

Managing BIM Deliverables  
-  
Specifying and Receiving the Information  
Your Organization Needs

David Kendrick

BIM/Archibus Systems Administrator  
Wright State University



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## Purpose

A white paper on how the campus facilities management (FM) professional can get started on the path of defining their institutions own Building Information Modeling (BIM) requirements document. As many higher education owners transition to BIM, the first step they need to take in that process is to create a set of BIM requirements. The creation of a BIM requirements document will serve as the cornerstone for a successful implementation of BIM deliverable documents. There is not a one size fits all template out there for a set of BIM requirements that meets all of the specialized needs of every institution. To create a set of BIM requirements there must be questions asked. What are they? Why are they important? How are they used? What will we find in them? We will dive into all of these and more throughout the paper. David Kendrick, the BIM/Archibus Systems Administrator at Wright State University, developed the following paper after participation in the 2018 the Campus FM Technology Association (CFTA) Conference held at the Ohio State University. Much of the white paper content was gathered through formal presentations as well as conversations with many conference attendees with special thanks to Chuck Mies from Autodesk and T.J. Meehan from CADD Microsystems.

This white paper was created in partnership with CFTA on behalf of the CFTA Grant Review Task Force. For information on this task force and how to apply for future CFTA grants, visit [www.cfta.org](http://www.cfta.org).

## Defining the Need

A well-developed BIM requirements document ensures continuity between projects and provides the owner with the data that they require in the format they desire. BIM requirements are critical for everyone; from a single building campus to institutions that manage multiple projects with various contractors across multiple buildings and sites, as well as numerous end users. The BIM requirements document is a fluid set of standards that evolve and change as the institution changes and should constantly be updated to reflect the current needs of the institution.

## Getting Started

The key is to not just say you want to convert to BIM but to achieve your goals for BIM. BIM requirements provide a clearly documented process for the design team to follow so that everyone knows what they should be doing and when they should be doing it. A BIM requirements document ensures the creation of consistently formatted model deliverables for both graphics and data. It allows the owner to state their goals and desires for their BIM project upfront. This is not a set of documents to replace anything you have presently, it is intended to augment what you currently have. It is intended to be used both in house by the owner of the project and the inside design team as well as the outside design firm. There are three key components to a set of BIM requirements which are detailed below.

1. **BIM Strategy** – The overall strategy where the goals and objectives are defined.
2. **BIM Requirements Document** – The backbone of your BIM transition and the central document of which everything is built.
3. **BIM Execution Plan** – What owners use on a per project basis.

## BIM Strategy

The roadmap for a successful transition to BIM starts with defining the BIM Strategy, where the goals and objectives are defined for the implementation of BIM. Keep in mind that BIM is a business process change,

it is not simply purchasing Revit and taking a class; it is much more involved than that. While going through this process it is important that the owners keep in mind the many departments/groups that are affected including but not limited to:

- Facilities Management
- Space Management
- Operations & Maintenance
- Lock Shop
- Planning and Development
- Design
- Construction
- Custodial Services
- Event Services

To do this, owners need to develop a strategy that clearly lays out what they are working towards by defining goals. These include:

- Short term goals (6-12 months)
- Medium term goals (1-3 years)
- Long term goals (3-5 years)

To achieve this, owners need to layout their tactics and the specific steps they are going to take moving forward to reach their goals. To make sure they are staying on this roadmap, owners need a way to measure themselves and to develop metrics. If they have a 12-month goal, then they need to be able to measure that goal with quantitative measuring tools so they can make sure that they are achieving that goal.

## BIM Requirements Document

An effective BIM requirements document is the backbone of the BIM transition and it becomes the keystone central document of which everything is built. BIM requirements define specifically what you want and what you do not want out of a BIM model deliverable and is designed to be a reference for all projects. It is important to note that this new BIM requirements document does not replace anything you already have and it will probably end up being a contract addendum. The owners' standard contract will tell their outside firm(s) to refer to the BIM requirements document to follow the BIM processes. The sooner this is in place, the sooner you can start building your model library.

BIM Requirements documents may not be pertinent to all projects but all projects will refer back to it. For example, if the owner is doing a small interior room renovation, they probably do not need to read the entire section on how roofs need to be modeled, but roofs do need to be defined so that other projects can refer back to it.

The typical process guideline for all projects is detailed below. Not all projects are the same and therefore modifications should be made on a per project basis.

### Initial Review

The project team should review the BIM Requirements and BIM Execution Plan (BEP) to make sure they have a clear understanding of the requirements.

## Kickoff Meeting

A BIM Kickoff Meeting is essential for a project's success. The BIM project team should be identified beforehand and listed in the BEP. These team members will attend the Kickoff Meeting and be prepared to discuss and decide on all BIM-related subjects. All modifications and addendums to the BIM Requirements Document should be documented in the BIM Requirements Document.

## Documentation

Every project will be required to follow the requirements outlined in that specific project's version of the BIM Requirements Document. The modified BIM Requirements Document from the Kickoff Meeting should be archived with a new release name that is project-specific for reference by the owner and all members of the design team.

## Typical Sections

There are five typical sections to the BIM requirements document:

- General Requirements
- Submittal Requirements
- Modeling Requirements
- Additional BIM Tasks
- Appendices

The goal of the owner should be to make the document their own, customize it to meet the particular needs of their institution and update it on an annual basis.

### General Requirements

The General Requirements section defines the purpose of both the BIM Requirements compared to the BIM Project Execution Plan and how the two work together. The General Requirements is where the owner will lay out the foundation of the BIM Requirements. The owner will define the terms used in the document and they will also specify the roles of all the players in the BIM Process. Owners need to define just what it is they need in their final model to successfully manage their building during its life span. Successful development of this goes back to the earlier BIM Strategy where owners made sure that input from the departments/groups that are affected are utilized in creating the BIM Requirements.

### Submittal Requirements

The submittal requirements section is where you define everything that you want in the various milestone deliverables. In addition to documenting requirements such as the software people should use and the format, Submittal Requirements are mainly about the different deliverables related to the BIM process. Certainly, a model is one deliverable (and that is defined in detail in

the next section, Modeling Requirements), but there are many others. These are typically laid out per project type, which are listed below, and broken out by project phase.

- Capital Projects
  - New Construction
  - Major Renovations
- Interior Projects
  - Small Interior Renovation Projects
  - Design in House
  - Construction in House

For example, Interior Projects may have phases like BIM Project Kickoff, DD, CD, and Project Closeout. Each of those phases represents a submittal milestone for BIM and has specific deliverables such as a BIM Kickoff Meeting, QC checklists, clash reports, Model Checker reports, and a data deliverable such as COBie. Capital projects may also include an SD phase. Another very common project type is As-Existing Conditions, where an owner simply commissions a firm to build a BIM model of an existing facility without actually performing any design or construction work. Lastly, because the construction process is very BIM heavy, and because almost all BIM requirements include coordination, many have a separate section just on construction submittals from BIM Kickoff, through pre-construction, and project closeout.

## Modeling Requirements

The construction model created by the outside firm(s) is what is used during the construction phase and is highly detailed with everything from manufacturer specifications, specific concrete and steel stipulations and other comprehensive construction details that are not necessarily needed by the owner for the long-term management of their facilities. This is the meat of the requirements where you define the model. The owner needs to ask the questions:

- What should that model look like?
- How should it be formatted?
- What data should be in it?
- How should the graphics look in the model?
- Model Organizations
  - a. This one is important, otherwise every project will split up the models involved differently. Clearly defining your standard model separations is key (for example: architecture, structure, MEP, and security are the only models at final deliverable, but for large projects, architecture can be split into core & shell and interiors while MEP can be broken up into separate models).
- Building Elements / LOD (Level of Detail/Development)

## Additional BIM Tasks

Every BIM Project is going to deliver two things. First, a clash coordination effort during construction to make sure everyone is coordinated by utilizing the models. Second, operations and maintenance data deliverable (usually in a COBie format (does not need to be)) those are typically the two requirements on all projects. But all projects are unique and that is where this section comes into play.

## Appendices

- Naming Conventions
- LOD Tables
- Parameter Lists

## BIM Execution Plan

Used on a per project basis and these are typically spreadsheets that should be filled out collaboratively at the BIM Project Kickoff Meeting by all project stakeholders: owner, architect, engineers, and contractor.

These contain QC checklists for the different stakeholders (designers, contractors) and the “Element Ownership” tables which define the LOD requirements for each category of building element at each submittal milestone.

## BIM Interoperability: Approach

Autodesk and CADD Microsystems have developed an approach based on three tenants

Classify > Validate > Deliver (defined in BIM requirements)

Classifying Information – Making sure that the information that owners are inputting into the model through the model base process is properly classified and structured. If owners can do that at the beginning of the process, they can head off issues that may happen later down the road. Issues such as not properly classifying elements which in turn means they will not be able to be read by other systems (i.e. your space management system won't understand the different space types or your O&M system won't recognize the maintainable equipment).

Validate – If information has been entered and classified appropriately how does one validate that the information has been inputted correctly with model checking and model validation tools. This must also be done through a workflow that is more integrated so it allows all parties to understand the challenges that may occur. This is an alternative to a punitive workflow, where the model is delivered through a back and forth between the designer and the owner, and time and money become a concern.

How do we do all this? With BIM Interoperability Tools.

These free (no licensing required) Autodesk apps are designed to help architects, engineers, contractors and owners with their BIM workflows. <http://www.biminteroperabilitytools.com>

The web site has six tools:

1. Autodesk Classification Manger for Revit
2. Autodesk Model Checker for Revit
3. Autodesk Model Checker Configurator
4. Autodesk Enhanced DWG exporter for Revit
5. Autodesk COBie Extension for Revit
6. Autodesk COBie Extension for Navisworks

## Resources

National BIM Guide for Owners

[http://www.energymep.it/wordpress/wp-content/uploads/Natl\\_BIM\\_Guide\\_for\\_Owners.pdf](http://www.energymep.it/wordpress/wp-content/uploads/Natl_BIM_Guide_for_Owners.pdf)

Autodesk Whitepaper – “Classification Systems and Their Use in Autodesk Revit: Managing the “I” in BIM”

<https://www.biminteroperabilitytools.com/classificationmanager/downloads/Autodesk%20Whitepaper%20-%20Classification%20Systems.pdf>

## Terms and Definitions

**BIM** – Building Information Modeling/Management (BIM) is a process that involves the creation and management of intelligent 3D models that are used to create and manage buildings and other infrastructure projects.

**COBie** – Construction Operations Building Information Exchange is a non-proprietary data format for the publication of a subset of building information models (BIM) focused on delivering asset data as distinct from geometric information. - <http://www.wbdg.org/resources/construction-operations-building-information-exchange-cobie>

**Classification Management** – a strategy to classify the built environment. There are multiple Classification Management systems used all around the world.

**MasterFormat** | A master list for organizing construction work results, requirements, products, and activities. Mostly used in bidding and specifications, MasterFormat originated in North America and is produced by the Construction Specifications Institute (CSI) and Construction Specifications Canada (CSC). <https://www.csiresources.org/home>

**UniFormat** | For arranging construction information, organized around the physical parts of a facility known as functional elements, and mainly used for cost estimates. UniFormat originated in North America and is produced by the Construction Specifications Institute (CSI) and Construction SpecificationsCanada (CSC).

**Uniclass** | For all aspects of the design and construction process. In particular, for organizing library materials and structuring product literature and project information. Uniclass originated in the United Kingdom and is produced by the Construction Industry Project Information Committee (CPIC) and the National Building Specification (NBS).

**OmniClass** | For organization, sorting, and retrieval of product information for all objects in the built environment in the project lifecycle. OmniClass originated in North America and is produced by the Construction Specifications Institute (CSI) and Construction Specifications Canada (CSC).

**LOD** – Level of Detail/Development. <https://bimforum.org/lod/>

**Model** – A three-dimensional electronic representation of the facility