013100 | Building Information Modeling Requirements

1. General

   A. This standard sets the minimum requirements for building information modeling. It is the design team's responsibility to incorporate these requirements into the construction documents. Where a construction manager or general contractor has their own scoping document for BIM coordination, it may be used but must include these standards as a minimum.

2. Application

   A. The Design Team Responsibilities listed herein apply to all capital projects (projects greater than $1M)

   B. The Contractor Responsibilities listed herein apply to all capital projects unless otherwise determined by the project manager.

   C. Any exception to this must be approved by the project manager.

3. Design Team Responsibility

   A. During Design

      1. Design teams are responsible to design in Autodesk Revit. The version of Revit being used must be within the previous three years of start of design.

      2. All aspects of the design shall be done in Revit including architectural, structural, and MEP to within 5' of the exterior of the building.

      3. Designs shall be completed to a Level of Development (LOD) 300.

      4. Designers shall draw and coordinate in the 3D model to ensure that the design works. Designers need to ensure that everything shown in a corridor or room can be installed there and still be concealed between structure and ceiling and still have maintenance access. They need to ensure that everything required to fit in a mechanical/electrical/IT room will fit and still provide maintenance and code-required clearances.

      5. Construction documents shall include a ceiling plan which shows all ceiling mounted devices to demonstrate they are coordinated with each other and open ceiling tiles are maintained for all above-ceiling maintenance points (VAV's, cable tray, etc.).

      6. Geo-referenced model - A/E shall geo-reference site plans and building models to NAD_1983_StatePlane_Kentucky_FIPS_1600_Feet coordinate system and USGS datum.

      7. The Design Model shall be shared with the contractor within two weeks of contract award for their coordination efforts.

      8. Existing Buildings

         a. The design team needs to determine a plan for coordination when working in existing buildings where existing utilities may or may not remain in place.

         b. The design team and UK should discuss whether a scan will be required for proper design and coordination.

  c. The scan may be performed during design when schedule and demolition allows.

  d. Where the scan is to be performed by the contractor during coordination, it shall be clearly called for and defined in the bid documents.

 B. During Construction

  1. Changes to the design shall be made in the Design Model and these model updates shall be shared with the contractor.

4. Contractor Responsibility

 A. The contractor is responsible for creating a fully coordinated 3D virtual model (**Coordination Model**). The Coordination Model shall provide an MEP installation which:

  1. Is free of clashes between MEP trades, the structure, and architectural elements.

  2. Provides adequate access for the maintenance and removal of all equipment, in above-ceiling spaces, mechanical spaces, and other spaces containing MEP equipment.

  3. Provides all code- and manufacturer-required clearances.

 B. Modeler Qualifications

  1. Contractors shall provide the necessary qualified staff to generate their 3D coordination models and subsequent drawings extracted from those models. All personnel shall have previous experience modelling for their respective trade.

  2. The expectation is that the modeler will be knowledgeable about the entire scope of work they are modeling, both in terms of work required for the specific project and a general knowledge of the trade they are modeling (i.e. the person modeling the plumbing scope needs to be familiar with all the plumbing work required for the project as well as a working knowledge of all plumbing such as slopes required, hanger spacing, distances to vents, etc.)

  3. If the contractor does not have the qualified in-house staff to generate their 3D coordination models and are using a third-party consultant, the contractor will provide a competent person from their company capable of making decisions on their scope of work, along with their consultant modeler(s), at each coordination meeting.

 C. Contractors shall use clash-detection software, such as Navisworks, to create a fully coordinated model – the Coordination Model.

 D. **Coordination Model** Contents - The following level of detail shall be provided in the model:

  1. HVAC: At a minimum, all ducts and mechanical pipes shall be modeled to the outside face dimension including flanges, joints, fittings, connections, insulation, offset requirements, dampers, controls, access zones, control panels, diffusers and grilles, and hangers and supports associated with the HVAC system. Control devices and panels requiring access and maintenance shall be modeled. Control conduits 2" and larger shall be modeled. Control devices in ceiling tile shall be shown (i.e. pressure sensors, occupancy sensors, etc.). HVAC equipment shall be modeled to accurately represent the submitted and approved shop drawings. **Where available, manufacturer-provided Revit models shall be used**.

  2. Plumbing: At a minimum all plumbing, piping, equipment (with pads), valves, cleanouts, vents, fittings, any other system accessories, hangers, and supports. Pipes will be modeled

to the outside diameter of the pipe or the pipe insulation where applicable. Plumbing-feeding fixtures such as sinks, toilets, drinking fountains, floor and roof drains shall be modeled for rough in location. Plumbing equipment shall be modeled to accurately represent the submitted and approved shop drawings. **Where available, manufacturer-provided Revit models shall be used.**

3. Fire Protection: At a minimum, all components of the fire alarm system shall modeled including, piping, valves, valve cabinets, fire pumps (with pads), sprinkler heads, hangers, supports, access zones, and control panels.

4. Electrical: At a minimum, all panels and distribution gear (including all applicable clearance zones), light fixtures (with installation clearances), cable trays (with clearance zones required by UK ITS standards), access control panels, lighting control panels, conduit larger than 1", hangers, and busways. Grouped (2 or more) conduit of any size in a particular location will be modeled to reflect the overall space requirements. All devices in ceiling shall be modeled including occupancy/vacancy sensors, light harvesting sensors, etc.

5. Fire Alarm: At a minimum, all components of the fire alarm system shall be modeled including all panels and devices with access zones and conduits 2" and larger. Grouped (2 or more) conduit of any size in a particular location will be modeled to reflect the overall space requirements.

6. Telecommunications: At a minimum, all cable tray (with clearance zones required by UK ITS standards), wire managements hooks, ceiling-mounted devices, conduits 2" and larger, and communication racks and cabinets will be modeled. Grouped (2 or more) conduit of any size in a particular location will be modeled to reflect the overall space requirements.

7. Structural Fabrication: At a minimum, all columns, beams, girts, purlins, bracing, girders, trusses, joists, kickers, steel shapes, slabs, pre-cast concrete elements, laminated wood framing, metal floors and roof decks, pre-engineered building components, miscellaneous framing, trestles, and catwalks shall be modeled.

8. Conveyance (elevators, escalators, etc.): At a minimum, all equipment including service access, support connections, and mechanical spaces shall be modeled.

9. Kitchen Equipment: At a minimum, all manufactured equipment and supporting elements requiring field installation either by this trade or by others shall be modeled. Include rough in locations for equipment services. Refer to HVAC requirements for ductwork associated with hoods or exhaust.

10. Ceiling Systems: Ceiling grids must be shown. If they are not provided with the Design Model, they need to be added to the Coordination Model. It is imperative that all above-ceiling access be coordinated closely with ceiling grid lines. Additionally, a 4" clear space shall be provided from the top of the ceiling grid system. This shall be shown in the model and kept clear of all utilities. This is required to allow the removal of ceiling tiles. Soffit framing is to be modelled.

11. All trades: Seismic bracing shall be shown where required.

12. All trades: All existing to remain systems, regardless of size, shape and location, shall be verified in the field manually or captured through laser scan data and modeled adhering to the same requirements for the trade detailed in this section.

13. All trades: All required access panel locations and sizes shall be shown as required.

14. When modeling Access and/or Clearance Zones:

   a. Above ceiling equipment zones must be modeled per equipment spec, building code, or UK standard – whichever is greater; and must extend down to the level below to insure there is adequate space to land a ladder for access.

   b. Zones for equipment installed below ceiling must be modeled per equipment specification, building code, or UK standard – whichever is greater; and must extend down to the level below.

15. Coordination Models shall be color-coded according to the following chart.

System	Color
Structural	143, 148, 156
Chilled Water Supply and Return	32,94,133
Heating Hot Water Supply and Return	242,212,132
High Pressure Steam and Return	160,38,34
Medium Pressure Steam and Return	170, 62, 30
Low Pressure Steam and Return	211, 114, 22
Condensate Pump Discharge	196, 200, 199
Domestic Cold Water	31, 120, 78
Domestic Hot Water	126, 193, 107
Domestic Hot Water Return	126, 193, 107
Supply Air Ductwork	40, 255, 255
Return Air Ductwork	40, 255, 40
Exhaust Air Ductwork	255, 160, 0
Electrical Conduits, Cable Tray, Panels	255, 255, 0
Fire Protection	255, 0, 0

E. Coordination Process

1. The contractor shall schedule regular coordination meetings as required to meet the project installation schedule.

2. The Project Manager shall be invited to all coordination meetings so that they may share the invitation with any interested parties at the university.

3. Coordination models shall be made available to the university in the form of Navisworks files.

4. When a coordination area is ready for sign-off, a meeting shall be scheduled with UK for review. The Navisworks file shall be provided to UK one week prior to this review meeting.

F. Construction Updates

1. The Coordination Model shall be updated throughout construction with changes to the project. UK shall be given the opportunity to review model changes.

2. Architectural, MEP, and Structural model changes shall come from the design team. This shall be incorporated into the Coordination Model.

3. The MEP systems shall be coordinated with any project changes.

5. Record Model

A. Format

1. The final record model shall be provided to the university with the closeout documentation in both Revit and Navisworks formats. Both shall be in a version of their respective software which is updated to within the previous three years.

B. Content

1. The Record Model shall include the updated architectural and structural models from the design team and the MEP coordination model from the contractor. The Record Model shall incorporate all architectural, structural, and MEP changes and be a true as-built 3D virtual model of the building.

2. The models shall be provided within the same folder. The architectural model shall contain links to the MEP, structural, and any other required model from within this folder.

Appendix A

BIM Model Types:

		BIM MODELS & ORGANIZATIONAL ROLES			
	Model Name	Description	Authored / Maintained	File Formats	Archived
Design	Architectural Design Models	Architect's model used for designing the project and creating design drawings. Structural Design Model and MEP Design Model are linked into this model.	Architectural Consultant	AutoDesk® Revit	Univ of Kentucky
	Structural Design Model	Structural engineering consultant's model used for designing the project and creating design drawings.	Engineering Consultant	AutoDesk® Revit	Univ of Kentucky
	MEP Design Model	MEP engineering consultant's model used for designing the project and creating design drawings.	Engineering Consultant	AutoDesk® Revit	Univ of Kentucky
Construction	Coordination Model	Model created by contractors for coordination and fabrication. This model begins with the Design Model, but all MEP components are detailed and manipulated to create a clash-free, coordinated model.	Contractor	AutoDesk® Revit & Navisworks	Univ of Kentucky
Operations	Record Model	Architectural Design Model, complete with all changes made during construction with the following models linked in and included: - Structural Design Model, complete with all changes made during construction - Coordination Model, complete with all changes made during construction	Consultants Contractor	AutoDesk® Revit & Navisworks	Univ of Kentucky
	Industry Foundation Classes (IFC) Model	For Archives: the IFC File Format	Consultant	AutoDesk® Revit Architecture	Univ of Kentucky
	Owners Model = Operations Model	Master Model [1] support planning and renovations [2] support operations - *includes A M E P Models - one per discipline* [3] include disclaimer	Univ of Kentucky	AutoDesk® Revit Architecture	Maintained Univ of Kentucky