

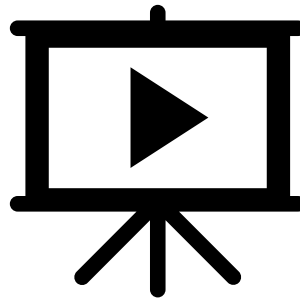
BIM Execution Plans And Contract Requirements

What's Shaping Your Project?

Presented by Tadeh Hakopian

INTRO

- 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.

INTRO

CONTENTS

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

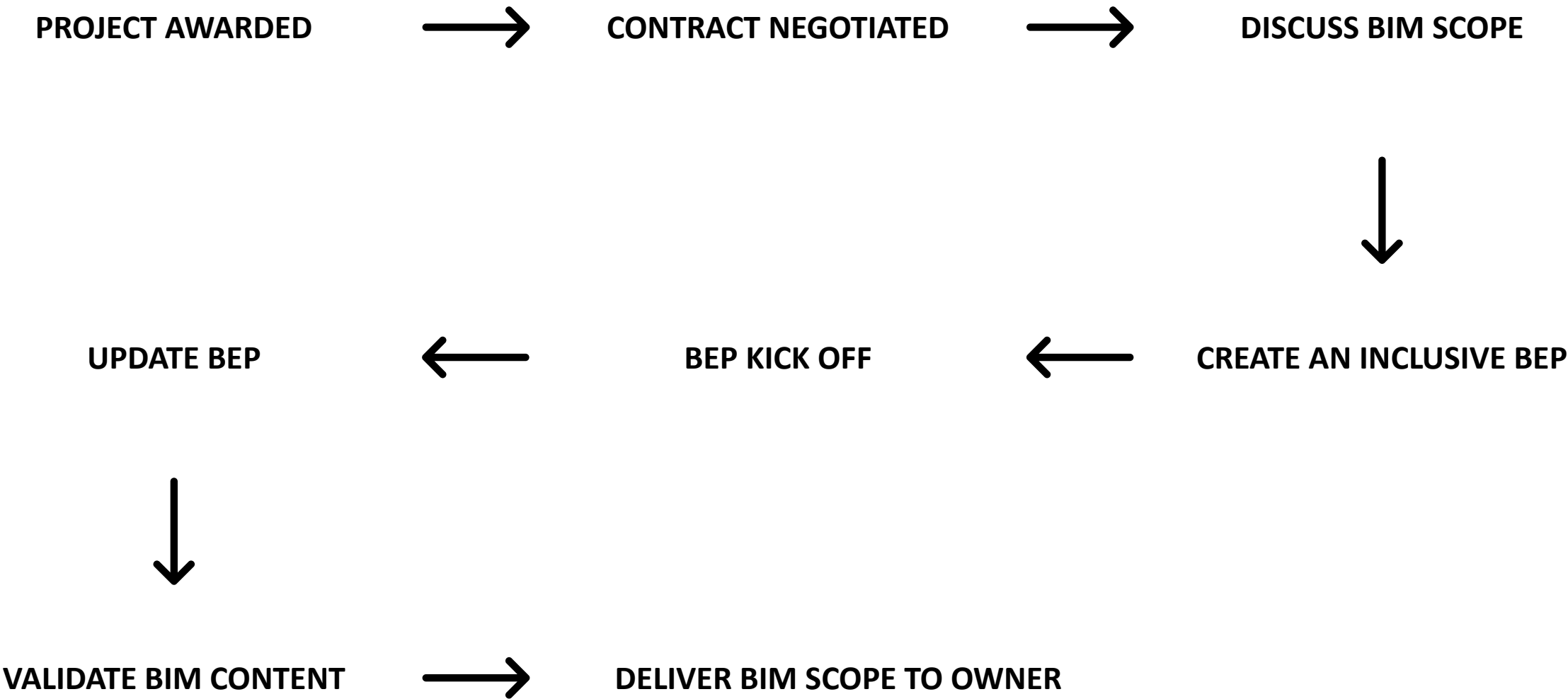
- BEP sample outline

STANDARDS

- BIM templates

PROCESS

EXPECTATIONS



EXPECTATIONS

EXPECTATIONS

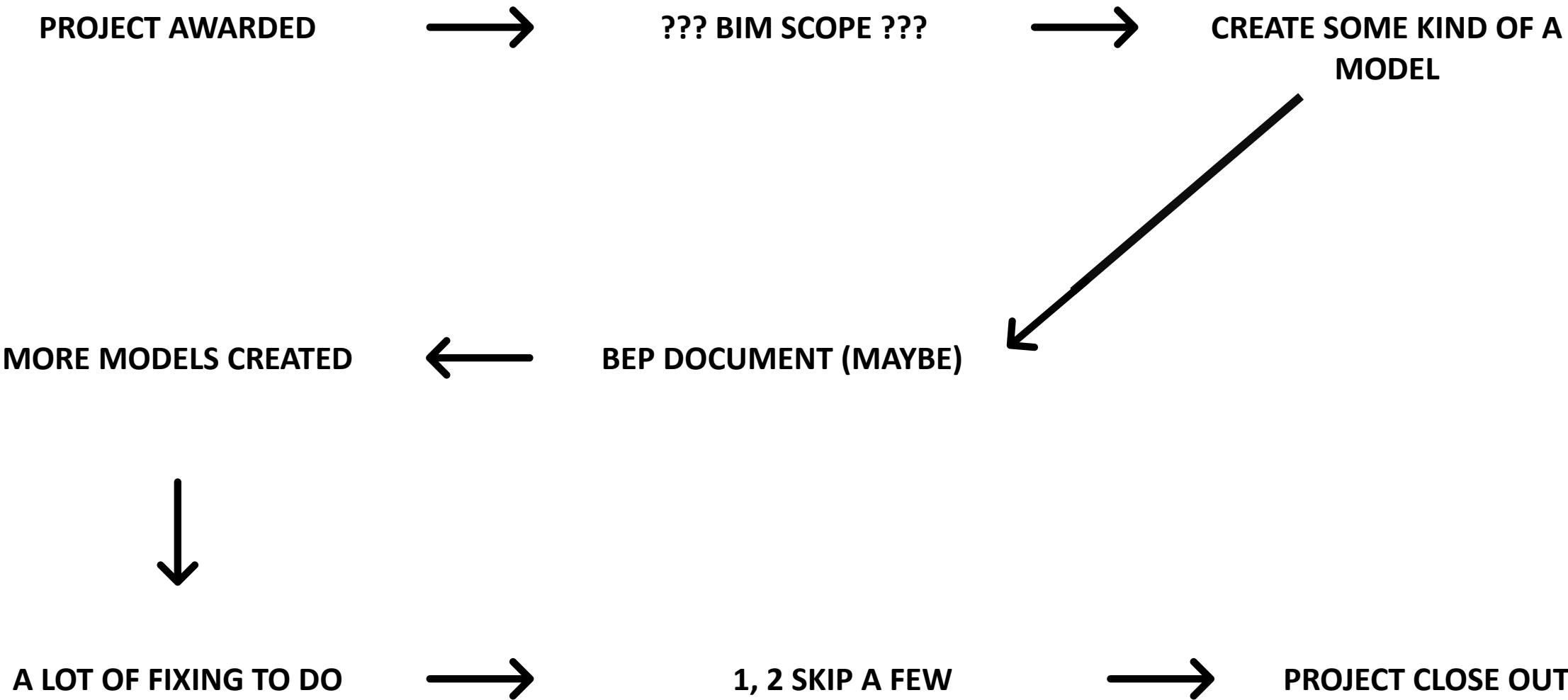


VS

REALITY



REALITY



PROJECTS

CASE STUDY – PROJECTS

HKS PROJECTS

<ul style="list-style-type: none">CIRCUMSTANCE	<ul style="list-style-type: none">CONTRACT REQUIREMENTS	LESSONS LEARNED
<ul style="list-style-type: none">TYPE	<ul style="list-style-type: none">STANDARDS	‘SMILE’ RATING
<ul style="list-style-type: none">PROGRAM	<ul style="list-style-type: none">WHAT CLIENT WANTED	
<ul style="list-style-type: none">SIZE	<ul style="list-style-type: none">WHAT TEAM DELIVERED	
<ul style="list-style-type: none">COST	<ul style="list-style-type: none">WHAT WE NEEDED	

CASE STUDY – UCSD TORREY PINES



CASE STUDY – UCSD TORREY PINES

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

Client Requirements

Only CAD outlined

Nothing Defined for BIM

Contract

Design Build

Owner had design build team
directly contracted

General Contractor led design
build team

AOR of record worked with
associate architect

Trades worked under General
Conctractor

BEP

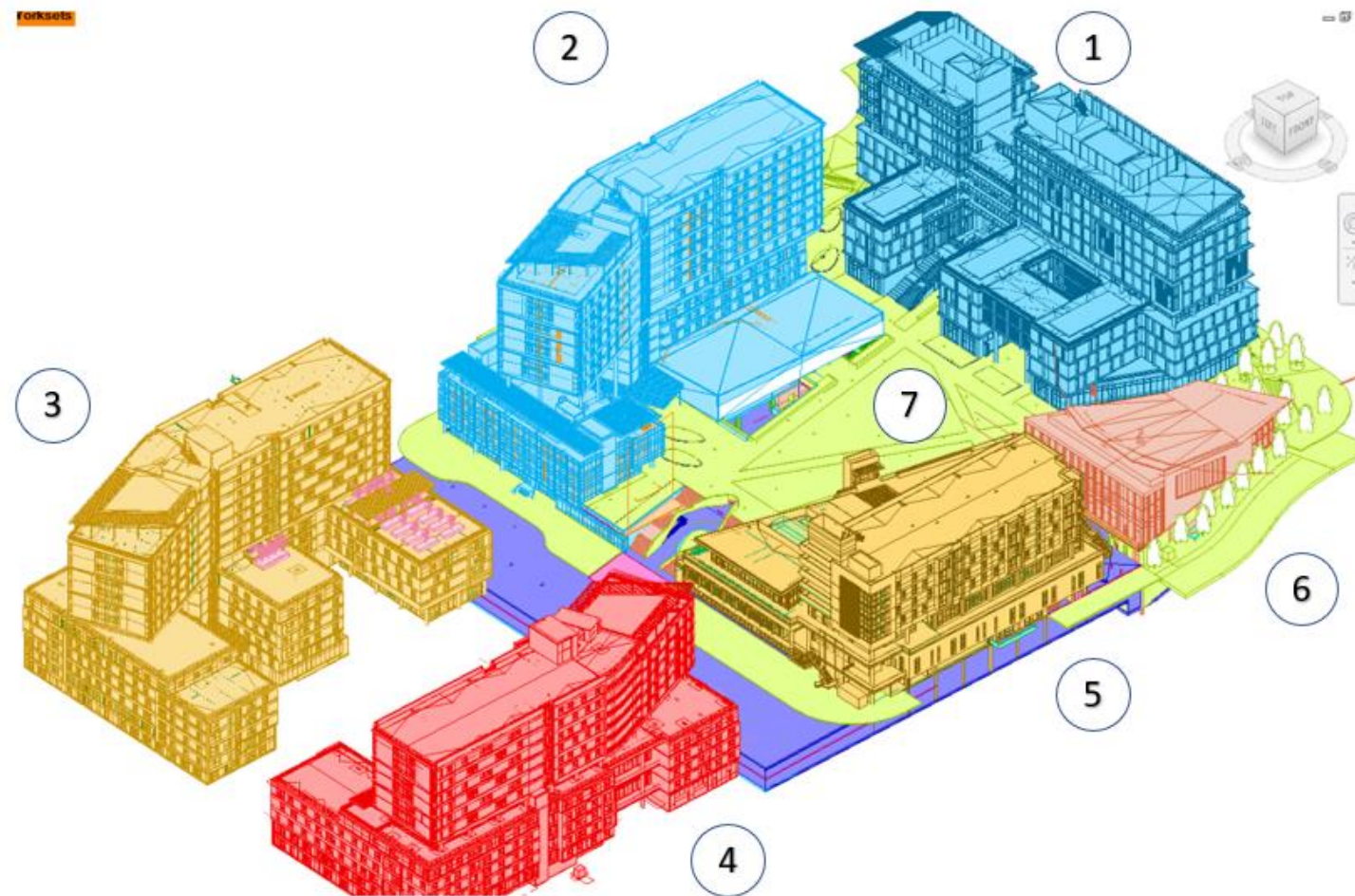
Based upon Penn state BEP
planning guide

Covered Clash detection

Model setup

CASE STUDY – UCSD TORREY PINES

Model Environment

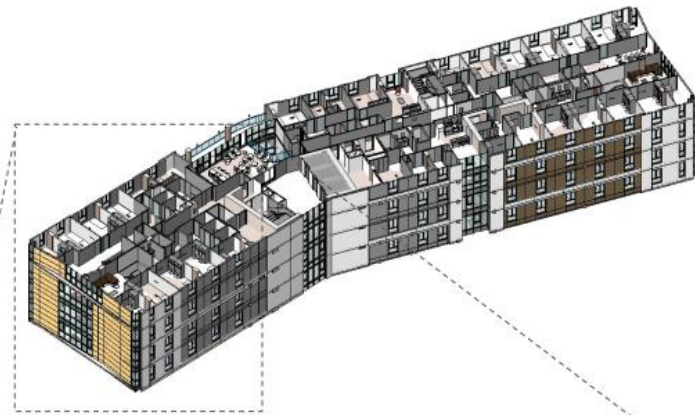
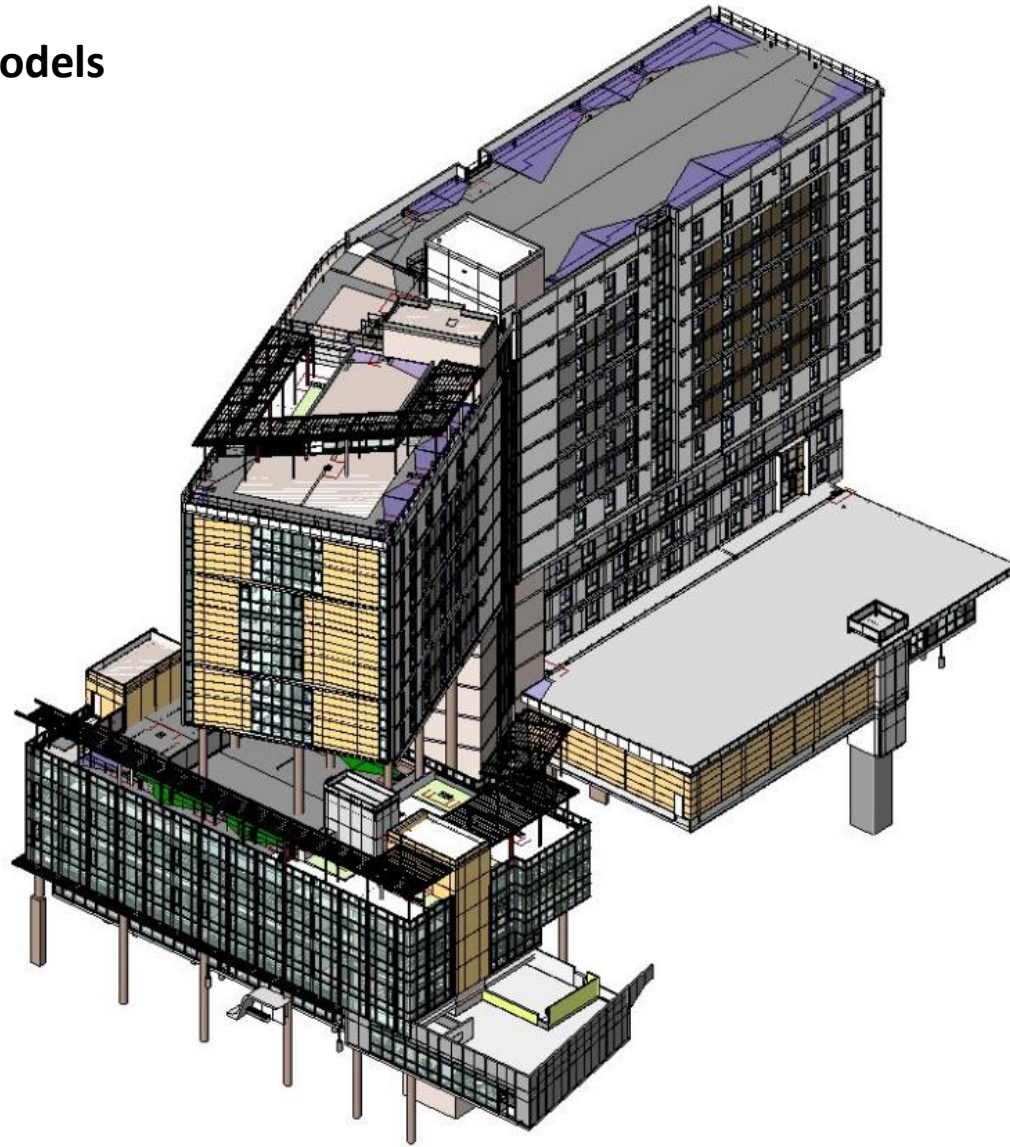


1. BUILDING 1 (SRA)
2. BUILDING 2 CS
3. BUILDING 3 CS
4. BUILDING 4 CS
5. BUILDING 5 CS
6. BUILDING 6 (SRA)
7. PARKING STRUCTURE
8. BUILDING 2 INTERIOR
9. BUILDING 3 INTERIOR
10. BUILDING 4 INTERIOR
11. BUILDING 5 INTERIOR
12. SITE (NOT SHOWN)

A lot of models with a lot of users – what could go wrong?

CASE STUDY – UCSD TORREY PINES

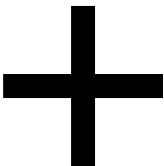
Detailed Models



Content including furnishing and room information

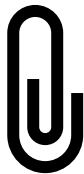
CASE STUDY – UCSD TORREY PINES

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



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

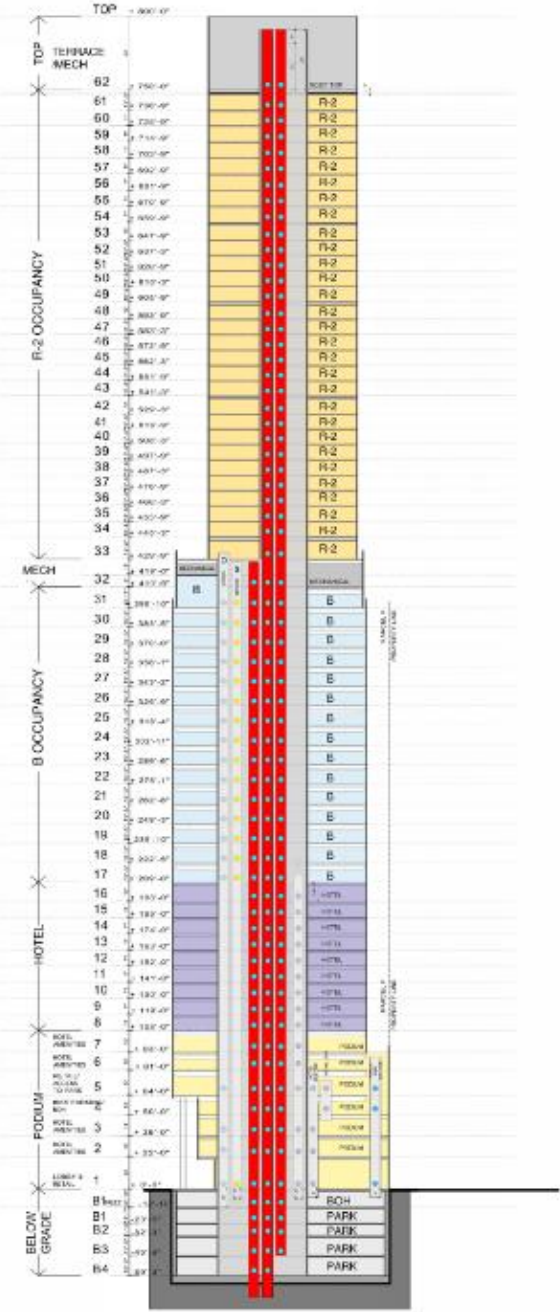
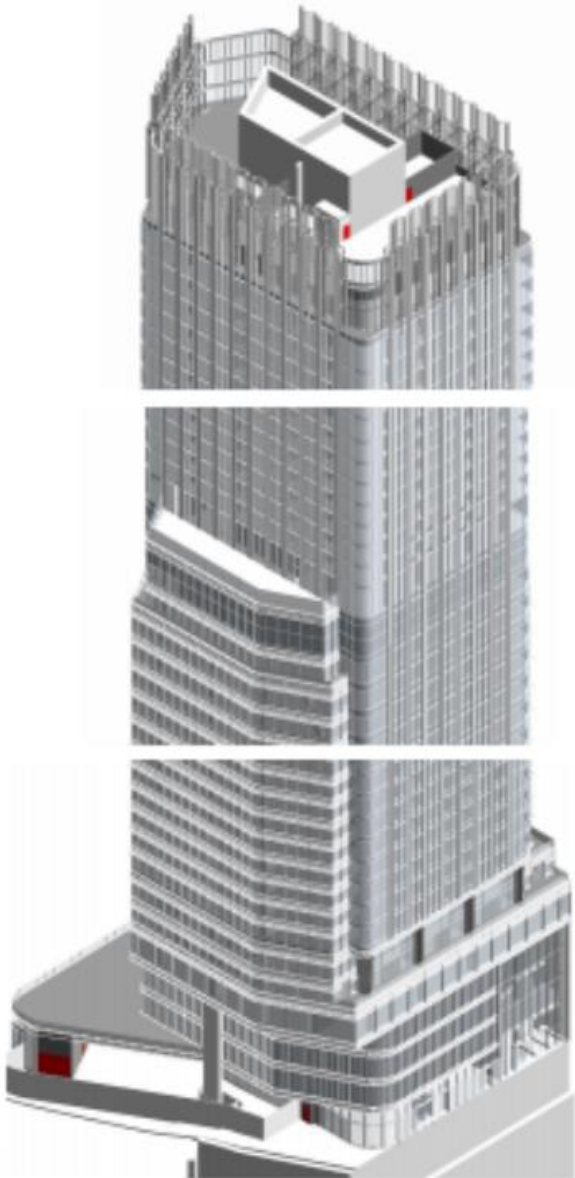


Figure 1: Section view of project

CASE STUDY – PARCEL F TOWER

Client Requirements

RFP had BIM deliverables outlined for everyone to accept as part of contract

Contract

Design Bid Build

Owner is private developer coordinating with project team

AOR of record worked with associate architect

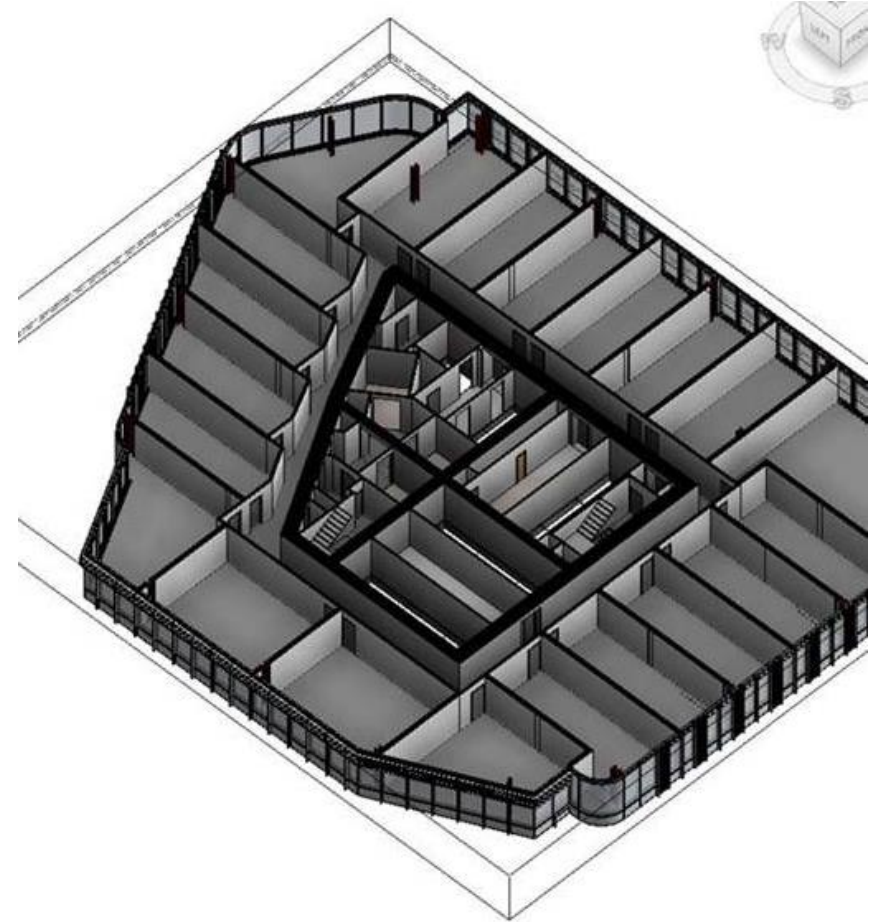
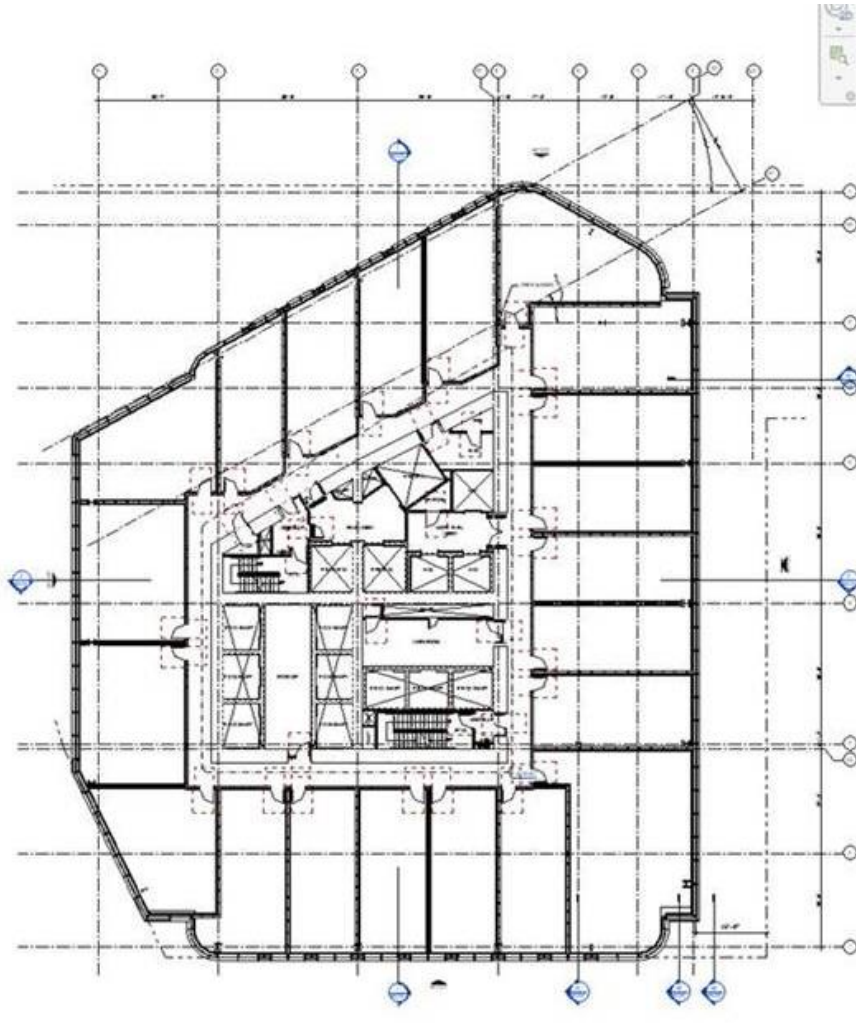
General Contractor will come on board when CD phase begins

BEP

Based upon internal HKS standards

Reference the BIM forum and AIA documents

CASE STUDY – PARCEL F

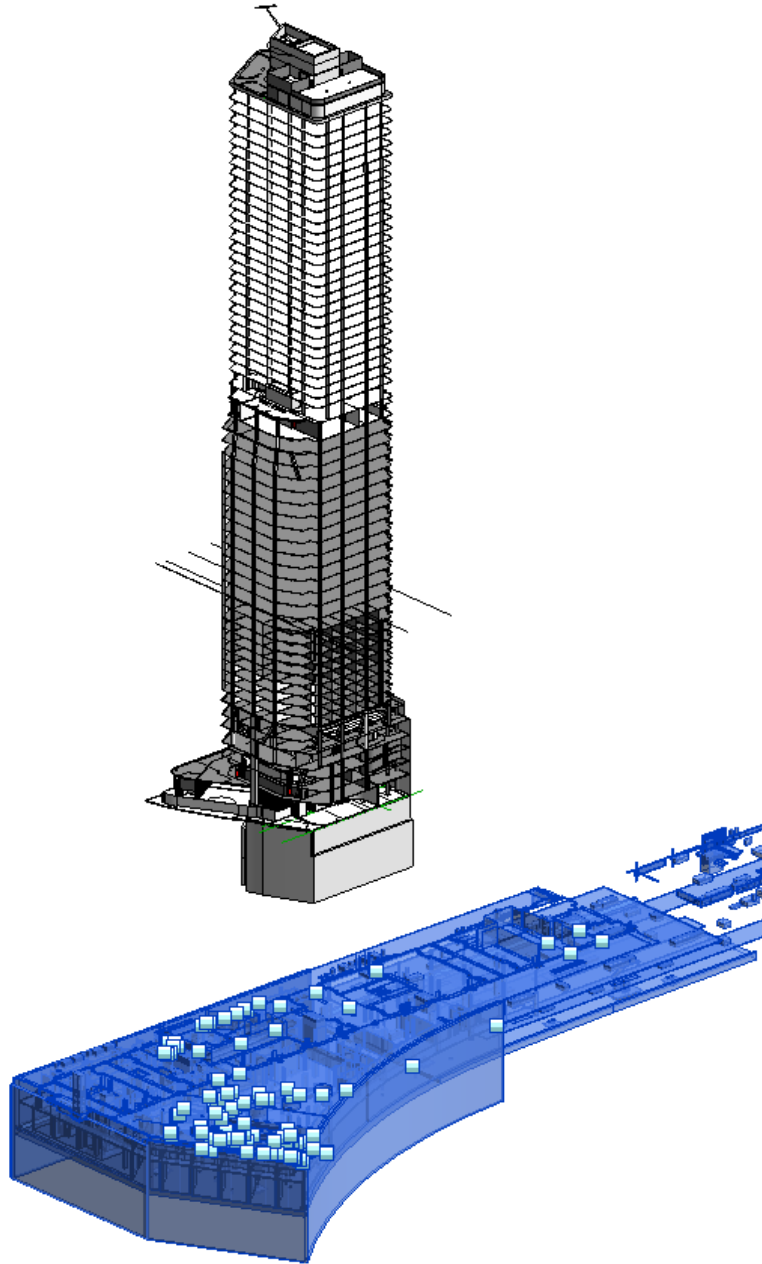


Detailed model but everything delivered as construction documents

CASE STUDY – PARCEL F TOWER

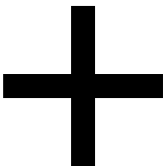
Execution Plan didn't address everything

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

BAD

General contractor and trades can't be brought on board until beginning of Construction Documents

Owner requirements in RFP were somewhat vague to the entire team

Many coordination meetings happened simultaneously and getting direction could be challenging

GOOD

Client knew what they wanted from proposal stage

Project team met weekly to review model progress

Coordinated BEP was setup early on to guide team

Reference documents were specified in the BEP



CASE STUDY – ROBERTSON LANE HOTEL



CASE STUDY – ROBERTSON LANE HOTEL

Profile

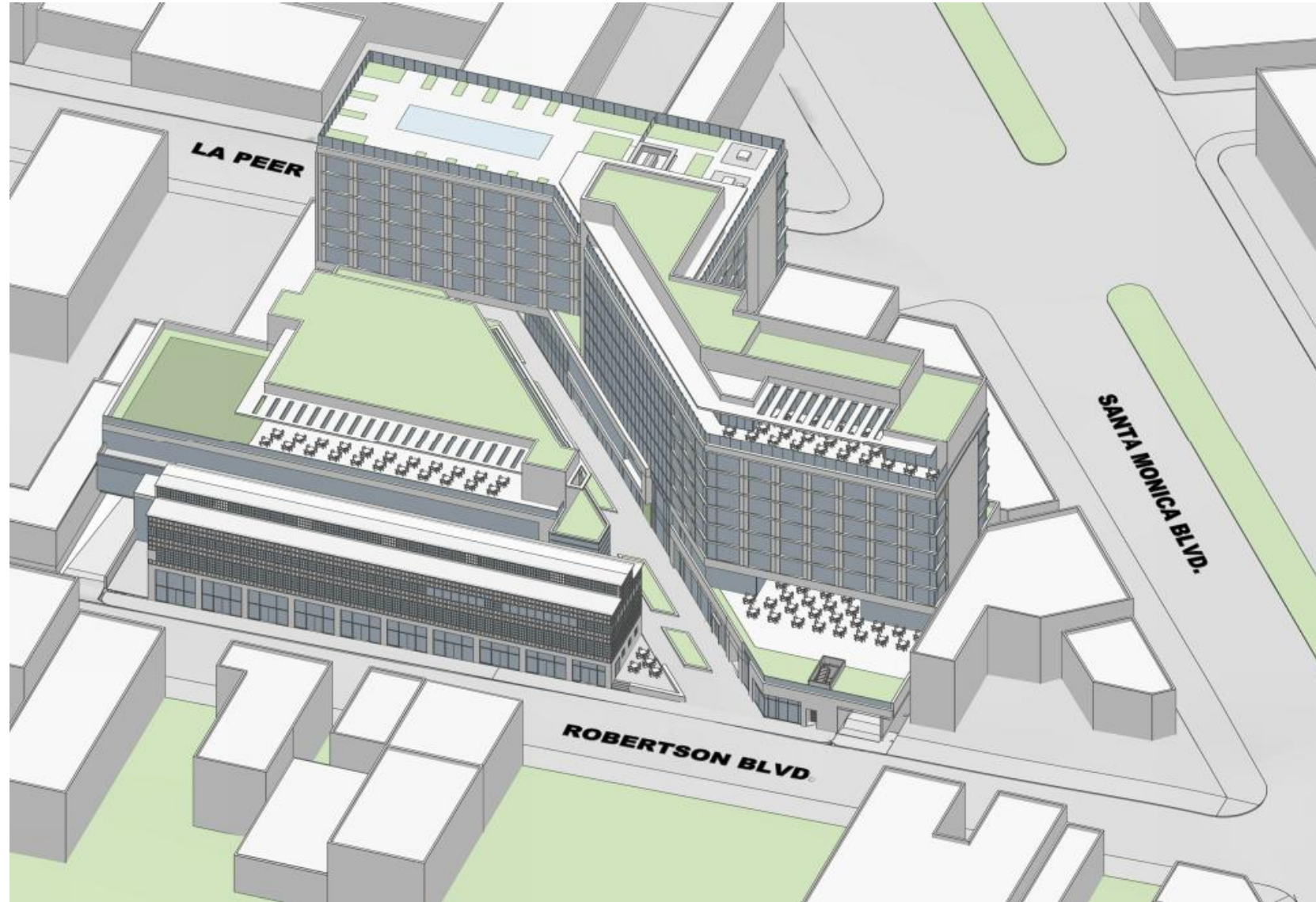
Hotel

Mixed program in tight constraints

Recreation and amenity spaces

200,000 SF overall with 241 rooms

Budget unspecified



CASE STUDY – ROBERTSON LANE HOTEL

Client Requirements

Nothing Defined for BIM

Contract

Design Build (Progressive)

Project went from one architect to another

Architect led early process with Contractor coming in at Design Development

BEP

Proprietary from HKS and Layton Construction

Referred to AIA digital documents and BIMforum LOD

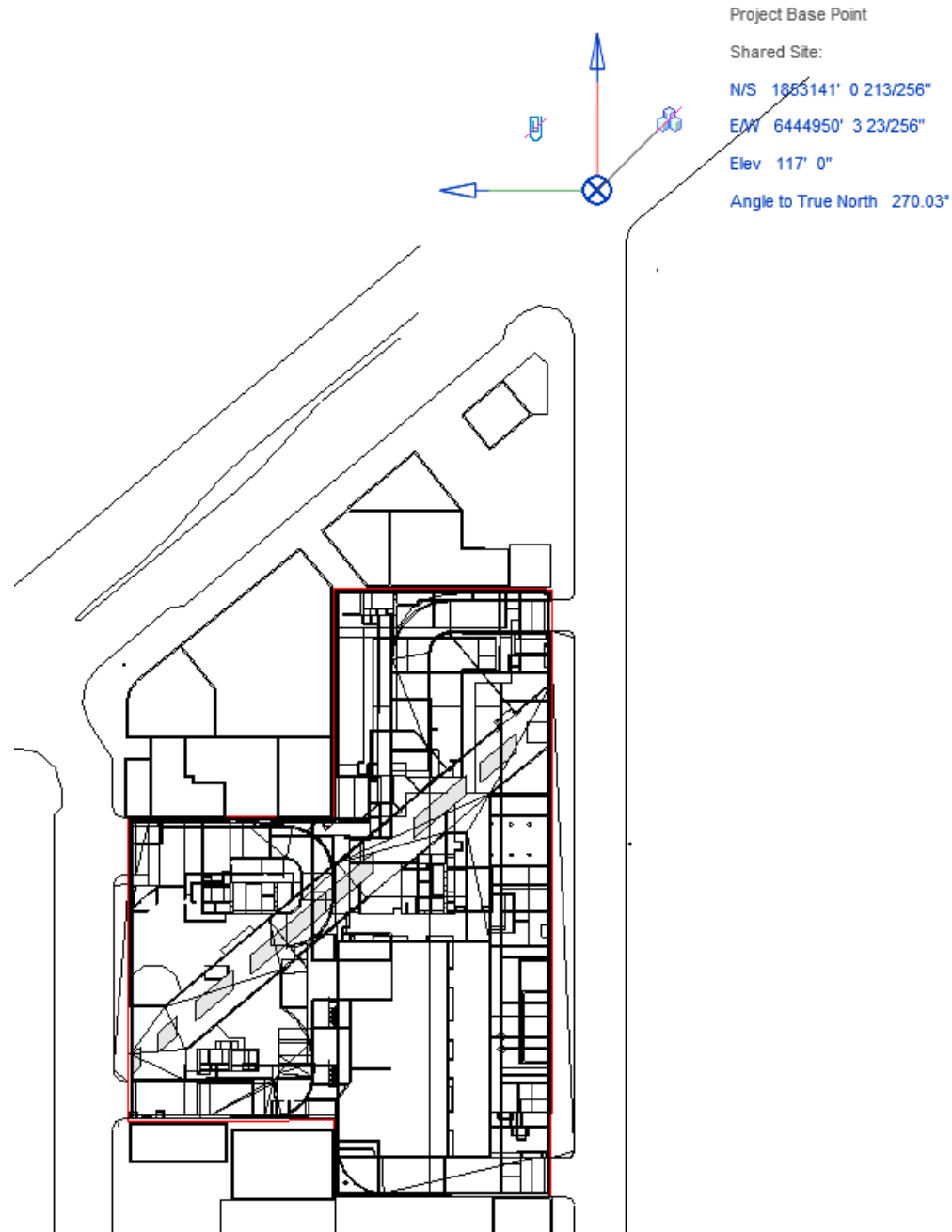
CASE STUDY – ROBERTSON LANE HOTEL



Fun fact – a historic building will be rotated 90 degrees and moved to the other side of the block as part of the project.

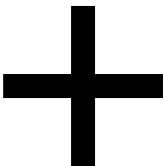
CASE STUDY – ROBERTSON LANE HOTEL

Orientation and Site Survey was critical. Unfortunately, it took 4 months to resolve so our BEP was held up because of it.



CASE STUDY – ROBERTSON LANE HOTEL

What We Added



What Client Wanted



What We Needed



Clash detection protocol

Horizontal Control

Nothing

2 rounds of BEP kick offs

First for design team

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

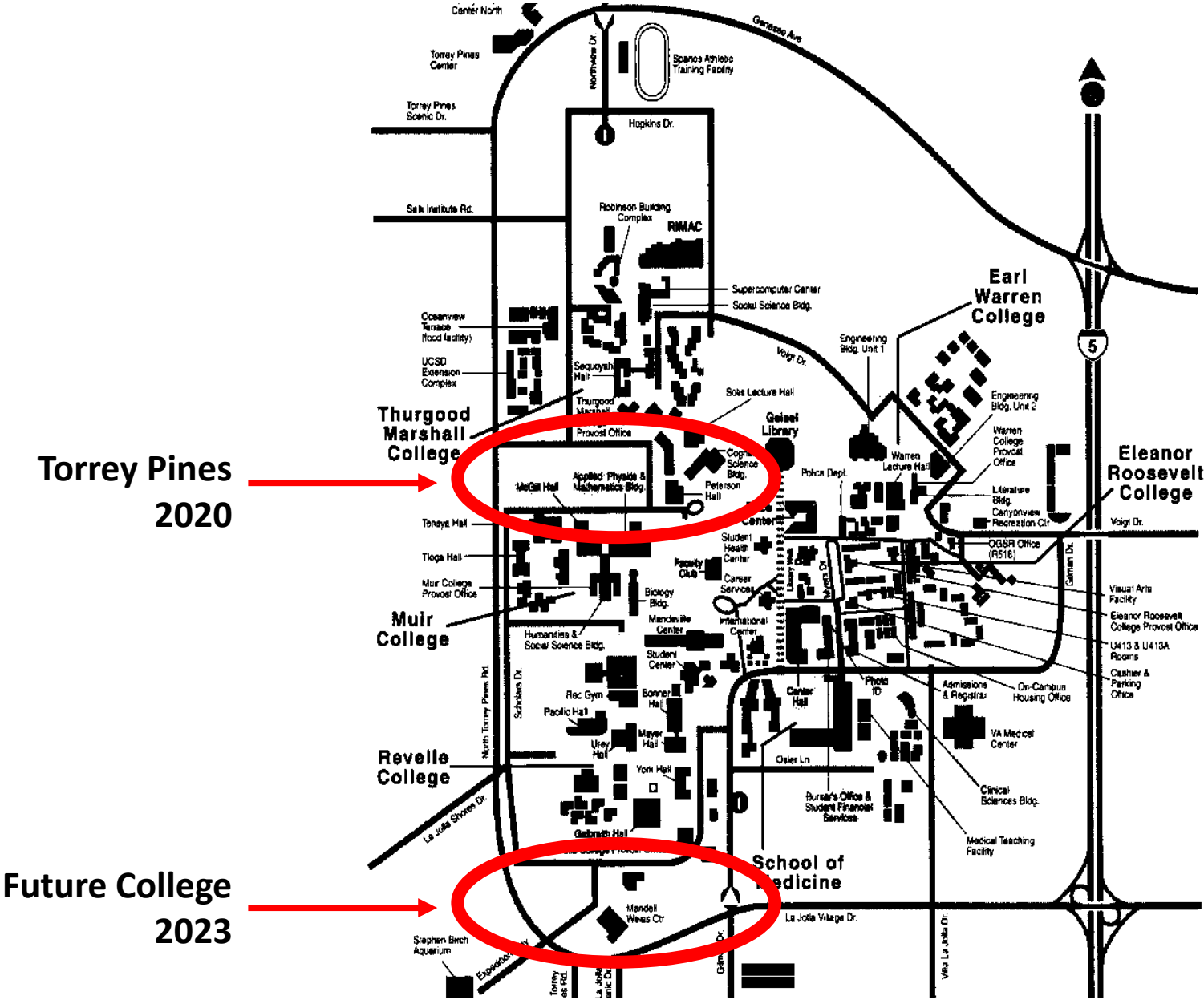
- Designer and Contractor could work together early in the process
- Project team met regularly to discuss BIM modeling requirements
- Coordinated BEP was setup early on to guide team
- Reference documents were specified in the BEP
- BIM 360 was used to fullest affect



CASE STUDY – UCSD FUTURE COLLEGE



CASE STUDY – UCSD FUTURE COLLEGE



CASE STUDY – UCSD FUTURE COLLEGE



CASE STUDY – UCSD FUTURE COLLEGE

Profile

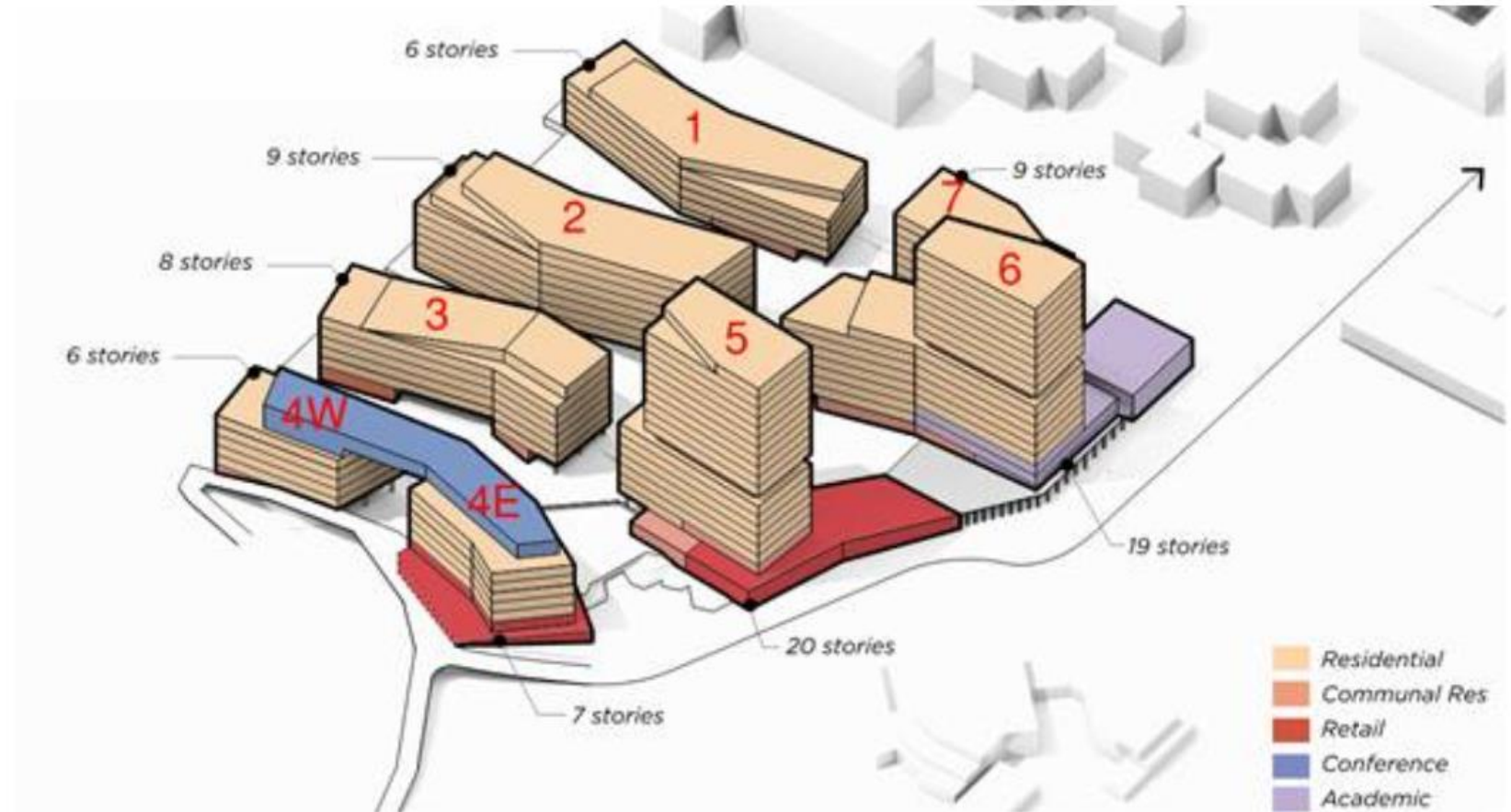
University Campus

Mixed use development

2000 beds with Academic,
Office, Recreational and Parking

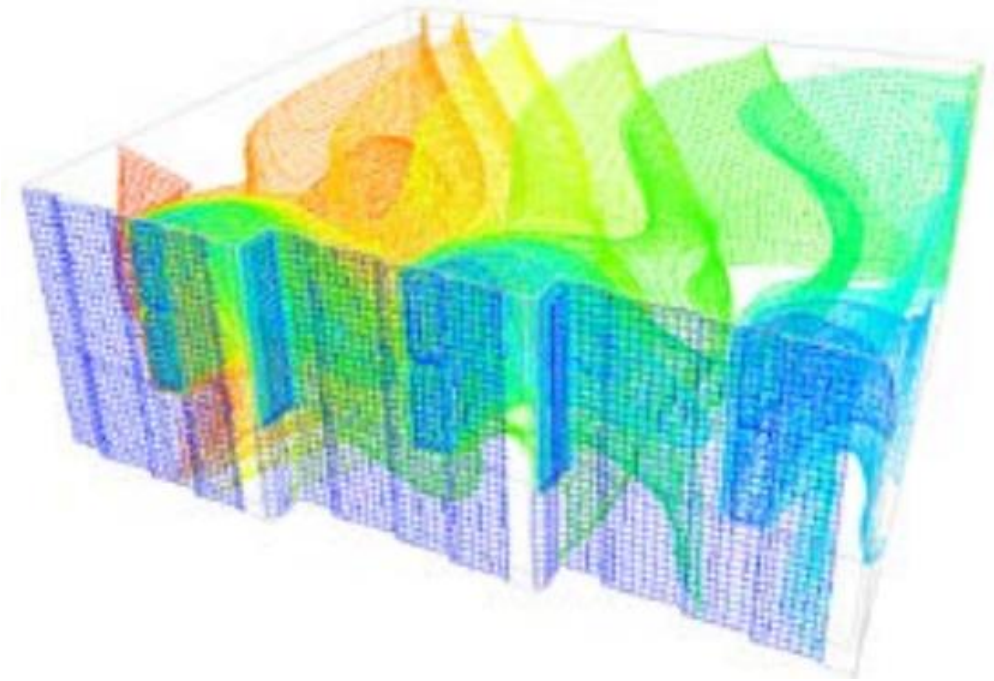
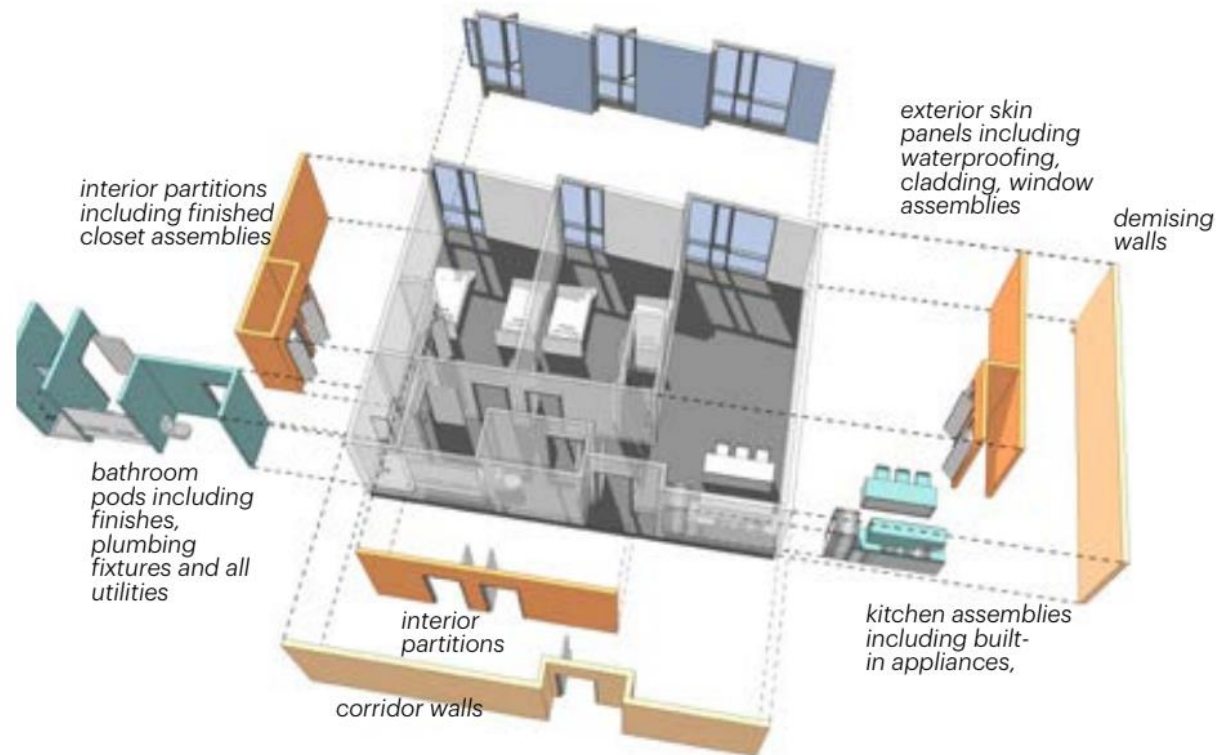
1.5 Million SF overall

\$500 Million Budget



CASE STUDY – UCSD FUTURE COLLEGE

Modeling



Prefabrication and sustainable analysis

CASE STUDY – UCSD FUTURE COLLEGE

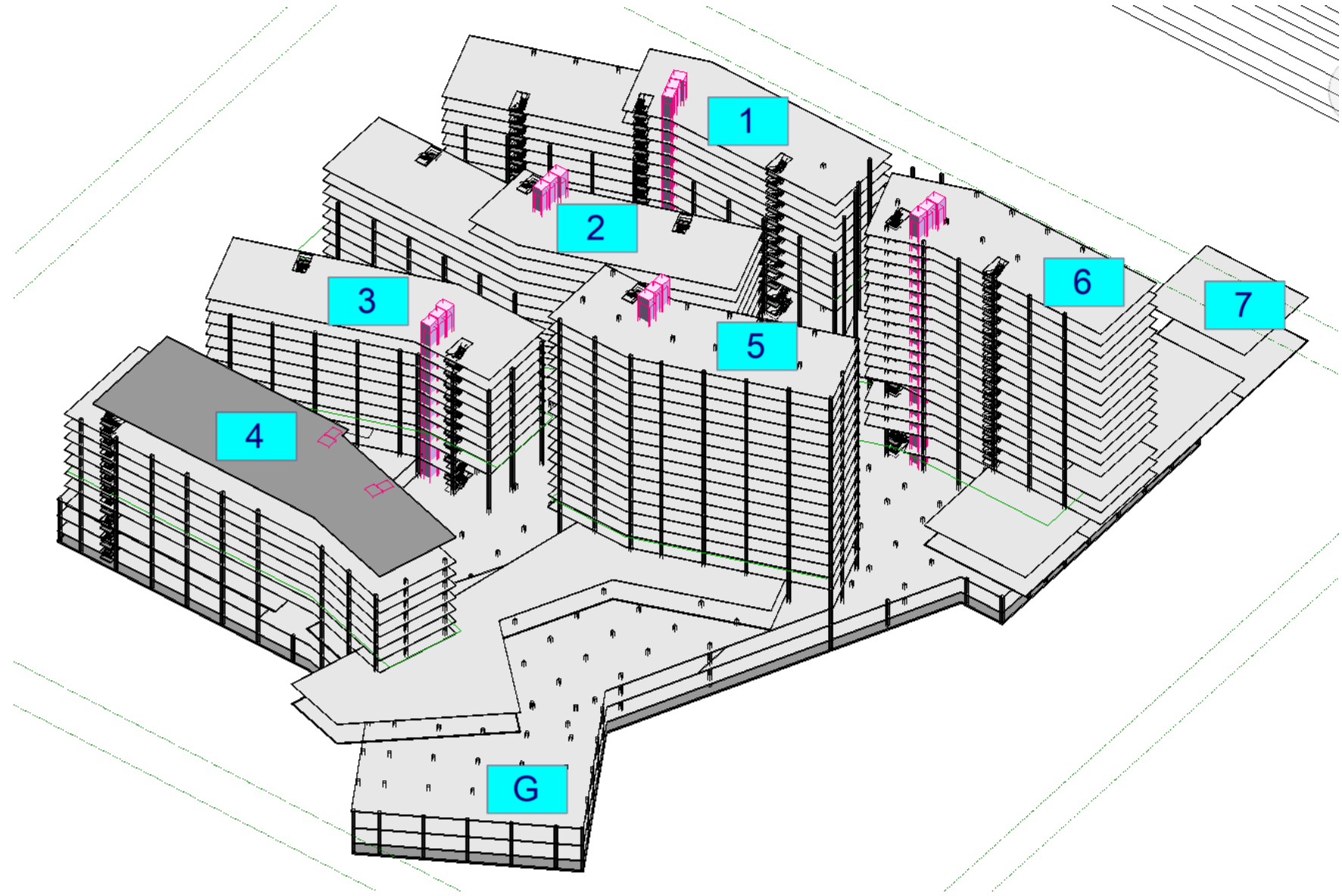
Client Requirements	Contract	BEP
Facility Data Reporting	Design Build	Hybrid between 2 Architects, General Contractor and Owner
Asset Information Modeling	Owner had design build team directly contracted	General Contractor leads the BEP process with design build team input for certain aspects
Coordinated and Issue free BIM models	General Contractor led design build team	Owner guides the process
	AOR of record worked with associate architect	
	Trades worked under General Contractor	

CASE STUDY – UCSD FUTURE COLLEGE

The project concept design took place the same time as the BEP drafting.

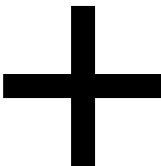
In this case the BEP is way ahead of the model progress which is a first

That also leaves a lot of things to be determined later

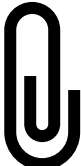


CASE STUDY – UCSD FUTURE COLLEGE

What We Added



What Client Wanted



What We Needed



Everything

Everything

Communication

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



LESSONS LEARNED

RECAP

What Worked and What Didn't

Good

Communicate with all stake holders early

Get a definitive explanation of what the owner expects for BIM delivery

Align goals within the project team and complement each other's process

Share information and communicate regularly

Bad

Waiting until last minute to coordinate BIM processes

Putting aside owner contracted delivery requirements until you are at a clouse out

Not having designated leads take control of the process

Ugly

Sorting out who has control – Owner, Designer, Builder

Adjusting BIM scope half way (or all the way) through the project

Working with an Owner who doesn't know what they want

Scoping out who does what for a large project

PROCESS

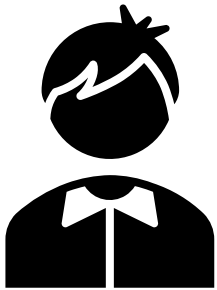
Influence Determines Outcomes

Who leads the process?

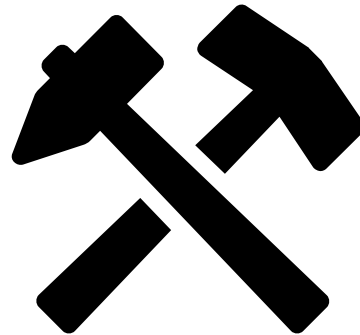
Whoever leads is the one who 'pulls' everyone

Consider the lead and the whole process will follow

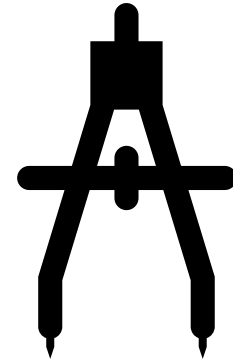
Owner



Contractor



Designers

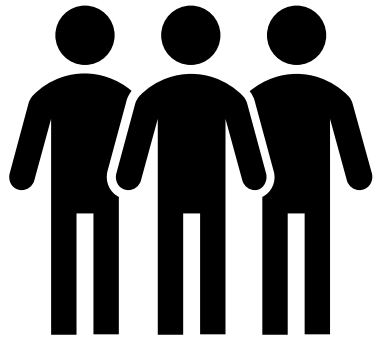


PROCESS

Integrate Workflows

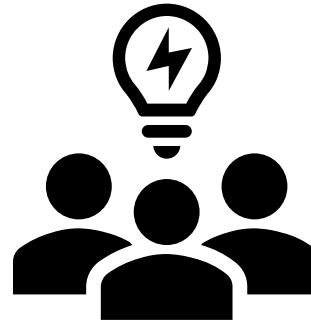
Be Proactive and reach out for coordination

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

OUTLOOK

OUTLOOK

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



OUTLOOK - WHAT DOES THE FUTURE HOLD

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

BEST PRACTICE

BEST PRACTICE

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

BEST PRACTICE

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

STANDARDS

HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)



STANDARDS

BIM / VDC STANDARDS & REFERENCES

National BIM Standard-United States (NBIMS-US)

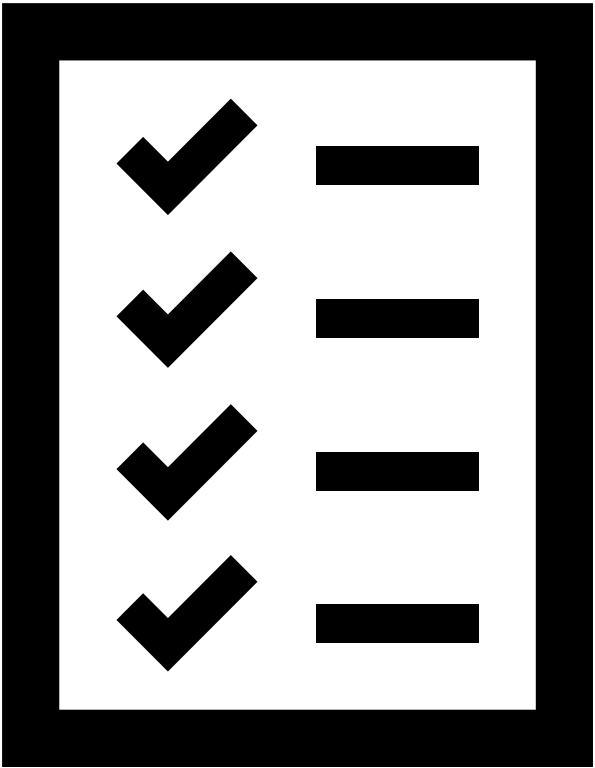
Penn State Project Execution Planning Guide

PAS 1192 / ISO 19650

BIMForum LOD

Canada BIM Management Plan

Proprietary – Designer, Builder, Owner



DOCUMENTS

NBIMS

FEATURES

Created by Building Smart Alliance and National Institute of Building Sciences to address growing information needs in buildings

Standardize the information for projects among all parties involved

Support for open source formats like IFC and COBie

TYPICAL USE CASE

Government Projects including Federal, State, Military, Justice, Aviation, Security and Infrastructure

DRAWBACKS

Focus on file formats without mention of comprehensive data flows

Not a lot of information about clash coordination and issue resolution

DOCUMENTS

PENN STATE PXP

FEATURES

- University research project supported by Building Pankow foundation to identify BIM project planning process
- Many sample workflows for setting company BIM standards
- Provided Templates for execution planning

TYPICAL USE CASE

- Commercial construction projects
- Commonly adopted by general contractors as the basis of their BIM standards and execution planning
- Owner guide version is available for BIM deliverables

DRAWBACKS

- Very extensive which can take time to absorb for a project team
- Usually the entire guide is taken as the standard at many companies rather than referencing it and tailoring the content for specific operations

DOCUMENTS

PAS 1192 / ISO 19650

FEATURES

PAS 1192 is the standard setting by the UK for using BIM on all government projects

ISO 19650 is the international standard that is derived from 1192

Details definitions and workflows like common data environment and ‘Levels’ of BIM use

TYPICAL USE CASE

Government projects in the UK

Government and Commercial Projects in Europe

DRAWBACKS

Started in UK with its own standards and formats which haven’t harmonized with other countries – especially the US

Not meant for BEP but a guide about how project planning should start for BIM leaving execution to the parties involved

DOCUMENTS

BIMFORUM LOD

FEATURES

Provides extensive list of Level Of Development (LOD) examples and templates

Created and organized by a committee from all sectors of building design and construction

Provides Unifomat and Omniclass definitions for all elements

TYPICAL USE CASE

North American Building Construction projects

Typical standard for model development expectations for clash detection and delivery

DRAWBACKS

Current form is that of a PDF requiring searching for the desired content

Meant for building projects which means definitions don't necessary scale up for large infrastructure construction

Database doesn't exist for ongoing updates and currently released once a year

DOCUMENTS

CONTRACT	DEFINITIONS	DELIVERABLE	DATA	OWNERSHIP	BEP
AIA	X	X	X	X	
CONSENSUS	X	X	X	X	X
DBIA	X	X	X	X	X
EJDC		X			

Summary – Most contract documents have a lot in common when it comes to Digital content making coordination easier for all involved

PROCESS

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

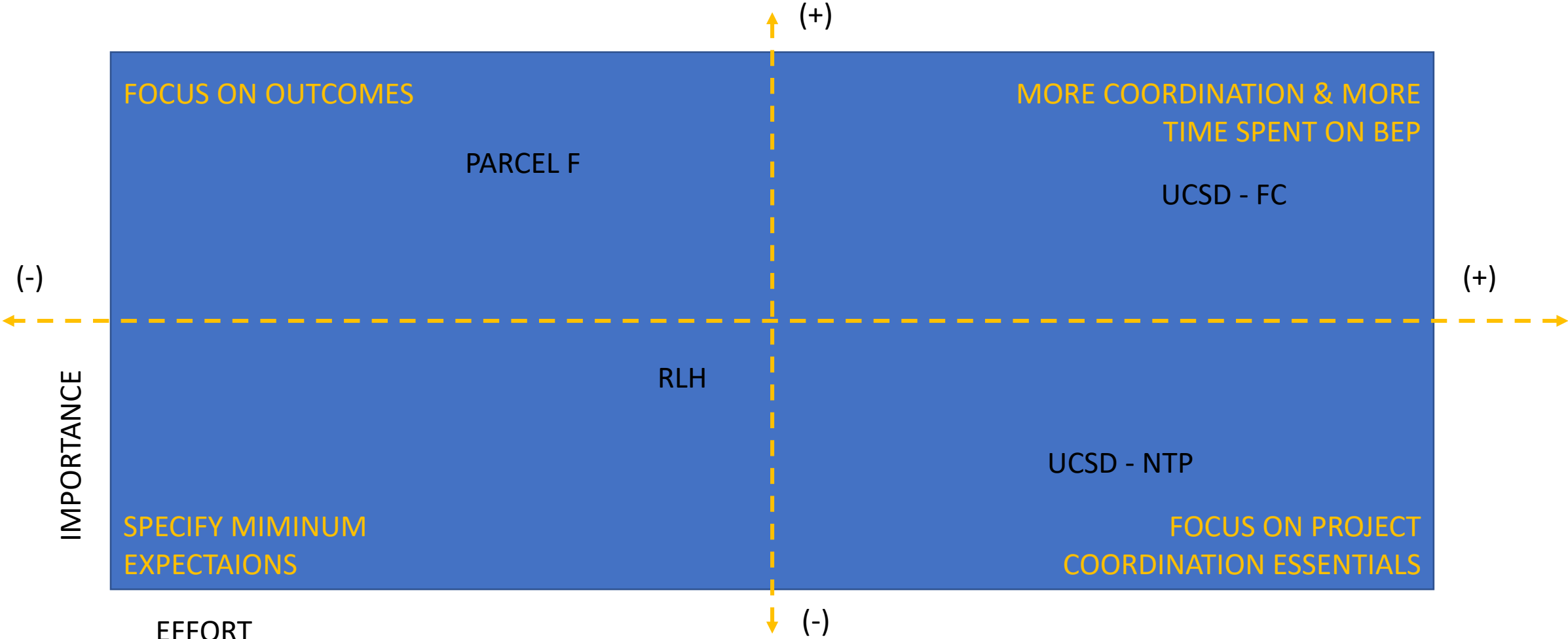
Adapt the BEP as the project moves forward and new issues arise

BEST PRACTICE

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

OUTCOMES

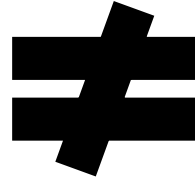


Summary – Standards are starting to align but can diverge when it comes to purpose

APPENDIX - DOCUMENTS

DOCUMENTS

CONTRACT DOCUMENTS



BIM EXECUTION PLAN

Project management requirements

Understand the roles between parties

Defining the deliverables outside of BIM

specific exports should be in the PM plan

Project goals and uses for BIM

investigate tools for the project needs

Discuss team member's experience

Add flexibility to your projects

Communicate with industry peers

DOCUMENTS

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.

....

DOCUMENTS

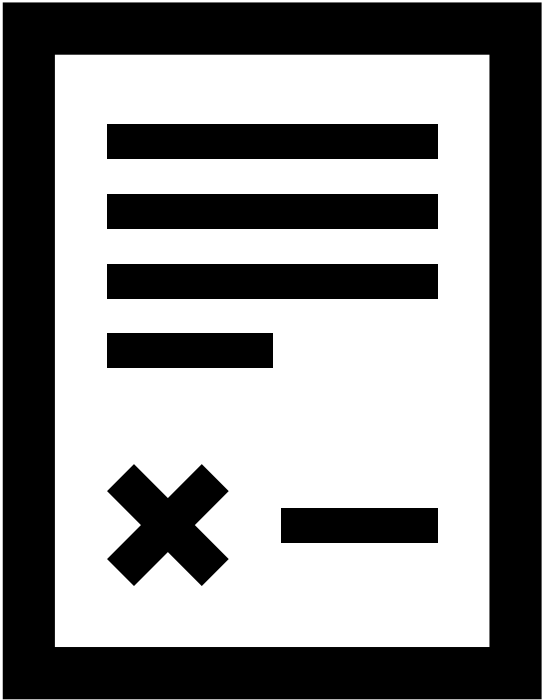
CONTRACTS

AIA Digital Practice Documents

Consensus docs

Design Build Institute

EJCDC Document 700



DOCUMENTS

AIA DIGITAL PRACTICE DOCUMENTS

E203

Building Information
Modeling and Digital Data
Exhibit

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

G201

Project Digital Data
Protocol Form

Digital Data refers to
information, including
communications,
drawings, specifications
and designs, created or
stored for the Project in
digital form.

G202

Project Building Information
Modeling Protocol Form

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

DOCUMENTS

CONSENSUS DOCS 301 ADDENDUM

**ARTICLE 1
GENERAL PINCIPLES**

301 addendum should be incorporated into contracts of all parties

**ARTICLE 2
DEFINITIONS**

All models must be developed according to the BEP according to the addendum

**ARTICLE 3
BIM MANAGER**

There will be a designated BIM lead who will manage information related to the scope of the BEP

**ARTICLE 4
BEP**

An Execution Plan will be drafted between all parties and used as an amendment to the addendum

**ARTICLE 5
RISK ALLOCATION**

Whoever models design or information content is responsible for that content

**ARTICLE 6
MODEL RIGHTS**

Limited license to reproduce content by parties in the project for purposes of project coordination only

DOCUMENTS

DESIGN BUILD INSTITUTE BIM EXHIBIT

**ARTICLE 1
DEFINITIONS**

BIM is the system described in this document and has been agreed by owner and design-build team

**ARTICLE 2
PURPOSE**

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

**ARTICLE 3
INFORMATION MANAGEMENT**

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

**ARTICLE 4
DELIVERABLES**

Participants will be responsible for reviewing and delivering content

**ARTICLE 5
RESPONSIBILITES**

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

**ARTICLE 6
MODEL RIGHTS**

Each participant property rights to submit their content for delivery in accordance with the Owner Agreement

DOCUMENTS

EJCDC DOCUMENT 700 – 3.06 (2007 ED.)

A

Data to the owner relied upon is limited to printed copies

Other file types in electronic format are for the convenience of the owner

Hard copies govern

B

All transfers of electronic data will be considered accepted after 60 days of delivery

CCC

Electronic media may deteriorate over time which can affect readability of the documents.

The transferring party is not liable for deteriorate electronic data held in archive by the owner

DOCUMENTS

CONTRACT	DEFINITIONS	DELIVERABLE	DATA	OWNERSHIP	SOFTWARE
NBIMS	X	X	X	X	X
PENN-PXP	X	X	X	X	X
BF LOD	X	X	X		
PAS / ISO	X		X		

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