BIM Execution Plan

INDIANA UNIVERSITY
UNIVERSITY ARCHITECT'S OFFICE

By signature below, this BIM Execution Plan is herewith adopted and incorporated into the Agreement , dated _____, for Professional Design Services between _____ and Indiana University.

_____   _____
Indiana University   Date

_____   _____
Architect   Date

_____   _____
Construction Manager   Date

_____   _____
Civil Engineer   Date

_____   _____
Structural Engineer   Date

_____   _____
Mechanical Engineer   Date

_____   _____
Electrical Engineer   Date

_____   _____
Plumbing Engineer   Date

_____   _____
Additional Party as Needed   Date

_____   _____
Additional Party as Needed   Date

I.   Overview

The intent of this BIM Execution Plan is to provide a framework that will let the owner, architect, engineers, and construction manager deploy building information modeling (BIM) technology and best practices on this project faster and more cost-effectively. This plan delineates roles and responsibilities of each party, the detail and scope of information to be shared, relevant business processes and supporting software.

II.   Project Initiation

This section defines the Core Collaboration Team, the project objectives, project phases, and overall communication plan throughout the project's phases.

A.   Project Information

Project Name:	
Project Number:	
Project Address:	
Project Description:	

B.   Core Collaboration Team

Contact Name	Role/Title	Company	Email	Phone

C. Project Goals and Objectives

Project Goal	Objective	Achieved if	Project Timeframe

D. Collaborative Process Mapping (Coordination Plan)

	Owner	Architect	Consulting Engineers	Construction Manager	Commissioning Agent
Conceptualization/ Program of Requirements	Provide requirements related to form, function, cost and schedule	Begin design intent model with massing concepts and site considerations	Provide feedback on initial building performance goals and requirements	Provide feedback on initial building cost, schedule, and constructability	Provide feedback on advanced commissioning requirements
Criteria Design/Schematic Design	Provide design review and to further refine design requirements	Refine Design Model with new input from Owner, Consulting Engineers, and Construction Manager. Conduct Reverse Phase Scheduling Activity	Provide schematic energy modeling and system iterations as Design Model continues to develop	Provide design review and continued feedback on cost, schedule, and constructability	Refine advanced commissioning requirements
Detailed Design/Design Development	Department design reviews. Final approval of project design and metrics	Continue to refine Design Model. Introduce consultants models and perform model coordination	Create Discipline specific Design Models. Create detailed energy model.	Create Construction Model for simulation, coordination, estimates, and schedule	Review design model for all disciplines
Implementation Documents/Construction Documents		Finalize Design Model, Construction Documents, and Specifications	Finalize Discipline specific Design Models and Final Energy Model	Enhance Construction Model and perform final estimate and final construction schedule	Review design model for all disciplines
Agency Coordination/Final Buyout	Assist with code compliance negotiations and permitting	Work with agencies on code compliances, plan acceptance and respond to construction RFI's	Work with agencies on code compliances, plan acceptance and respond to construction RFI's	Manage bid process, project buyout, and preconstruction RFI's	
Construction	Monitor construction and give input to construction changes and issues	Perform contract administration, update Design Model with changes	Assist with RFI's and update Discipline specific Design Models, field conditions, and commissioning	Manage construction with subcontractors and suppliers, inform changes to Design Model	Observe construction and perform advanced commissioning.

Facility Management	Engage Architect and Facilities Group for model turnover to staff.	Coordinate information exchange through model to Facilities Group			

E. Project Phases / Milestones

Project Phase / Milestone	Estimated Start Date	Estimated Completion Date	Project Stakeholders Involved
Conceptualization/ Program of Requirements Phase			Owner, Architect, Consulting Engineers, CM
Criteria Design/Schematic Design Phase			Owner, Architect, Consulting Engineers, CM, Commission Agent
Detailed Design/ Design Development Phase			Owner, Architect, Consulting Engineers, CM, Commission Agent
Implementation Documents/ Construction Documents Phase			Owner, Architect, Consulting Engineers, CM
Agency Coordination/Final Buyout Phase			Owner, Architect, Consulting Engineers, CM
Construction Phase			Owner, Architect, Consulting Engineers, CM, Commission Agent
Facility Management Phase			Owner, Architect

III.   Modeling Plan

Advance planning around which models will need to be created during the different phases of the project, who will be responsible for updating models and distributing them, and predetermining the content and format of models as much as possible will help your project run more efficiently and cost-effectively during every phase.

A. Model Managers

Each party—such as the owner, architect, contractor, or sub-consultants—that is responsible for contributing modeling content should assign a model manager to the project. The model manager from each party has a number of responsibilities. They include, but are not limited to:

- Transferring modeling content from one party to another
- Validating the level of detail and controls as defined for each project phase
- Validating modeling content during each phase
- Combining or linking multiple models
- Participating in design review and model coordination sessions
- Communicating issues back to the internal and cross-company teams
- Keeping file naming accurate

- Managing version control
- Properly storing the models in the collaborative project management system

Stakeholder Company Name	Model Manager Name	Email	Phone

B. Planned Models

In the table below, outline the models that will be created for the project. List the model name, model content, project phase when the model will be delivered, the model's authoring company, and the model authoring tool that will be used. For models that will not be used or created in your project, just leave the row blank, and add rows for model types you anticipate needing that are not already listed. The first line offers an example.

Model Name	Model Content	Project Phase	Authoring Company	Authoring Tool
Architectural Model	Architectural objects, code information	Conceptualization / Program of Requirements Phase		Autodesk Revit Architecture
Civil Model	Topography, site utilities to within 5 feet of perimeter, hard and soft surfaces, other site objects	Criteria Design / Schematic Design Phase		Autodesk Civil 3D
Structural Model	Structural steel members, bearing and shear walls, analytical structural model, lintels	Criteria Design / Schematic Design Phase		Autodesk Revit Structure
Mechanical Model	Mechanical systems, equipment, load information, utilities within 5 feet of building perimeter	Criteria Design / Schematic Design Phase		Autodesk Revit MEP
Electrical Model	Electrical systems, equipment, load	Criteria Design / Schematic Design		Autodesk Revit MEP

	information, utilities within 5 feet of building perimeter	Phase		
Plumbing Model	Plumbing systems, equipment, load information, utilities within 5 feet of building perimeter	Criteria Design / Schematic Design Phase		Autodesk Revit MEP
Energy Model	Energy data, run iterations, life cycle costing, peak loads	Criteria Design / Schematic Design Phase		Autodesk Ecotect
Construction Model	Scheduling information, sequencing information	Criteria Design / Schematic Design Phase		Autodesk Navisworks
Estimate Model	Costing data, quantity takeoffs	Criteria Design / Schematic Design Phase		Autodesk Quantity Takeoff
Coordination Model	Design Intent Models and Fabrication information	Construction		Autodesk Navisworks

C. Model Components

As an aid to usability during later phases of your project, specify what the content, level of detail, and file naming structure of your models should look like.

i. File Naming Structure

Determine and list the structure for model file names. The first line offers an example.

File Names for Models Should Be Formatted as:	
DISCIPLINE-Project Name	
Architectural Model	ARCH-
Civil Model	CIVIL-
Mechanical Model	MECH-
Electrical Model	ELECT-
Plumbing Model	PLUMB-
Food Service Model	KITCHEN-
Structural Model	STRUCT-
Energy Model	ENERGY-
Construction Model	CONST-
Estimate Model	COST-
Coordination Model	COORD-

ii. Precision and Dimensioning
Models should include all appropriate dimensioning as needed for design intent, analysis, and construction. With the exception of the exclusions listed below, the model will be considered accurate and complete. In the table below, enter which items' placement will not be considered entirely accurate and should not be relied on for placement or assembly.

Items that Will Not Be Considered Accurate for Dimensioning or Placement
Architectural –
MEP –
Civil –
Construction –
Food Service –
Structural –

iii. Modeling Object Properties
The level of property information in the modeling objects and assemblies depends on the types of analysis that will be performed on the model. See *Section IV-A (Analysis Models)* for the types of analysis that will be performed.

iv. Modeling Level of Detail
Specify the level of detail in your models below. The level of detail can be defined by exclusions and/or by object size.

1. Exclusions: List the objects that will be excluded from the model in the table below.

Items that Will Be Excluded from the Model
Architectural –
MEP –
Civil –
Construction –
Food Service –
Structural –

2. Size: Any object smaller than [TBD] will not be included in the model.

D. Detailed Modeling Plan
For each phase of the project, the project team should create a detailed modeling plan, which should include the modeling objectives, models included, and the roles and responsibilities of model contributors. Model objectives and model manager roles and responsibilities by phase are outlined below.

i. Conceptualization / Program of Requirements Phase

1. Objectives: Provide initial design based on conceptual parameters established by the owner, ensure that code and zoning requirements meet project objectives, and establish a 3D

reference point of model coordination. Provide Program of Requirements and all space considerations for reference in the model.

2. Model Roles: A model may or may not take shape during the Conceptualization / Program of Requirements phase. If a model is created, its role will be to depict the visual concept and general layout of the project along with space requirements.

3. Responsibilities: The architect's designated model manager will establish a baseline model to be used as the basis for other models. During the Conceptualization / Program of Requirement phase, the model managers from all parties will establish modeling standards and guidelines.

ii. Criteria Design / Schematic Design Phase

1. Objectives: Provide spatial design based on input from the Conceptualization / Program of Requirement phase; provide initial design for building system and attributes including architectural, structural, and MEP; identify initial coordination issues between building systems; receive input from suppliers and fabricators regarding system cost, placement, fabrication and scheduling.

2. Model Roles: The Architectural model will show the general design and layout of the building structure and act as the baseline for all other subsystem designs, such as MEP and Structural models. The subsystem designs will be used to show the initial selection and layout of building components. The Architectural model and Consulting Engineers' model will be used to inform the Energy Models.

3. Responsibilities: Once the baseline conceptual structure has been created, the architect's model manager will send the model to the sub-consultants so they can develop their designs. The consulting engineers' designated model managers will audit and deliver the completed models to the architect's model manager. The architect's model manager will review the models to ensure compliance with the phase requirements. Once the models meet the requirements, the architect's model manager will link or combine cross-disciplinary models. The architect's model manager should coordinate with the consulting engineers' model managers to eliminate duplicate or redundant objects.

iii. Detailed Design / Design Development Phase

1. Objectives: Provide final design of building and building systems; resolve coordination issues between building systems; provide a Construction model capable of analyzing schedule, cost, and constructability.

2. Model Roles: The Architectural model will continue to act as the baseline for all other subsystem designs. The subsystem designs will be modified accordingly to represent the enhanced design.

3. Responsibilities: The consulting engineers' model managers will use the Architectural model to revise and complete their designs. Once the models are complete, the consulting engineers' model managers will deliver their models to the architect's model manager. The architect's model manager will review the models to ensure compliance with the phase requirements. The architect's model manager will provide the construction manager's model manager with the Architectural model and the Consulting Engineers' models.

iv. Implementation Documents / Construction Documents Phase

1. Objectives: Finalize design of the building and all building systems, prepare documentation for agency review, and provide construction modeling that highlights constructability, trade coordination, and fabrication.

2. Model Roles: All design models will be used to reflect the design. The models will then be used to generate the contract documents. The Construction model will be used primarily for estimating, scheduling, and constructability analysis.

3. Responsibilities: The architect's and engineers' model managers will prepare contract documents for agency review based on the Design Intent models.

v. Agency Coordination / Bidding Phase

1. Objective: Revise Design Intent models based on agency feedback on all models.

2. Model Roles: The design models will be adjusted to reflect agency feedback. The Construction model will be enhanced and further used for estimating, scheduling, construction sequencing, trade coordination, and constructability analysis.

3. Responsibilities: The architect's model manager will communicate agency comments back to the design team. The consulting engineers' model managers will revise their design models accordingly and submit them back to the architect. The architect's model manager will provide the construction manager's model manager with the Architectural model and the Consulting Engineers' models.

vi. Construction

1. Objectives: Update Architectural and Consulting Engineers' models based on submittals, RFIs, or owner-directed changes; maintain the Construction model based on construction activities. The construction team will submit RFIs and submittals through the collaborative project management system.

2. Model Roles: The Architectural and Consulting Engineers' models will be revised throughout construction, based on owner directives and unforeseen conditions. The models will always reflect the revised contract documents. The Construction model will be used for scheduling analysis, construction sequencing, and trade coordination.

3. Responsibilities: The architect's model manager will work with their consulting engineers to answer the RFIs and submittals and adjust the models accordingly. The construction manager's model manager will update the Construction model and will work with the architect to develop the Architectural and Consulting Engineers' models.

vii. Facility Management

1. Objective: Use the Architectural and Consulting Engineers' models for facility management, with the possibility of use in ongoing operations.

2. Model Roles: The Architectural and Consulting Engineers' models will be used to represent the actual assembly of the building from construction. The model can be updated further and used to show construction changes to facilitate the operation of the facility.

3. Responsibilities: The architect will deliver the models at the end of the project to the owner.

IV.   Analysis Plan

By listing and specifying what types of analysis your project will likely require at the beginning of your project, you can ensure that your key models will include the relevant information, making the analysis easier and more efficient.

A. Analysis Models

Your project's scope of work may require performing certain kinds of analysis, such as the ones listed below, based on existing or specially created model(s). In most cases the quality of the analysis depends on the quality of the original model that the analysis is derived from. Therefore the project team member performing the analysis should clearly communicate the analysis requirements to the original model authoring team member.

i. Quantity Takeoff Analysis
The objective of quantity takeoff analysis is to use modeling property data to automate or simplify the quantity takeoff process. This information from the quantity takeoff tool can then be imported or tied to cost-estimating software. In order for the quantity takeoff process to work seamlessly, the original modeling author will need to include the relevant property information in the design and an agreement of modeled content communities to estimate.

ii. Scheduling Analysis
Scheduling analysis lets the project team use the project model to analyze the timeline and sequencing for construction. This information can then be used to modify or adjust the construction schedule. Tools currently exist that allow project team members to visualize the construction over time, but no systems exist yet that interact automatically with scheduling tools.

iii. Visualization Analysis
Visualization tools let the project team view the design or construction of the project in 3D, giving them a more accurate perspective of the end product.

iv. LEED Rating/Energy Analysis
LEED (leadership in energy and environmental design) Rating/Energy Analysis tools help the project team evaluate the impact of design decisions on sustainability and energy consumption. This analysis model is usually based on the main Architectural model, after which material and building system inputs can be used to evaluate the project's sustainability and energy consumption.

v. Structural Analysis
Structural analysis tools use the model to analyze the building's structural properties. Structural analysis programs typically use the finite element method (FEM) to measure the stresses on all structural elements of the design. For structural analysis to work seamlessly, the original structural modeling tool needs to be compatible with the structural analysis tool, and the original structural model property data must include information about the structural elements.

B. Detailed Analysis Plan

For each type of analysis that may be performed for your project, list the models used for the analysis, which company will perform the analysis, the file format required for the analysis, the estimated project phase, and the analysis tool that will be used. If there are other special instructions associated with the analysis, mark the Special Instructions column and list the details in the Special Instructions table in the next section.

Analysis	Analysis Tool	Model	Analyzing Company	Project Phase	File Format Required
Visualization		Architectural Model			.rvt/.nwf
Structural		Structural Model			.rvt/?
Quantity Takeoff		All Models			.rvt
Scheduling /4D		All Models			.rvt/.nwf/?
Cost Analysis /5D		All Models			.rvt/.nwf
Energy/LEED		Architectural Model			.rvt/.GBXml
Daylight/Lighting		Architectural Model			.rvt/.FBX

C. Clash Detection Process

Clash detection analysis is done to check for interferences between the designs of one or many models. To reduce change orders during construction, clash detection should be performed early and continue throughout the design process. For clash detection to work properly your project's models need to have a common reference point and they must be compatible with the clash detection tool.

V.   Concurrent As-Built Modeling Plan

As-built modeling will be a collaborative effort between the Architect and consultants and the construction team. During the construction process, the design team will incorporate changes triggered by requests for information (RFIs), architect's supplemental instructions (ASIs) and change orders in into the Architectural and Consultant models. At specified dates during the construction process, the construction team will provide the design team with necessary changes due to shop drawings, coordination drawings and change orders. As required, the completed form of the construction will also be verified at these specified dates using laser scanning. The design team will then incorporate the changes reported by the construction team into the Architectural and Consultant models. At the end of construction, it will be the updated Architectural and Consultant models that are used for facility management.

A. Construction Capture Schedule

Event	Date	Parties involved
Construction Capture 1		Construction team, Design Team, [Laser Scanning]
Construction Capture 2		Construction Team, Design Team, [Laser Scanning]
Construction Capture 3		Construction Team, Design Team, [Laser Scanning]
Construction Capture 4		Construction Team, Design Team, [Laser Scanning]

V.   Collaboration Plan

Creating a collaboration plan early on—including defining permissions and file structures—will help team members efficiently communicate, share, and retrieve information throughout the project. It lets you get the most out of your collaborative project management system, saving time and increasing your ROI.

A. Document Management

A Collaborative Project Management system will have to be researched and agreed upon prior to start of project. The requirements of the Collaborative Project Management system are;

- Be web-based or web-enabled—so all relevant, authorized project team members can remotely access it.
- Accommodate different permissions profiles for different project team members.
- Allow communication through either internal messaging or system-generated email.
- Include document management capability that lets the project team create a customized and permission-based folder structure which offers upload, download, and version control capabilities.
- Include a viewer that allows the project team to view .dwg, .dgn, .plt, .dwf, .pdf, .tif, .jpg, .doc, and .xls files.
- Include construction management capabilities for the tracking of requests for information (RFIs), submittals, design review, meeting minutes, daily reports, issues, correspondence, and transmittals.
- Able to interact with the file folder structure in the document management section.
- Able to automatically accept raw data from the clash detection tool.
- Include bid management capability, and this bid management solution should allow the project team to post the contract drawings and specifications for viewing in the form of a Plan Room.
- Allow for cost management controls, and this cost management capability should include budgeting, contracting, change orders processing, and payments applications tracking.
- Allow the project team to run reports based on the information in the system.
- Allow for the workflow and routing throughout the document, construction and cost management components of the solution.

B. Document Management Solution

A document management solution will be provided by the owner. The document management solution that will be used is called [TBD].   The architect will setup the site and set up all permissions for the site. The architect will lead a training session for the entire project team on how to use the site. The site will be maintained from the signing of this document until the occupation of the building.