BIM Execution Plans And Contract Requirements

What's Shaping Your Project?

Presented by Tadeh Hakopian
- Coordinating BIM execution plan essentials for Architects and Builders

- Level of Development (LOD) and what that means for your organization and project AIA contract documents

- Execution Plan value for Architects, Contractors and Owners

- Best practice to align all stake holder BIM plans and guides into one comprehensive guiding document for the entire project
Tadeh (Todd-A) is a BIM Coordinator and design technology specialist with experience throughout the AEC field working for Engineers, Contractors and Architects for the last 8 years. Along the way he experienced first hand the spectrum of BIM expanding to provide solutions to common project problems. His current fields of interest include Dynamo scripts with Python and leveraging the Metadata in BIM models for life cycle analysis.
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PROCESS
   Expectations
   Reality

PROJECTS
   Torrey Pines
   Parcel F
   Robertson Lane
   Future College

OUTLOOK
   What to expect for future requirements
   Takeaways

PLANNING
   Creating a BEP draft
   BEP sample outline

STANDARDS
   BIM templates
EXPECTATIONS

PROJECT AWARDED → CONTRACT NEGOTIATED → DISCUSS BIM SCOPE

→ UPDATE BEP

→ BEP KICK OFF

→ CREATE AN INCLUSIVE BEP

→ VALIDATE BIM CONTENT

→ DELIVER BIM SCOPE TO OWNER
EXPECTATIONS VS REALITY
REALITY

PROJECT AWARDED \[\rightarrow\] ??? BIM SCOPE ??? \[\rightarrow\] CREATE SOME KIND OF A MODEL

MORE MODELS CREATED \[\leftarrow\] BEP DOCUMENT (MAYBE) \[\rightarrow\]

A LOT OF FIXING TO DO \[\downarrow\] 1, 2 SKIP A FEW \[\rightarrow\] PROJECT CLOSE OUT
CASE STUDY – PROJECTS

HKS PROJECTS

- CIRCUMSTANCE
- TYPE
- PROGRAM
- SIZE
- COST

- CONTRACT REQUIREMENTS
- STANDARDS
- WHAT CLIENT WANTED
- WHAT TEAM DELIVERED
- WHAT WE NEEDED

LESSONS LEARNED

‘SMILE’ RATING
Profile

University Campus

Mixed use development

2000 beds with Academic, Office, Recreational and Parking

1.5 Million SF overall

$500 Million Budget
## CASE STUDY – UCSD TORREY PINES

<table>
<thead>
<tr>
<th>Client Requirements</th>
<th>Contract</th>
<th>BEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only CAD outlined</td>
<td>Design Build</td>
<td>Based upon Penn state BEP planning guide</td>
</tr>
<tr>
<td>Nothing Defined for BIM</td>
<td>Owner had design build team directly contracted</td>
<td>Covered Clash detection</td>
</tr>
<tr>
<td></td>
<td>General Contractor led design build team</td>
<td>Model setup</td>
</tr>
<tr>
<td></td>
<td>AOR of record worked with associate architect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trades worked under General Contractor</td>
<td></td>
</tr>
</tbody>
</table>
A lot of models with a lot of users – what could go wrong?
Content including furnishing and room information
CASE STUDY – UCSD TORREY PINES

What We Added

- Software for clash detection
- Coordination updates

What Client Wanted

- Full Facility Data reporting
- Comprehensive BIM deliverable

What We Needed

- Building Information Modeling and Digital Data Exhibit either internally or from the owner
CASE STUDY – UCSD TORREY PINES

OUTCOMES

BAD

The BEP was a hand off between different managers along the way.

Changes were made in reaction to problems.

No model clean up procedure was implemented.

Many hours were spent fixing problems that could have been addressed with coordinated project teams and owner expectations guiding them.

GOOD

Project team had a unified BEP to guide model progress.

Owner saw the potential of BIM models and wanted to pursue higher standards with a BIM FM pilot project.

Progressive attitude among team to make most of technology and methods for a large complex project.

😊😊/5
CASE STUDY – PARCEL F TOWER
CASE STUDY – PARCEL F TOWER

Profile

High Rise Tower

Mixed use development

Residential, Hotel, Office, Public and Transit oriented development

1.1 Million SF overall

Budget unspecified
## Case Study – Parcel F Tower

<table>
<thead>
<tr>
<th>Client Requirements</th>
<th>Contract</th>
<th>BEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFP had BIM deliverables outlined for everyone to accept as part of contract</td>
<td>Design Bid Build</td>
<td>Based upon internal HKS standards</td>
</tr>
<tr>
<td>Owner is private developer coordinating with project team</td>
<td>AOR of record worked with associate architect</td>
<td>Reference the BIM forum and AIA documents</td>
</tr>
<tr>
<td>General Contractor will come on board when CD phase begins</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Detailed model but everything delivered as construction documents
Execution Plan didn’t address everything

Project is close to transit structures, so we had to improvise along the way
CASE STUDY – PARCEL F TOWER

What We Added

- LOD requirements

What Client Wanted

- BIM reporting verification

What We Needed

- More direction from the owner
- Coordination early between AOR and Design Architect
## CASE STUDY – PARCEL F TOWER

### OUTCOMES

<table>
<thead>
<tr>
<th>BAD</th>
<th>GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>General contractor and trades can’t be brought on board until beginning of Construction Documents</td>
<td>Client knew what they wanted from proposal stage</td>
</tr>
<tr>
<td>Owner requirements in RFP were somewhat vague to the entire team</td>
<td>Project team met weekly to review model progress</td>
</tr>
<tr>
<td>Many coordination meetings happened simultaneously and getting direction could be challenging</td>
<td>Coordinated BEP was setup early on to guide team</td>
</tr>
<tr>
<td></td>
<td>Reference documents were specified in the BEP</td>
</tr>
</tbody>
</table>

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Profile

Hotel

Mixed program in tight constraints

Recreation and amenity spaces

200,000 SF overall with 241 rooms

Budget unspecified
<table>
<thead>
<tr>
<th>Client Requirements</th>
<th>Contract</th>
<th>BEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing Defined for BIM</td>
<td>Design Build (Progressive)</td>
<td>Proprietary from HKS and Layton Construction</td>
</tr>
<tr>
<td></td>
<td>Project went from one architect to another</td>
<td>Referred to AIA digital documents and BIMforum LOD</td>
</tr>
<tr>
<td></td>
<td>Architect led early process with Contractor coming in at Design Development</td>
<td></td>
</tr>
</tbody>
</table>
Fun fact – a historic building will be rotated 90 degrees and moved to the otherside of the block as part of the project.
Orientation and Site Survey was critical. Unfortunately, it took 4 months to resolve so our BEP was held up because of it.
<table>
<thead>
<tr>
<th>What We Added</th>
<th>What Client Wanted</th>
<th>What We Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clash detection protocol</td>
<td>Nothing</td>
<td>2 rounds of BEP kick offs</td>
</tr>
<tr>
<td>Horizontal Control</td>
<td></td>
<td>First for design team</td>
</tr>
</tbody>
</table>
|                           |                    | Second for trades onboarded     | later
CASE STUDY – ROBERTSON LANE HOTEL

OUTCOMES

BAD

Client wasn’t involved in any way for BIM expectations

Model hand off from one Architect to another is always a problem

Unknown conditions in tight sites can lead to a lot of backtracking to get the project ready

GOOD

Designer and Contractor could work together early in the process

Project team met regularly to discuss BIM modeling requirements

Coordinated BEP was setup early on to guide team

Reference documents were specified in the BEP

BIM 360 was used to fullest affect

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5
CASE STUDY – UCSD FUTURE COLLEGE

Future College 2023

Torrey Pines 2020
Profile

University Campus

Mixed use development

2000 beds with Academic, Office, Recreational and Parking

1.5 Million SF overall

$500 Million Budget
CASE STUDY – UCSD FUTURE COLLEGE

Prefabrication and sustainable analysis
### Client Requirements

<table>
<thead>
<tr>
<th>Facility Data Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Information Modeling</td>
</tr>
<tr>
<td>Coordinated and Issue free BIM models</td>
</tr>
</tbody>
</table>

### Contract

<table>
<thead>
<tr>
<th>Design Build</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner had design build team directly contracted</td>
</tr>
<tr>
<td>General Contractor led design build team</td>
</tr>
<tr>
<td>AOR of record worked with associate architect</td>
</tr>
<tr>
<td>Trades worked under General Contractor</td>
</tr>
</tbody>
</table>

### BEP

<table>
<thead>
<tr>
<th>Hybrid between 2 Architects, General Contractor and Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Contractor leads the BEP process with design build team input for certain aspects</td>
</tr>
<tr>
<td>Owner guides the process</td>
</tr>
</tbody>
</table>
The project concept design took place the same time as the BEP drafting.

In this case the BEP is way ahead of the model progress which is a first

That also leaves a lot of things to be determined later
CASE STUDY – UCSD FUTURE COLLEGE

<table>
<thead>
<tr>
<th>What We Added</th>
<th>What Client Wanted</th>
<th>What We Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everything</td>
<td>Everything</td>
<td>Communication</td>
</tr>
</tbody>
</table>
CASE STUDY – UCSD FUTURE COLLEGE

OUTCOMES

BAD

Delivery requirements not always clear

Many revisions to come as the project evolves

Significant time commitment for so many workflows to integrate with each other

Communication between all members of the project team is a learning curve and some things slip through the cracks

GOOD

Designer, Owner and Contractor could work together early in the process

Project team met regularly to discuss BIM modeling requirements

Coordinated BEP was setup early on to guide team

Reference documents were specified in the BEP

BIM 360 was used to fullest affect

😊😊😊😊😊 / 5
<table>
<thead>
<tr>
<th>Good</th>
<th>Bad</th>
<th>Ugly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communicate with all stakeholders early</td>
<td>Waiting until last minute to coordinate BIM</td>
<td>Sorting out who has control – Owner, Designer, Builder</td>
</tr>
<tr>
<td>Get a definitive explanation of what the</td>
<td>processes</td>
<td>Adjusting BIM scope half way (or all the way) through</td>
</tr>
<tr>
<td>owner expects for BIM delivery</td>
<td>Putting aside owner contracted delivery</td>
<td>the project</td>
</tr>
<tr>
<td>Align goals within the project team and</td>
<td>requirements until you are at a close out</td>
<td>Working with an Owner who doesn’t know what they want</td>
</tr>
<tr>
<td>complement each other’s process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share information and communicate regularly</td>
<td></td>
<td>Scoping out who does what for a large project</td>
</tr>
</tbody>
</table>
Influence Determines Outcomes

Who leads the process?

Whoever leads is the one who ‘pulls’ everyone

Consider the lead and the whole process will follow

---

Owner

Contractor

Designers
Integrate Workflows
Be Proactive and reach out for coordination

**Ideal Scenario**
Everyone gets together on the project team and sorts out responsibilities and commitments together

**Progressive Scenario**
One group starts but integrates other groups along the way

**Limited Scenario**
Each company does a simple hand off and only absolute essentials are coordinated
WHAT DOES THE FUTURE HOLD?

After 20 years we are finally seeing BIM standards harmonize and projects commonly adopt BIM

But we are not done yet

Once data is introduced to the project we are only at the beginning and the expectations will rise
### NEAR TERM
- More time spend upfront on planning BIM requirements
- Owners will get involved with their requirements in RFP
- Governing bodies will provide their own standards and guidelines
- Drivers will include gathering data and providing lifecycle analysis and support with the execution plan

### EMERGING
- New Requirements beyond traditional BIM and VDC expectations
- Constantly updated databases for buildings
- More data and automation will accelerate the next wave of information modeling
- Asset Information Management
- IOT & Digital Twins
- Geographic Information Systems
- Sustainable Analysis

### LONG TERM
- Don’t get comfortable
- Big Data streaming from Smart Cities will be a reality in the next 10 years
- Cities are made of buildings
- Buildings are designed with software tools
- That process will fall back on AEC professionals to adapt and continue to push coordination to meet these needs
How to get Started

• Find the Influence in your project

• Set out expectations early

• Assume higher standards if no standard is given to you

• Pick the right reference documents for your project
Takeaways

• Work with everyone on the team – the earlier the better

• Understand the deliverables and standards for the team

• Gather all people needed to draft a BEP

• Provide clarity to your project team about the BEP requirements

• Be ready to adapt to changing conditions in your project
THANK YOU
APPENDIX – GUIDES & STANDARDS
HOW STANDARDS PROLIFERATE:
(SEE: AIC CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)

SITUATION:
THERE ARE 14 COMPETING STANDARDS.

14?! RIDICULOUS!
WE NEED TO DEVELOP
ONE UNIVERSAL STANDARD
THAT COVERS EVERYONE'S USE CASES.
YEAH!

SITUATION:
THERE ARE 15 COMPETING STANDARDS.
BIM / VDC STANDARDS & REFERENCES

National BIM Standard-United States (NBIMS-US)

Penn State Project Execution Planning Guide

PAS 1192 / ISO 19650

BIMForum LOD

Canada BIM Management Plan

Proprietary – Designer, Builder, Owner
<table>
<thead>
<tr>
<th><strong>FEATURES</strong></th>
<th><strong>TYPICAL USE CASE</strong></th>
<th><strong>DRAWBACKS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Created by Building Smart Alliance and National Institute of Building Sciences to address growing information needs in buildings</td>
<td>Government Projects including Federal, State, Military, Justice, Aviation, Security and Infrastructure</td>
<td>Focus on file formats without mention of comprehensive data flows</td>
</tr>
<tr>
<td>Standardize the information for projects among all parties involved</td>
<td></td>
<td>Not a lot of information about clash coordination and issue resolution</td>
</tr>
<tr>
<td>Support for open source formats like IFC and COBie</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEATURES</td>
<td>TYPICAL USE CASE</td>
<td>DRAWBACKS</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>University research project supported by Building Pankow foundation to identify BIM project planning process</td>
<td>Commercial construction projects</td>
<td>Very extensive which can take time to absorb for a project team</td>
</tr>
<tr>
<td>Many sample workflows for setting company BIM standards</td>
<td>Commonly adopted by general contractors as the basis of their BIM standards and execution planning</td>
<td>Usually the entire guide is taken as the standard at many companies rather than referencing it and tailoring the content for specific operations</td>
</tr>
<tr>
<td>Provided Templates for execution planning</td>
<td>Owner guide version is available for BIM deliverables</td>
<td></td>
</tr>
</tbody>
</table>
PAS 1192 / ISO 19650

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>TYPICAL USE CASE</th>
<th>DRAWBACKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAS 1192 is the standard setting by the UK for using BIM on all government projects</td>
<td>Government projects in the UK</td>
<td>Started in UK with its own standards and formats which haven’t harmonized with other countries – especially the US</td>
</tr>
<tr>
<td>ISO 19650 is the international standard that is derived from 1192</td>
<td>Government and Commercial Projects in Europe</td>
<td></td>
</tr>
<tr>
<td>Details definitions and workflows like common data environment and ‘Levels’ of BIM use</td>
<td></td>
<td>Not meant for BEP but a guide about how project planning should start for BIM leaving execution to the parties involved</td>
</tr>
</tbody>
</table>
### BIMFORUM LOD

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>TYPICAL USE CASE</th>
<th>DRAWBACKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides extensive list of Level Of Development (LOD) examples and templates</td>
<td>North American Building Construction projects</td>
<td>Current form is that of a PDF requiring searching for the desired content</td>
</tr>
<tr>
<td>Created and organized by a committee from all sectors of building design and construction</td>
<td>Typical standard for model development expectations for clash detection and delivery</td>
<td>Meant for building projects which means definitions don’t necessary scale up for large infrastructure construction</td>
</tr>
<tr>
<td>Provides Uniformat and Omniclass definitions for all elements</td>
<td></td>
<td>Database doesn’t exist for ongoing updates and currently released once a year</td>
</tr>
<tr>
<td>CONTRACT</td>
<td>DEFINITIONS</td>
<td>DELIVERABLE</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>AIA</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CONSENSUS</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DBIA</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>EJDC</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Summary – Most contract documents have a lot in common when it comes to Digital content making coordination easier for all involved
THE ROAD TO A PROJECT BEP

Understand the project

Understand what is to be completed

Understand the contract

Understand the standards in use by each party

Then draft a BEP to address all the project and team parameters

Drafts should be presented to team and agreed upon as a guiding document by everyone

Adapt the BEP as the project moves forward and new issues arise
SAMPLE BEP OUTLINE

- Cover Page
- Company Contact Information
- Table of Contents
- Project Introduction
- Project Schedule
- Project Contacts
- BIM Uses
- Project Goals
- Software Requirements
- Meeting Time and Method
- Model Delivery Schedule
- File Exchange Platforms
- Process Map for Project Team
- Model Ownership right to use
- File Naming Standard
- Sheet Organization Parameters
- Workset Requirements
- Linked Files Standards
- Model Origin
- Coordinate System
- Measure System Units
- Copy Monitor Requirements
- Phase Requirements
- Design Options
- Data Reporting Requirements
- Exporting Standards for CAD/ BIM
- Level of Development (LOD) Definitions
- LOD Matrix per phase
- Quality Control Methods
- Model Deliverables
- Definitions
- Clash detection Protocol
- Signature Page
Summary – Standards are starting to align but can diverge when it comes to purpose.
<table>
<thead>
<tr>
<th>CONTRACT DOCUMENTS</th>
<th>BIM EXECUTION PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project management requirements</td>
<td>Project goals and uses for BIM</td>
</tr>
<tr>
<td>Understand the roles between parties</td>
<td>investigate tools for the project needs</td>
</tr>
<tr>
<td>Defining the deliverables outside of BIM</td>
<td>Discuss team member's experience</td>
</tr>
<tr>
<td>specific exports should be in the PM plan</td>
<td>Add flexibility to your projects</td>
</tr>
<tr>
<td></td>
<td>Communicate with industry peers</td>
</tr>
</tbody>
</table>
LEGAL ASPECTS

When BIM first appeared, there were many risk exposure questions regarding ownership of the dataset, completeness of the constituent functional parts, and control over revisions and common access.

As technology has improved, many of these practical concerns have been addressed through software.

Increased experience with the process has identified early negotiation points that can help ensure that issues in the BIM process do not need to immediately result in change-order battles or litigation.

....
CONTRACTS

AIA Digital Practice Documents
Consensus docs
Design Build Institute
EJCDC Document 700
AIA DIGITAL PRACTICE DOCUMENTS

<table>
<thead>
<tr>
<th>E203</th>
<th>G201</th>
<th>G202</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Information Modeling and Digital Data Exhibit</td>
<td>Project Digital Data Protocol Form</td>
<td>Project Building Information Modeling Protocol Form</td>
</tr>
<tr>
<td>Requires that parties create a data protocol if BIM is being used on a project. If the parties cannot agree on the use and reliance of BIM, any party using it does so at their own risk. This downstream waiver may equally extend to trades.</td>
<td>Digital Data refers to information, including communications, drawings, specifications and designs, created or stored for the Project in digital form.</td>
<td>Document, at the outset of the Project, their general expectations about how, and the extent to which, Digital Data and Building Information Modeling will be used.</td>
</tr>
</tbody>
</table>
## CONSENSUS DOCS 301 ADDENDUM

<table>
<thead>
<tr>
<th>ARTICLE 1</th>
<th>GENERAL PRINCIPLES</th>
<th>ARTICLE 2</th>
<th>DEFINITIONS</th>
<th>ARTICLE 3</th>
<th>BIM MANAGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>301 addendum should be incorporated into contracts of all parties</td>
<td>All models must be developed according to the BEP according to the addendum</td>
<td>There will be a designated BIM lead who will manage information related to the scope of the BEP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ARTICLE 4</th>
<th>BEP</th>
<th>ARTICLE 5</th>
<th>RISK ALLOCATION</th>
<th>ARTICLE 6</th>
<th>MODEL RIGHTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Execution Plan will be drafted between all parties and used as an amendment to the addendum</td>
<td>Whoever models design or information content is responsible for that content</td>
<td>Limited license to reproduce content by parties in the project for purposes of project coordination only</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BIM is the system described in this document and has been agreed by owner and design-build team.

This exhibit is to establish the procedures associated with using BIM for the project.

Identify the software participants must use for BIM along with cost for licenses and services.

Participants will be responsible for reviewing and delivering content.

Participants shall review the material provided and confirm that it is consistent with requirements for deliverable.

Each participant property rights to submit their content for delivery in accordance with the Owner Agreement.
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>CCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data to the owner relied upon is limited to printed copies</td>
<td>All transfers of electronic data will be considered accepted after 60 days of delivery</td>
<td>Electronic media may deteriorate over time which can affect readability of the documents.</td>
</tr>
<tr>
<td>Other file types in electronic format are for the convenience of the owner</td>
<td></td>
<td>The transferring party is not liable for deteriorate electronic data held in archive by the owner</td>
</tr>
<tr>
<td>Hard copies govern</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>DELIVERABLE</td>
</tr>
<tr>
<td>------------</td>
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<td>-------------</td>
</tr>
<tr>
<td>NBIMS</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PENN-PXP</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>BF LOD</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PAS / ISO</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Summary – Standards are starting to align but can diverge when it comes to purpose