

North Carolina Board of Examiners for Engineers and Surveyors

Building Information Modeling (BIM) Use on Projects **Signing and Sealing Building Imaging** **Modeling/Integrated Project Delivery (BIM/IPD)** **Projects Guidelines**

(These guidelines are in effect as of ~~December 31, 2018~~ January 1, 2019 and will be reviewed for any revisions after the NCEES Guidelines are issued in final form.)

The North Carolina Board of Examiners for Engineers and Surveyors is providing this document to serve as an interpretative guide for the proper signing and sealing of building imaging modeling/integrated project delivery (BIM/IPD) projects to comply with The Engineering and Surveying Licensing Act, G.S. 89C. The variation in specific organization and services requires that these general guidelines be applied to the specific facts for each project, taking into account the requirements in the Board Rules in 21NCAC 56.1103 for certifying documents and 21NCAC 56.0701(c)(3) for responsible charge. The NC Board of Architecture (NCBA) and the NC Board of Examiners for Engineers and Surveyors (NCBEES) approved a Pilot Program that examined the use of seals in a BIM/~~IPM~~-IPD environment.

This document is intended to offer guidance to Professional Engineers and Professional Land Surveyors (hereinafter “licensees”) and their firms that are practicing in North Carolina who wish to use a Building Information Modeling execution plan ~~coupled with an Integrated Project Delivery contract. (BIM/IPD).~~ This guidance may also apply to any project delivery method employing three dimensional modeling software to virtually construct all building components by a collaborative team based process from design start to construction completion.

~~*This does not apply to projects using BIM or IPD individually, using BIM without IPD or an equivalent collaborative delivery process that does not utilize both BIM and IPD.*~~

Definitions

- Building information model or modeling (BIM): Model-based technology linked with a database of project information, using multidimensional, real-time dynamic modeling software, to plan construction. The model encompasses at least geometry, spatial relationships, geographic information, and quantities and properties of components.

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- Execution plan: A document prepared and mutually agreed to by the project team that clearly defines an overall vision for BIM use and implementation details, including but not limited to roles, responsibilities, actions, and interactions of the team and any external parties (such as building code officials, other permitting authorities, software systems to be followed, technology infrastructure needs, process maps, deliverables to be provided, Documents to be produced, intellectual property control, model use, archiving, BIM model ownership, and turnover process to owner at project completion). The execution plan should clearly define the scope and responsible charge of all design professionals and model managers to the extent possible.

- Model manager: Responsible for ensuring that BIM is successfully implemented on a project in accordance with its execution plan, with the following key responsibilities:
 1. Management of all BIM-related software systems § Preparation of BIM-related standards, templates, and deliverable formats in accordance with the execution plan
 2. Reporting of BIM model status to the project team § Leadership in providing project-specific training to the project team members and in providing periodic model reviews by the project team
 3. Assistance in modeling work and resolution of all conflicts/constraints
 4. Communication of BIM model development and updates to the project team

The model manager may change during project execution, subject to approval of the project team and lead design professional.

- National BIM standard—United States: A consensus-based standard issued by the buildingSMARTalliance® under the sponsorship of the National Institute of Building Sciences so that end users can use BIM to efficiently access and use information necessary to design, construct, and operate a specific project. The latest issue is version 3, published in May 2015.

- Project team: Leadership from each organization participating in the development of a BIM model, including the owner, project manager, design professionals (architects, landscape architects, engineers, professional: surveyors, interior designers; also referred to as “licensees”), model manager, and contractors

- Lead design professional: Licensed design professional, responsible for coordinating and integrating the work of design professionals, model manager, and other members of the project team

- Responsible charge: Direct control and personal supervision of engineering or surveying work

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- BIM products: Documents (drawings, lists, specifications, and other data) extracted from the BIM model

Guidelines and references

A. Use of BIM Project Execution Planning Guide

The project team should prepare a specific execution plan for any project using a BIM model. The referenced planning guide provides an overview of how to prepare such a plan including content and structure. Section B below contains recommended minimum topics to include in an execution plan, which is typically referenced in project contract sections related to engineering, procurement, and construction delivery.

B. Minimum topics to include in project-specific execution plan

Each project (e.g., building, bridge, road, power plant) is unique in terms of configuration, complexity, and development timeline. Similarly, the extent of BIM's use on a project will be different and interrelated with the project delivery method (such as integrated project delivery, design/build, or design/bid/build). This section addresses topics which are important to the successful use of BIM capabilities and products.

1. Model use

How the BIM model will be used—from project inception to construction to the post-commissioning stage—must be defined up front and accounted for in the project cost estimate. Examples of usage topics include model ownership, turnover to the owner at project conclusion, involvement of the project team in model preparation/development through lifecycle, use for structural detailing, cost/schedule inclusion, and products that will be produced (when and where).

2. Responsibilities of design professionals/licenseses and scope definition

Each design professional working with a BIM model will have responsible charge for a portion of the project. This includes what aspects of project design that the professional will provide as input (e.g., data, 3D model input, specific discipline design) and BIM products that will be extracted at different milestones during the project life cycle to satisfy project needs (e.g., Documents to obtain permits and regulatory approvals, to have a third party develop fabrication drawings, to procure equipment, for construction, and for as-built archive). It is imperative that each design professional clearly define his or her primary role and scope of responsibility, particularly where the professional's scope boundaries align with those of another discipline (such as building management system inputs).

3. Lead design professional's role

Each project team should appoint a lead design professional to oversee the BIM model development to ensure that communication channels are effective, that schedule milestones are achieved, and that the model manager is efficiently and effectively completing his or

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her responsibilities. This person should have a working knowledge of the scope of all design professionals, documents to be produced, and project design and goals in total.

4. Model manager's role

Reporting to the lead design professional, the model manager serves an important role in coordinating the development of the BIM model and data import consistent with the execution plan's stated needs. The lead design professional will ultimately have a role of ensuring that all design professionals have participated in the BIM model to the extent of their responsible charge and scope.

5. Owner's role and responsibilities

The owner should designate a representative who should be able to communicate owner's requirements to the project team; serve as a primary liaison for all BIM-related issues; have oversight on BIM requirements in all project phases; and receive, review, and approve BIM deliverables (see "National BIM Guide for Owners").

6. Changes to model overtime/communications

The BIM model is a dynamic tool that constantly develops throughout the design phase of the project and typically matures at the time when issued-for-construction products are produced. The model will also be affected by the evolution of construction, and changes to the BIM model will occur until project commissioning and owner acceptance. The lead design professional and model manager need to stay involved in the project execution through the construction phase to ensure that construction-driven changes are reviewed and approved by the affected design professional(s) in advance of actual construction.

7. BIM products

The execution plan should define expected products to be extracted out of the BIM model at different points in time during the overall project schedule (phase), and the design professionals responsible for their preparation and issuance. The products of each project will be different; as a result, the execution plan should define initial products with said listing subject to change as the project design continues forward. The execution plan should also provide an overview of how quality reviews are to be completed, as well as BIM model reviews throughout the project lifecycle.

8. Archiving

The execution plan should clearly define the host document control system to be used, and best practices associated with storing project records including the BIM model and products, including all Documents, both to demonstrate that milestones have been achieved and to confirm the design professional's scope of work and responsibility have been accomplished.

C. Sign-and-seal deliverables

At a point in project development agreed to by the owner's team and per the owner's agreement with the project team members, the licensee shall affix a seal/signature to only that part of the products from the BIM model for which he or she is responsible as stated in the Board Rules. A digital archive of the design professional's final product at the completion of each project phase shall be retained in the BIM model archives.

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Definitions:

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IPD: a project delivery method that integrates key participants (owner, architect, engineer, surveyor, contractor, code official, et al.), systems, business structures and practices into a process that collaboratively plans and constructs facilities. The collaborative process begins in early design and continues through all phases of design, fabrication and construction.

(1) Use of the Professional Seal and Signature on BIM IPD Documents Confirming Project Development. At a point in project development agreed to by the Authority Having Jurisdiction (AHJ) and owner's team, per the owner's agreement with the project team members, the licensee shall affix a digital seal and signature to only that part of the model for which they are responsible.

a. A digital archive "snapshot" of the licensee's final product at the completion of that project phase must be retained in the model as an unalterable record.

o *Commentary Model programming assures that issuing the Digital Archive as an export keeps the format in a "read-only" state, meaning that changes cannot be made. It also allows the AHJ to accept models from different authoring systems in the future and be trained in a neutral platform that is a free viewer.*

b. The digital archive shall be formatted per the requirements below:

o 2D DWF, 3D DWF, & NWD exports from the native authoring software (Autodesk Revit) and will contain a digital signature issued by a public certification authority (VeriSign or Thawte). The naming of proprietary software refers to current commercially available programs that satisfy the intentions of this guidance, it is not intended to represent that those are the only programs capable of meeting the requirements. Similar or equivalent software is acceptable provided it is capable of DWF exports that can be digitally signed and authenticated by a verifiable source.

c. The digital signature shall contain a statement listing the scope of the licensee.

d. The digital archive must be submitted to the AHJ for initial code review and secure storage on an AHJ managed and secure "read-only" website.

(2) Use of Digital Signature on Other Benchmark Documents. For other benchmark documents not included in a project phase completion information set, the licensee shall affix a digital signature to the document. (refer to 21 NCAC 56.1103(e) Requirement for and Use of Professional Seal) A digital archive "snapshot" of the licensee benchmark documents must be retained in the model as an unalterable record.

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~~(3) Collaboration. The methods of collaboration should be at the discretion of the licensee and the other team members.~~

Construction

~~(4)A. Professional review of others' documents.~~ When the licensee is required by the owner's agreement to review the contractor's drawings (shop drawings) for general conformance with the plans and specifications, the review by the licensee shall not constitute taking of responsibility for the documents and the licensee shall sign and seal, disclaiming that it is only as to general conformance with the plans and specifications unless they were prepared under the responsible control of the licensee as set forth in 21 NCAC 56.0701(c)(3).

~~(5)B. Changes during construction.~~ It is recognized that the owner's full design team will work with a mix of professionally sealed information sets, as well as other model information, inputted by other project team members. When changes occur in the construction strategy that are deemed significant enough to require supplemental documents from the design professionals regardless of type, the professional may rely on the information from others in the model (including the contractor's team), so long as the professional clearly indicates the modifications made, his/her responsibility for it and seals only his/her work.

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