

## PENN STATE OFFICE OF PHYSICAL PLANT BUILDING INFORMATION MODELING (BIM) CONTRACT ADDENDUM

**Version 2.0**

03.15.2012

The purpose of this addendum is to define the scope of Building Information Modeling (BIM) for facilities designed and constructed for The Pennsylvania State University. This document is to be used in conjunction with the OPP BIM Project Execution Plan Template<sup>1</sup>, the OPP BIM Standards and Guidelines<sup>1</sup> document, Asset Attribute Requirements<sup>1</sup> and referenced by FORM OF AGREEMENT 1-P, 1-S and 1-C, 1-CM(GMP, SP, P). The content of this addendum may be modified by the OPP project leader based with support from the OPP BIM team on project specific constraints. Please read the document entirely and contact Eric Nulton by email at [eric.nulton@psu.edu](mailto:eric.nulton@psu.edu), if you should have any questions.

This addendum applies to all projects exceeding a Total Project Cost of \$5 million new construction, substantial renovation, or as directed by the OPP project leader.

### **DEFINITION OF TERMS**

**PSU:** The Pennsylvania State University (Owner)

**OPP:** The Office of Physical Plant at PSU, interchangeable with PSU

**Professional:** Designer, Architect, Engineer or Consultant

**Contractor:** Construction Manager (CM) Agent or At-Risk; or General Contractor (GC)

**Project Team:** Professionals, Contractor, Owner, and other stakeholders

**Project Leader:** Penn State Project Manager (PM) or Project Coordinator (PC)

**Building Information Modeling (BIM):** A process focused on the development, use and transfer of facility attribute data of a building project to improve the design, construction and operations of a project in order to achieve project specific goals

**Level of Development (LOD):** Level of completeness to which a model element is developed at the end of each design and construction phase

**Model Element:** Portion of the model(s) representing a component, system, or assembly within a building or site

**Model Element Author:** Responsible party for developing the BIM content of a specific Model Element to the LOD required for a particular phase of the Project

**Design Intent Model:** Model(s) based on criteria that is important to the translation of the facility's design

**Means and Methods Model:** Model(s) based on criteria that is important to the translation of the facility's construction

**Facility Attribute Data:** Associated intelligent attribute data (e.g. manufacturer, model, warranty information, etc.)

**Record Model Deliverable:** Model(s) based on Design Intent Model(s) and installed conditions

**As-Built Model Deliverable:** Model(s) based on Means and Methods Model(s) and installed conditions

**CAD Deliverable:** submitted CAD drawings (e.g. plans, elevations, sections, schedules, details, etc.) in the form of shop drawings, design deliverables, and as-built drawings

**BIM Project Execution Plan:** a plan that defines how BIM will be implemented throughout the project lifecycle.

**Project Lifecycle:** from conception to demolition including four distinctive phases (Planning, Design, Construction, and Operations)

---

<sup>1</sup> Latest version available for download at [www.opp.psu.edu](http://www.opp.psu.edu). Please contact Eric Nulton by phone at 814.867.7268 or by email at [eric.nulton@psu.edu](mailto:eric.nulton@psu.edu), if you should have any questions.



## ARTICLE 1: PROJECT BIM REQUIREMENTS

- 1.1. BIM Project Execution Plan. The Project Team shall develop a BIM Project Execution Plan (BIM Plan) documenting the collaborative process in which BIM will be implemented throughout the lifecycle of the project. Refer to Article 2.0 of this document for requirements for the BIM Plan.
- 1.2. Model Element Authoring. Develop all designs using Building Information Modeling (BIM) and Computer Aided Design (CAD) software. See Article 4.3 for model reliance information.
  - 1.2.1. Design Intent Model. The Professional shall develop a Design Intent Model that includes all accurate and relevant geometry and facility information required to design the facility. This model will be transferred to the Construction team for the creation of the Means and Methods Model. Professional will update the Design Intent Model with all design revisions at agreed upon intervals during the Construction phase.
  - 1.2.2. Means and Methods Model. The Contractor shall develop a Means and Methods Model that includes all accurate and relevant geometry and facility information required to construct the facility. Contractor will update Means and Methods Model with all revisions at agreed upon intervals during the Construction phase.
  - 1.2.3. As-built Model. A Project Team member, preferably the Contractor, will validate the Means and Methods Model to produce a field accurate As-built Model to be delivered to PSU at project turnover.
  - 1.2.4. Record Model. A Project Team member, preferably the Professional, will validate and revise the Design Intent Model to produce a field accurate Record Model to be delivered to PSU at project turnover.
- 1.3. Model Responsibility. It shall be understood that there may be an information gap between what is required for the final BIM deliverables to the Owner and what is required for each team member to perform their required and/or recommended BIM Use. It is responsibility of the individual member of the Project Team to provide that information. If developed, all information shall be made available to the entire Project Team.
- 1.4. BIM Model and Facility Attribute Data. Professionals shall use BIM application(s) and software(s) to develop project designs. Professionals shall use the Design Intent Model to produce accurate Construction Documents. All submitted BIM Models and associated Facility Attribute Data shall be fully compatible with the latest version of Autodesk Revit at the time of Design.
  - 1.4.1. BIM Model Updates. The Project Team will update the Model with any revisions as required to complete the work, or at a minimum, at each Design Phase Submittal. The Model shall remain current and represent design intent.
- 1.5. Drawing Requirements. Deliver Construction Document drawings per requirements with any revisions as specified in the OPP Design and Construction Standard. Specification of a CAD file format for these Drawings does not limit which BIM application(s) or software(s) may be used for project development and execution.
  - 1.5.1. Drawing Deliverables. Submitted drawings (e.g. plans, elevations sections, schedules, details, etc.) shall be derived (commonly known as extractions, views or sheets) and maintained from the submitted Model and Facility Attribute Data.
  - 1.5.2. Deliverable Requirements. BIM deliverables shall conform to the requirements of Article 3.0 below.
- 1.6. Owner Requirements
  - 1.6.1. Model Content. The Model and Facility Attribute Data shall include, at a minimum, the requirements of Section 10.0 Model and Database Structure in the BIM Plan. Further content may be specified in the BIM Information Exchange Worksheet (Section 6.2: Developing Information Exchanges of the BIM Plan) which defines the exchange of information between each project phase for each project team member and the Facility Asset Attribute List (Section 7.0 Penn State Facility Attribute Data Requirements of the BIM Plan).

- 1.6.2. Model Granularity. Models vary in level of detail for individual elements with a model, but at a minimum must include enough detail to establish design intent, perform BIM Uses specified in Section 5.0 Project BIM Uses of the BIM Plan, coordinate and detect clashes in the model prior to the creation of Construction Documents, create Construction Documents, and meet the deliverable requirements of the BIM Plan. Submitted models shall have a scale of 1:1.
- 1.6.3. Facility Attribute Data. Develop Facility Attribute Data consisting of intelligent elements for the Model (e.g. doors, air handlers, electrical panels, etc.). This Facility Attribute Data shall include all material definitions and attributes that are necessary for the Project design, construction, and operations. Minimum Facility Attribute Data requirements are located in Section 7.1: Asset Attribute Information of the BIM Plan.
- 1.7. Quality Control. Implement quality control (QC) parameters for the Model, including procedures described in Section 11.0: Quality Control Procedures of the BIM Plan. As a minimum provide the following:
  - 1.7.1. Model Standards Checks. QC validation used to ensure that the Model(s) have no undefined, incorrectly defined, or duplicated elements. Report non-compliant elements and corrective action plan to correct non-compliance elements. Provide OPP with detailed justification and request OPP acceptance for any non-compliant element which the Project Team proposes to remain in the Model(s).
  - 1.7.2. CAD Standards Check. QC checking performed to ensure that the fonts, dimensions, line styles, levels, and other Construction Document formatting issues are followed per the OPP Design and Construction Standards.
  - 1.7.3. Model Commissioning. QC validation to ensure that the model and database is compliant with the defined quality control procedure for component level of detail and stakeholder information.
  - 1.7.4. Other Parameters. Develop such other QC parameters as Professional and Contractor deems appropriate for the Project and provide to the OPP for concurrence.
  - 1.7.5. Over-The-Shoulder Quality Control Review. Periodic QC meetings shall include reviews of the implementation and use of the model, including but not limited to, interference management, design change tracking information, and coordination validation.
- 1.8. Project BIM Uses. Section 5.0: Project BIM Uses of the BIM Plan indicates the minimum BIM Use requirements for each project phase.

## **2.0 ARTICLE 2: BIM PROJECT EXECUTION PLANNING**

- 2.1. The BIM Plan will be developed by the Project Team members documenting the collaborative process in which BIM will be implemented throughout the lifecycle of the project. The Professional shall lead the development of the BIM Plan during the design phase and the Contractor shall lead development during the construction phase.
  - 2.1.1. An initial BIM Plan shall be developed by both the Professional and Contractor detailing the requirements identified in this Addendum and the OPP BIM Plan Template. It shall be submitted for approval by to PSU prior to contract execution.
  - 2.1.2. A collaborative BIM Plan shall be developed with the Contractor/CM prior to completion of the schematic design phase. In the event that a Contractor is not procured for preconstruction services, the Professional Team and Owner shall develop the collaborative BIM Plan and revisited when the Contractor if procured.
  - 2.1.3. The BIM Plan shall be revisited with the entire project team prior to Construction and submitted to the OPP for final approval. The BIM Plan shall be reviewed with specialty contractors prior to their contract execution. Any revisions to the BIM Plan must be submitted to the OPP for final approval
  - 2.1.4. Payment may be held at each development phase until the BIM Plan is approved. Suggested review milestones can be found in Section 2.5: Project Milestones of the BIM Plan.

- 2.2. In developing the BIM Plan, both the Professional and Contractor will utilize the latest version of the OPP BIM Project Execution Plan Template (BIM Template), which identifies the minimal BIM Requirements to develop an acceptable BIM Plan.
- 2.3. Model Development Process. The process in which project team members create and share facility information for downstream stakeholders to produce intermediate and final deliverables. An agreed upon model development process must be reviewed by the project team and approved by OPP. An example of this process can be found in Section 1.2 Record Model & As-built Model Development Process of the BIM Plan.
- 2.4. Within sixty (60) days after the acceptance of the BIM Plan, the Project Team shall conduct review and demonstration to verify the functionality of the Model technology workflow and processes set forth in the BIM Plan. If modifications are required, the Project Team shall complete the modifications and resubmit the BIM Plan and perform a subsequent demonstration for OPP acceptance. OPP may also withhold payment for Design and Construction for unacceptable performance in executing the accepted BIM Plan.
- 2.5. Reference. For additional information regarding the OPP BIM requirements, please reference the OPP BIM Standards and Guidelines.

### 3.0 ARTICLE 3: PROJECT DELIVERABLE REQUIREMENTS

- 3.1. Provide deliverables in compliance with the BIM Plan Deliverables at stages described in Section 2.5: Project Milestones of the BIM Plan.
  - 3.1.1. At each stage, provide a written report confirming that consistency checks as identified in Article 1.7 have been completed. This report shall be discussed as part of the review process and shall address cross-discipline interferences, if any.
  - 3.1.2. At each stage, provide OPP with the following (as detailed in Section 12: Project Deliverables of the BIM Plan):
    - 3.1.2.1. BIM Project Execution Plan.
    - 3.1.2.2. Design Intent Model(s)
    - 3.1.2.3. Two dimensional drawing deliverables printed directly from the model in PDF format. Documents to be stamped and signed in traditional practice to comply with the OPP Design and Construction Standard and local permitting requests.
    - 3.1.2.4. Means and Methods Model(s) per Discipline
    - 3.1.2.5. A three dimensional interactive review format of the Model in the latest version of Autodesk Navisworks, Adobe 3D PDF or other format as per the BIM Plan requirements. The file format for reviews can change between submittals.
    - 3.1.2.6. Construction Submittals. All Construction Submittals, Request For Information (RFI), and Change Order Requests (COR) should make use of the model for clear interpretations.
    - 3.1.2.7. Record Model(s)
    - 3.1.2.8. As-built Model(s)
    - 3.1.2.9. A report generated from the Model of all assets and attributes
    - 3.1.2.10. A report verifying the Model compliance with PSU Facility Attribute Database
    - 3.1.2.11. A report verifying the accuracy of the delivered model elements and asset attributes
    - 3.1.2.12. An Interference Check Report

- 3.1.2.13. A list of all submitted files. The list should include a description, directory, and file name for each file submitted. Identify files that have been produced from the submitted Model and Facility Attribute Data.
- 3.1.2.14. The BIM Plan will define additional intermediate deliverables for the project

**4.0 OPP shall confirm acceptability of all project deliverables. ARTICLE 4: OWNERSHIP, RIGHTS, AND LIABILITIES IN DATA**

- 4.1. Ownership. The BIM Model is an instrument of service and is considered to be a component of Design and Construction Documents governed by Article 7 of the Owner/Professional AGREEMENT (Form 1-P), Article 1 of the Owner/Contractor Agreement (Form 1-C), and Article 14.3 of General Conditions of the Contract (Form CM-GMP-GC) without exception. In addition, each Model Element Author (MEA) contributing to the BIM model(s) and database agrees to provide all project stakeholders and Penn State (Owner) a non-revocable, exclusive license to utilize any and all intellectual property provided by each MEA contained within this BIM for the sole purpose of completing the design, construction and other uses as stipulated and/or implied by the executed Owner/Professional Agreement and Owner/Contractor Agreement for this project.
  - 4.1.1. Submitted Model(s), drawings, and all embedded asset attribute information may be used at the discretion of the OPP throughout the construction and lifetime of the facility.
- 4.2. Liability. Nothing in this Addendum shall relieve the Professional from their obligation, nor diminish the role of the Professional as responsible for and in charge of the design of the project and respective model(s).
  - 4.2.1. No parties involved in creating in model shall be responsible for costs, expenses, liabilities, or damages which may result from the use of the model beyond the uses described in the BIM Plan.
- 4.3. Reliance on Model Elements. The BIM Model(s) produced by the project stakeholders associated with the Design Team will serve as the basis of design and is considered the Design Intent Model. The model prepared by the Design Team will be used by the Contractor to prepare a Means and Methods Model. This Right of Reliance pertains to all models and applications associated.
  - 4.3.1. The Construction Team may rely on the accuracy of the model(s) prepared by the Design Team in accordance with the traditional Standard of Care provisions that apply and govern the design and construction of comparable building in two dimensional design formats and methods.
  - 4.3.2. Conversely, the Design Team may rely on the accuracy of the model(s) prepared by the Construction Team in accordance with traditional Standard of Care provisions that apply and govern the preparation of shop drawings, fabrication drawings, sequencing and other instruments used to convey the means and methods under the control of the Contractor, subcontractors, consultants and other agents working on this project.
  - 4.3.3. As mutually agreed by all parties, including Professional, Contractor, and Owner, nothing shall be construed by the content and/or preparation of the associated model(s) as a warranty or guarantee of accuracy and/or completeness by the Design Team. Standard and traditional procedures for design, documentation, means and methods, shop drawing submittals, verification by the contractor, requests for information, etc. shall apply to the design, construction and construction administration of the project.
  - 4.3.4. The construction manager, contractors and subcontractors shall be solely responsible for means and methods and the execution of the Design Intent Model through the execution, preparation and management of delegated design, the Means and Method Model(s), fabrication, installation, and construction.

**5.0 ARTICLE 5: BIM SCHEDULE OF VALUES**

The Professional(s) and Contractor shall provide any cost incurred to comply with the OPP BIM Addendum. All costs are included in the base contract prices. Both the Professional(s) and Contractor are responsible for developing a Schedule of Values to perform additional BIM services. The Schedule of Values will be submitted for approval to PSU prior to contract execution.