Building Information Management (BIM) Universal Addendum

THE PENNSYLVANIA STATE UNIVERSITY

Purpose: The purpose of this addendum is to define the scope of Building Information Modeling (BIM) for facilities-related work executed under contract to the Pennsylvania State University (PSU). The PSU BIM requirements are structured to support a facility lifecycle management approach. As such, considerations from many entities within the PSU system and its various enterprise-level units are incorporated.

General Information:
This document is to be used in conjunction with the supporting documents noted throughout. It is structured to represent the minimum requirements for BIM implementation and coordination for the project. The approach is to provide performance-based requirements, allowing implementers the freedom of execution with prescriptive constraints as needed for integration within the context of PSU's facility lifecycle management approaches.

The content of this addendum may NOT be modified by any entity, to include the OPP project leader, without coordination of the multiple PSU units impacted through the synchronization facilitated by this document. This document and the supporting documents referenced identify requirements. Unless specifically noted within these documents as optional, these statements shall be considered required under the contract agreement. The OPP BIM team is available to support the OPP's project leaders through the use and coordination of modifications on project-specific constraints.

The BIM team provides resources (guides, videos, templates, and tools) available for use in support of the PSU BIM Requirements. These resources are listed in the resources section (see paragraph ARTICLE 7 Resources / Supplemental Documents) of the BIM addendum and can be found at https://www.opp.psu.edu/building-information-modeling-bim-resources (see "Resources"). The use of any of the resources is "at the user's risk." Use indicates an agreement to indemnify PSU and hold its officers, affiliates, and employees harmless of any errors, conflicts, expenses, or damage incurred through their direct or indirect use.

Comments for continuous improvement of the minimum BIM requirements are welcome and should be provided to the BIM team. Questions on the PSU OPP BIM requirements should be directed to the BIM team at psubim@psu.edu.

Table of Contents (BIM Addendum)

NOTE: Page numbers below refer to the pages in the PSU BIM addendum. (e.g. 4 below would refer to page "BIM-4").

ADDITIONAL DEFINITIONS:

▲ indicates specific deliverable locations on PSU's e-Builder site information as identified in the User Guide. See paragraph 4.24.2 for more details.

◆ indicates examples and explanations of intent are available in the User Guide. See paragraph 7.4 for details.

♦ indicates a requirement that is linked to payment/invoice requests. See paragraph 4.1 for more details.

Acquisition Strategy means the combined approach for execution of the specific project. This includes the delivery methodology, procurement methodology, and contract type. This information is determined by Penn State and will be provided to the project teams.

BIM Manager means the individual assigned by the prime contractor to coordinate, manage, and ensure all BIM requirements are met as prescribed in the time frames specified. Please see definitions elsewhere in this document for Prime Contractor as it can refer to either the designer or builder.

cDays means the number of calendar days.

Commissioning (Cx) Agent (CxA) Prime Contractor means the prime contractor responsible for Cx on the project.

Construction Prime Contractor means the prime contractor responsible for the construction effort on the project.

Contract Type means the terms identified that assign financial risk between the owner and the seller of the contracted services. Examples include guaranteed maximum price (GMP), lump sum, or cost-plus fee.

Coordination Model means the Navisworks file used to coordinate construction trades and all associated source files in their original format at the agreed-upon level of development and level of information.

Delivery Method means the methodology by which the project participant relationships are structured and the sequence in which they are acquired in the overall acquisition strategy. Examples include design-bid-build, design-build, and construction manager at risk.

Design Intent Model(s) means the model that captures the intended design. This/these model(s) include(s) all accurate and relevant geometry and facility information required to convey the intent of the design to the builder to construct the facility.

Design Prime Contractor means the prime contractor responsible for the design effort on the project.

Level of Development (LOD) means the degree to which an element's geometry has been thought through and the degree to which the user of that geometry may rely on it when using the model. This varies from the National BIM guide specifically to differentiate between geometry only versus geometry and information (data). See LOI for data/information description.

Level of Information (LOI) means the level of data / information required for a specific element and the degree to which a user may rely upon it.

Means and Methods Model means a model used for coordination and planning of the construction which is representative of the means and methods intended to be used for the project. For the purposes of the BIM addendum requirements, all means and methods model(s) are inherently part of and reflected within the coordination model and its source files.

Prime Contractor means the entity having a direct contractual relationship with PSU under this contract. This term universally refers to but is not limited to design professionals (designers), builders (general contractors, construction contractors, construction managers, construction management agents acting in a CMAR role, etc.), construction management agents (acting solely in an owner agent construction management role), consultants, or vendors.

Procurement Method means the process used by the owner, or entity contracting services, to select the team of contractors used in the acquisition of the facility. Examples include sole source, best value, or low bid.

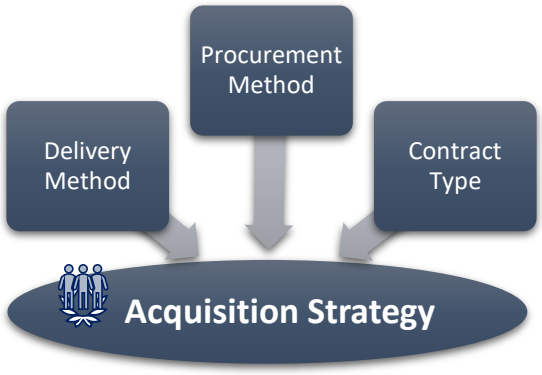
Record Model means the source Revit model(s) that reflects as-built conditions at the prescribed level of development and level of information. This model is a level of detail and information prescribed by the owner with the intent of use to facilitate common facility operations and modifications / adaptations over the life of the building. It is intended to be used as a lightweight model with enough geometric detail to enable multiple enterprise operations efforts. Typically, the design intent model is used as the baseline and then updated incrementally to incorporate all the changes during construction. It is differentiated from the coordination model in two primary ways: (1) the record model is completely in Revit, and (2) it most often contains more data and less complex geometry than the coordination model.

ARTICLE 1 APPLICABILITY TO ACQUISITION STRATEGY

1.1 Provided Examples

1.1.1 Current industry practice employs a variety of acquisition strategies, which employ innumerable combinations of delivery methods, procurement methods, and contract types. Acquisition strategies continue to evolve and vary by project. This addendum applies to all acquisition strategies. Examples provided within this addendum related to specific acquisition strategies or subcomponents (delivery, procurement, and contract) are not intended to be all-inclusive. Rather, they are provided to demonstrate the application of the minimum BIM requirements in various combinations of delivery, procurement, and contract scenarios.

1.2 General Application by Acquisition Strategy



1.2.1 While acquisition strategies vary, projects support typical stages of the facility life cycle. Depending on the acquisition strategy, these stages may be sequential, concurrent, or some combination thereof. These stages include common elements, such as planning, programming, execution (design and construction), commissioning, turnover (standup and testing), and operations. This addendum addresses requirements predominantly from the prime contractor's responsibilities during the various stages of facility's lifecycle. It is the responsibility of the prime contractor to ensure they have sufficiently addressed these minimum BIM requirements through subcontract relationships associated with this contract.

Example: The designer may typically execute the design. However, the contractual responsibility for a design deliverable defined in this requirement is the responsibility of the prime contractor owning the design. For a design-bid-build (DBB) delivery method the contractual responsibility for the minimum BIM design-related requirements associated with this addendum is the responsibility of the contracted designer(s) who are in a prime contractor relationship with PSU.

However, in a common design-build (DB) delivery method relationship the design tasks are typically executed by a designer through a sub-contractual arrangement with the design-build entity. In this scenario the contractual responsibility for the minimum BIM design related requirements associated with this addendum is the responsibility of the design-build entity (typically a builder or construction manager).

1.3 BIM Execution Coordination in Multi-Prime Contract Scenarios

1.3.1 Acquisitions with fewer prime contractors typically have less BIM execution plan (BEP) coordination complexity. As stated in section 2.1 below, the prime contractor is responsible for coordinating their BIM plan with other prime contractors' BEP's associated with this project. The prime contractor shall plan their BIM execution strategy and execution with sufficient resources based on the acquisition strategy and the number of associated prime contractors. In such scenarios, the prime contractors may be required to share relevant

project data or serve as the curator of project data assembled prior to their respective effort, updating or validating certain elements (data or model graphics). This plan shall include effective coordination with other prime contractors associated with the project for various BIM deliverables, such as file sharing during construction trade coordination efforts using BIM and sharing information incrementally with the entity responsible for the BIM Record and Coordination Models.

Example 1: Given a scenario of a design-bid-build (DBB) delivery, the design prime contractor(s) would develop their BIM execution plan with planning for the successful handoff of BIM deliverables described within this addendum for the design effort to PSU and the builder(s) for continued progression of execution towards an eventual successful handoff to PSU for operations. Similarly, the prime contractor builder(s) and agent(s) would review the designer(s) BEP and deliverables in order to incorporate relevant preceding efforts in the most efficacious way into their BIM execution strategy. Through this approach, the builder(s) and agent(s) would successfully execute the requirements described in this addendum for the builder(s).

Example 2: Given a scenario of a construction manager at risk (CMAR) delivery, the prime contractor would be responsible for the BEP incorporating all entities under their contract scope. The CMAR would also be responsible for ensuring their BEP is synchronized with any other project prime contractors, such as the designers' BEP(s), including the foresight for a seamless and successful project handoff to PSU operations.

ARTICLE 2 GENERAL RESPONSIBILITIES

2.1 BIM Execution Plan Development (BEP)

2.1.1 Each prime contractor shall develop a BIM execution plan for the project and provide it to PSU for approval. The BEP should reflect owner stated objectives, use of BIM tools to achieve those results, and the intended processes for project information coordination. The contractor shall apply and follow the efforts defined and agreed to in the BEP. The prime contractor shall keep the document current and accurate throughout the period of performance of this contract. The contractor shall coordinate their BEP with other prime contractors associated with the project. This includes, but is not limited to, designers, builders, and associated subcontractors. Prime contractors shall ensure all elements are coordinated and synchronized to include the work done by any subcontracted work procured by the prime contractor associated with this contract.

2.1.1.1 BEP Draft. ♦ The prime contractor shall submit a draft BEP that is coordinated specifically to reflect the characteristics of the project supported by this contract. This shall be submitted no later than 45 calendar days after the effective date of notice to proceed with the work covered by this contract.

2.1.1.2 BEP Completed. ♦ The prime contractor shall submit a fully coordinated BEP specifically reflecting the characteristics of the project supported by this contract. This deliverable shall address all aspects of this BIM addendum as pertinent to the scope defined in this contract. This shall be submitted no later than 60 calendar days after the effective date of notice to proceed on this contracted work.

2.1.1.3 Updated BEP. ♦ The prime contractor shall submit a fully coordinated BEP updated with any known changes to the current BEP for the project supported by this contract. This shall be submitted no later than 30 calendar days from the time the change is identified.

2.1.2 The prime contractor shall identify any conflicts between BIM addendum requirements and other requirements of this contract effort no later than 30 days after official notice to proceed. The contractor shall coordinate with the PSU project leader and BIM team project representative to de-conflict and ensure approved changes are reflected in the BEP.

2.1.3 Irreconcilable differences between multiple prime contractor(s)BEPs shall be directed to PSU for assistance in de-conflicting. The prime contractor shall exhaust all possible means of reconciliation prior to seeking assistance from PSU.

2.1.4 The BEP shall be uploaded to the BIM execution plan folder for the project on PSU's e-BUILDER site.
▲ When uploading new versions, they should be uploaded as a version rather than a new file.

2.2 BIM Manager

2.2.1 The prime contractor is responsible for assigning a BIM Manager during the entirety of this contract. The BIM Manager shall act as the single point of contact for all aspects of the work required in this addendum and ensure the coordination for all requirements defined in this addendum related to this contract or through executed sub-contractors performing work under this contract.

2.2.2 Typically, the BIM Manager shall coordinate directly with the PSU BIM team project representative. Communication methods other than direct coordination between the BIM Manager and PSU BIM team representative shall be clearly spelled out in the BEP and approved by the PSU project leader. Communications and coordination shall not be construed as agreements to amend the contract, nor shall they imply an exception without amendment to this contract.

2.2.2.1 The prime contractor BIM Manager shall coordinate with the PSU BIM representative to ensure availability for key project BIM meetings that require PSU attendance and input.

2.2.3 The prime contractor's BIM Manager shall be responsible for effectively coordinating with all other prime contractor BIM Managers associated with the project to achieve successful execution of their own BEP and the requirements described within this addendum.

2.2.4 BIM Technical Representative. Each design and construction sub-contracted entity related to the Modeling Requirements (see paragraph 3.2 below) shall assign an individual for the duration of the contract to act in the role of the BIM technical representative for the specific design discipline and construction trade.

2.3 PSU BIM Team Project Representative (PSU BIM Rep)

2.3.1 PSU will provide a representative from the BIM team to serve as the liaison to PSU on all BIM-related issues. The representative will assist the prime contractor BIM manager in the BIM coordination process related to ensure correct implementation of the requirements defined in this addendum.

2.3.2 Due to the number of projects covered by each representative they will not attend all BIM related project meetings.

2.3.3 The PSU BIM representative will assist and advise the PSU project leader with determining compliance with BIM addendum requirements and certifying the completion of elements defined in "Approval of Payment to Contractors: Associated BIM Deliverables" in ARTICLE 4 below.

2.4 Visualization ◆

The primary purpose of visualization deliverables is to increase clarity of design and construction intent as well as spatial awareness and understanding. Visualization will be used to help facilitate project management and facility user communication and decision making, marketing for potential donor(s) or sponsor(s), and operational safety planning and execution.

2.4.1 The prime contractor, shall develop visualizations to achieve the desired objectives of the visualizations. The prime contractor shall develop visualization requirements in coordination with and at the direction of the Penn State project leader. The agreed to visualization requirements shall be included in the BIM Execution plan.

2.5 Data Collection

The primary purpose of the data collection is to increase understanding of project details, aid in the effectiveness of informed decision-making from the various project delivery team stakeholders, and facilitate facility life cycle operational readiness, transition, and facility operations within the greater PSU enterprise system. Data collection will be conducted through the equipment data (EQD) process in eBuilder.

2.5.1 All data required to be submitted within the EQD shall be 100% complete by substantial completion unless otherwise approved by the PSU project leader.

2.6 File Naming Convention

2.6.1 The prime contractor shall provide documents indicated in the PSU OPP file naming requirements. ♦ ◆ Details of the file naming requirements can be found in paragraph 7.4.3 below.

2.6.2 The prime contractor shall demonstrate an understanding and capability to provide all document types listed in the file naming convention described in paragraph 7.4.3 below for file types applicable as deliverables under this contract. The contractor shall demonstrate two examples for each applicable file type by uploading them to the correct PSU e-BUILDER project folders. This demonstration shall be completed successfully no later than 60 calendar days from the notice to proceed. ♦ ◆

2.7 Generation of 2D drawings

2.7.1 The prime contractors shall ensure that 2D drawings are derived and produced from the building information model(s) for reviews, contracting, and official submittals. ♦

2.7.2 The prime contractor(s) shall ensure all relevant schedules are provided to ensure an effective communication of design intent. Schedules shall be derived from the model for all elements defined in the Modeling Requirements section of this addendum. The **Error! Reference source not found.** defines schedules (“Schedule Type”) that shall be included in the model and 2D drawing set. ♦

2.8 Revit and Navisworks Requirements

2.8.1 PSU OPP requires Revit as the BIM platform used for generating models and Navisworks for use in constructability sequencing, planning, and coordination.

2.8.2 Revit shall be used as the primary BIM authoring tool for design and construction trade modeling. ARTICLE 3 below defines those elements of the design that shall be modeled in Revit as a minimum. Elements of design not specifically listed may use other authoring tools. However, the prime contractor(s) are encouraged to use Revit for all design elements.

2.8.3 Navisworks shall be used for the coordination model requirements defined in this addendum. Refer to 6.2 below (Coordination Model) for related details.

2.9 Facility Management (FM) Operations Accessibility

2.9.1 The prime contractors shall provide over-the-shoulder reviews with PSU FM staff to review planning for operational support spaces (e.g., ceiling spaces, utility shafts, mechanical rooms, electrical rooms,

communication rooms, etc.), building system equipment and their respective access, maintainability, and replacement over the life of the building. The prime contractor shall be able to demonstrate clearance requirements as defined in 3.5.6.1 below.

2.9.1.1 The design prime contractor(s) shall conduct an initial review no later than the mid-point of design development (or its design equivalent), additional interim reviews as needed to resolve any identified issues, and a final over-the-shoulder review at the completion of design-development (or its design equivalent). The final review shall occur no later than the mid-point of the construction document (or its design equivalent) development for the project.

2.9.1.2 The construction prime contractor shall conduct an over-the-shoulder review demonstrating that the maintenance clearances designed have been maintained in the coordination model prior to work related to elements defined in 3.5.6 below.

2.9.1.3 The over-the-shoulder reviews shall be identified in the BEP as key milestone events.

2.9.1.4 The prime contractor shall provide meeting minutes intended for distribution to the FM Operations team members. The minutes shall include the issues identified, their resolution status, and an explanation for comments that were not incorporated at a minimum.

2.10 Reliance on Model Elements

This Right of Reliance pertains to all associated models and applications.

2.10.1 The builder may rely on the accuracy of the model(s) prepared by the designer in accordance with the traditional Standard of Care provisions that apply and govern the design and construction of comparable facilities in two-dimensional design formats and methods.

2.10.2 Conversely, the designer may rely on the accuracy of the model(s) prepared by the builder 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 a construction prime contractor, subcontractors, consultants, and other agents working on this project.

2.10.3 As mutually agreed by all parties, including designer, builder, and owner (PSU), 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 designer. 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.

2.10.4 Submittals shall meet the level of development (LOD) and level of information (LOI) completeness as defined by the project-specific BEM BIM Element Matrix (BEM). The prime contractor asserts to the project team members the level of accuracy and completeness implied by the LOD and LOI for deliverables identified in the project-specific BEM. Submittals that do not meet the project specific LOD and LOI defined will be considered incomplete and not be accepted by PSU.

2.10.5 The construction prime contractor(s) 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.

ARTICLE 3 MODELING REQUIREMENTS

The model(s) serve multiple purposes, supporting effective facility lifecycle management objectives for PSU. Details of the PSU BIM objectives can be found in the User Guide (see paragraph 7.4 below). The use of BIM facilitates the maximization of project quality, cost control, and schedule control. The model(s) shall be used to achieve no less than the following:

3.1 Data Collection & Visualization

The model(s) provide effective means for visualization both during design and construction, supporting multiple PSU objectives. Additionally, models provide an effective means to track key attribute information related to various asset elements. Together, visualization and accurate data ensure an understanding of project details and support effective decision-making across the facility's lifecycle. See paragraph 2.5 above for data collection requirements and paragraph 2.4 above for visualization requirements.

3.2 Model Granularity

3.2.1 Models vary in level of development and information for individual elements within them, and the prime contractor shall ensure appropriate and sufficient development of the model(s).

3.2.2 The design prime contractor, at a minimum, shall ensure the inclusion of enough detail to establish design intent, incorporate the model requirements defined in paragraph 3.5 below, coordinate and detect clashes prior to the creation of construction documents, create construction drawings, and meet the requirements defined throughout this addendum.

3.2.3 The construction prime contractor, at a minimum, shall ensure the inclusion of enough detail to incorporate the model requirements defined in paragraph 3.5 below, coordinate and detect clashes prior to construction, establish effective trade coordination and sequencing, produce an effective coordination model set, support effective Record Models, and meet the requirements defined throughout this addendum.

3.3 Geographical (Geo) Referencing

3.3.1 The prime contractor shall identify a common project coordinate datum shared among all associated project models. The geographical coordinates shall reflect the project's actual location on earth.

3.3.2 The reference coordinate system shall be readily convertible to PA State Plane North.

3.3.3 The project geo reference shall be present on all 2D CAD files provided to PSU.

3.4 Model Tolerance

3.4.1 The prime contractor(s) shall ensure a model tolerance for exact dimensions, physical orientation, and location of +/—1" for elements within the model.

3.4.2 The prime contractor shall establish stricter tolerances for aspects of the project that require more accuracy. This includes but is not limited to model design for fabrication, complex spatial, equipment, and furniture coordination, key building envelope connection, or congested/dense ceiling and shaft utility distribution spaces.

3.5 Design and Construction Coordination Model Requirements

The design prime contractor(s) shall use the model(s) to coordinate design, minimize errors and conflicts, minimize requests for information (RFIs), minimize change orders, maximize understanding of design intent, increase high-performance building characteristics, and produce 2D drawings from schematic through construction documents (or its equivalents in concurrent design & construction delivery). The construction prime contractor(s) shall use the model(s) to coordinate construction, minimize field conflicts, minimize construction duration, minimize waste (supporting lean construction practices), minimize change orders,

maximize the quality of the project, and ensure facilities maintainability. The prime contractor shall model and coordinate the following elements using BIM tools.

3.5.1 Except where noted, all object elements listed must be created in Revit or as Revit parametric 3D families in 3D.

3.5.2 See the **Error! Reference source not found.** in paragraph **Error! Reference source not found.** for details of the required equipment. All prime contractors shall ensure the types of assets listed for modeling are included in their respective models and coordinated as part of the design and construction effort.

3.5.3 Site/Civil Model. Model(s) shall contain all site-related features of the project which are not integral to the building envelope:

- Erosion Control (Temporary and Permanent) (Note 2)
- Parking spaces (Note 1)
- Paving (Note 1)
- Planting Materials (Note 2)
- Project Laydown Areas (Note 2)
- Retaining walls (Note 2)
- Site furnishings (Note 2)
- Site stairs, ramps, and railings (Note 1)
- Stormwater Detention and Filtration Structures (Note 2)
- Topography (Note 2)
- Utilities (typically modeled to the point of connection to an existing utility) (Note 2)
- Water Quality Ponds (Note 2)

Site/Civil Notes:

1. The indicated elements must be reflected in Revit as individual parametric Revit objects that can be queried and edited/updated in the associated Revit model.
2. Elements of the site/civil not specifically indicated with “Note 1” may be represented in the model using a Civil 3D CAD-derived object. These elements shall be represented in 3D to allow effective coordination.

3.5.4 Architectural Model. Model(s) shall contain all architectural features for a building and site-related features extending 5’-0” beyond the facility footprint:

- Architectural floor slabs
- Core and vertical systems (including elevators, stairs, escalators, and railings)
- Doors (including frames, hardware information, and lockset information)
- Equipment (including owner-provided equipment)
- Exterior wall systems
- Finishes
- Fire-rated walls
- Furniture

- Glazing (including windows, interior glazing, curtain walls, and storefronts)
- Interior wall systems
- Millwork and Casework
- Reflected ceiling plans
- Roofing system
- Toilet Accessories
- Toilet Partitions

3.5.5 Structural Model. Model(s) shall contain all structural features for a building:

- All structural steel members in their true shape and dimensions with corresponding connection details
- Column Gridline
- Elevator hoist and separator beams
- Exclusions: nuts and bolts
- Foundations (as solid mass), footings piers, walls (including areaways), and pits
- Framing (as solid mass), hollow core floor plank and solid floor slabs, T-beams, L-beams, columns, CMU bearing walls, exterior perimeter CMU walls, brace frames, shear walls
- Miscellaneous structural components
- Primary bearing wall openings
- Primary floor openings (stairs, elevators, mechanical shafts)
- Structural slab (as solid mass)
- Wall kickers should be considered for modeling where they are anticipated to impact the constructability of the project

3.5.6 Mechanical, Electrical, Plumbing, Fire Protection Model(s). The design model(s) shall contain all MEP and fire protection features needed for effective communication of the design intent and elimination of conflicts. The construction model(s) shall contain all MEP and fire protection for effective coordination, intended offsite fabrication, and field trade coordination.

3.5.6.1 ♦ The prime contractor shall model and coordinate all clearance requirements for the mechanical, electrical, plumbing, and fire protection elements identified in section 3.5.6.3 through 3.5.6.6. Clearance requirements for:

- Equipment access
- Maintenance and service space requirements
- Testing and gauge (reading accessibility of these items)
- Valve operational clearances
- Panel access
- Other operation clearances shall be modeled and coordinated by both the design and construction prime contractor(s).

3.5.6.2 Construction hangers, anchors, and means and methods structural supports apply to only the construction stage and coordination model. These supports need to be modeled only where they impact or affect the planning or coordination of other trades.

3.5.6.3 Mechanical Model shall include:

- Hangers and structural supports (applicability see 3.5.6.2)
- HVAC equipment and associated systems (including control panels, tanks, and pumps)
- Mechanical ductwork and associated systems (including VAV boxes, flanges, dampers, flex ducts, heat exchangers)
- Mechanical piping and associated systems (including valves, cleanouts, vents, meters)
- Thermostats, pressure sensors, and other related control sensors within occupied spaces

Mechanical Model Notes:

1. Ducts shall be modeled using their outside dimension and shall include insulation if applicable.

3.5.6.4 Electrical Model shall include:

- Electrical conduit 1” and larger; or two or more conduits directly adjacent regardless of size
- Electrical equipment, including specialty systems and pads
- Electrical light fixtures and ceiling devices
- Electrical panels and panel schedules
- Hangers and structural supports (applicability see 3.5.6.2)
- Maintenance, calibration, and testing access space
- Power feeds to equipment, transformers, panels, gear, junction boxes, cable trays, distribution boxes, etc.
- Safety and security systems
- Telecommunication racks and under-floor tray(s)
- Telecommunication boxes at the point of use
- Wifi transmitters

3.5.6.5 Plumbing Model shall include:

- Hangers, spring hangers, structural supports, and anchors (applicability see 3.5.6.2)
- Insulation, vents, pipe racks, supports, valves, meters, cleanouts
- Piping 1” and larger or two or more pipes directly adjacent regardless of size
- Plumbing equipment and fixtures

Notes:

1. Pipe slope shall be modeled

3.5.6.6 Fire Protection Model shall include:

- Complete bay to include sprinkler heads and associated devices affecting other trades

- Fire protection mains/standpipes

3.5.7Fire/smoke dampers, and other associated in-line devices

- Associated Gauges and valves with corresponding tags (only when necessary for coordination)
- Hangers and structural supports (applicability see 3.5.6.2)

ARTICLE 4 APPROVAL OF PAYMENT TO CONTRACTORS: ASSOCIATED BIM DELIVERABLES

The PSU OPP minimum BIM requirements are important to the overall success of this project in the broader facilities' life cycle management efforts. The prime contractor shall provide the noted deliverables to the specified location at or before the specified milestone to submit a request for payment beyond the indicated threshold. Any requests for payment related to this contract that have not successfully met the below requirements shall be rejected until the prime contractor successfully meets the contractual requirements specified.

Specific requirements are listed throughout this addendum. Deliverable requirements that are tied to requests for payment are graphically identified throughout the document with a ♦. Paragraph 6.7 below lists all BIM-related deliverables, how they are measured (e.g., calendar days, percentage of contract effort complete, etc.), life cycle stage association, and the related paragraph(s) detailing the requirement.

4.1 BIM Deliverables Linked to Payment / Invoicing ♦

4.1.1 If the requirements defined in this addendum are met successfully by the prime contractor, the BIM requirements will not affect payment or invoicing. However, if the requirements are not met, it will affect the prime contractor's ability to submit requests for payment and receive payment for work on this contract until the requirements are met.

4.1.2 Deliverable requirements related to payment and acceptance of invoicing will be conducted by PSU through multiple methods. They are broken into two primary categories: (1) calendar days from specific project milestones and (2) percentage of total contract value billing. The percentage of contract billing is represented by the percentage of the total contract value.

Example: 35% on a $1M contract would mean that payment beyond $350K cannot be submitted, nor will payment be made, until a specific requirement is successfully met.

4.1.3 Where applicable, the percentage of error rate found by PSU's quality assurance process and their respective thresholds are identified for acceptability of successful completion of the requirement.

4.1.4 Refer to paragraph 6.7 below for a summary of deliverables tied to contract payment/invoicing.

4.2 Deliverable Location & Formatting ▲

4.2.1 Unless otherwise noted throughout this addendum, the deliverables shall be uploaded to the appropriate folder in the PSU e-BUILDER .

4.2.2 Unless otherwise noted throughout this addendum, the deliverables shall be provided in the format of origin (e.g. Revit, AutoCAD, Navisworks, Excel, etc.).

4.2.3 Additional details are available in the User Guide when indicated by the graphic "▲" which help identify the specific deliverable locations on PSU's e-BUILDER.

ARTICLE 5 QUALITY CONTROL AND QUALITY ASSURANCE

5.1 Quality Control (QC)

The prime contractor is responsible for quality control and assuring all model(s), data, and deliverables are constructed in accordance with the applicable specifications and achieve the performance specifications of this addendum. This includes, but is not limited to, the accuracy of model elements, parameters and their associated data, appropriate levels of detail and information, elimination of duplicate elements, CAD layering requirements, required schedules, color schemas, file naming, and removal of non-related project metadata.

5.1.1 The prime contractor can use multiple QC tools to perform effective QC.

5.1.1.1 The contractor shall use the Revit Model Checker with PSU OPP standards, providing a report to PSU with the interim and final model reviews. Interim model review submittals shall include brief remediation plans to address identified defaults in the model and an expected timeline for correcting the errors found. Final model review submittals shall be free of errors identified by the Revit Model checker.

5.1.1.2 Model Standards Checks. The final QC validation shall ensurethat the Model(s) have no undefined, incorrectly defined, or duplicated elements. All reports prior to the final model checker report indicating non-compliant elements shall include a corrective action plan to correct non-compliant elements. The contractor shall provide OPP with detailed justification and request OPP acceptance for any non-compliant elements which the Project Team proposes to remain in the Model(s).

5.1.1.3 CAD Standards Check. QC checking shall be 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.

5.1.1.4 Model Commissioning. QC validation shall ensure that the model and database comply with the defined quality control procedure for component-level development and stakeholder information.

5.1.1.5 Other Parameters. The prime contractor shall develop such other QC parameters as deemed appropriate for the Project and provide them to the OPP for concurrence.

5.1.1.6 Over-The-Shoulder Quality Control Review. The prime contractor shall conduct periodic QC meetings, which include reviews of the implementation and use of the model, including but not limited to, interference management, design change tracking information, and coordination validation.

5.2 Quality Assurance (QA)

PSU OPP will conduct quality assurance on the model(s), data, and deliverables throughout the scope of performance set forth in this addendum. The general approach for Quality Assurance will be through sample set reviews and progressively increasing/broadening sample sets if initial testing and validation are not met.

5.2.1 The BIM User Guide highlights many of the Quality Assurance checks that will be performed by PSU, however it is not all inclusive and may vary based on project scope, scale, and criticality to PSU's overall facilities inventory.

ARTICLE 6 SCHEDULES & DELIVERABLES

The BIM deliverables are tied to the PSU OPP project major milestones and closeout process. The deliverables within this addendum occur throughout the facility lifecycle associated with this contract. The following indicates key BIM deliverable points associated with this addendum.

Examples of intent and potential methods to achieve various elements of this addendum can be found in the UG PSU OPP BIM User Guide (see paragraph 7.4 below). The "◆" symbol throughout this addendum identifies available references in the guide.

6.1 Design Intent Model(s) (DIM)

6.1.1 The design prime contractor shall provide a DIM. Project specific in-progress reviews (IPR) of the DIM will be conducted as part of the planned over-the-shoulder model review sessions.

6.1.2 The most current version of the models shall be uploaded to the appropriate location on the PSU e-BUILDER site. The design prime contractor shall ensure this is done no less than quarterly or more frequently as defined in the project-specific BEP.

6.1.3 This model will be transferred to the construction prime contractor as a reference and to aid in creating the coordination model.

6.1.4 The design prime contractor shall incrementally update the Design Intent Model with all design revisions at intervals defined in the project-specific BEP as approved by PSU to reflect any approved changes made during the construction stage. These revisions to the DIM will finally result in the Record Model (see paragraph 6.3).

6.1.5 In a design multi-prime contractor scenario, the prime contractor responsible for the majority of the architectural design effort shall be responsible for conducting the coordination of the design prime contractors and their BIMs across the entire project design effort. All other design prime contractors shall be responsible for submitting their model(s) to the designated file coordination location at the designated time in the designated format described in the current BEP.

6.2 Coordination Model

6.2.1 The construction prime contractor shall develop the coordination model. The coordination model shall include all accurate and relevant geometry and facility information required to construct the facility and shall ensure sufficient model elements and information to allow full coordination and planning of the construction effort across all trades.

6.2.2 The model shall include all elements defined in the Modeling Requirements (see ARTICLE 3 above). These elements shall be coordinated to remove conflicts prior to construction.

6.2.3 ARTICLE 3 above defines those elements of the project that shall be modeled in Revit. Elements not defined may be modeled in other authoring tools. However, the prime contractor(s) shall ensure they are modeled in such a way that allows effective 3D trade coordination and conflict/clash resolution prior to fabrication and field assembly or construction.

6.2.4 The coordination model is a Navisworks file which incorporates the various models used by the trades across the entire project for 3D construction planning, sequencing and coordination.

6.2.5 The construction prime contractor shall update the coordination model with all revisions at agreed-upon intervals as defined in the project-specific BEP during the construction stage of the project. The final coordinated coordination model and its source files will serve as the final coordination model deliverable.

6.2.5.1 In a construction multi-prime contractor scenario, the prime contractor acting in the role of a Construction Management Agent shall be responsible for the coordination model, scheduling meetings between the various multi-primes for designing and building the project and coordinating the flow of information from construction prime contractor(s) to the design prime contractor(s).

6.3 Record Model

6.3.1 The design prime contractor shall develop a record model. This model shall be at the agreed-upon level of development and information defined by PSU and represents the cumulative set of all changes identified in the as-built documentation provided by the builders. The level of development and information required is defined in the BEM BIM BEM(see paragraph 7.2 below).

6.3.2 Federated Record Model. The prime contractor shall ensure Federated model sets are linked to a master Record Model. When delivered to PSU, the prime contractor will ensure the models are not linked/synchronized to a central company/firm server location (e.g. models provided to PSU shall be detached from central and relative links should be applied).

6.3.3 For multi-prime design contractor scenarios, each design prime contractor shall be responsible for updating their respective models and delivering them to the designated file location, in the designated format, and with the designated model elements and information. All design prime contractors shall coordinate with the primary architectural designer for the project and shall provide their record model(s) linked to the master federated record model no later than 30 calendar days before the complete federated model set is delivered to PSU. The prime contractor responsible for the majority of the architectural design shall be responsible for the coordination of the final single federated model set delivery to PSU.

6.4 Block Plans

6.4.1 The design prime contractor shall submit AutoCAD (.dwg) files for each floor of the facility that comply with the PSU Space Management Block Plan Standards.

6.4.2 The block plans shall be derived from the Revit file, exported using the “Course” detail level, and applying the PSU Space Management Block Plan Layering Standards.

6.4.3 The block plans shall be submitted as part of the “Space Report” deliverable defined in paragraph **Error! Reference source not found.**. ▲ ◆

6.5 Commissioning Validation

The CxA prime contractor shall coordinate with the construction prime contractor(s) to validate those attributes identified in **Error! Reference source not found.** (see paragraph **Error! Reference source not found.**) with a “V” under the “Tab or Cx” column to ensure the data listed is valid for the respective assets. This may be achieved through direct testing and observation and through the use of the TAB reports for the project. The CxA prime contractor shall review the BEP to understand timing, formats, and points of contact to ensure the validation is completed with the necessary project timeline to allow needed updates to the Record Model.

6.6 Color Schema Submittals

6.6.1 The color schema submittal indicates the parameters required for use in the following schemas that shall be provided by the design prime contractor. The color schemas shall be produced from the model. Color Schemas shall be submitted as 11x17 printable in PDF format. ◆ The color schema sheet shall include a schedule listing the individual rooms, quantities, total, appropriate descriptive text, and grouped as defined below.

6.6.2 Interim color schema deliverables shall be provided by the design prime contractor no later than the start and completion of design development, and final color schemas deliverables at the completion of construction documents (or their respective design equivalents for concurrent delivery methods).

6.6.2.1 Department Color Schema. The design prime contractor shall provide a floor-by-floor plan of the rooms and their associated departments. This is based on the “Department” parameter.

6.6.2.2 Cost Center Color Schema. The design prime contractor shall provide a floor-by-floor plan of the rooms and their associated assignments, based on the "Cost_Center" parameter.

6.6.2.3 Floor Finish Color Schema. The design prime contractor shall provide a floor-by-floor plan of the rooms and their associated floor finishes. This is based on the "Finish_Floor" parameter.

6.6.2.4 Room Type Color Schema. The design prime contractor shall provide a floor-by-floor plan of the rooms and their associated room types. This is based on the "Room_Type_Description" parameter. The accompanying schedule of spaces shall be grouped by assignable and non-assignable spaces.

6.7 Table of Deliverables

Refer to the applicable notes and ARTICLE 4 for details of the "Payment Relationship" column.

Item	Description	Life Cycle Stage of application	Paragraphs	Payment Relationship
1	BEP Draft 💧	All	2.1.1.1	Note 1
2	BEP Completed 💧	All	2.1.1.2	Note 1
4	Color Schemas (Interim)	Design	6.6	
5	Block Plan Drawings	Design	6.4	
6	File Naming Compliance Demonstration 💧	Design & Construction	0	Note 1
7	Updated BEP 💧	All	2.1.1.3	Note 1
8	2D Drawings 💧	Design	2.7	Note 2
10	FM Operation Over-the-Shoulder Meeting Minutes 💧	Design & Construction	2.9.1.4	Note 1
11	Design Intent Model(s) 💧	Design	6.1, 5.1.1.1 & 5.1.1.6	Note 5
12	Model Visualizations	Design & Construction	2.4	
13	Color Schemas (Final)	Design	6.6	
15	FM Operations Accessibility Review Meeting Minutes 💧	Design & Construction	2.9	Note 3
16	Required Supporting Documents / Files 💧	Construction	**Error! Reference source not found.** & 7.5	95%
17	Coordination Model 💧	Construction & Turnover	6.2	90%
18	Record Model 💧	Turnover	6.3 & 5.1.1.1	Note 4

Note 1 – See the corresponding paragraph for details relating to payment / invoicing implications. Until the requirement is met by the prime contractor responsible for the noted deliverable that prime contractor shall not make requests for payment to PSU. See ARTICLE 4 above for additional details.
Note 2 – The deliverables are defined in the primary contract. However, the means of development/production are defined in the noted paragraph of this addendum.
Note 3 – For design stage-related tasks, 65% of the design fee, including all over associated sub-contracts, travel costs, etc., associated with this contract. For construction stage-related tasks associated with the deliverable, 25% of the total construction award is associated with this contract.
Note 4 – The design prime contractor shall identify the value of the record model deliverable no later than 30 days after notice to proceed is issued. The design prime contractor shall not request payment for more than 50% of that effort until the Record Model is delivered to PSU and meets the requirements.
Note 5 – Payment relationship pertains only to paragraph 5.1.1.1 and 5.1.1.6 requirements. The specific number of submittals and reviews of the BIM are identified and defined by the project team within the project-specific BEP.

ARTICLE 7 RESOURCES / SUPPLEMENTAL DOCUMENTS

7.1 BxP BIM Execution Plan (BEP) Template

7.1.1 PSU OPP has provided a template for the BEP required for the project. The contractor shall ensure their BEP includes all elements noted within the BEP Template unless specifically noted as optional. This template can be found at: https://bit.ly/3xyZhQb

7.2 BEM BIM Element Matrix (BEM)

7.2.1 The BIM information exchange document is a template provided by PSU OPP to be used by the prime contractor in defining the specific Level of Development and Level of Information associated with the project and its respective building components. This template can be found at: https://bit.ly/3VTJTqN

7.3 MC Revit Model Checker

7.3.1 The PSU OPP Revit Model checker is provided as part of the Autodesk Model Checker © plugin and facilitates the validation of the individual model's compliance with the PSU OPP BIM requirements. Model Checker can be found at: https://interoperability.autodesk.com/modelchecker.php

7.4 UG PSU OPP BIM User Guide

7.4.1 PSU OPP has provided a BIM user guide with more detailed explanations of the objectives driving the PSU OPP BIM requirements. This user guide also details the various resource documents' interrelationships, more examples of various acquisition strategy applications of this BIM addendum, basic examples of possible solutions to various aspects of these BIM requirements, and explanations of how the data collected tie into relevant PSU operational databases.

7.4.2 The user guide is provided as a supplemental resource to allow prime contractors better insight into PSU BIM life cycle facility management implications. Its intent is as "guide" versus a list of additional requirements. The guide shall not be interpreted to represent any changes or alternatives to this addendum's requirements, nor the associated requirements provided by referenced supplemental documents.

7.4.3 The user guide can be found at: https://bit.ly/4bfpT6D PL Picklist

7.4.4 The picklist provides a list of allowable entries for various parameters, attributes, and fields used by PSU. Parameters/attributes with related picklist information is indicated in the **Error! Reference source not found.** document. The specific "picklist" and the column of the picklist table containing the acceptable entries is identified.

7.4.5 The picklist file can be found at https://bit.ly/4cgb4ly

7.5 OPP File Naming Standards

7.5.1 The OPP Document Center has provided standard file naming guidance for select document types. The prime contractors shall ensure all deliverables comply with these standards.

7.5.2 The file naming standards can be found at https://sites.psu.edu/ebuildertraining/file-naming-convention/

ARTICLE 8 DATA OWNERSHIP & LIABILITY

8.1 Ownership.

8.1.1 The Building Information Model (BIM) ("model") is an instrument of service and is considered to be a component of Design and Construction Documents.

8.1.2 Each Model Element Author (MEA) contributing to the model(s) and database agrees to provide all project stakeholders and PSU (Owner) a non-revocable, exclusive license to utilize 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 all contracts associated with this facility and associated site work currently or in the future.

8.1.3 The PSU has ownership of rights to all CAD, building information models, objects, elements, associated model data, facility, and site information developed under this contract.

8.1.4 No prime contractor, nor their associated sub-contractors, shall assert against PSU any right of copyright for materials developed under this contract.

8.1.5 Model elements that exist prior to this contract and are incorporated are perpetually licensed to PSU for use in all aspects of the facility lifecycle management without fee. This includes but is not limited to current construction, future operations and renovations or additions.

8.1.6 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.

8.1.7 No parties involved in creating a model shall be responsible for costs, expenses, liabilities, or damages that may result from the use of the model beyond the uses described in the BIM Plan.

8.1.8 The prime contractor(s) shall ensure this language is incorporated in all sub-contracts associated with this contract execution.

8.2 Liability

8.2.1 Nothing in this Addendum shall relieve the design prime contractor from their obligation nor diminish the role of a licensed design professional with responsibility for and in charge of the design of the project and respective model(s).

ARTICLE 9 ADDENDUM UPDATE HISTORY

The following table lists the updates that were made from one version to the next of the BIM addendum.

Version	Description of Changes	Published Date
2	Baseline	2012
3	Restructured and consolidated contractual language requirements, clarified intent aligned to defined OPP facility lifecycle management objectives	10.2017
3.1	Fixed grammatical errors and links	10.2017
3.2	Fixed grammatical errors and formatting corrections; Removed double column formatting; added picklist information	11.2017

Version	Description of Changes	Published Date
4.0	Fixed grammatical errors and formatting corrections; Clarified comments relating to site/civil, and hangers and supports required and clearance coordination; Added clarity to federated model delivery of Record Model; Removed paragraph 7.1.3; Updated visualization requirements; updated the acronym BXP to BEP; Updated data collection requirements	03/2025