Building Your BIM Standards: Essential Elements for Revit Workflows

Johnny Fortune
Bullock Tice Associates

Learning Objectives

- Learn how to develop company or corporate standards that strike the right balance between stringent and flexible
- Discover basic BIM guidelines and best practices that are common among various published standards
- Understand the differences between standards and guidelines, and learn how best to implement each
- Discover aspects of BIM workflows that need not be standardized

---

Description

Authoring and implementing BIM (Building Information Modeling) standards can be tedious and difficult. Where do you even start? This class will present data collected from standards and guidelines of various entities, such as corporations, academia, local and federal government, and national and international groups. We'll identify commonalities from each of the standards and compile them to produce data that you can use to develop and implement BIM standards that work for you. The session will delve even deeper to identify Revit software-specific content needed for BIM standards. The class will help make clear distinctions between standards and guidelines, as well as identify topics that don't need to be standardized. The class will focus on standards development for a holistic BIM workflow within Revit and provide essentials for integrating workflow with AutoCAD software and Navisworks software.

Speakers

|	
Johnny Fortune **BIM Director** **BTA** Bullock Tice Associates ARCHITECTURE with PURPOSE	Johnny Fortune serves as BIM director at [Bullock Tice Associates](#) in Pensacola, Florida and has led the complete transition from CAD to BIM production for the firm and directs the company's overall BIM strategies, standards, technology operations, and integration with external team members. He is currently a member of several national committees, including the National CAD Standards Project Committee, the United States National BIM Standard Project Committee, and the United States Army Corps of Engineers / Industry BIM CIM Consortium. Additionally, he is a member of the buildingSMART alliance® Board of Direction and is a contributing author for several national/federal standards documents. He has often presented on the topic of standards at venues such as Autodesk University, BIMForum, National Institute of Building Sciences Innovation Conference and Expo, GeoBuiz, and various Society of American Military Engineer and Construction Specification Institute chapter events. Additionally, he was the Subject Matter Expert, Technical Writer and Editor for the latest versions of the Department of Veterans Affairs BIM Guide and a primary author of the National BIM Guide for Owners. **Bullock Tice Associates** Bullock Tice Associates, Inc. (BTA) is a 35-person architectural and interior design firm based in Pensacola, Florida. The practice offers services in architecture, sustainable design, strategic facility planning, programming and budgeting, space planning, interior design, and construction administration. Its practice focuses on the US Southeast region in three target markets: Department of Defense, Commercial Development, and Governmental/Institutional. The firm is a leader in BIM implementation in its region and beyond. The firm is also a member of Structured Parking Solutions (SPS), a parking focused total solution provider. Solution sets include: design, construct, turnkey, lease back, and operate.

Why BIM Standards?

So, you want to develop your company BIM Standards… huh?   Since you are reading this handout, you likely already have ideas about what you want to accomplish with BIM Standards. Being able to describe the "why" typically leads to better adoption.
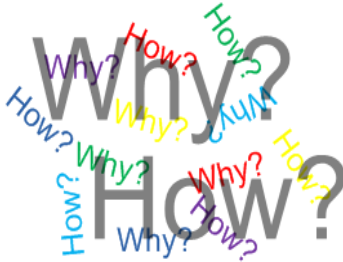
Here are some questions to consider:
1. Why? Why are we developing our own standards?
2. Who? Who are the key stakeholders that are needed for buy-in and implementation?
3. What? What should our standards address? What should it omit?
4. When? When will we develop or update this content?
5. Where? Where will this content live and how will be accessed?
6. How? How will these align with the organizational mission, goals, and objectives? How will we implement these standards?

Only you and your organization can determine what is best defined as your BIM Standards. The importance of planning before getting started cannot be over emphasized. For some organizations, the goal will simply be to update an old CAD standard. For others, it may be to get a handle on quality management of drawings and models. Yet others, may be seeking to drive overall technology and workflow changes.

The remainder of this handout and session presents ideas for consideration. This is not intended to indicate these as all absolutely necessary and certainly not the only means to accomplish a desired goal. They are, however, observations from practice and analysis. They are presented here as cupboard of ingredients. What you make of it is up to you.

BIM Standards System

Before we continue our session, we need to ensure our definitions of terminology are aligned. Here are some terms[1] you will hear throughout this session.

Standard - an idea or thing used as a measure, norm, or model in comparative evaluations. A required or agreed level of quality or attainment

Requirement - a thing that is compulsory; a necessary condition.

Guideline - general rule, principle, or piece of advice.

For the purpose of this session when the term *Standards* is used it refers to the overall system and level of quality the system is attempting to attain. *Requirement* indicates a topic that is not optional whereas *Guideline* indicates a recommendation but one that may be optional.

Generally, a BIM manual is not enough to outline all the topics that should be addressed for an organization. Some topics are better addressed as *Requirements* while others are more suited to *Guidelines*. Some standards can be addressed in *Content* while others may take *Training*.

Complete BIM Standards are typically made up of a system with multiple subsystems. To be successful, the system will need *Administration*; in terms of implementation and enforcement. Below is an example of a systems approach to organizational BIM Standards. In other words, its not just one document. It is a system of documents, people and processes that are all aligned with the *Why* in achieving the *Outcome*.

Support	Training	Admin
Guidelines		Content
Requirements		
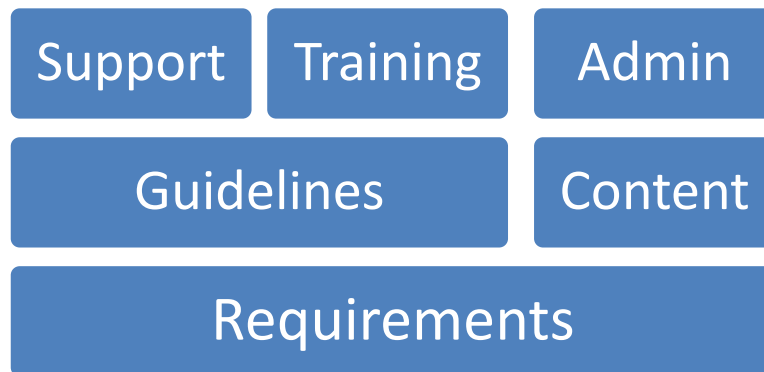
DOCUMENTS

Requirements
The requirements manual consists of hard fast and measurable standards. The topics addressed in the manual are cut-and-dried and considered *not optional*.

Guidelines
The guidelines consist of how-to documents and suggested workflows. By definition, the guidelines carry some degree of option with them. The guidelines should be considered a strong recommendation. If it is a workflow that you don't want considered optional, ensure it is in the requirements manual and not a how-to document.

---

[1] Definitions taken from Google.com (uses the Oxford English Pocket Dictionary)

Content

Content contains the software templates and object library. Content should be automated as much as possible. Making it easier for users to comply with the system facilitates successful implementation. If certain content is mandated (e.g., using a company Revit template), ensure the *Requirements* manual includes the mandate.

Support

Consider how the users will get support. Not every question will be answered within the requirements or guidelines. You need a support team. Be wise about who this is. Having a designated support team can be helpful – just ensure they are champions of the Standards system. Meet with the team often and consider having them keep a log of topics on which they assist others. This will inform topics that you might need to train on or add to the requirements, guidelines, or content.

Training

Train on the Manual, Guidelines, and Content. Use training events to inform and reinforce the system. Use this venue to tie the system together.

Administration

Consider who is responsible for enforcing the system. Having a protocol in place for how to handle deviations is important. Ensure you have the proper buy-in or you'll just become frustrated.

For the entire system, remember ALIGNMENT is paramount. One change in a subsystem effects the overall system and often requires another change in a different subsystem.
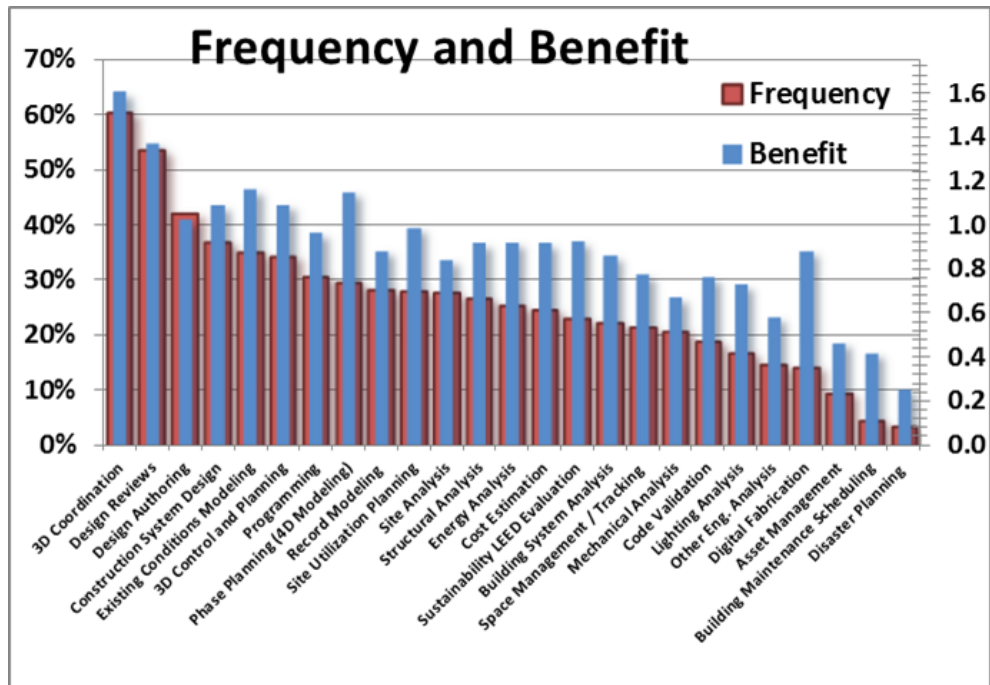
General Topics

Now that we have covered the idea of a system (rather than just one document), let's look at some general topics that your standards system should include (regardless of what software is used). In a recent study, Chae and Kang[2] (2015) analyzed 11 leading BIM guidelines to determine frequently mentioned topics to identify Essential BIM Skills necessary. Not only is the data indicative of which skills should be developed, it provides us guidance on the most common topics in guidelines and therefore topics that we should ensure are covered in the BIM Standards System.
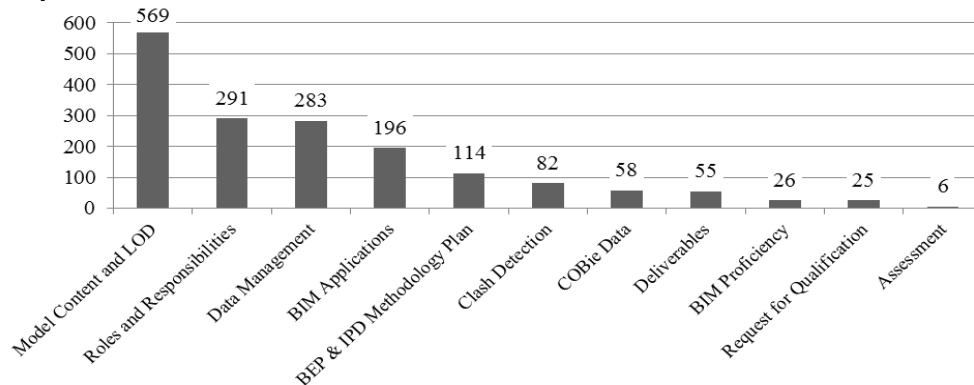
Requirement Categories' Frequency-Of-Mention [2]

---

[2] Chae, L. S., & Kang, J. Ph.D. (2015). **Understanding of Essential BIM Skills through BIM Guidelines**. 51st ASC Annual International Conference Proceedings, Associated Schools of Construction. http://ascpro0.ascweb.org/archives/cd/2015/paper/CPGT384002015.pdf

Additionally, research by Penn State Computer Integrated Construction regarding BIM Uses reveal the BIM Uses that ranked the highest in terms of frequency and benefit in 2009. Even a decade later these are commonly referenced BIM Uses and 3D Coordination, Design Review, and Design Authoring still seem to be the most commonly used. Identify which BIM Uses your organization deems most valuable and ensure that the BIM Standards system adequately addresses the topics.

The Frequency and Benefit of each BIM Use[3]

The remaining General Topics are categorized by *References*, *Organizational*, *Process*, and *Output*.

References

Do other existing standards cover much of what you want to accomplish? Use this to your advantage. Incorporate by reference other standards or sections of the standards. Always identify the version and date of the reference because they do change over time.

Full Reference

Some references can be incorporated as a full reference (including the entire document). Good examples of ready to use full references are the BIMForum LOD Spec & the USACE M3 (see Reference Material section this document).

---

[3] Ralph Kreider, John Messner, and Craig Dubler, "Determining the Frequency and Impact of Applying BIM for Different Purposes on Building Projects," in *Proceedings of the 6th International Conference on Innovation in Architecture, Engineering and Construction (AEC)* (Penn State University, University Park, PA, USA, 2010), http://www.engr.psu.edu/ae/AEC2010/.

Partial Reference

Some references might include only a portion of content you want to use. Some of the other content within the reference might cause issues in your standards or workflows. Good examples of partial references are the NCS – BIM Implementation Section and NBIMS – COBie (see Reference Material section this document).


Avoid reinventing something that already works well.

If you can use references it may eliminate the need to redefine certain topics in the following sections. If you use a reference, ensure your users have quick access to it.

Organizational

Include the following for your requirements manual and overall system:

- Purpose – tell the user what you hope to achieve with this system and why. Align this with the organizational mission, goals, and/or objectives.
- Scope – indicate the limits of Standards scope. Is it used only for specific project phases (Design Development, Construction Documents)? Is it excluded in others (Schematic Design)?
- Background – give some history if appropriate and helpful. This might help the user understand why you have arrived at some of the components of this system.
- Glossary – a tedious section but necessary. Use it to clarify semantics.
- Policy – this usually occurs in conjunction with IT management but at the very least ensure the following is documented:
    - Where files are stored
    - How files are accessed
    - How files are backed up and how frequent
- Structure – provide documentation on the system, supra-system, and sub-systems. Again, this can be a little tedious but necessary – especially for newer employees.
- Roles and Responsibilities – define what is typical for your projects. It is recommended to have a Model Manager for every project. This role is the single point of contact for all things related to the administration of the model.
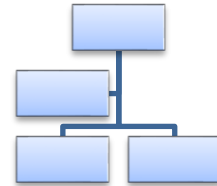
Process

- Execution Plan – BIM Implementation, Management, Execution, and Project Execution Plans are common place. Regardless of which flavor you prefer (BIP, BMP, BEP, PxP) the important factor is that you have one for all projects (even those that don't require BIM). If it is not a contract requirement, use a company version to get everyone aligned as to how you will execute BIM. The company version can be simpler than

what is often part of contract requirements. Perhaps a 5-page version is more applicable to your projects than a 30-page version.

- BIM Uses – Have a common definition of which BIM Uses your organization employs. This can be a predefined list (like that offered by Penn State - http://bim.psu.edu/Uses) or one that you create on your own.
- LOD – have defined definitions of Level of Development and/or variations of LOD if applicable to you (Level of Detail, Level of Reliability). Again – if you can reference standards already in the industry this will save a lot of effort. Just ensure your organization is using the same definition.

Output

- Graphical Standards – This encompasses all the printed (or PDF) graphics that come from model elements.
- Drafting standards – what symbols do you use? How do you want the details to look?
- Sheet set organization – How do you want the sheet set organized?
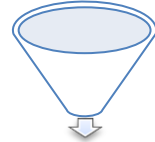
Revit Topics

In addition to the general topics from the previous section, the following Revit-specific topics often appear in BIM standards. Each should be given consideration as to whether it is an important topic for your organization to address.

File Setup

- Establishing model coordinates
- Naming conventions – File, view, sheet, families and types, materials, and parameters
- Central & Local Files – Worksharing or cloud collaboration?
- How/when will projects be divided into multiple models?

Management

- Define frequencies for the following
  - Audit
  - Compress
  - Purge
  - Review/Address Warnings
- Browser Organization
- View specifics – view templates standardized, Export views
- Protocol for collaborating with others outside of your organization
- Phasing and Design Options setup and use

Modeling

- What elements to constrain or pin and when
- Define the use of Detail components vs. drafting lines
- When can Detail Lines be used?
- When can Model Lines can be used?
- When should your users create Drafting Views vs. Detail Views?
- Do you use classification systems?
- When/how will you use grouping?

Additional Workflows

The following are more Revit workflows to consider:

- How to start a project
- Protocol for when something goes wrong
- Prepare CAD data (or other formats) for insertion
- Export to CAD or Navisworks –
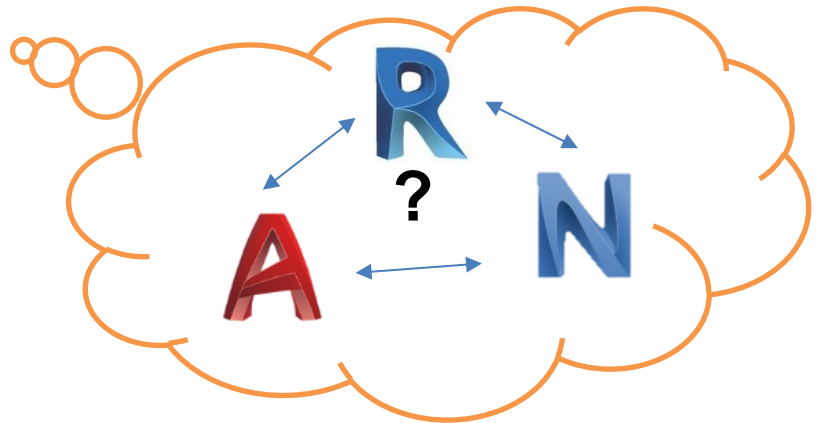
What are the steps a user should take to ensure consistency?

Creating the System

Now that we have identified the need for a system and the topics to be addressed, we can start categorizing the topics and identify to which subsystem they belong. Some topics will transcend more than one subsystem but below are general recommendations for what each subsystem might contain.

Requirements	Guidelines	Content
Organizational Topics • Purpose • Scope • Background • Glossary • Policy • Structure • Roles/Responsibilities References • Full • Partial Minimum LOD Output Standards • Graphic • Drafting • Sheet Set	BIM PxP BIM Uses Expanded LOD Project Startup File Setup Importing/Exporting CAD Navisworks Integration *What* to use *When* & *How* Modeling Guidelines Other process topics Workflows Model Management Project Closeout	Templates Families Website Resources Web Portal File Storage Other Tools

Support	Training	Administration
Designate a Support team of individuals that champion the system. Meet often with the team. Log the requests for help.	Train on the entire System. Explain the outcome and why. Use training as a feedback mechanism.	Identify key personnel that needs to buy-in to the System for success. Who updates the system? Who enforces the standard?

System Development Tips

Here are some tips for developing your BIM Standards system.

1. Your Standards should aim to quickly onboard new employees.
2. Your Standards should aim for efficiency and productivity gains.
3. Establish consistent formatting for your Requirement Manual and Guidelines.
4. If you use certain writing conventions, provide guidance to the reader to reference.
5. Create a hyperlinked index. This seems simple and obvious but without it the documents will likely not be used.
6. Make a PDF (or online document) for users to access. Keep the working documents in a protected directory. The 'live' or published versions should be PDF. Plus, the PDF is easily searchable!
7. Consider an online portal for the System (SharePoint or similar).
8. Version and date all documents in the header or footer.
9. Tag content if using an online system (so it can be indexed and searched)
10. Use imperative tone for mandatory items (write it like a specification).
11. Clearly distinguish between what is a requirement versus a guideline. Let your users know what is optional and what is not.
12. Don't assume everyone understands. Say what you mean explicitly – nothing more, nothing less.
13. Follow the CSI rules of writing – concise, consistent, complete, & correct.
14. Capture what is already being done right (don't assume it will continue).
15. Correct what is being done wrong.
16. Have a review period and an implementation period. Include a grace period for compliance.
17. Include the *Why* for subtopics when necessary.
18. Provide graphical examples when possible.
19. Consider developing an Example set as a go-by.
20. Provide a change log (track changes) for each revision.

Conclusion

We began by identifying key questions to answer (Who, What, When, Where, Why, & How) for BIM Standards. We followed that with a clear understanding and distinction between requirements, guidelines, and content. Further, we established that a single document will not likely be sufficient to build your BIM Standards and offered a Systems approach. The System demonstrated included buckets of Requirements, Guidelines, Content, Support, Training, and Administration. From research and experience, we further identified common general topics of BIM Standards as well Revit-specific Topics. You now have a list of topics to consider for inclusion as well as some indicators from research on what to prioritize. As you build your BIM Standards system, remember to focus on the system as a whole and keep it in alignment with the overall organizational goals and objects. For additional resources see the Reference Materials at the end of this document as well as Additional Class Materials from the Autodesk University website. Thanks for reading the handout and good luck!

Please feel free to reach out to me with any questions or comments.

@fortunejohnny
www.linkedin.com/in/fortunejohnny

Reference Material

The list is by no means exhaustive, but here are some commonly referenced BIM Standards and guidelines. This will give you ideas of additional content the Standards should address.

National	
NBIMS – National BIM Standard – United States v3	http://nationalbimstandard.org/
NBGO – National BIM Guide for Owners	https://www.nibs.org/page/nbgo
NCS – U.S. National CAD Standard	https://www.nationalcadstandard.org
2018 BIMForum LOD Spec	https://bimforum.org/lod/
Government	
GSA (Revit-specific)	https://www.gsa.gov/real-estate/design-construction/3d4d-building-information-modeling/bim-guidelines-for-revit/gsa-bim-guidelines-for-revit
US Army Corps of Engineers (USACE) BIM Requirements (including the Minimum Modeling Matrix – M3)	https://cadbimcenter.erdc.dren.mil/
Ohio BIM Protocol	http://ofcc.ohio.gov/Portals/0/Documents/Resources/Publications/M830-01-BIMProtocol.pdf?ver=2015-02-25-171103-410
Port of Portland	https://popcdn.azureedge.net/pdfs/POP_CAD_BMI_Stndrds.pdf
New York City DDC	http://www.nyc.gov/html/ddc/downloads/pdf/DDC_BIM_Guidelines.pdf
VA BIM Requirements	https://www.cfm.va.gov/til/projREg.asp
Academia	
Penn State BIM Planning	http://bim.psu.edu/
Ohio State University	https://pare.osu.edu/servicesfacilities-information-and-technology-services/building-information-modeling
LACCD	http://www.build-laccd.org/
USC BIM Guidelines:	https://facilities.usc.edu/uploads/documents/cas/BIMGuidelines_VS1_6_2012.pdf
International	
AEC (UK) CAD & BIM Standards	https://aecuk.wordpress.com/
ANZRS (Australian & New Zealand)	http://www.anzrs.org/