Division of Facilities Development

BUILDING INFORMATION MODELING (BIM) GUIDELINES

August, 2022

Version 1.0

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1. General Information

1.1. Introduction

These BIM Guidelines have been created to establish baseline requirements for consistent model development, coordination, and management across capital projects managed by DFD. This applies to all projects advertised on or after April 1, 2022.

This document will routinely be reviewed by DFD staff and stakeholders to ensure the BIM Guidelines are kept relevant. Should you have comments or questions specific to this document, please consult with your DFD Project Manager or email DFDBIM@wisconsin.gov

1.2. Applicability

The applicable guidelines are based on the project's scope of work and overall project budget. BIM Guidelines align with the DFDM Policies and Procedures Manual (PPM) and the Master Specifications and Design Guidelines.

The table below is a general guideline.

Project Type	**Definition**	**Tier 1**	**Tier 2**
New Construction or Major Renovation (NC/MR)	A new building, an addition, or an existing building with conditioned space where the scope of work includes two or more of the three systems: mechanical, electrical, plumbing, fire protection, and envelope.	< $15M	> $15M
Tenant Improvement (TI)	Any existing space that does not meet criteria for major renovation	< $3M	> $3M

Tier 1 - BIM is not required, however the use of BIM is up to the DFD Project Manager's discretion and should be discussed at the A/E kickoff meeting. The A/E team is not obligated but may choose to follow the guidelines of this document. If the A/E team chooses not to utilize BIM they shall complete the project in 2D following the DFD CAD Standards Instruction Manual.

Tier 2 - BIM is required, and the A/E shall follow guidelines outlined in this document.

1.3. Definitions

A/E: The Architect/Engineering firms, along with all the consultants hired by the A/E to produce the design intent model and all documentation necessary to support bidding and construction.

Building Information Model (BIM): A digital representation of physical and functional characteristics of a facility. A compilation of pertinent layout and systems that show sizes and locations of system components and required access areas to ensure that no two objects will occupy the same space.

BIM Project Execution Plan (BPxP): A document prepared by the A/E team that defines the expected BIM deliverables and guides the coordination of the design project team throughout the project lifecycle.

Design Intent Model: Building Information Model that demonstrates and communicates the objectives of the designer. The Design Intent Model is made available to the contractors solely for convenience and for informational purposes. Contractors are not to rely upon the Design Intent Model and the data and/or information contained therein in preparing any of the BIM coordination model for the project. Updated Design Intent Models will not be provided to the contractor throughout the construction lifecycle.

As-built Model: The Design Intent Model updated with actual constructed locations for equipment, systems, walls, etc. Updates are to be completed based on markups provided by the contractors. Once updates are completed the Record Model is used by the A/E to produce PDF record documents.

1.4. BIM Goals

Model based verification of constructability.

- DFD expects the A/E to demonstrate to DFD through the BIM that all disciplines have been coordinated with one another and all information input into the BIM is accurate.
- The A/E is expected to perform detailed field verification of existing building conditions prior to development of the BIM. It is critical that existing conditions are field verified, and that the information is correctly input into the BIM. Reduce the quantity of change orders through the use of a BIM as a coordination tool.

2. General Requirements

2.1. Building Information Modeling (BIM)

BIM shall be used to support the creation and communication of an optimal design solution that meets the owner's functional and aesthetic requirements. BIM shall include all geometry, physical characteristics, field verified existing conditions and data needed to produce a coordinated set of Bid and Construction Documents. Each team member shall model the building and infrastructure systems they are responsible for to a level that allows the team to verify clearances, analyze conflicts, and properly coordinate their work with other aspects of the project.

2.2. Accepted Software

DFD accepts object-oriented software applications that comply with current industry interoperability standards. BIM authoring software shall at a minimum comply with the Industry Foundation Classes, IFC2x3 coordination view. All software should be capable of data exchange with coordination and collaboration

software.

Currently pre-accepted software includes:

- Model Authoring:
  - Revit, AutoCAD (and its various verticals), ArchiCAD, Bentley Architecture, Digital Project, Tekla, Vectorworks, Bentley Inroads, Autodesk Civil 3D, and AutoCAD Plant 3D
- Coordination:
  - Navisworks, Solibri Model Checker, Trimble Connect

2.3. BIM Execution Plan

A BIM Project Execution Plan (BPxP) is required to be submitted at the end of the Pre-Design phase. It should be treated as a living document, and any edits and/or updates must be communicated to the DFD Project Manager.

BPxP shall cover at a minimum the following topics:

- A/E Consultant and DFD BIM goals
- Model authoring software
- Model hosting/sharing
- A/E coordination process and frequency of clash coordination meetings
- A/E and DFD BIM model review meeting frequency
- Process for capturing existing conditions
- Geo reference and model linking strategies
- Model naming and responsibilities

2.4. Model Sharing

All models shall be shared freely amongst the A/E team. Team members consuming data from models generated by other team members are using them at their own risk. The 2D PDF documents are still the contractual documents. Models shall be used to gain a clearer picture of design intent and for general spatial coordination. Project teams are encouraged to use cloud-based model hosting/sharing sites to foster a more collaborative project team experience. Final model sharing protocol for the project shall be defined in the BPxP.

2.5. File Naming

All project models shall adhere to the DFD file naming standards as shown below.

DFD project number-Trade Designator-Model Type-BIM

Trade designator instructions:

A	Architecture
C	Civil/Site
E	Electrical
F	Fire Protection
G	General (title sheet, sheet indexes)
H	Hazardous Materials (asbestos, lead)

L	Laboratory
K	Kitchen
M	HVAC
P	Plumbing
Q	Special Equipment
R	Remediation (soil)
S	Structural
T	Technology Services (low voltage, AV)

Model type instructions:

- Use DI during predesign through final design project phases.
- Use RD at record model handover.

Examples:
21A1B-00-A-DI-BIM
21A1B-00-M-DI-BIM
21A1B-00-A-RD-BIM
21A1B-00-M-RD-BIM

2.6. Title Block

The DFD has developed AutoCAD title block templates drawings for the following sheet sizes:

File Name	Sheet Size
tb-8.5x11.dwg	ANSI A
tb-11x17.dwg	ANSI B
tb-18x24.dwg	ARCH C
tb-24x36.dwg	ARCH D
tb-30x42.dwg	ARCH E1

A/E to select a project sheet sized from this list. Other sheet sizes are not allowed.

It is the responsibility of the A/E to convert the .DWG file into a format that works with the BIM software selected to complete the project. After converting the title block, content and format shall match the CAD version; however, TrueType fonts such as Arial may be used in place of DFD-Bold.shx.

3. Model Quality

3.1. Accurate Modeling

The A/E shall practice efficient and accurate modeling.

Model elements shall represent actual dimensional data needed to describe the design intent.

The A/E is expected to perform detailed field verification of existing building components prior to development of the BIM. It is critical that existing conditions are field verified, and that the information is correctly input into the BIM.

Input data shall be reviewed on a regular basis throughout the design process. It is critical that this data is accurate and input correctly in the BIM as this is the starting point of the coordination process.

A minimum list of elements, per discipline, to be included in the Design Intent Model is noted below.

Architectural

- Interior and exterior walls modeled to exact height, length, width, finish and rating.
- Curtain wall systems to have mullions and windowpanes according to the basis of design profile.
- Interior and exterior doors, windows, and louvers.
- Architectural specialties, including toilet accessories, toilet partitions, grab bars, lockers, display case, shelving, and other interior architectural elements.
- Ceiling systems, soffits, ceiling openings, sloped ceilings, and ceiling accessories. Ceiling systems, including framing and bracing, shall be modeled as the overall thickness which includes modeling elevation changes and termination points.
- Fire extinguisher cabinets.
- Roof shall be modeled to include the roof type with overall thickness including insulation, drainage system, major penetrations, access ladders and specialties.
- Stairs
- Code-required signage.
- Door, window, and finish schedules.
- Fixtures and equipment shall be modeled to meet layout requirements.
- Maintenance and access clearance zones.

Structural

- Cast-in-place (CIP) concrete, including penetrations and openings identified in Construction Documents, shall be modeled. Chamfers at corners are not required to be modeled. Include structural floor slab recesses, curbs, and pads.
- Edges of slabs and penetrations of structural systems. Primary and secondary structural steel members, including standard steel member sizes, gusset plates, braces and kickers.
- Reinforcing steel is not required to be modeled for MEP coordination.
- Metal, wood and concrete decks shall be modeled as the overall thickness of slab. Ribs in metal deck are not required to be modeled.
- Pre-cast concrete. Primary and secondary elements.
- Stair framing members and necessary openings for the stair system.
- Shafts, pits, and openings.
- Equipment (all mechanical equipment required to operate the building; any

equipment which is fixed/ attached to the building, has a known location and infrastructure; and medium/large equipment with a specific location, needing infrastructure).
- Concrete pads.
- Maintenance and access clearance zones.
- Equipment shall be modeled to its overall height, width, and depth.

Equipment
- Tier 1 - Equipment that is fixed or attached to the building and has a known location and infrastructure (such as mechanical, electrical, plumbing) must have a 3D object modeled to account for spatial coordination.
- Tier 2 - Small and medium equipment with no infrastructure (except 120V outlet), has no specific location and can be moved does not need to have a 3D object modeled.

Mechanical
- Ductwork, including flexible duct and transitions.
- Duct insulation.
- Access doors.
- Air handling equipment.
- Filters and access to filters.
- Grilles, registers, and diffusers.
- Fire dampers, smoke dampers and combination fire/smoke dampers (include access to motors and dampers).
- Dampers (automatic and controlled).
- Sound attenuating equipment.
- VAV boxes and access clearances.
- Maintenance and access clearance zones.
- Mechanical Equipment (pumps, heat exchangers, steam prv stations, condensate pumps, etc.)
- Mechanical equipment shall be modeled to its overall height, width, and depth.
- Temperature control panels.
- VFD's
- Valves (manual and automatic) including access.
- Piping to be modeled to 5 feet outside building footprint.
- Groups of 3 or more pipes routed side-by-side regardless of size.
- Ganged runs of 3 or more individual pipes, regardless of size, shall have a generic 3D object modeled to account for spatial coordination.
- Piping insulation.
- Equipment drains.
- High point vents.
- Low point drains.
- Meters and filters.
- Piping runs 1 inch and larger.

Electrical, Technology, Low Voltage, Security and Audio Visual
- Conduits 1 ½ inches or greater.

- Ganged runs of 3 or more individual conduits, regardless of size, shall have a generic 3D object modeled to account for spatial coordination.
- Communication service controls, audio equipment, speakers, phone and data ports and connections (both above ground and underground). Projector image throw to verify projected image is not obstructed. Cable tray routing with hanger supports and access zones.
- Permanently mounted light fixtures, lighting controls, switches, and junction boxes. Luminaires (include depth and access for removal above fixture) – both above and below ceiling.
- Uninterruptible Power Supply (UPS) and emergency generator systems.
- Switch gear, transformers, and equipment.
- Electrical panels.
- Fire alarm control panels.
- Maintenance and access clearance zones.
- Power feeds to equipment and switch gear.
- Switches and outlets where coordination with architectural or interior elevations are a concern.
- Security devices, keypads, cameras, and motion sensors.

Plumbing

- Piping to be modeled to 5 feet outside building footprint.
- Groups of 3 or more pipes routed side-by-side, regardless of size.
- Ganged runs of 3 or more individual pipes, regardless of size, shall have a generic 3D object modeled to account for spatial coordination.
- Piping insulation.
- Pipe slope shall be incorporated in model.
- Valves and cleanouts.
- Equipment control panels.
- Meters and filters.
- Plumbing equipment (water heaters, softeners, specialty water systems, backflow preventers, grease interceptors, sump pumps, sewage ejectors, etc.)
- Plumbing equipment shall be modeled to its overall height, width, and depth.
- Maintenance and access clearance zones.
- Floor and roof drains.
- Plumbing fixtures.

Fire Protection Sprinkler and Alarm

- Space allowance for sprinkler main and branch piping standpipes.
- Valves
- Drains
- Fire hose cabinets.
- Fire Department connection.
- Clearances and access space.
- Fire and jockey pump.
- Tanks
- Maintenance and access clearance zones.

Civil/ Utility

- Model to a point of connection within the project boundary to within 5 feet of the building footprint. Including hydrants, shut off valves, cleanouts, manholes, post indicator valves (PIV), fire department connections (FDC), and backflow preventors.

3.2. Topographic and Property Line Surveying

Detailed requirements of what is to be included in surveying deliverables is managed by DFD staff in consultation with the A/E on a project-by-project basis. Surveys shall be provided in electronic format and minimally include 3D topographic information including paving and retaining walls.

Topographic and property surveys shall be tied to the State's GIS WTM83, NAD83 (1991) coordinate system and USGS datum. The surveyor shall provide electronic files that clearly define the project site and include accurate x/y/z coordinates on all survey items. The file(s) shall be in a format that allows for importing directly into the State's GIS system. Survey points must 'land' within the State's GIS datum within the margin for error that is normal in the industry.

3.3. Geo-Referenced Model

Project models shall use the coordinate system defined by the property survey. If no property survey is provided the project team can define an arbitrary coordinate system to be used by all models on the project. It is important that all project models are using the same coordinate system to ensure models are properly aligned when referenced together.

3.4. Existing Conditions

Model all existing conditions needed to explain the extent of the construction work for renovation and addition projects. The A/E is responsible for accuracy of existing conditions.

The A/E is expected to perform detailed field verification of existing building conditions prior to development of the BIM. It is critical that existing conditions are field verified, and that the information is correctly input into the BIM.

4. Coordination

4.1. General

The A/E shall use conflict checking software to resolve major clashes between disciplines and specialties included on the project. The conflict checking software is to be used during A/E clash coordination meetings. The frequency of A/E clash coordination meeting shall be documented in the BPxP. Hard clashes between the various elements and soft clashes between an element and a required clearance shall be identified and resolved throughout the design life cycle of the project. All major clashes in the models shall be resolved or coordinated before the Final Design Submittal.

Do not rely upon clash detection/software as the only means of conflict discovery.

Detailed field verification and accurate input data is critical to the overall success of the BIM. Along with clash detection the A/E shall review the BIM for accurate input data on a regular basis throughout the design process. This should be demonstrated to DFD along with clash detection at the designated BIM model review meetings.

4.2. A/E and DFD BIM Model Review

It is up to the A/E and DFD PM to determine the frequency of model review sessions for each project. It is recommended A/E and DFD review coordination progress a minimum of once per project phase. The A/E and DFD model review dates shall be documented in the BPxP.

4.3. Tolerance Level

Clash tolerance may begin as high as 1 inch during Preliminary Design but must be run at ¼ inch by the end of Final Design.

4.4. Clash Resolution Sign Off

The A/E shall submit a statement to the DFD Project Manager that the goals set forth in 1.4 BIM Goals and DFD expectations have been met after posting for biding but prior to notice to proceed.

5. Deliverables

5.1. General

The A/E is responsible for the submitting the following items:

- BIM Project Execution Plan (BPxP)
  - By end of Pre-Design or beginning of Preliminary Design, as appropriate.
  - Prior to bidding, if modified.
- Design Intent Model
  - After posting for biding but prior to notice to proceed.
- Clash Resolution Sign-off Statement
  - After posting for biding but prior to notice to proceed.
- Record Model
  - At project closeout.

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