of the BIM Project Delivery Standard (BIM PDS)) and those in the project RFP, the Design and Construct Model Managers should identify which BIM Use Cases will be implemented on the project, along with a brief description of their intended application in the matrix below. The BIM Use Cases marked with (*) represent the minimum requirements and (**) represents options to leverage BIM on projects.

Any deviations from these University minimum requirements or the implementation of additional BIM Use Cases can be identified by the Design and Construct Team members and shall be submitted to the University Project Manager for approval.

Design BIM Use Cases
Model Authoring – Design Intent BIM*
-
Existing Conditions Documentation/Modeling*
-
Program of Requirements (POR) Validation*
-
Site Design*
-
Model Reviews*
-
Sustainability (Energy Modeling, Simulation and Performance)**
-
Design Simulation/Analysis**
-
Clash Prevention*
-
Conformed Design Intent BIM*
-
Other
-

Construct BIM Use Cases
Model Authoring – Trade Coordination BIM*
-
Model Authoring – Shop/Fabrication BIM**
-
Clash Detection*
-
Model-based Scheduling (Sequencing/Simulation)**
-
Model-based Estimating (Quantification/Cost Estimating)**
-
Site Analysis Planning*
-
Record Construction BIM*
-
Other
-
Other
-

4. BIM PROJECT PARTICIPANTS

4.1. MODEL AUTHOR DEFINITIONS

Per Section 3. (BIM Project Participant Roles of the BIM Project Delivery Standard (BIM PDS)), the Discipline Model Managers and their organizations will be documented as Model Element Authors (MEA) in the following Model Author Matrix. The following tables represent standard naming conventions that consistently represent the participating organizations and should be utilized throughout the BIM Execution Plan (BIM EP). Model Element Author abbreviations and naming conventions shall not be edited, but can be removed or added with the approval of the University Project Manager as needed per project.

Abbreviation	Model Element Author	Organization
U	University	The Ohio State University
A	Architect	
SE	Structural Engineer	
PE	Plumbing Engineer	
HE	HVAC Engineer	
FE	Fire Protection Engineer	
EE	Electrical Engineer	
TE	Technology Engineer	
CE	Site/Civil Engineer	
LA	Landscape Architect	
CM	Construction Manager	
GC	General Contractor	
SC	Structural Contractor	
DB	Design Builder	
PC	Plumbing Contractor	
HC	HVAC Contractor	
FC	Fire Protection Contractor	
EC	Electrical Contractor	
TC	Technology Contractor	
	Other	
	Other	
	Other	
	Other	

4.2. BIM PROJECT PARTICIPANTS AND MODEL ELEMENT AUTHORS

In addition to The Ohio State University Project Participants, all BIM Project Participants from the Design and Construct phases of the project shall be outlined in the following matrix.

The Ohio State University Project Participants				
Department	Role	Name	E-mail	Phone
FOD	Project Manager			
FOD	University Model Manager			
TSG	Project Representative			
	Other			
	Other			
	Other			

Led by the Design Model Manager, the following Design Team Project Participants will be focused on the development and utilization of the Design Intent BIM for the Use Case defined in Section 3. (BIM Project BIM Goals of the BIM EP) as well as the project deliverable outlined in the BIM PDS.

Design Team Project Participants				
MEA	Role	Name	E-mail	Phone
	Primary A/E			
	Design Model Manager			
A	Architectural Model Manager			
SE	Structural Model Manager			
HE	HVAC Model Manager			
PE	Plumbing Model Manager			
EE	Electrical Model Manager			
CE	Site/Civil Model Manager			
	Other			
	Other			
	Other			

Led by the Construct Model Manager, the following Construct Team Project Participants will be focused on the development and utilization of the Trade Coordination BIM for the Use Case defined in Section 3. (BIM Project BIM Goals of the BIM EP) as well as the project deliverable outlined in the BIM PDS.

Construction Team Project Participants				
MEA	Role	Name	E-mail	Phone

	Construct Model Manager			
	Other			
	Other			
	Other			
	Other			
	Other			
	Other			
	Other			
	Other			
	Other			
	Other			
	Other			

5. MODEL SOFTWARE

All BIM Project Participants and Model Element Authors (per Section 4.(BIM Project Participants of the BIM Execution Plan (BIM EP))) are required to have their own software licenses and computers capable of running the needed software (as outlined below) to perform their portion of work. In addition, they shall have network connectivity and wi-fi accessibility enabling remote project collaboration via webinars and model sharing per the requirements outlined in Section 6.(Model Collaboration, Transmission and Permitted Use Strategies of the BIM EP).

As stated in Section 2. (BIM Use Cases of the BIM Project Delivery Standards (BIM PDS)) the BIM Use Case column represents the minimum requirements (*) and options (**) to leverage BIM on projects. Per the "Use of the BIM Execution Plan" statement, these should be updated per project.

BIM Use Case	MEA	Software	Native File Format	Version
Design Intent BIM*				
Existing Conditions Documentation/ Modeling*				
PoR Validation*				
Site Design*				
Model Reviews*				
Sustainability**				
Design Simulation/Analysis**				
Clash Prevention*				
Model Authoring - Trade Coordination BIM*	TC			Current Version
	TC			Current Version
	TC			Current Version
	TC			Current Version
Model Authoring - Shop/Fabrication BIM**	TC			Current Version
	TC			Current Version
	TC			Current Version
	TC			Current Version
Clash Detection*				
Model-based Scheduling**				
Model-based Estimating**				
Site Analysis Planning*				
Conformed Design Intent BIM*	A	Revit Architecture	.rvt	2014
	SE	Revit Structure	.rvt	2014
	PE	Revit MEP	.rvt	2014
	HE	Revit MEP	.rvt	2014

	FE	Revit MEP	.rvt	2014
	EE	Revit MEP	.rvt	2014
Record Construction BIM*	CM, GC or DB			Current Version

Any technology-centric object enablers, installs, viewers or other downloads that are required to view and/or utilize models based upon their permitted use as outlined in Section 6. (Model Collaboration, Transmission and Permitted Use Strategies of the BIM EP) should be outlined below.

Software	Object Enabler Name	Link to Download Object Enabler

6. MODEL COLLABORATION, TRANSMISSION & PERMITTED USE STRATEGIES

Design and Construct Model Managers are responsible for completing the following matrix, identifying how and when digital data will be shared between Model Element Authors (sender) and what the Permitted Use of that information is by the Model User (receiver).

As stated in Section 2. (BIM Use Cases of the BIM Project Delivery Standards (BIM PDS)) the BIM Use Case column represents the minimum requirements (*) and options (**) to leverage BIM on projects. Per the "Use of the BIM Execution Plan" statement, these should be updated per project.

BIM Use Case	MEA	Model User	Frequency	Model File Name	File Exchange Format	Permitted Use
Design Intent BIM*	A					
	SE					
	PE					
	HE					
	FE					
	EE					
Existing Conditions Documentation/ Modeling*						
PoR Validation*						
Site Design*						
Model Review*						
Sustainability**						
Design Simulation/Analysis**						
Clash Prevention*						
Design Intent BIM (CDs)*		U and (CM, GC or BD)	Once		Native, .ifc	
Model Authoring - Trade Coordination BIM*	TC	U	Once		Native, .ifc	U
	TC				Native, .ifc	U
	TC				Native, .ifc	U
Model Authoring - Shop/Fabrication BIM**	TC	U	Once		Native, .ifc	U
	TC				Native, .ifc	U
	TC				Native, .ifc	U
Clash Detection*						
Model-based Scheduling**						
Model-based Estimating**						
Site Analysis						

Planning*						
Conformed Design Intent BIM*	A	U	Once		.rvt, .ifc	U
	SE				.rvt, .ifc	U
	PE				.rvt, .ifc	U
	HE				.rvt, .ifc	U
	FE				.rvt, .ifc	U
	EE				.rvt, .ifc	U
Record Construction BIM*	CM, GC or BD	U	Once		Native, .ifc	U

6.1. PERMITTED USE

The following Permitted use(s) of the BIM and/or shared digital data by the Model User' (Receiver) will be identified for each BIM Use Case in the matrix above. The Model Element Author is not responsible for any use of the geometry and data beyond its prescribed reliability and documented Permitted Use.

Permitted Use Abbreviations and Descriptions	
S	Store, View and Query
I	Integrate (incorporate additional data without modifying data received)
M	Modify as required to fulfill project obligations
U	As defined in Section 5.4. (Model Ownership and Intellectual Property Rights of the BIM PDS)

6.2. MODEL COLLABORATION AND TRANSMISSION WORKFLOW DIAGRAMS

Further explanations of the data transmission process and workflow diagrams, folder structures, project websites infrastructure for collaboration and interoperability should be included here. This should also include how project teams may take advantage of co-location opportunities as well as other model review/presentation technologies such as iRooms or Computer Aided Virtual Environments (CAVE).

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7. BIM MEETING PROCEDURES

Design and Construct Model Manager are responsible for defining the required meetings, frequency and needed participants to support the project BIM Deliverables outlined in BIM Project Delivery Standard (BIM PDS).

Meeting Type	Project Phase	Frequency	Participants	Location
BIM Kick-off	Design	Once	University, Design and Construct Model Managers	
BIM Execution Plan Review	Design	Once		
Model Review	Design	As Required		
One University Review	Design	Once	U	
Model Review	Design	As Required	U	
Clash Prevention Meetings	Design	As Required	U	
Clash Detection Meetings	Construct	As Required		
Coordination Sign-off Meeting	Construct	As Required	U	
Conformed Design Intent BIM Development	Construct	As Defined in Section 7.1.	Design & Construct Model Managers	
Conformed Design Intent BIM Turnover	Project Completion and Turnover	Once	University & Design Model Managers	
Record Construction BIM Turnover	Project Completion and Turnover	Once	University & Construct Model Managers	
COBie Worksheet Turnover	Project Completion and Turnover	Once	University, Design & Construct Model Managers	

7.1. Conformed Design Intent BIM Development

Project Team Members shall document their intended process to support the on-going development and evolution of their Conformed Design Intent BIM for final submission to the University at the completion of the project.

Include process maps and/or definitions here (comment can be deleted once updated)

8. MODEL ELEMENT TABLE

The following Model Element Table (derived from the AIA G202-2013 which is organized by CSI UniFormat 2010) will be completed by the Design and Construct Model Managers referencing the LOD Definition outlined in Section 5. (BIM Deliverable Development of the BIM Project Delivery Standard (BIM PDS)). In addition to defining the model's minimum progression via the LOD benchmarks, the Design and Construct Model Manager will also define the responsible party for developing that geometry in the MEA (Model Element Author) Column. Additional notes and comments should be called out at the end of this section.

LOD Matrix of BIM Deliverables										
		One University Review		Design Intent BIM (CDs)		Trade Coordinati-on BIM		Conformed Design Intent BIM		
		LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	Note
A: SUBSTRUCTURE										
A10 Foundations										
A1010	Standard Foundations			300				300		
A1020	Special Foundations			300				300		
A20 Subgrade Enclosures										
A2010	Walls for Subgrade Enclosures			300				300		
A40 Slabs-on-Grade										
A4010	Standard Slabs-on-Grade			300				300		
A4020	Structural Slabs-on-Grade			300				300		
B:SHELL										
B10 Superstructure										
B1010	Floor Construction			300				500		
B1020	Roof Construction			300				500		
B1080	Stairs			300				300		
B20 Exterior Vertical Enclosures										
B2010	Exterior Walls			300				500		
B2020	Exterior Windows			300				500		
B2050	Exterior Doors and Grilles			300				500		
B2070	Exterior Louvers and Vents			300				300		
B2080	Exterior Wall Appurtenances			300				300		
B2090	Exterior Wall Specialties			300				300		
B30 Exterior Horizontal Enclosures										
B3010	Roofing			300				500		
B3020	Roof Appurtenances			300				300		
B3040	Traffic Bearing Horizontal Enclosures			300				300		
B3060	Horizontal Openings			300				300		
B3080	Overhead Exterior Enclosures			300				300		
C: INTERIORS										
C10 Interior Construction										
C1010	Interior Partitions			300				500		
C1020	Interior Windows			300				500		
C1030	Interior Doors			300				500		
C1040	Interior Grilles and Gates			300				300		

C1060	Raised Floor Construction			300				300		
C1070	Suspended Ceiling Construction			300				500		
C1090	Interior Specialties			300				300		
C20 Interior Finishes										
C2010	Wall Finishes			300				300		
C2020	Interior Fabrications			300				300		
C2030	Flooring			300				300		
C2040	Stair Finishes			300				300		
C2050	Ceiling Finishes			300				300		
D: SERVICES										
D10 Conveying										
D1010	Vertical Conveying Systems			300				500		
D1030	Horizontal Conveying			300				500		
D1050	Material Handling			300				300		
D1080	Operable Access Systems			300				300		
D20 Plumbing										
D2010	Domestic Water Distribution			300				500		
D2020	Sanitary Drainage			300				300		
D2030	Building Support Plumbing Systems			300				500		
D2050	General Service Compressed-Air			300				500		
D2060	Process Support Plumbing Systems			300				300		
D30 HVAC										
D3010	Facility Fuel Systems			300				300		
D3020	Heating Systems			300				500		
D3030	Cooling Systems			300				500		
D3050	Facility HVAC Distribution Systems			300				500		
D3060	Ventilation			300				500		
D3070	Special Purpose HVAC Systems			300				300		
D40 Fire Protection										
D4010	Fire Suppression			300				500		
D4030	Fire Protection Specialties			300				500		
D50 Electrical										
D5010	Facility Power Generation			300				500		
D5020	Electrical Service and Distribution			300				500		
D5030	General Purpose Electrical Power			300				500		
D5040	Lighting			300				500		
D5080	Miscellaneous Electrical Systems			300				300		
D60 Communications										
D6010	Data Communications			300				300		
D6020	Voice Communications			300				500		
D6030	Audio-Video Communication			300				300		
D6060	Distributed Communications and Monitoring			300				500		
D6090	Communications Supplementary Components			300				300		
D70 Electronic Safety and Security										

D7010	Access Control and Intrusion Detection			300				300		
D7030	Electronic Surveillance			300				300		
D7050	Detection and Alarm			300				500		
D7070	Electronic Monitoring and Control			300				300		
D7090	Electronic Safety and Security Supplementary Components			300				300		
D80 Integrated Automation										
D8010	Integrated Automation Facility Controls			300				300		
E: EQUIPMENT & FURNISHINGS										
E10 Equipment										
E1010	Vehicle and Pedestrian Equipment			300				300		
E1030	Commercial Equipment			300				500		
E1040	Institutional Equipment			300				500		
E1060	Residential Equipment			300				300		
E1070	Entertainment and Recreational Equipment			300				300		
E1090	Other Equipment			300				300		
E20 Furnishings										
E2010	Fixed Furnishings			300				300		
E2050	Movable Furnishings			300				300		
F: SPECIAL CONSTRUCTION & DEMOLITION										
F10 Special Construction										
F1010	Integrated Construction			300				300		
F1020	Special Structures			300				300		
F1030	Special Function Construction			300				300		
F1050	Special Facility Components			300				500		
F1060	Athletic and Recreational Special Construction			300				300		
F1080	Special Instrumentation	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
F20 Facility Remediation										
F2010	Hazardous Materials Remediation	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
F30 Demolition										
F3010	Structure Demolition	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
F3030	Selective Demolition			300				300		
F3050	Structure Moving			300				300		
G: BUILDING SITEWORK										
G10 Site Preparation										
G1010	Site Clearing	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
G1020	Site Elements Demolition	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
G1030	Site Element Relocations			300				300		
G1050	Site Remediation	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
G1070	Site Earthwork			300				300		
G20 Site Improvements										
G2010	Roadways			300				300		
G2020	Parking Lots			300				300		

G2030	Pedestrian Plazas and Walkways			300				300		
G2040	Airfields			300				300		
G2050	Athletic, Recreational, and Playfield Areas			300				300		
G2060	Site Development			300				300		
G2080	Landscaping			300				300		
G30 Liquid and Gas Site Utilities										
G3010	Water Utilities			300				300		
G3020	Sanitary Sewerage Utilities			300				300		
G3030	Storm Drainage Utilities			300				300		
G3050	Site Energy Distribution			300				300		
G3060	Site Fuel Distribution			300				300		
G3090	Liquid and Gas Site Utilities Supplementary Components			300				300		
G40 Electrical Site Improvements										
G4010	Site Electric Distribution Systems			300				500		
G4050	Site Lighting			300				500		
G50 Site Communications										
G5010	Site Communications Systems			300				300		
G90 Miscellaneous Site Construction										
G9010	Tunnels			300				300		

Notes:

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9. MODEL COORDINATE SYSTEMS

All survey work performed on or for The Ohio State University shall follow the Requirements for Survey Information as outlined in Appendix E of the Building Design Standard.

Project Coordinates, Work Points and orientation to True North are identified by the Design and Construction Model Managers and agreed upon by the University Project Manager. This includes the definition of a Shared Coordinate System and intelligent Project Base Point in the Conformed Design Intent Model which will synchronize back the University's GIS applications and bring a high level of consistency to the integration of models into the large context of the campus.

The Project Base Point Coordinates should be documented in the following chart.

Coordinates	
North/South	0'-0"
East/West	0'-0"

The Project Base Point Elevation should be 0'-0" allowing the BIM to be set to its accurate elevation (in reference to the NAVD88 Datum) as stated and documented in Section 11. (Floor/Level and Elevation Naming Conventions of the BIM Execution Plan (BIM EP)).

10. MODEL STRUCTURE

10.1. MODEL NAMING CONVENTIONS

Design and Construct Model Manager are responsible for documenting the Model Naming Conventions for their final BIM Deliverables in accordance with Section 5.1. (Model Naming Conventions, Formats & Turnover Process of the BIM Project Delivery Standard (BIM PDS)) in the tables below. Any deviations from the outlined naming convention shall be discussed with and approved by the University Project Manager.

Design Intent BIM Naming Structure	
Architectural BIM	
Structural BIM	
HVAC BIM	
Electrical BIM	
Plumbing BIM	
Fire Protection BIM	
Site/Civil BIM	
Other BIM	
Other BIM	
Other BIM	

Construct BIM Naming Structure	
Architectural BIM	
Trade Coordination BIM	
Trade Coordination BIM	
Trade Coordination BIM	
Trade Coordination BIM	
Trade Coordination BIM	
Other BIM	
Other BIM	
Other BIM	

BIM Deliverable Naming Structure	
Design Intent BIM	
Trade Coordination BIM	
Shop Fabrication BIM	
Conformed Design Intent BIM	
Record Construction BIM	
COBie Worksheet	

10.2. Building Keyplan

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11. FLOOR/LEVEL AND ELEVATION NAMING CONVENTIONS

In collaboration with the University Project Manager, Design and Construct Team Members will work to define the relevant Floor Level Naming conventions for the project based upon the University's existing standards. The Floor Levels listed represent only the levels of the building that have occupiable space and can be quantified as net or gross square footages.

The University Project Manager will assist in coordinating the appropriate naming conventions on a project by project basis. The Project Team will document those naming conventions along with their corresponding elevation which should follow the standards outlined in Section 9: (Model Coordinate Systems of the BIM Execution Plan (BIM EP)).

Floor Level Name	Floor Elevation
TL – Tunnel Level	
SB – Sub-Basement	
0B – Basement Floor	
0G – Ground Floor	
01 – First Floor	
02 – Second Floor	
02M – Second Floor Mezzanine	
03 – Third Floor	
RF - Roof	