State of Tennessee
Office of the State Architect
Building Information Modeling Standards
(TN OSA BIMs) Version 2.0 Webinar

Presented by: Chris Byerly, Project Manager – Tennessee Office of the State Architect

Acknowledgements

• TN OSA BIMs Task Force Members – AIA, ACEC, AGC, ABC, SPAs, THEC, KFA, JLL, Skanska, AUTODESK, CADD MICROSYSTEMS, OSU, OSA

• Pilot project teams – The Lewis Group, Christman Co., Centric Architecture, Messer Construction
Outline

1. TN OSA BIM Mission
2. TN OSA BIM Purpose
3. Version 2.0 – Guiding Principles
4. State-Designated BIM Projects
5. TN OSA BIMs Background | 2012 - Present
6. What is BIM? What is COBie?
7. Questions
8. TN OSA BIMs v2.0 Overview – Designer / Contractor Requirements
9. Version 2: Key Revisions
10. OSA Resources / Website / BIM Tools
11. Useful Links
12. OSA Contact
13. Questions
The mission of the State of Tennessee Office of the State Architect (TN OSA) BIM Standards is to utilize consistent Building Information Modeling (BIM) technology standards to create building projects with greater long term owner value through a collaborative design, construction and operations process.

TN OSA BIMs Version 2.0, July 1, 2020, Section 2
The TN OSA has established these BIM Standards for the consistent development and management of BIM on State designated BIM projects. For projects designated by the State Procurement Agency (SPA) to use BIM, these BIM Standards apply to designers and their consultants, and/or to contractors and their subcontractors, qualified by the State Procurement Agencies (SPAs).

TN OSA BIMs Version 2.0, July 1, 2020, Section 2
Version 2.0

GUIDING PRINCIPLES

- **Quality** – Maintaining the highest standards of BIM deliverables for the State of Tennessee
- **Scalable** – Responsive with regard to scope and varying owner requirements
- **Adaptable** – To align with various conventions of conveying design intent
- **Simple** – Focused on essential BIM and COBie deliverables
Which projects are State-designated BIM projects?

- Determined by the SPA
- There is not a project budget threshold
- Should be considered as part of a broader campus/agency BIM and/or facility management strategy
- Projects not designated by the State as BIM-required projects may implement these standards.

On State projects not designated to use BIM, the designers and/or contractors may voluntarily choose, on their own, to use BIM. The State encourages designers and contractors using BIM on projects, where BIM is not a State requirement, to adopt these BIM Standards. Designers and contractors using BIM on projects, where BIM is not a State requirement, may deliver BIMs, in addition to paper documents, for the aspects of the project for which they have followed these BIM Standards.
TN OSA BIMs

Background

2012 - PRESENT

- **August 2012** - KFA brought under contract
- **September 2012** - BIM Kickoff with KFA
- **September 2012** - KFA Presentation to the SBC
- **September 2012** - KFA Presentation to the SPAs
- **September 2012** - KFA Presentation to industry
- **December 2012** - BIM Standards – v.0
- **August 2013** - KFA: BIM Training
- **Completed 2017** BIM Pilot Projects: Tennessee School for the Deaf and
- **Completed 2018** Julius T Johnson Metrology Laboratory
- **October 2017** - Published “Lessons Learned” from pilot projects
- **July 2015** - BIM Standards – v.1.0
- **July 2020** - BIM Standards – v.2.0
TN OSA BIMs Pilot Projects

TENNESSEE SCHOOL FOR THE DEAF
Knoxville, TN

BIM DELIVERABLES

- 3D BIM Models (IFC format)
- COBie Managed Assets Spreadsheets
TN OSA BIMs
Pilot Projects

JULIUS T JOHNSON METROLOGY LAB
Nashville, TN

BIM DELIVERABLES

- 3D BIM Models (IFC format)
- COBie Managed Assets Spreadsheets
What is BIM?

**Building Information Model:** Is the digital representation of physical and functional characteristics of a facility. As such it serves as a shared knowledge resource for information about a facility, forming a reliable basis for decisions during its life cycle from inception onwards.

*National BIM Standard – United States Version 3.0*
What is COBie?

Construction Operations Building Information Exchange: An international standard relating to managed asset information including space and equipment. It is closely associated with building information modeling approaches to design, construction, and management of built assets.

TN OSA BIMs Version 2.0, July 1, 2020, Appendix E
### COBie Data

**Managed Assets**

<table>
<thead>
<tr>
<th>Contact</th>
<th>Facility</th>
<th>Floor</th>
<th>Space (e.g., FICM, OMNICLASS TABLE 13), See Useful Links</th>
<th>Type</th>
<th>Components</th>
<th>System</th>
<th>Document</th>
<th>Attribute</th>
<th>Spreadsheet format, .xlsx, .xls</th>
</tr>
</thead>
</table>

**TN OSA BIMs Version 2.0, July 1, 2020, Appendices C and E, Table E1**
### COBie Data

**Managed Assets**

<table>
<thead>
<tr>
<th>TABLE D2 - STATE OF TENNESSEE - STANDARD REQUIRED EQUIPMENT - ASSET MAPPING AND ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSET DESCRIPTION</strong></td>
</tr>
<tr>
<td>CHILLERS</td>
</tr>
<tr>
<td>BOILERS</td>
</tr>
<tr>
<td>AIR HANDLING UNITS</td>
</tr>
<tr>
<td>FAN COIL UNITS</td>
</tr>
<tr>
<td>EVAPORATOR UNITS (INDOOR UNITS)</td>
</tr>
<tr>
<td>FANS</td>
</tr>
<tr>
<td>AIR TERMINAL UNITS</td>
</tr>
<tr>
<td>HEAT PUMPS (PACKAGED/SPLIT)</td>
</tr>
<tr>
<td>CONDENSER UNITS (OUTDOOR UNITS)</td>
</tr>
</tbody>
</table>

- **Asset Description**
- **OmniClass Title**
- **Table 23 OmniClass #**
- **Type ID**
- **Attribute Groups A and B**
- **Attribute Group C**

TN OSA BIMs Version 2.0, July 1, 2020, Appendix D, Table D2
### COBie Data

#### Managed Assets

<table>
<thead>
<tr>
<th>TABLE E1 - STATE OF TENNESSEE - DESIGNER AND CONTRACTOR REQUIRED BIM ATTRIBUTE VALUES FOR COBie DOCUMENTATION BY PROJECT STAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COLUMN VARIABLE</strong></td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td><strong>COBie Version</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>CreatedBy</td>
</tr>
<tr>
<td>CreatedOn</td>
</tr>
<tr>
<td>Category</td>
</tr>
<tr>
<td>ProjectName</td>
</tr>
<tr>
<td>SiteName</td>
</tr>
<tr>
<td>LinearUnits</td>
</tr>
<tr>
<td>AreaUnit</td>
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<tr>
<td>VolumeUnits</td>
</tr>
<tr>
<td>CurrencyUnit</td>
</tr>
<tr>
<td>AreaMeasurement</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>CreatedBy</td>
</tr>
<tr>
<td>CreatedOn</td>
</tr>
<tr>
<td>Category</td>
</tr>
<tr>
<td>Elevation</td>
</tr>
<tr>
<td>Height</td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>CreatedBy</td>
</tr>
<tr>
<td>CreatedOn</td>
</tr>
<tr>
<td>Category</td>
</tr>
<tr>
<td>FloorName</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td>GrossArea</td>
</tr>
<tr>
<td>NetArea</td>
</tr>
</tbody>
</table>

#### Designer

- Contact
- Facility
- Floor
- Space
- Type (Name only)
- Components (Name only)

*TN OSA BIMs Version 2.0, July 1, 2020, Appendix E, Table E1*
## COBie Data

### Managed Assets

**TABLE E1 - STATE OF TENNESSEE - DESIGNER AND CONTRACTOR REQUIRED BIM ATTRIBUTES VALUES FOR COBie DOCUMENTATION BY PROJECT STAGE**

<table>
<thead>
<tr>
<th>Category</th>
<th>REQUIRED ATTRIBUTES*</th>
<th>BIM TYPE WHERE ATTRIBUTE VALUES ARE PROVIDED</th>
<th>PROJECT STAGE WHERE ATTRIBUTE VALUES ARE PROVIDED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>CONSTRUCTION DOCUMENTS</td>
<td>CONSTRUCTION perpendicular &amp; SUBMITTALS</td>
</tr>
<tr>
<td>SYSTEM</td>
<td></td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Name</td>
<td>Construction: BIMs</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>CreatedBy</td>
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<td></td>
<td>C</td>
</tr>
<tr>
<td>CreatedOn</td>
<td>Construction: BIMs</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Category</td>
<td>Construction: BIMs</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>ComponentName</td>
<td>Construction: BIMs</td>
<td></td>
<td>C</td>
</tr>
</tbody>
</table>

| ATTRIBUTE |                       |                             | C | U/C |
|-----------|------------------------|-----------------------------| C | U/C |
| Name      | Construction: BIMs     |                             | C | U/C |
| CreatedBy | Construction: BIMs     |                             | C | U/C |
| CreatedOn | Construction: BIMs     |                             | C | U/C |
| Category  | Construction: BIMs     |                             | C | U/C |
| ShowName  | Construction: BIMs     |                             | C | U/C |
| RoomName  | Construction: BIMs     |                             | C | U/C |
| Type      | Construction: BIMs     |                             | C | U/C |
| Unit      | Construction: BIMs     |                             | C | U/C |

*See Table E2, Column 3 for Attribute Descriptions

**Contractor**

- Contact
- Type (Except name)
- Components (Except name)
- System
- Document
- Attribute

**TN OSA BIMs Version 2.0, July 1, 2020, Appendix E, Table E1**
Questions
TN OSA BIMs Overview

- BIM Requirements for Designers
- BIM Requirements for Contractors
- Appendices A - F
Who produces Design BIMs?

- Architectural
- Structural
- Mechanical
- Plumbing
- Electrical
- Other specialties

TN OSA BIMs Version 2.0, July 1, 2020, Section 3.1
Formats Compatibility
Asset Naming

- IFC and COBie - compliant BIM authoring software
- COBie data / managed asset names (e.g. Space, Equipment)
- Encourages BIM Analysis (Energy Modeling, Program Verification, Clash Detection)
- BIM Execution Plan (BEP)

TN OSA BIMs Version 2.0, July 1, 2020, Sections 3.2-3.10.6, Appendices A - E
BIM Execution Plan (BEP)

This plan lays out how BIM will be implemented and which goals or BIM uses will be pursued on the project as a result of the decisions of the Project Team. This is a living document that is updated at key milestones during the project. In most cases, there will be one BEP developed by the design team and a second BEP developed by the contractor.

TN OSA BIMs Version 2.0, July 1, 2020 Sections 3.9, Appendices A and F
TN OSA BIMs Overview

Requirements for Designers

BIM Execution Plan (BEP)

- Deliverable for all design phases (Not Early Design Phase (EDP))
- Project Information
- Designer and Consultant Contact Information
- BIM Goals and Objectives
- Roles and Responsibilities
- BIM Software and Versions
- Project Deliverables

TN OSA BIMs Version 2.0, July 1, 2020, Section 3.9 and Appendix A
TN OSA BIMs Overview

Requirements for Designers

BIM Methodology

- Geometrically and Dimensionally Accurate
- Drawings are direct representation of the BIM
- Details at scales larger than ¼”=1'-0" are not required to be a direct representation in the BIM
- COBie data (Managed Asset Information) is applied in the BIM
- Design changes are updated in the BIM

TN OSA BIMs Version 2.0, July 1, 2020, Section 3.11
BIM Deliverables

Summary

Design BIMs

- CDP and Closeout
- Required Disciplines
- IFC format
- Contain COBie Data
- Include design changes
- Validated - COBie Validator
- File naming system

BIM Execution Plans

- Alternate BEPs contain minimum content in Appendix A
- Each design phase
- PDF format
- File naming system

TN OSA BIMs Version 2.0, July 1, 2020, Section 3, Appendices A, C, D and E
TN OSA BIMs Overview

Requirements for Designers

• Design BIMs (IFC format, COBie Validator, File Naming System, Include design changes / design Intent, not required to include contractor field changes) – Required Disciplines

• BIM Execution Plans (Each design phase, pdf format, other BEPs must contain minimum content in Appendices A)

• COBie data (Contact, Facility, Floor, Space and Equipment Names), Appendix E, Table E1

Summary

TN OSA BIMs Version 2.0, July 1, 2020, Section 3
TN OSA BIMs Overview

BIM Process for Designers

- Assign BIM Manager
- Establish BIM software version
- Establish file standards and web transfer protocols
- Develop BEP

- Install BIM tools (OSA Website)
- Populate BIM Object library
- Identify COBie names and attributes for managed assets
- Update BEP

- Populate BIM with required COBie Data
- BIM-based analysis
- BIM Model Checker
- COBie Validation
- Submit Design BIM
- Update BEP

- Update BIM to reflect change documents
- Provide updated model per BEP
- Update BEP

- Review COBie assets for Contract Document conformance
- Validate COBie data in final Design BIMs
- Review and submit final design BIMs
- Review and submit final BEP

TN OSA BIMs Version 2.0, July 1, 2020, Section 4
Who produces Construction BIMs?

- Structural Steel
- Mechanical (HVAC, HVAC Pipe)
- Plumbing
- Electrical
- Pneumatic Tube
- Building Automation Systems *
- Fire Protection *
- Low Voltage *
- Civil *
- Other Fabrication, Other Trades *

TN OSA BIMs Version 2.0, July 1, 2020, Section 5.1
Formats Compatibility
Asset Naming

- IFC and COBie - compliant BIM authoring software
- COBie managed asset data (e.g. Type, Components, Attributes)
- BIM Analysis (Coordination, Fabrication, Installation)
- BIM Execution Plan (BEP)

TN OSA BIMs Version 2.0, July 1, 2020, Sections 5.1-5.11.3, Appendices D and E
BIM Execution Plan (BEP)

Requirements for Contractors

- Deliverables for key milestones
- Project Information
- Contact Information: contractor, subcontractors and major suppliers
- BIM Goals and Objectives
- Roles and Responsibilities
- BIM Software and Versions
- Modeling Standards and Content
- Project Deliverables

TN OSA BIMs Version 2.0, July 1, 2020, Section 5.8 and Appendix F
TN OSA BIMs Overview

Requirements for Contractors

BIM Execution Plan (BEP)

BIM Kickoff Meeting

- BIM / COBie coordination meetings
- Software versions/limitations impacting deliverables
- BIM collaboration utilities
- COBie data capture process / data QA
- Model update schedules
- Model coordination software
- Interference detection / resolution
- Final BIM / COBie Deliverables

TN OSA BIMs Version 2.0, July 1, 2020, Section 5.8 and Appendix F
BIM Deliverables

- Construction BIMs
- BIM Execution Plans
- COBie Worksheets

TN OSA BIMs Version 2.0, July 1, 2020, Section 5.11
TN OSA BIMs Overview

Requirements for Contractors

Summary

• Construction BIMs (IFC format) – Required Trades
• BIM Execution Plans (pdf format, key milestones)
• COBie data (e.g., Contact, Type Component, Attribute, Document), Appendix E, Table E1
• BIM for analysis

TN OSA BIMs Version 2.0, July 1, 2020, Section 6
TN OSA BIMs Overview

BIM Process for Contractors

Contractor NTP

- Contractor assigns BIM Manager
- Subcontractor and vendors assign BIM Coordinator
- Establish BIM software implemented amongst contractor, vendors and subcontractors
- Align modeling standards with owner requirements and deliverables
- Contractor establishes file sharing system and protocols
- Develop BEP

BIM Kickoff Meeting

- Install BIM tools (OSA Website)
- Coordinate tools, systems, standards and protocols
- Update BEP

Construction Commencement

- Develop Construction BIMs
- Identify and resolve building system / asset conflicts
- Update BEP

During Construction

- Update coordinated Construction BIMs
- Construct and fabricate from coordinated construction BIMs
- Leverage Construction BIMs for shop drawings
- Update and maintain required COBie asset attributes
- Perform preliminary COBie validation tests
- Update BEP

Project Closeout

- Validate and export COBie worksheets for contractor and architect review for Contract Document conformance
- Submit final Construction BIMs for required trades
- Submit final validated COBie worksheets
- Submit final BEP

TN OSA BIMs Version 2.0, July 1, 2020, Section 6
Version 2: Key Revisions

**Designer**

- Floor naming systems and equipment Type IDs may be established by the designer.

- The designer is responsible for the coordination of the design. The standard strongly encourages the implementation of BIM for clash detection by the designer and consultants. The standard does not require a clash detection report as a deliverable unless otherwise required by the owner.

- An abbreviated equipment tagging system is specified in the standard and may be used on the drawings in lieu of the full component name.

- The designer-provided Design BIM contains COBie equipment attributes for the Type and Component names only. Other equipment attributes are provided by the contractor upon approved submittal or install.

- Eliminated incremental COBie worksheet deliverables at various design stages. Design BIMs are COBie-validated per the standard prior to Design BIM hand off to the contractor and updated as design changes require.

- Removed the allowance for a contractor-created Architectural and Structural Proxy Model. Instead, a Design BIM is provided by the designer to the contractor. The contractor does not re-model a Design BIM.

TN OSA BIMs Version 2.0, July 1, 2020, Appendix H, Change Log
Version 2: Key Revisions

The standard specifies that contractors update COBie equipment attribute data at the time of approved submittal or install eliminating the potential need to change designer-provided data when design changes occur.

The standard specifies that while design changes must be incorporated into the final Construction BIMs, minor field changes are not required to be incorporated into the final Construction BIM.

TN OSA BIMs Version 2.0, July 1, 2020, Appendix H, Change Log
OSA Resources

OSA Website – See Useful Links

- OSA COBie Validator, 32 bit/64 bit
- BIM Templates
- Shared Parameter Files
- COBie Toolkit / BIM Interoperability Tools
- BIM Model Checker (Customizable)
Useful Links

- TN OSA BIMs V.2.0, July 1, 2020 - https://www.tn.gov/content/tn/osa/capital---real-estate/capital-projects/bim-standards.html
- COBie - https://www.nibs.org/page/bsa_cobie
- COBie - https://www.biminteroperabilitytools.com/
- https://www.csiresources.org/standards/omniclass
- https://www.tn.gov/osa/general-information/events---presentations.html
Next Steps

- Post-pilot project phase
- State-required BIM projects
- TN-Required BIM project data acquisition, utilization and analysis
- Part II TN OSA BIMs Session – SPA’s, BIM/COBie Deliverables
- Part III TN OSA BIMs Session – BIM / COBie Tools
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Questions