

UNIVERSITY of **HOUSTON**

FACILITIES PLANNING & CONSTRUCTION DEPARTMENT

UHS BIM Protocol

S E C T I O N 1 - DATA REQUIREMENTS

BIM authoring software: The design team is required to use parametric BIM authoring software for creation of models that include all geometry, physical characteristics and product data needed to describe the design and construction work to the level of detail required in the Implementation section of this protocol. While a specific BIM authoring software is not required by this protocol, all members of the design team shall provide models and data in the format necessary to support the model level of detail required for the project. A specific deliverable file format, if required for a specific project, will be described in the request for professional services and bidding documents for that project. Deliverable requirements are as specified in the Deliverables section of this protocol document.

Open architecture: The design team is encouraged to use products based on or using open standards for greatest interoperability between consultants, contracting authority, and owner facility maintenance and management systems.

IFC Compliance: BIM authoring software shall be compliant with the latest release of the Industry Foundation Classes (IFC) as certified by the buildingSMART alliance.

Project Collaboration: The design team shall provide the Owner and its contractor model reviewing tools (readers) that support the collaborative review environment for design and construction work.

Geo-reference: The design team is required to geo-reference building information models, site plans and associated construction drawings to provide projection and coordinate system information necessary to ensure interoperability with existing Geographic Information Systems (GIS). Final models, site plans and associated construction drawings shall be delivered in the respective Texas Coordinate System of 1983 and Zone within which the project is located; shall utilize the North American Datum of 1983, 2001 Adjustment (NAD83-2001 adj.) and the North American Vertical Datum of 1988, 2001 Adjustment (NAVD 88-2001 adj.), and; shall employ measurement units appropriate to the project's scale and design (i.e. US Survey Feet or Meters). The State's GIS are maintained by the Texas Natural Resource Information System (TNRIS), which may be contacted by phone at 512.463.8337, or by visiting their website at <http://www.tnris.state.tx.us/>.

Project-specific requirements: Additional requirements for data development and transmission may be required for the project. The design team is advised to thoroughly review the solicitation for design services for the project for specific requirements.

S E C T I O N 2 - MODEL MANAGEMENT

Model Manager: Unless noted otherwise in the agreement, the architect will be responsible for management of the model throughout the design and construction phases of the project, and will coordinate all updates for the individual and specialized models and databases to insure completeness and accuracy of the overall project model. The Owner may consider other parties (e.g., Construction Manager) as the model manager at their discretion and as appropriate for the project.

BIM Execution Plan: This protocol has established a level of development for model elements and data requirements. The project participants are required to develop a BIM Execution Plan (e.g., Computer Integrated Construction Research Program's "BIM Project Execution Planning Guide") or similar tool to develop a detailed plan for development and management of the model throughout the design process and construction phase. The plan shall incorporate the requirements specified for the project, and be reviewed and approved by the contracting authority.

Ownership of the Model: BIM models and facility data developed for the project are the property of the project owner. The owner may make use of this data as allowed under the laws of the state of Texas for electronic data and contract documents.

S E C T I O N 3 - IMPLEMENTATION

Determination of the BIM requirements for a project is based on a three part approach to select the type of model development and level of development required for models. Each part of this selection focuses on a specific element of model development: owner defined requirements for model use; categories of modeling development; and level of development for each model component.

Owner defined requirements: These requirements describe how the model(s) will be used by the owner during and after construction. Owner defined requirements are split into two categories: requirements for model use during design and construction, and requirements for model use by the owner after project completion. Models shall be of a level of development sufficient to support an integrated design process that coordinates critical systems for proper building function and performance.

Requirements for model use during design and construction: These requirements are standard for BIM implemented projects, and include the following:

Programming: Models support and confirm the program of requirements for the project.

Energy modeling: Models shall be of a minimum level of development to support requirements for energy modeling and for LEED certification, if required for the project.

Coordination: Models shall be able to support the review of conflicts, clearances and “clashes” through evaluation software utilized by the design team and/or construction manager, or as selected by the owner.

Visualization: Models shall be of a level of development to support a three dimensional illustration of the organizational and spatial relationship of the occupied spaces.

Requirements for model use by the Owner (Post Construction): These requirements will vary depending on the specific needs of the owner and project. Several examples of owner use requirements include:

Capital planning support: The model may be required to support owner planning activities for capital project development. The model will be of sufficient development to assist the owner in reviewing renovation and systems requirements for future projects.

Integration into energy management systems: The owner may require the model to provide a level of development to support electronic management systems or other monitoring and control systems.

Facilities management: The *owner* may require elements of the model to provide levels of development to support a facilities management system or process.

Owner defined requirements should be developed at project initiation, and will be included in the announcement and selection process of architects and design professionals.

Model Development Categories: The category of model development required for a specific project will be described in the solicitation for design services, and will be incorporated into the agreement. The selected model development level may be adjusted to accommodate a specific project or Owner need. The design team's response to the solicitation will constitute its acceptance of the specific modeling development requirements described with the solicitation. The four categories of model development are described as follows:

I: This model will support project planning through space and volume illustration, adjacencies, and site positioning.

II: This model will include a sufficient level of development to support document and system review, clash detection and coordination, and support an as-built format for Owner use after completion. If no Model Development Category (“*MDC*”) is identified, then MDC II will apply.

III: This model will include all the benefits and requirements of the early model categories, and will provide sufficient detail to support a detailed model development of systems supporting building occupancy and facility management.

IV: This model will include the benefits and requirements of the earlier model categories, and support highly detailed logistical, scheduling, and estimating efforts.

As the technology and expertise of model development expands, additional model development categories will be added. The next likely category will be a level of model development necessary to support post construction facility management.

Level of development for model components: The level of development for each model component is based on the model content criteria established by AIA Document E202, Building Information Modeling Protocol Exhibit. The content for each level of development is described as follows:

Level 100: Overall building massing indicative of area, height, volume, location and orientation.

Level 200: Generalized systems or assemblies with approximate quantities, size, shape, location and orientation.

Level 300: Specific assemblies accurate in terms of quantity, size, shape, location and orientation.

Level 400: Specific assemblies accurate in terms of quantity, size, shape, location and orientation with complete fabrication, assembly and detailing information.

Level 500: Constructed assemblies that are actual and accurate in terms of size, shape, location, quantity and orientation.

Each of the model categories has an established level of model development for each building system. The level of development for each building system may be adjusted to reflect Owner requirements. Refer to the following matrix for the specific building system levels of development (“*LOD*”) for each model category:

| Building System | Model Category/Level of Development | | | |
|-----------------------------------|--|-----------|------------|-----------|
| | I | II | III | IV |
| Substructure | 0 | 300 | 300 | 400 |
| Structure | 100 | 300 | 300 | 400 |
| Enclosure* | 100 | 300 | 300 | 400 |
| Interior* | 100 | 300 | 300 | 400 |
| Conveying Systems | 100 | 200 | 300 | 400 |
| Plumbing | 100 | 200 | 300 | 400 |
| HVAC | 100 | 200 | 300 | 400 |
| Fire Protection | 0 | 100 | 300 | 400 |
| Electrical | 100 | 200 | 300 | 400 |
| Equipment and Furnishings* | 100 | 200 | 300 | 400 |
| Special Construction | 100 | 200 | 300 | 300 |
| Site work | 0 | 100 | 100 | 200 |
| Site Improvements* | 100 | 200 | 200 | 300 |
| Site Utilities | 100 | 200 | 300 | 300 |

** Additional LOD descriptions are provided for these building systems.*

Several building systems are composed of elements that may require separate levels of component development as described below:

| Building System Component | Model Category/Level of Development | | | |
|----------------------------------|--|-----------|------------|-----------|
| | I | II | III | IV |
| Enclosure | 100 | 300 | 300 | 400 |
| Exterior Walls | 100 | 300 | 300 | 400 |
| Exterior Windows | 100 | 200 | 300 | 400 |
| Exterior Doors | 100 | 300 | 300 | 400 |
| Roof Coverings | 100 | 200 | 300 | 400 |
| Roof Openings | 100 | 300 | 300 | 400 |
| Interior | 100 | 300 | 300 | 400 |
| Interior Partitions | 100 | 300 | 300 | 400 |
| Interior Doors | 100 | 300 | 300 | 400 |
| Interior Specialties | 0 | 200 | 300 | 400 |
| Stair Construction | 100 | 300 | 300 | 400 |
| Wall Finishes | 0 | 200 | 200 | 300 |

| Building System Component | Model Category/Level of Development | | | |
|----------------------------------|-------------------------------------|-----|-----|-----|
| | I | II | III | IV |
| Ceiling Finishes | 0 | 200 | 200 | 300 |
| Windows | 100 | 200 | 300 | 400 |
| Floor/Ceiling Construction | 100 | 300 | 300 | 400 |
| Equipment and Furnishings | 100 | 200 | 300 | 400 |
| Fixed Equipment | 100 | 200 | 300 | 400 |
| Moveable Furnishings | 100 | 100 | 200 | 300 |
| Special Equipment | 100 | 200 | 300 | 400 |
| Fixed Furnishings | 100 | 200 | 300 | 400 |
| Site Improvements | 100 | 200 | 200 | 300 |
| Roadways | 100 | 200 | 200 | 300 |
| Parking | 100 | 200 | 200 | 300 |
| Pavements | 100 | 200 | 200 | 300 |
| Landscaping | 0 | 100 | 100 | 200 |
| Irrigation | 0 | 100 | 200 | 200 |

The model categories should be reviewed together with the Owner-defined requirements, adjusting the specific levels of development for building components to support the end-user requirements. For example: Owner may select an MDC II model for the project, but require detailed equipment data for the HVAC system to support future expansion and systems management. The category II model would remain as stated, with the exception of the HVAC system components which may be set at a higher level of development.

S E C T I O N 4 - DELIVERABLES

The requirement for BIM deliverables will not replace the current deliverables specified within the agreement. The BIM deliverables indicated below (the “*BIM Deliverables*”) are required to be submitted with the standard phase deliverables for each design phase. The BIM Execution Plan should establish primary and secondary responsibility for each deliverable. The level of development for each BIM Deliverable should be sufficient to produce traditional two-dimensional deliverables required for that stage.

Pre-Design

- BIM Execution Plan (within 30 days after contract execution)
- Feasibility Models
- Data Base of Programs/Spaces Massing/Volume/Area Relationships/Functions
- Responsibility Matrix
- Data Organization Outline Restatement of Owner Requirements AIA E202 Refinements

Schematic Design

- BIM Execution Plan Update
- Preliminary Energy Model
- Concept Model- 3 scheme concept
- Architectural Model- Based on approved concept model.
- Preliminary Systems Model - Structural, MEP, Civil or other systems required by the project. Clash Detection Report

Design Development

- Energy Model
- Architectural Model Structural Model MEP Model Site/Civil Model Systems Model
- Detailed Clash/Collision Report
- Code Review Model

Construction Documents

- Energy Model
- Architectural Model
- Structural Model
- MEP Model Site/Civil Model Systems Model
- Detailed Clash/Collision Report - Showing issues and resolutions. Code Review Model
- Quantity Reports

Construction

- Coordination
- MEP Model Architectural Model Structural Model

As Built

- Record Models – A fully aggregated model updated with field changes and as-built conditions and comprised of all Models employed in the course of design and construction of the project, delivered in Navisworks format.
- Quantity Reports
- No energy model or clash report.