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BIM Execution Planning: How an $800 Million Project Got it Done

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Learning Objectives

- Craft an effective BEP. It's more than just current Revit version.

- Understand the various points of interest throughout the project life-cycle.

- Communicate clearly, and early in a project, the functional uses of the BIM.

- Leverage emerging industry standards around delivery.

Description

BIM Execution Planning (BEP) is the most important step that few are taking in their current workflows. Architects speak of "standard of care" & "traditional scope" and contractors talk in "time saved". Owners want to save as much money as possible. Can BIM really make this process easier? The course will try to tackle the big questions that BIM poses in our industry today and hopefully provide the answers necessary to get your next project kicked off on the right foot.

Using a recent, very large, multi-disciplinary project, I will show how the planning process should start early and be monitored throughout the project; this is not a "one-and-done" scenario. With so many contributors and interested parties, managing expectations is as equally important as managing the model. It's not about getting it right once, it's about getting it right.

Your AU Experts

Clay Starr is the Director of Engineering Applications for Arcadis US. With 16 years experience in CAD/BIM, Clay is responsible for managing the training, implementation, and support for all aspects of Arcadis's use of engineering and design technology including BIM, Parametric Design, Integrated Delivery, Energy Analysis, or global collaboration.

As European BIM Business Development Manager, Bram Mommers is responsible for the implementation of BIM in our European business, where BIM is more than just creating a design in a BIM. For us, BIM is about managing all the information of a structure over the entire lifecycle. This to ensure that we offer our clients the best possible solution

## 4 Levels of BIM

Level 0 – Lonely BIM

These projects will most likely be exported to CAD or rebuilt in another modeling and documentation tool and usually do not progress past the end of design development. There is no object base information or intelligence.

Level 1 – 3D Centric BIM

These projects are taken all the way through Construction Administration. These have very little BIM management oversight and there is a mix of 2D, CAD, 3D, and data that is aggregated by the project team. Some building geometry inaccurateness or incompleteness is acceptable and encouraged to help maximize file performance, minimize the modeling time, and the effort impact of design changes.

Level 2- Prescriptive BIM
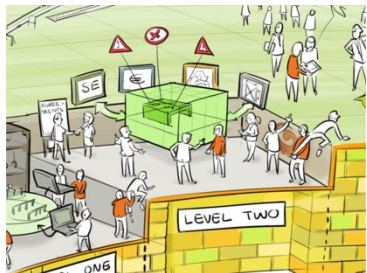
These projects have many interested parties in the BIM process and require deep engagement by the BIM leaders as well as careful client management to control expectations. Sometimes owner or contractor guidelines are already agreed upon, other times we are asked to provide an execution plan for their model. These include BIM project meetings and early model collaboration in addition to specific project model deliverable standards that are specific to the client and can mean significant scope/fee adjustment.

Level 3 – Integrated BIM
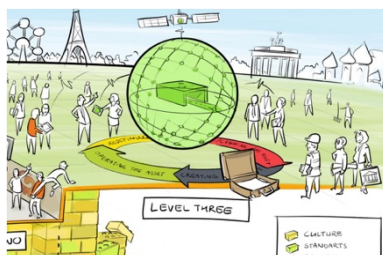
Works intelligently with open shared information throughout out the life cycle. Ensures knowledge of how things were designed, specified, built, and maintained is not lost (delivering significant cost and time savings for our clients). Independent from software applications.

What is BIM Execution? What is there to plan?

BIM Execution Planning is more than a formality by which you kick off projects in Revit. It serves as the backbone to the project doling out responsibilities and timelines to all parties to make sure model information is usable and reliable. It can be as exact or general as you want, but it must be done. In short, BIM execution is project execution.

What's included?

A BIM Execution Plan (BEP) consists of many points of interest but at very least should include:

- Project team contacts
- BIM team contacts
- Software versioning
- Information Exchanges/Requirements
- BIM Uses and Goals
- Project Objective
- Project Information
- BIM Goals and BIM uses
- Hardware specifications
- Model setup
- Quality Control
- Level Of Development (LOD)

CASE STUDY: What's in ours?

Our BEP template contains the previously mentioned basic amount of information as to what the initial function of our models are as well as some legal-sounding language that specifies the nature of the BIM as it relates to the printed documents. Its focus is primarily that of Document Centric BIM.

From there, the client and the team began working toward a mutually beneficial plan. This included about 40 hours of on-site meetings with the entire team in a giant room hashing out the reasons for and against certain things being modelled, how drafting elements are used, enriching the model with data that doesn't directly influence the AE documentation, and clash detection methodologies.

On the subject of clash, this was a sticking point in the early planning stages because the use of "automated clash detection" seems like such a simple button to push, but in reality, the demands of the project design and delivery did not allow for zero clash DD models at zero tolerance. We spent a lot of time on the concept of what a clash really was and how important it is at the time it is found.

I caution the use of the even the word "clash" these days as it elicits certain expectations for the design models that are unrealistic and burdensome. We refer to the process early in the project as "conversation detection" as a result.

Crafting an effective BEP

Most of the early BIM Planning is an education course for the client. The expectations are on one or the other the extreme end of spectrum. Either is a fully virtualized, as-constructed, kitchen sink style effort or "we want you to use a computer" approach to design.

The client in our case study had a good handle on BIM and was excited with the process of learning the "whats, whys, and hows" of the design process. This gave us many opportunities to discuss why certain things should or should not be in the model.
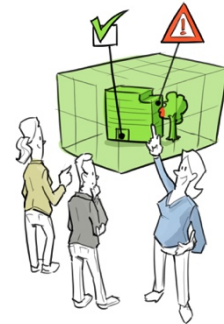
Where to start?

Is your client BIM "savvy"? Have they written language into the RFP or even the contract that states what their vision of BIM for their project is? Start there. Meet clients where they are and show how your BIM process will not only achieve their goals for the project, but add value beyond what they were expecting. Our current standard BEP consists of over 65 pages of information that we require from all parties when we start a project.

CASE STUDY: Crafting the BEP.

In our case, the client had very Prescriptive BIM goals for the project and we worked on a process that got us there together. Our BIM plans are highly customized to meet the needs of the client. While all share some basic guidelines and language, the final document is almost completely dependent on the client and contract goals.

Begin with the end in mind

Crafting an effective BEP is 100% tied to the end goals of the project and the model(s). Our client was insistent from the very beginning that the BIM would be used for "Record Modelling" and "Asset Management" at the very least. This meant that our traditional scope of services would have to be amended. The problems that came from these discussions on how the project and BIM were to be delivered started with the general misunderstanding of what architectural services are.
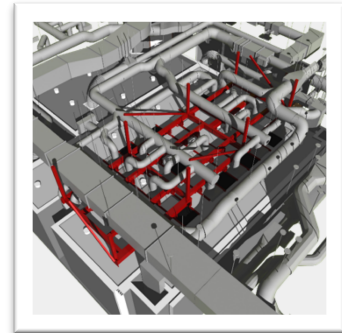
Using the Penn State BIM Uses as a guide, we crafted, firstly, a document that stated, in BEP language, exactly what we traditional provide. These are the BIM Uses our "standard of care" provided by default. From there we were able to begin the actual planning session.

CASE STUDY: Crafting the BEP (cont)

Planning Our Project

The client hired a BIM consultant to make sure his goals and interests in the model and effort were both protected and enforced. Some of the earliest conversations revolved around contract language and risk, but eventually we settled into discussing exactly how the team was going to deliver.

Again, using the Penn State Planning Guide, we began aligning the client's goals for the project with the stated 'uses' of a BIM by the Penn State guide. Priorities were established by the owner while the architect, engineers, and contractor debated over responsibilities, accuracies, and timing.

The original meeting was a full 40 hour work week, on site, with all parties having their say as to what would or wouldn't be part of their agreement with the owner.

PRIORITY HIGH(1) MED(2) LOW(3)	GOAL DESCRIPTION	POTENTIAL BIM USES
1	Drastically reduce design RFI's and changes by having a fully coordinated design model	3D Coordination, Design Authoring
1	Reduce construction coordination issues and coordination schedule duration by involving key MEP/FP subcontractors during preconstruction to collaborate and coordinate during design	3D Coordination
1	Eliminate field conflicts, coordination-related RFI's and changes by having a coordinated, clash-free construction model	3D Coordination
1	Increase field productivity and reduce rework through extensive MEP/FP prefabrication	3D Coordination, Digital Fabrication
1	Deliver an accurate "as-built" model (including RFI's, revisions etc.) for use on future expansion projects	Record Modeling
1	Deliver an accurate "as-built"/record model (including RFI's, revisions etc.) for use by FM to transfer into their software/databases	Record Modeling, Building Maintenance Scheduling, Asset Management, Space Management/Tracking
1	Deliver an accurate "as-built" model (including RFI's, revisions etc.) with component spec information, O&M data (add for O&M) etc. for use by FM to operate and maintain the building	Record Modeling, Building Maintenance Scheduling
2	Reduce owner changes through 3D visualization of facility by Dr's, Nurses, Users	Design Reviews
1	Improve design efficiency and accuracy	Design Authoring
1	Reduce energy consumption	Energy Analysis
3	Improve accuracy, efficiency, and detail of estimates	Cost Estimation
2	Bring job in on time or early by solving schedule-related issues using BIM during the preconstruction and construction phases	3D/4D Site Utilization Planning, 4D Scheduling
2	Track progress during construction and provide schedule "transparency" to project team	3D/4D Site Utilization Planning, 4D Scheduling
2	Communicate project phasing and schedule to stakeholders	3D/4D Site Utilization Planning, 4D Scheduling
3	Reduce cost of mockups by using BIM mockups	Design Reviews
3	Improve field efficiency through automated digital layout	3D Control and Planning

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Understand the points of interest throughout the project

It's not enough to "do Revit" as many firms and individuals will tell you they do that just fine. The BIM process comes from the same area of expertise our old school PMs come from; what's important and when? If anything, a well-defined BEP will do nothing more than lay out, on paper, a seemingly traditional process of project delivery spelling out exactly what's in our source files, why they are there, and what their function is. For now, most of those functions begin and end by delivering large pieces of paper with symbols of our design printed on them.

Where to start?

Start where every other project starts. Define project goals, client expectations, and deliverables. The process changes in that we find ourselves either rationalizing traditional workflows in spite of BIM or adding value because of it. Documents like the AIAE202 can help these early conversations move forward, but can also be a burden if the team isn't prepared. As stated before, the key to a good BEP is beginning with the end in mind.

CASE STUDY: Our points of interest.

Knowing our client had specific goals for the project, we began working our way back from the end to help define how the data would be entered into the model and most importantly, when it would be included. One of the things we deal with the most is the "too much, too soon" One of the biggest benefits of BIM is not 3D, but learning design. Where we were once just draftsmen set loose on you task, we now have the power to touch any and all aspects of the projects. With that power comes new responsibility. Mentoring is more important than ever considering that recent graduates are given the keys to the kingdom, so to speak. That means, determining what's important and when while communicating that to the design team.

"Too much, too soon" is, more often than not, a symptom of under-management. By laying out the specifics of our project deliverables and deadlines, we were able to focus the efforts of the design team to a point where there was little or no extraneous efforts in the model that didn't serve the current goal or advance a future one. This is where documents like the AIA E202 doc come in really handy. Admittedly, it's an arduous task, but in retrospect was a very

important one. For the first time, every designer, constructor and owner rep sat in a room and deliberately laid out our process, our limits, and reasons, for all to see. It was not only difficult, but extremely liberating.

Learn to communicate the functional uses of the BIM.

Speaking the same language helps in communication. It's true in life and is true in BIM. Many tools and example exist out there to define what BIM, what is for, and who can access it.

Where to start?

There's really no industry specific language that all parties can speak regarding the uses of the model(s). We rely on the Penn State list to help start the conversations early on and that works well. There are 25 in all and the moment that they are useful in projects can be seen here.

It is very difficult and sometimes even impossible (read: expensive) to add more uses to the model the further into the project you get. More often than not (read: 100% of the time), a client or contractor will realize half-way through DD that the design team is using Revit and begin asking for the more and more from the model. For

PLAN	DESIGN	CONSTRUCT	OPERATE
Existing Conditions Modeling			
Cost Estimation			
Phase Planning			
Programming			
Site Analysis			
	Design Reviews		
	Design Authoring		
	Structural Analysis		
	Lighting Analysis		
	Energy Analysis		
	Mechanical Analysis		
	Other Eng. Analysis		
	LEED Evaluation		
	Code Validation		
		3D Coordination	
		Site Utilization Planning	
		Construction System Design	
		Digital Fabrication	
		3D Control and Planning	
		Record Model	
			Maintenance Scheduling
			Building System Analysis
			Asset Management
			Space Mgmt/Tracking
			Disaster Planning

■ Primary BIM Uses
■ Secondary BIM Uses

this reason alone, BIM planning is the most important step you can take at the beginning of a project.
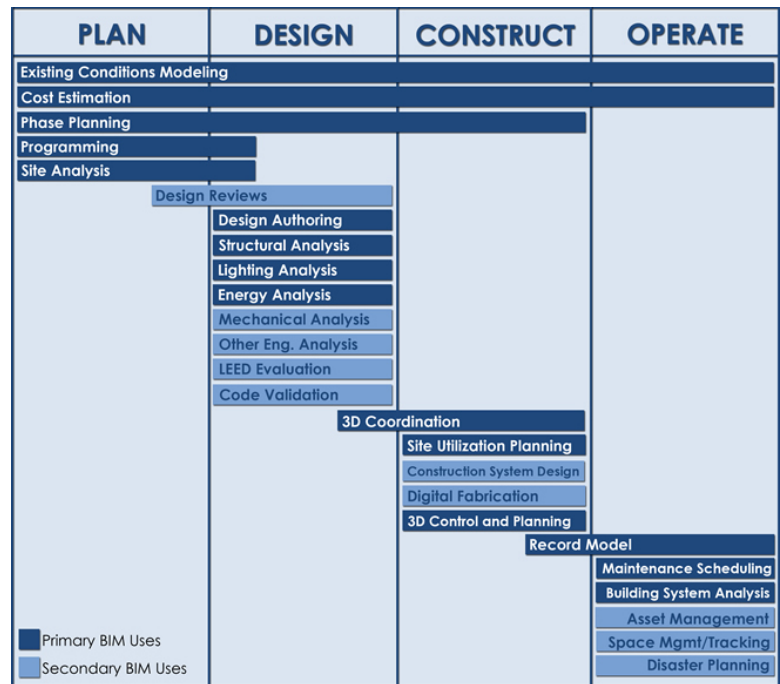
CASE STUDY: Our Functional Uses

As stated before, there were some very specific BIM goals for the project but communicating the benefits of BIM doesn't end with meeting only the client's goals. We adopted BIM years before clients were requesting it or even before most had even heard of it. We did it because of the benefits our process saw and being able to show clients a "value add" to their requests is always a good thing. The BIM uses laid out by Penn State started us off on the track of redefining our scope using the language in their planning guide. These were aligned with our process and a first step, but didn't stop there.

There are uses that enhance our design and delivery inherent in the BIM process. Design Authoring and Design Review come to mind. Some of the biggest advantages to Architectural BIM are things like space tracking and visualization. That these functions are now co-mingling with documentation and collaboration makes the data that much more trustworthy. Many times throughout the project, GM, CM, or consultants would ask for data (areas, counts, etc) that would have traditionally taken extra time to create, so when they came to understand that this data was in the model by default (with occasional caveats), it was seen as a value add.

It was important that our client was aware of these benefits and we made sure they made their way into the BEP. Sometimes, just taking account of all we are doing and the benefits therein is exactly what a client needs to hear and we (the AEC) generally don't do a fantastic job at that.

In Closing

"Prescriptive BIM" does not mean "Restrictive BIM" any more than "Document Centric BIM" precludes us from enriching our models for uses beyond our own desires. The most important thing to understand when entering into a BIM project is "what is it that we do"? As stated earlier, Revit is not BIM. Revit is software that enables and enhances certain functions of the building data, but doesn't mean BIM. Some are overselling themselves and under delivering all over the industry, so understanding exactly what you do and "why" will get you off on the right foot. With that in mind, I'll give you a checklist of best practices of BIM planning based on our experience on this project.

Have reasons

You will be asked to deliver the moon. Some tasks are seemingly easy, but that doesn't mean they are. Software thinks differently quantities than you do.

Start Early

The sooner everyone is speaking the same language, the better. Remember, the longer you go before developing a BEP, the more difficult it will be.

Communicate

Communication doesn't happen less because of a BEP. It will take work and constant revision.

Standardize

Get the easy stuff settled as soon as possible. Get file/view naming, layer export colors, Navisworks templates, and any other of the basic information set early so you can begin focusing on the big BIM stuff.

Good luck!

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