DBIA Manual of Practice

BIM & Lean in Design-Build Project Delivery

Presentation Outline

1. Introduction / Overview
2. BIM in the RFP Process
    a. Aesthetic concepts
    b. Conceptual site plan and site constraints
    c. Program space requirements
    d. Performance specification
    e. Full bridging documents

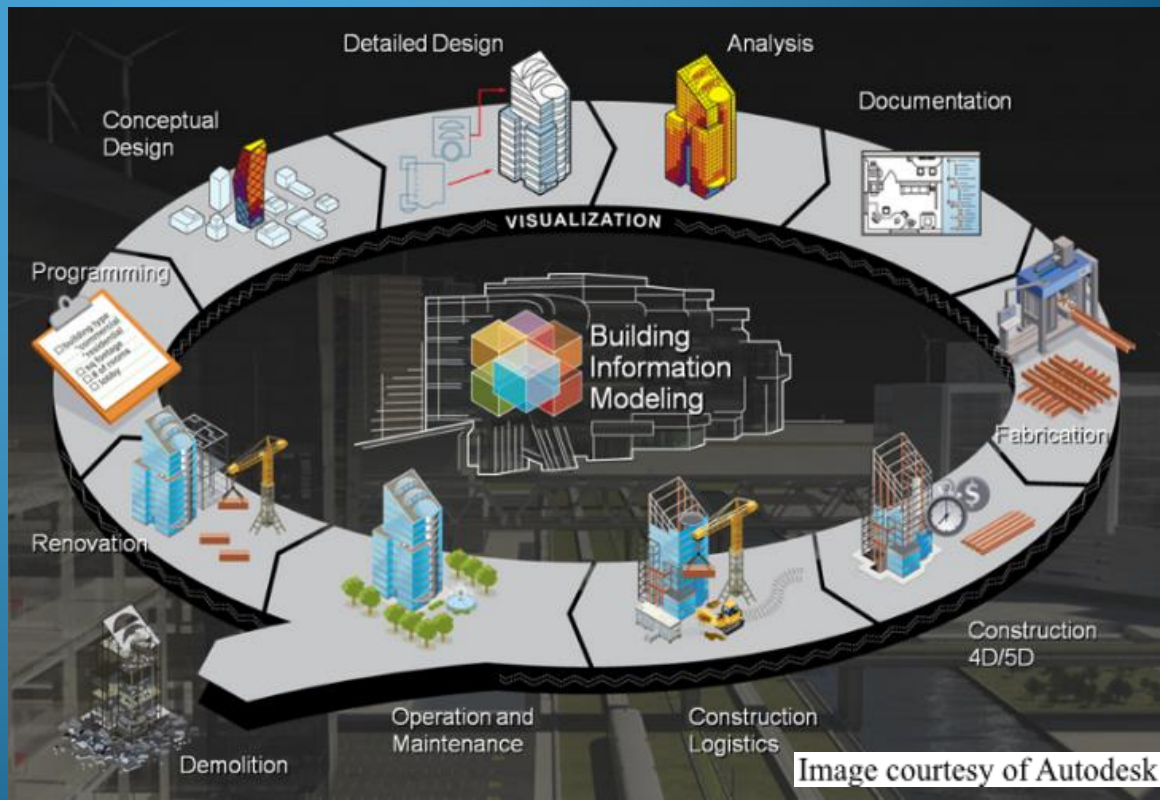
BIM & Lean in Design-Build Project Delivery

(Presentation Outline continued)

3. BIM in the Proposal Submission/Evaluation
   a. Design to a Budget – Target Value Design (TVD)
   b. BIM as a communication tool
4. BIM after contract award
5. Project Closeout
6. Key Takeaways
7. Questions

What is BIM?

- Building Information Modeling
- Describes All Aspects of the Project
- It's More than 3-D Modeling
- 4-D Scheduling
- 5-D Cost
- 6-D Operations



What is Lean?

- A process of adding value while eliminating waste
- Learning – Continuous Improvement
- What's Lean about Design-Build?
  - Designers and builders working side by side
  - Designing once to how we want to build it
  - Coordination that eliminates waste (like RFI's)
  - 3-D Imagery for quick decision making
  - Utilizing BIM models for cost estimating
    - Designing to a cost (TVD)
    - Set Based Design (Selecting systems for their value)

BIM in the D-B process

- Owner Visualization Tool
- Utilized in the RFP Process
- D-B Team RFP Submission Proposal
  - D-B Team communicates utilizing BIM
  - Visual depiction of proposed concept
- Incorporated Into Design/Construction
  - 3-D Modeling – clash/coordination
  - 4-D Scheduling/5-D cost
- Operations

BIM & Lean in Design-Build Project Delivery

Design-Build Procurement Process

1. Defining the Program
2. Request for Qualifications (RFQ)
3. Request for Proposal (RFP)
4. Proposal Submission and Evaluation
5. Contract Award
6. Documentation/Construction
7. Closeout

BIM in the RFP Process

- Aesthetic Concepts
- Conceptual Site Plan and Site Constraints
- Program Space Requirements
  - New construction area requirements
  - Repurposed/remodeled spaces
- Performance Specification
  - Program adjacencies
- Full Bridging Documents
  - Plans, elevations, and specifications

Aesthetic Concepts

- Renderings

Figure 1 - Owner Visualization – Barksdale AFB LA Load Training Facility

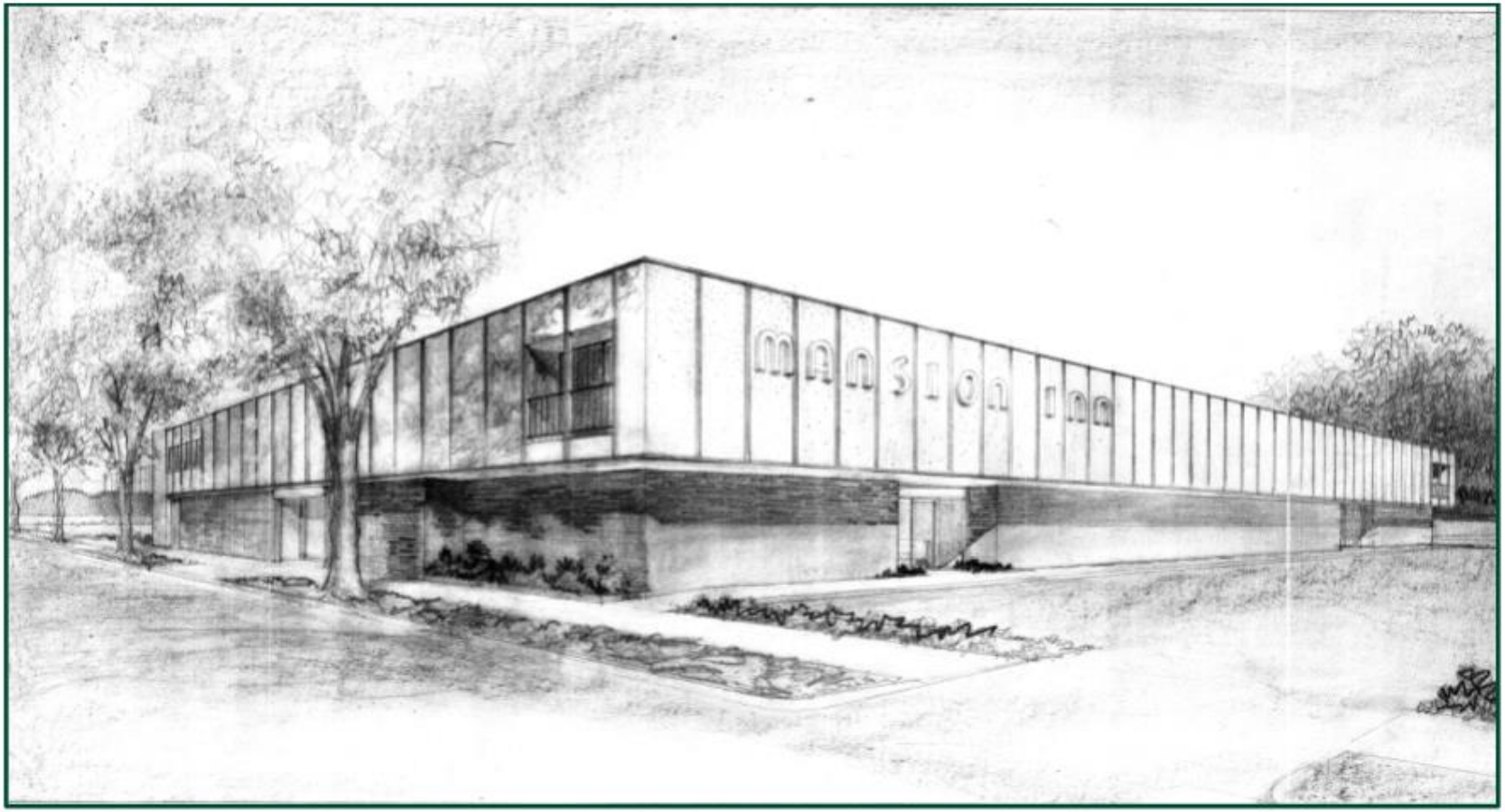
Aesthetic Concepts

- Renderings

Figure 12 - Virtual Site Model, Temple University

Aesthetic Concepts

- Renderings – Before BIM



Proposed Hotel – Original Renderings

Conceptual Site Plan and Site Constraints

- Aerial 3-D Image Enhances Cut & Fill Accuracy

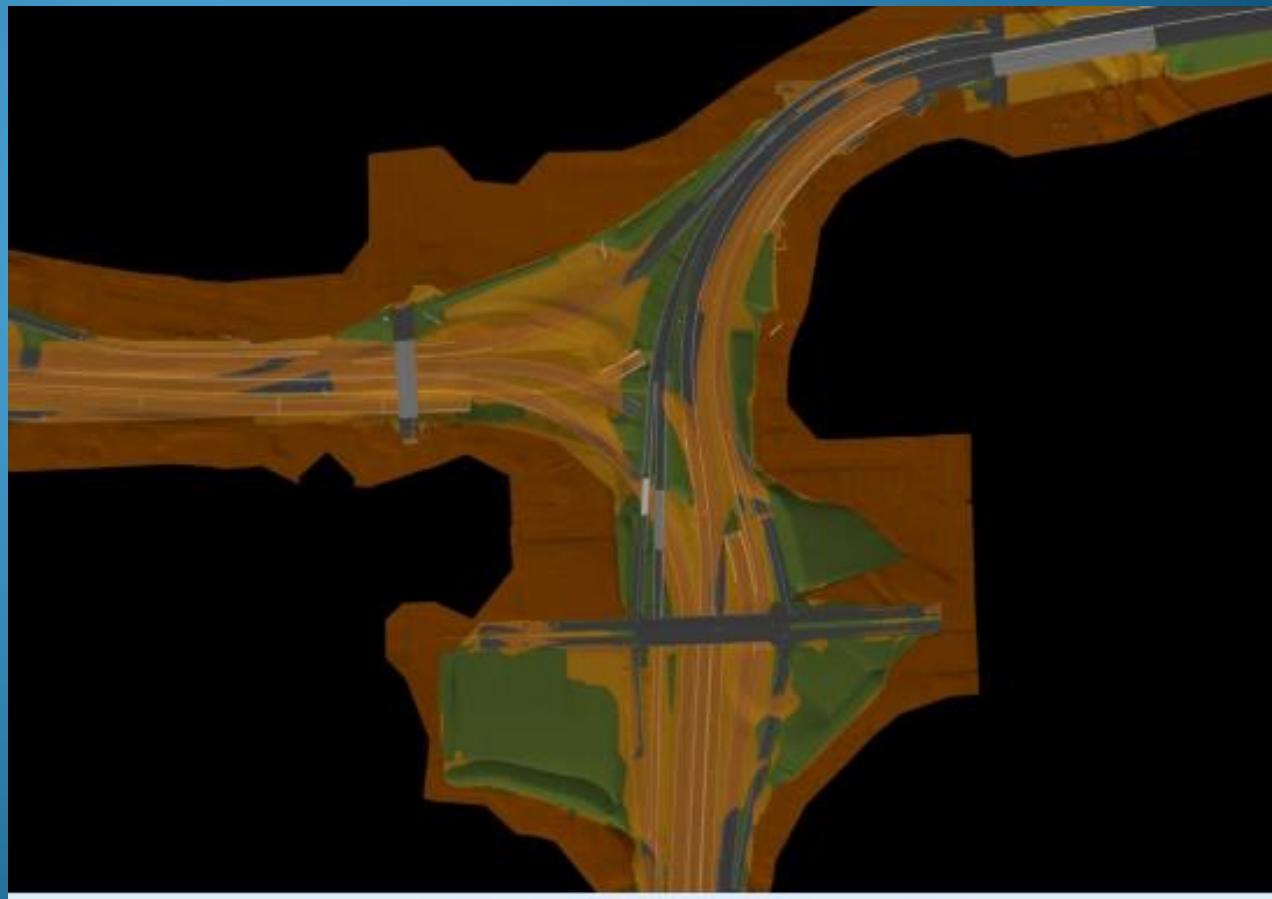
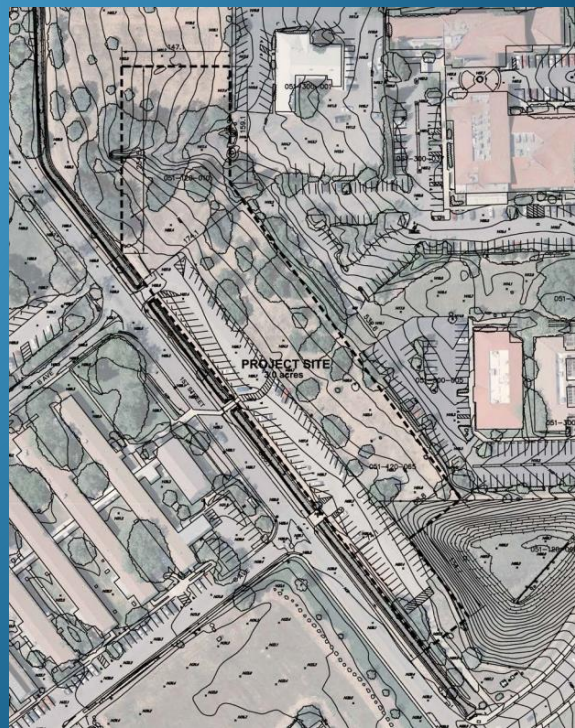


Figure 16 – I-94 NS Mitchell Interchange, Milwaukee, WI

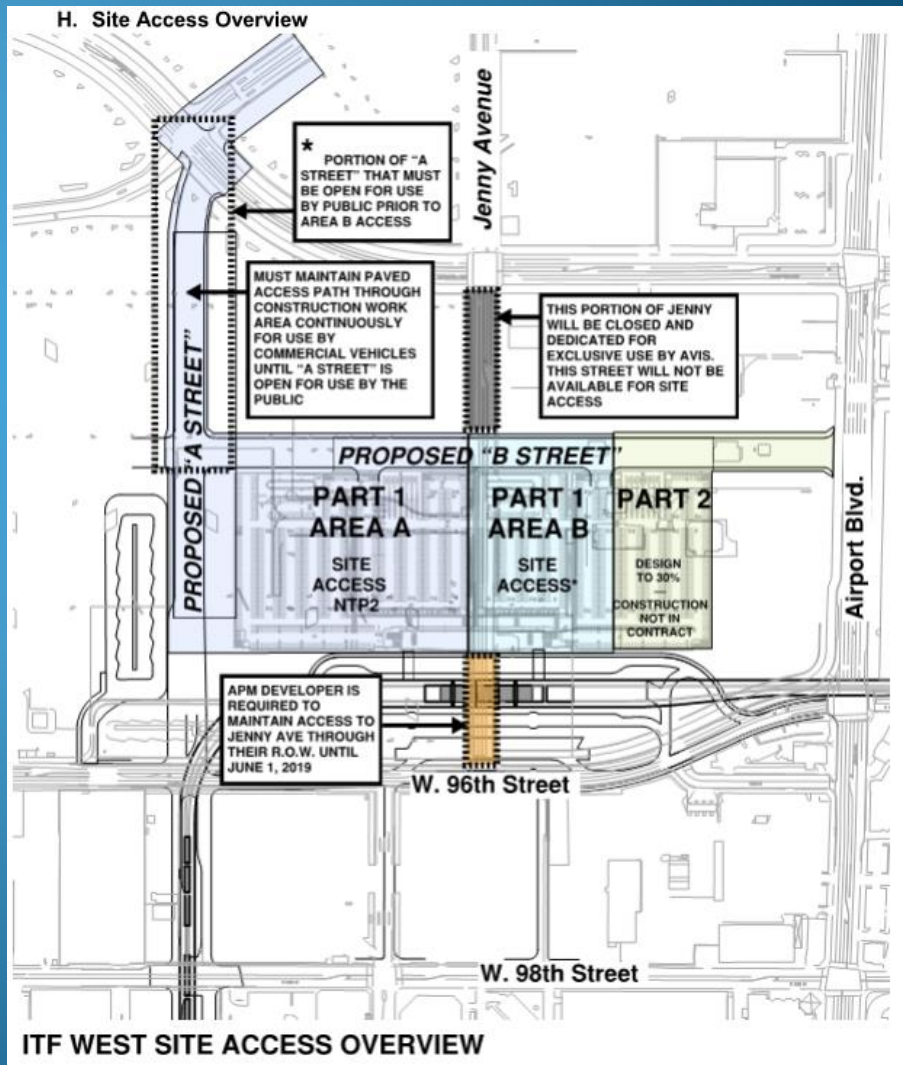
Conceptual Site Plan and Site Constraints

- Site Location
- Site Topography



Conceptual Site Plan and Site Constraints

- Site Access Constraints

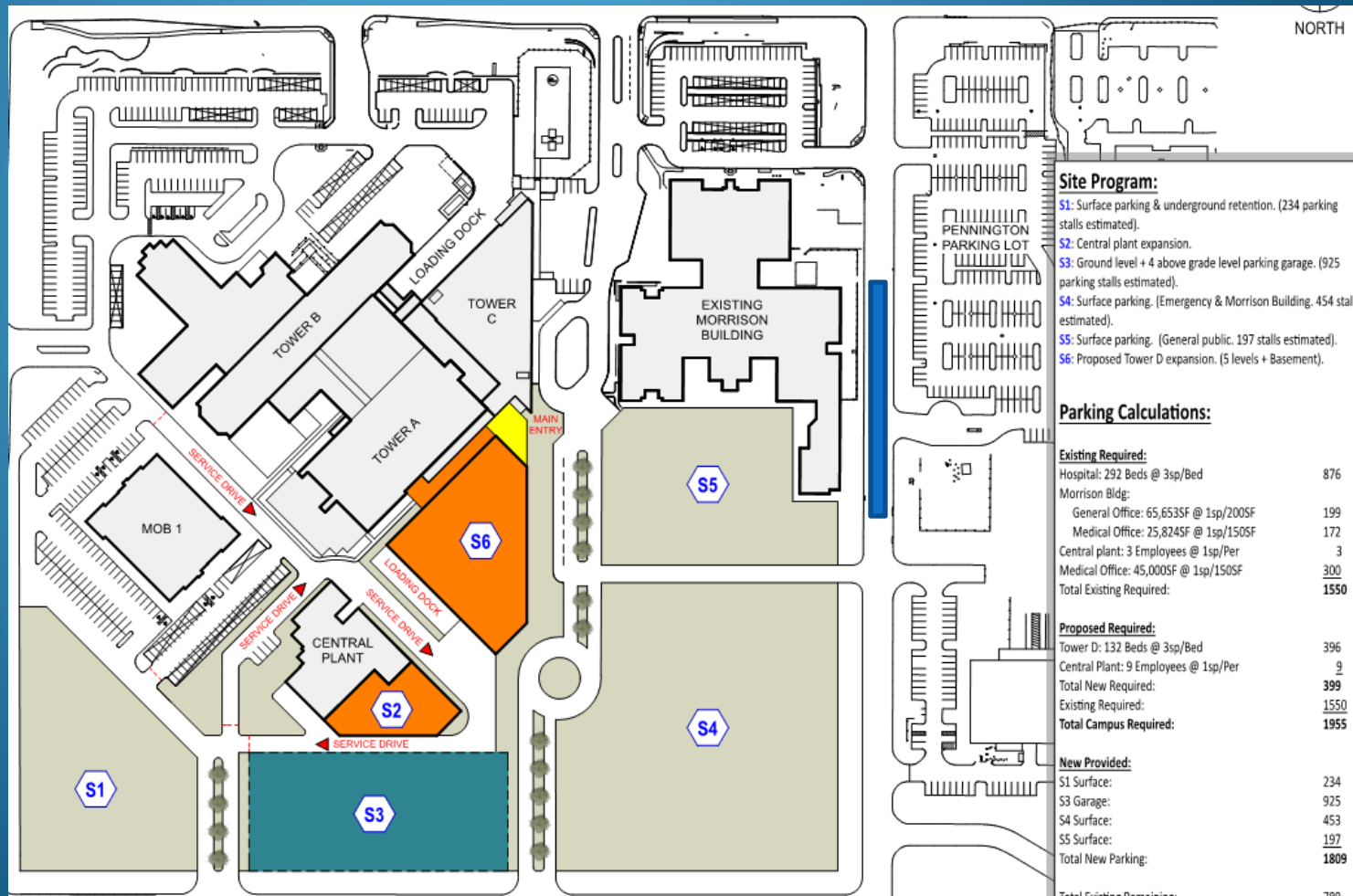


Conceptual Site Plan and Site Constraints

- Project Overview

Conceptual Site Plan and Site Constraints

- Site Constraints



Program Space Requirements

- New Construction Area Requirements

Basement

Space / Department	Space / Beds / Bays	DGSF per Space / Bed / Bay	DGSF	New	Heavy Reno	Med Reno	Light Reno	No Work	Remarks
Full Basement	1	37,925 s.f.	37,925 s.f.	●					Accommodates Bed Storage, Bio Med, EVS, Materials Management, MEP support spaces
		TOTAL	37,925 s.f.	Building Grossing Factor built-in					

First Floor

Space / Department	Space / Beds / Bays	DGSF per Space / Bed / Bay	DGSF	New	Heavy Reno	Med Reno	Light Reno	No Work	Remarks
Lobby / Entry	1	1,000 s.f.	1,000 s.f.	●					
Education Center	1	6,500 s.f.	6,500 s.f.	●					
Physician Support	1	1,750 s.f.	1,750 s.f.	●					
Medical Staff Services	1	1,750 s.f.	1,750 s.f.	●					
Administration	1	6,000 s.f.	6,000 s.f.	●					
Outpatient Registration	1	2,500 s.f.	2,500 s.f.	●					
ATU	1	6,500 s.f.	6,500 s.f.	●					
Outpatient Rehab	1	1,750 s.f.	6,000 s.f.	●					
Cardiac Rehab	1	1,750 s.f.	3,000 s.f.	●					
Wound Center	1	1,750 s.f.	5,050 s.f.	●					
Chapel	1	1,500 s.f.	1,500 s.f.	●					
Central Plant Expansion	1	13,500 s.f.	13,500 s.f.	●					Assume 6,000 s.f. of interior space
		TOTAL	55,050 s.f.	Building Grossing Factor built-in					

Second Floor

Space / Department	Space / Beds / Bays	DGSF per Space / Bed / Bay	DGSF	New	Heavy Reno	Med Reno	Light Reno	No Work	Remarks
Waiting Areas / Connections	1	1,950 s.f.	1,950 s.f.	●					
Pre-Op / PACU	24	469 s.f.	11,250 s.f.	●					
Tele / Med Surg Unit	24	1,171 s.f.	28,100 s.f.	●					
		TOTAL	41,300 s.f.	Building Grossing Factor built-in					

Third Floor

Space / Department	Space / Beds / Bays	DGSF per Space / Bed / Bay	DGSF	New	Heavy Reno	Med Reno	Light Reno	No Work	Remarks
Tower A connection	1	650 s.f.	650 s.f.	●					
Waitng / Connection to Tower C	1	1,150 s.f.	1,150 s.f.	●					
ICU	36	1,039 s.f.	37,400 s.f.	●					
		TOTAL	39,200 s.f.	Building Grossing Factor built-in					

Fourth Floor

Space / Department	Space / Beds / Bays	DGSF per Space / Bed / Bay	DGSF	New	Heavy Reno	Med Reno	Light Reno	No Work	Remarks
Waiting / Connecting Corridor	1	1,800 s.f.	1,800 s.f.	●					
Tele / Med Surg Beds	36	1,039 s.f.	37,400 s.f.	●					
		TOTAL	39,200 s.f.	Building Grossing Factor built-in					

Fifth Floor

Space / Department	Space / Beds / Bays	DGSF per Space / Bed / Bay	DGSF	New	Heavy Reno	Med Reno	Light Reno	No Work	Remarks
Waiting / Connecting Corridor	1	1,150 s.f.	1,150 s.f.	●					
Tele / Med Surg Beds	36	1,039 s.f.	37,400 s.f.	●					
		TOTAL	38,550 s.f.	Building Grossing Factor built-in					

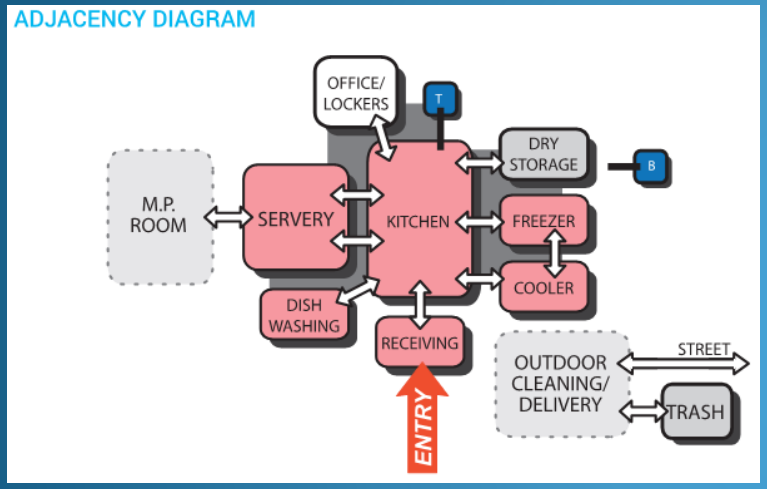
251,225 s.f.	Total Projected Area

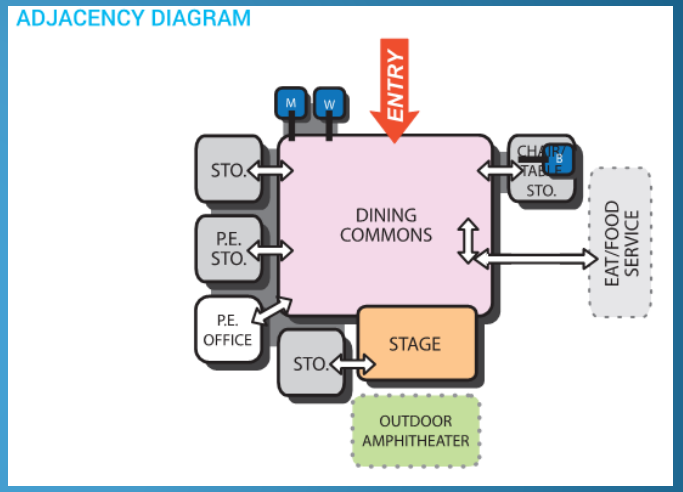
Performance Specification

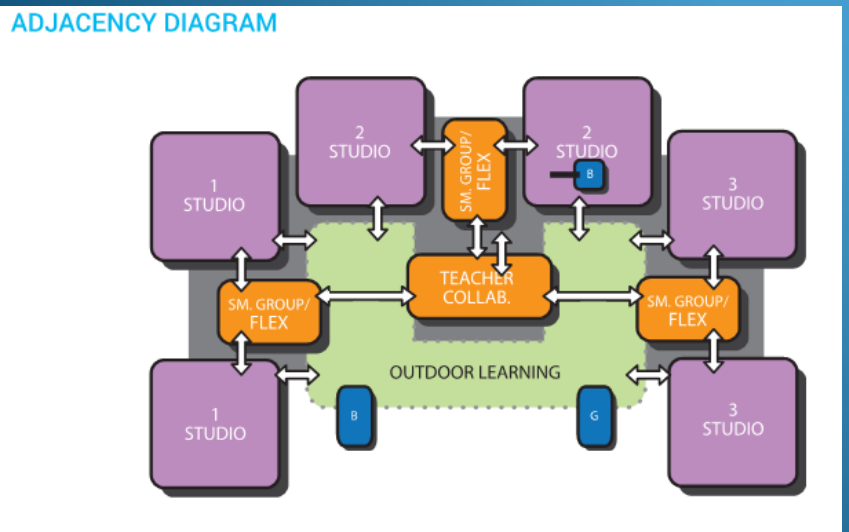
- Example Specification Items
  - LEED certification level
  - Energy requirements (Net Zero Energy)
  - Daylighting
  - Seismic performance
  - Security levels
  - Parking requirements
  - Program adjacency requirements
  - Net square footage requirements per department
  - Floor loading requirements
  - Contractual requirements
  - Stipulated sum budget

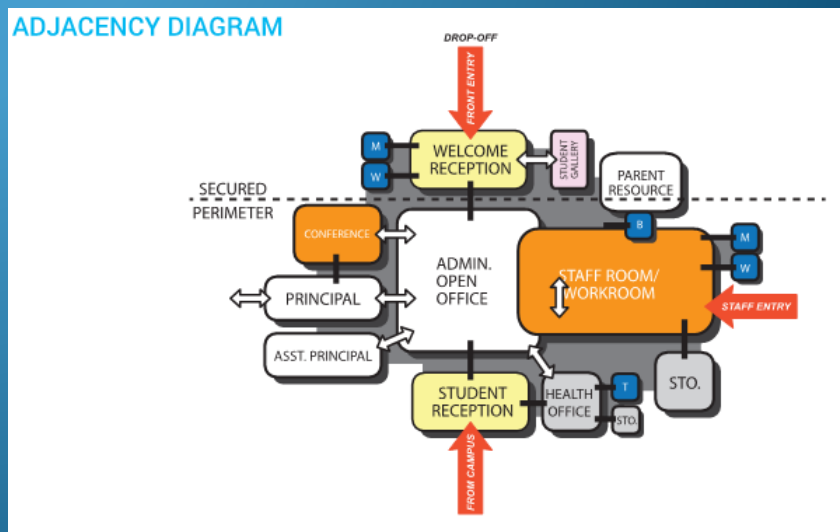
Performance Specification

- Program Adjacency Requirements



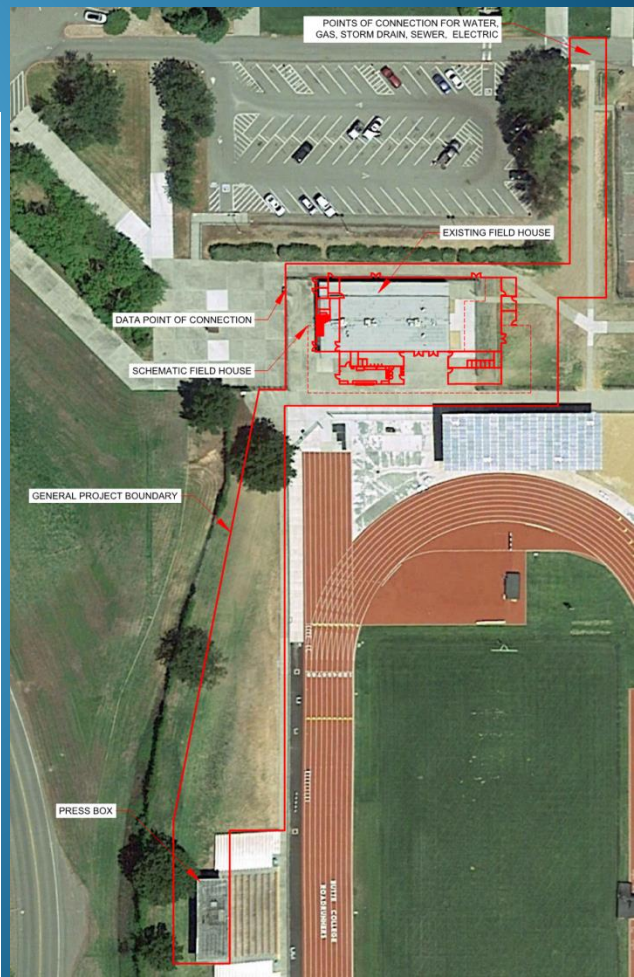






Performance Specification

- Site Plan Layout
- 3-D Space Planning Layout

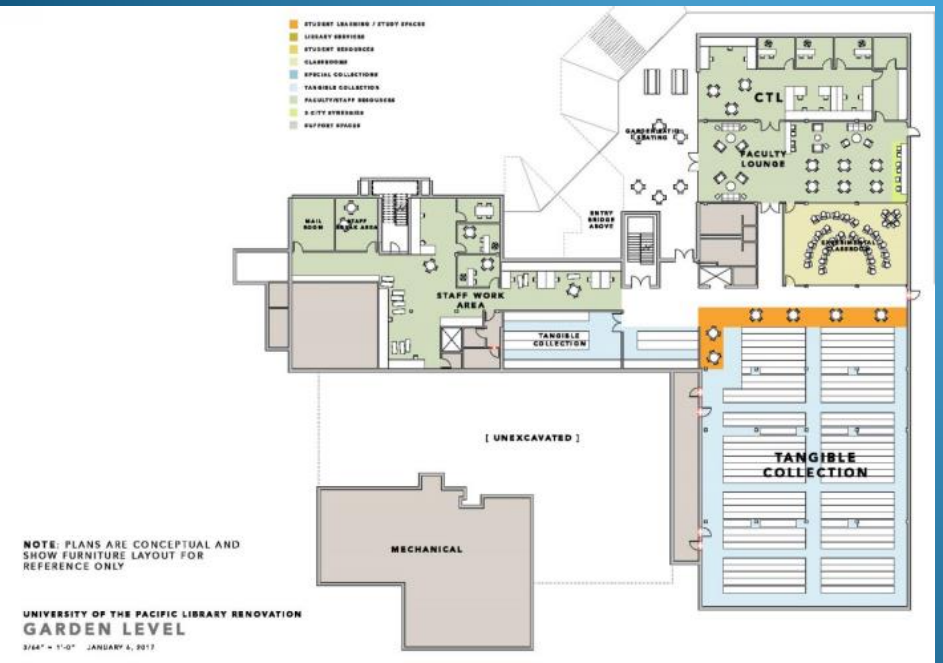


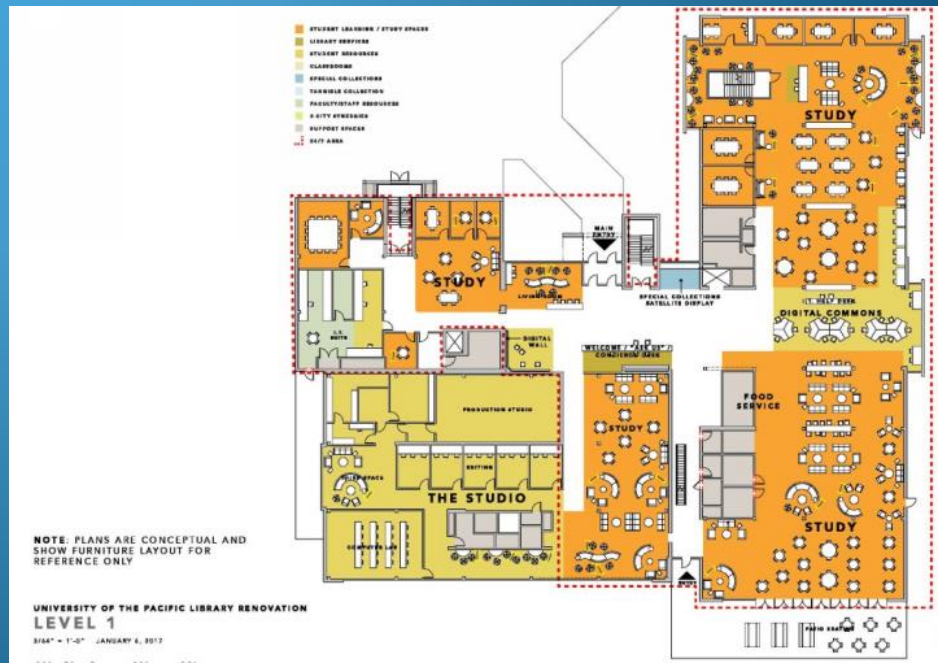
Performance Specification

- Energy Performance - Zero Net Energy
- Prescriptive Program and Site Layout

Full Bridging Documents

- Program Completed
- Plans Provided For All Levels
- Rooms Specified





Full Bridging Documents

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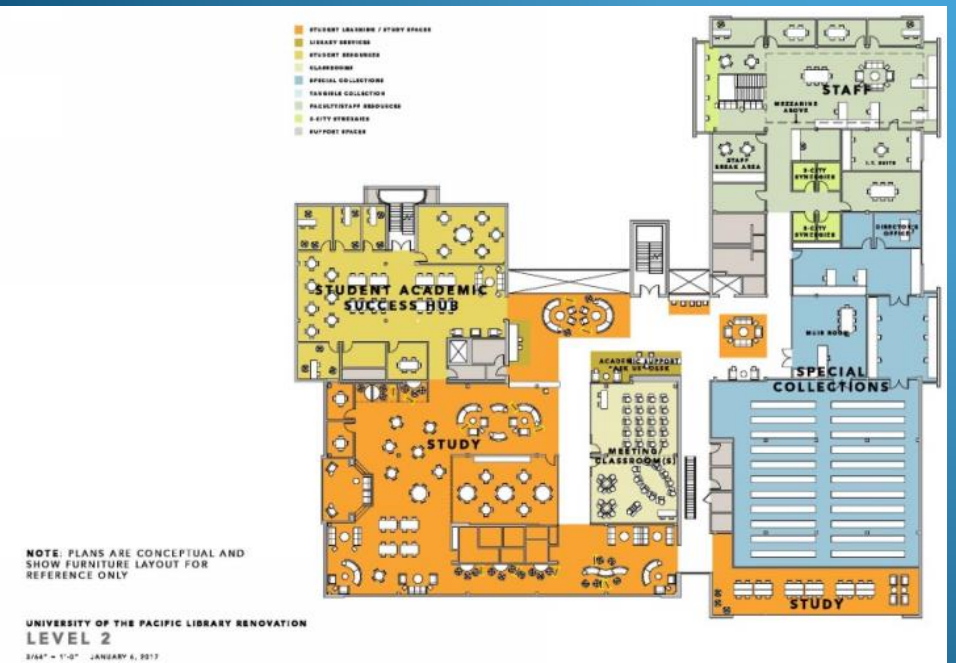
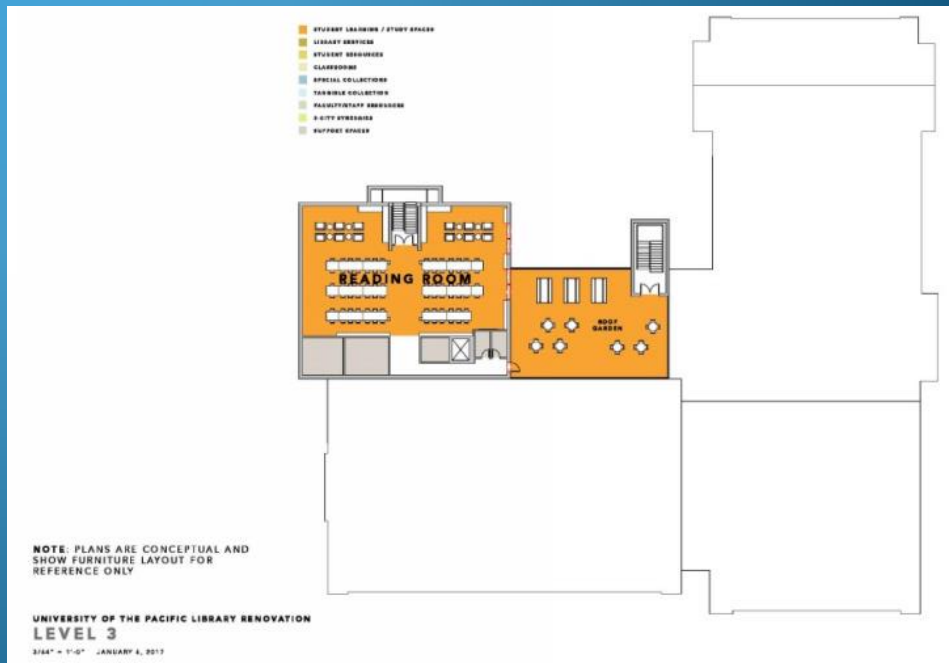




Full Bridging Documents

- Conceptual Interior Renderings

Full Bridging Documents

- Nearly 100 Sheets of Drawings Plus Narratives/Specs
- Required for Security and Operations

1.03 Bridging Documents

A. Bridging Documents describe the minimum mandatory scope and needs of the Project.

B. Bridging Documents are made available under Document 00 5201 (Bridging Documents).

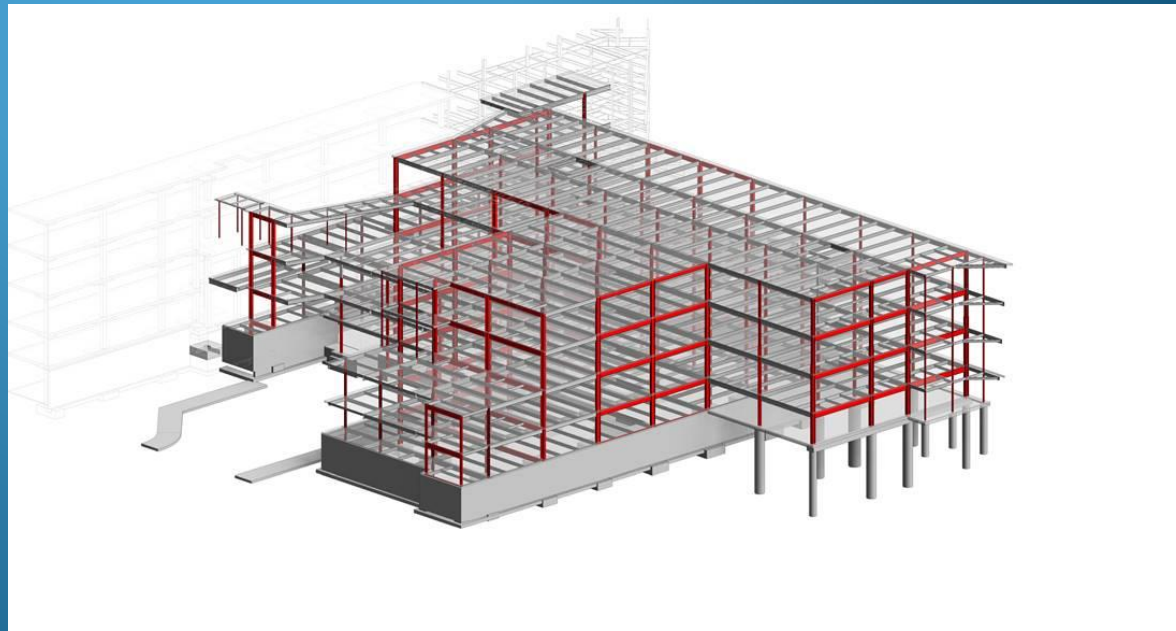
BIM in the Proposal Submission/Evaluation

Align the Design Approach with the Owner's Values

- Design to a budget – Target Value Design (TVD)
- BIM as a Communication Tool
  - Produce multiple design options
    - Massing
    - Materials
    - Orientation
    - Side by side comparisons
    - Price options

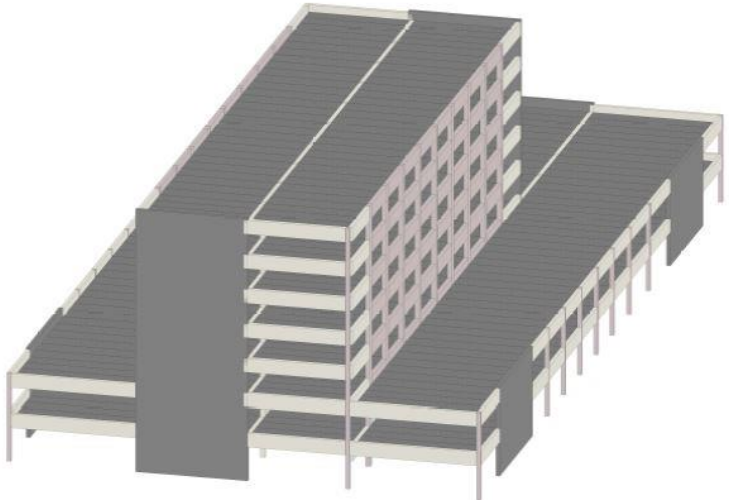
Design to a Budget - TVD

- What if *we design to a detailed budget rather than budget to a detailed design?*
- Identify Costs and BIM Goals
  - Cost estimating
  - Quantity takeoffs
  - Scheduling
  - Model sharing



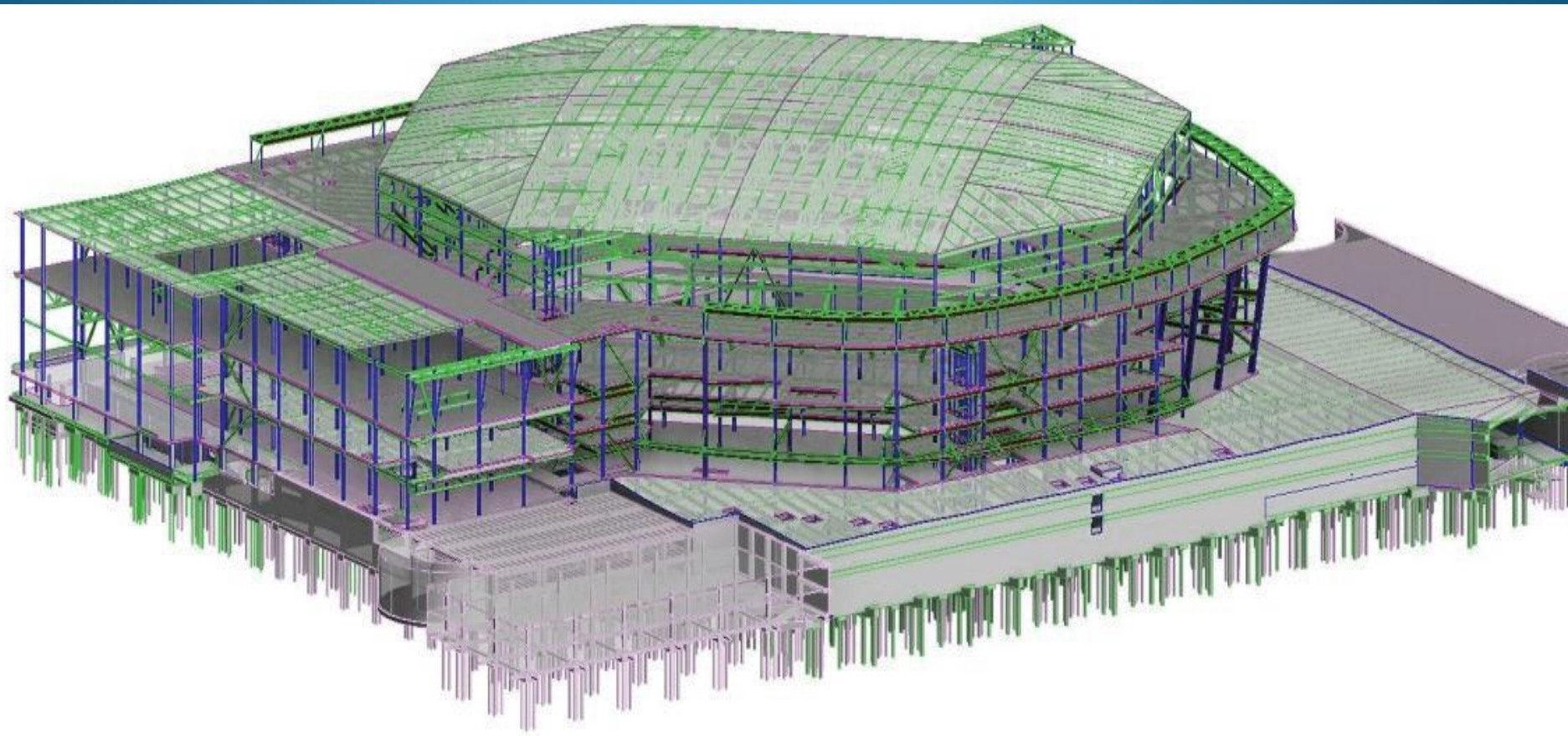
Design to a Budget - TVD

- Set Based Design
  - Select system based on value



Design to a Budget - TVD

- Sharing Models With Trade Partners



BIM as a Communication Tool

- BIM renderings to validate owner's vision
- BIM as a communication platform

Figure 9 - BIM / VDC, Turning Virtual Into Reality

BIM as a Communication Tool

Figure D - Proposal Virtual Perspective, Ft. Carson, CO WR IBCT Complex

BIM as a Communication Tool

- BIM renderings to validate owner's vision
- BIM as a communication platform

Figure A- Proposal Perspective Rendering, MCAS New River, NC Hangar

Figure 2 - Proposal BIM Rendering Model, Ft. Stewart, GA Headquarters

BIM as a Communication Tool

- BIM interior renderings provide design options
- BIM virtual office tour

Figure 5 - VDC Model, Office Virtual Model

Figure E - Lighting Options Model, Ft. Carson, CO WR IBCT Complex

BIM as a Communication Tool

- BIM in Progressive (Collaborative) Design-Build

BIM as a Communication Tool

- BIM in Progressive (Collaborative) Design-Build
- Validate the cost and the vision

Hospital Fly Through Video

BIM After Contract Award

- BIM strategy for project production
- Project coordination for all disciplines/trades
- 3-D modeling plus 4-D (scheduling), 5-D (cost), and 6-D (operations)
- Utilize fabrication models for VDC (virtual design and construction)
- Shared model between designers & builders
- Promotes prefabrication
- Construction planning and sequencing

BIM After Contract Award

- BIM modeling for site logistics
- Coordinate utilities, material lay-down area, crane location, staging area, site traffic flow, etc.

Figure 3 - Site Layout – University of Colorado Lab RC-II

BIM After Contract Award

- 4-D schedule simulation provides an accurate forecast for site planning

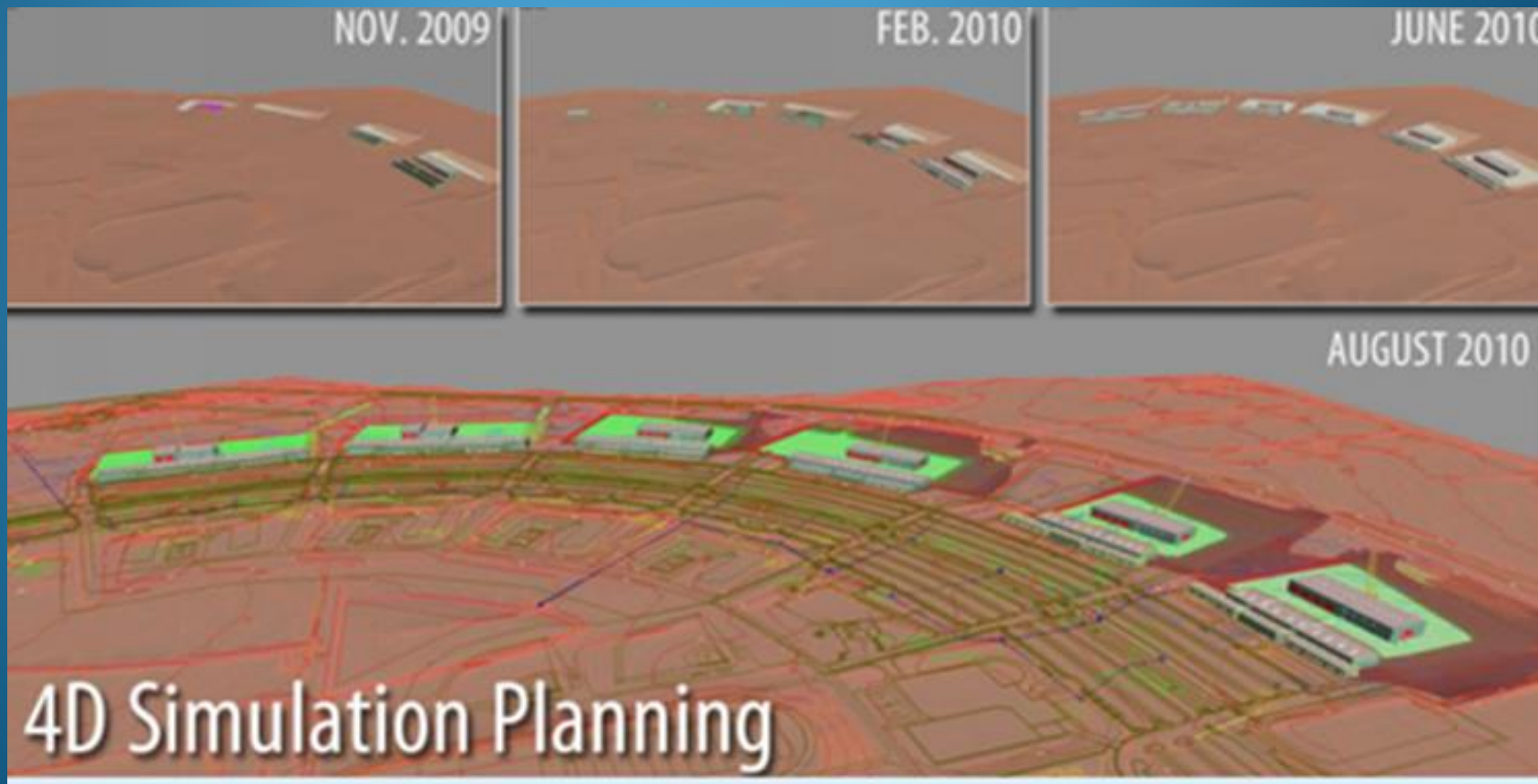


Figure G - 4-D Schedule Simulation Model, Ft. Carson, CO WR IBCT Complex

BIM After Contract Award

- 3-D fabrication model allows for prefabrication
- Prefabrication speeds installation and construction schedule

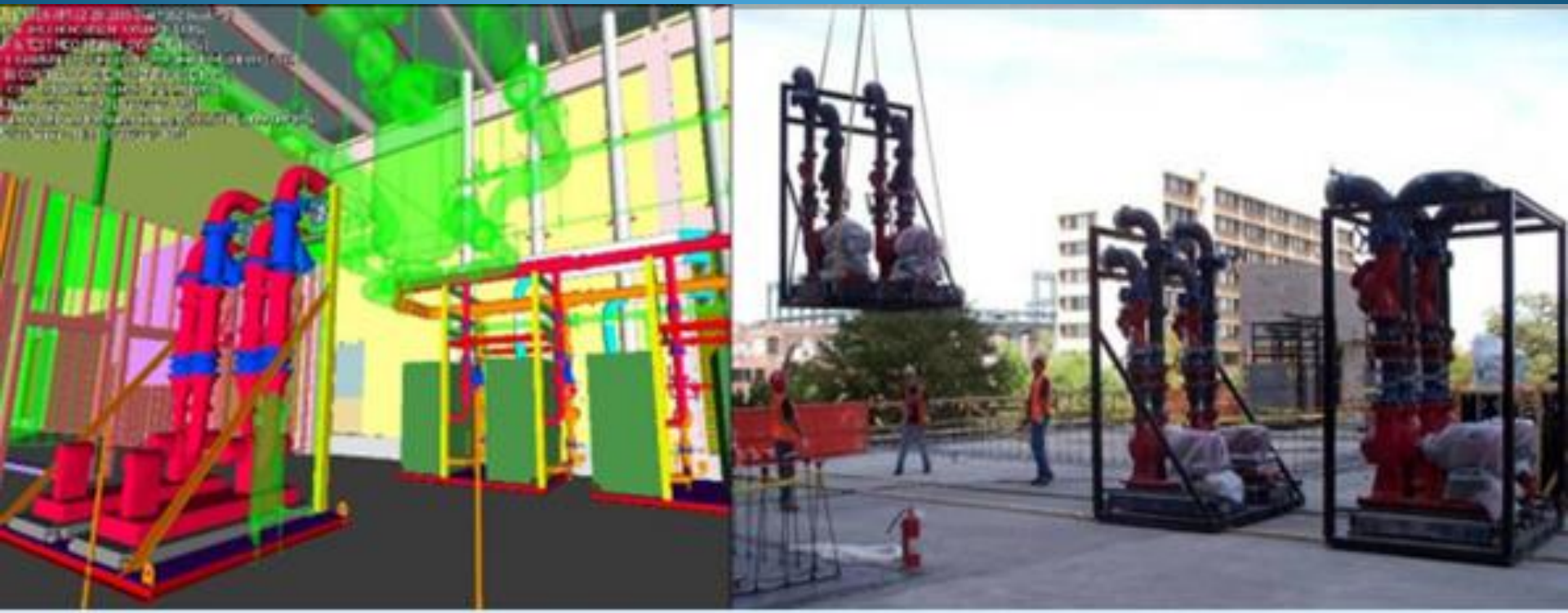


Figure 23– System Fabrication Model

Prefab Main Electrical Room Underground Conduits Video

BIM After Contract Award

- BIM utilized for virtual design and construction
- Fabrication models can provide accurate vision of final product

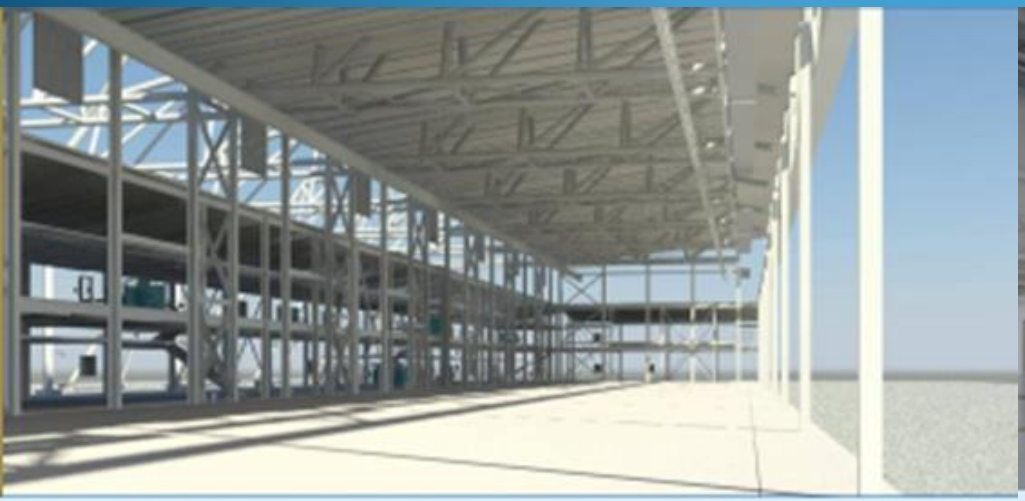


Figure B - Hangar Bay Rendering Model, MCAS New River, NC Hangar

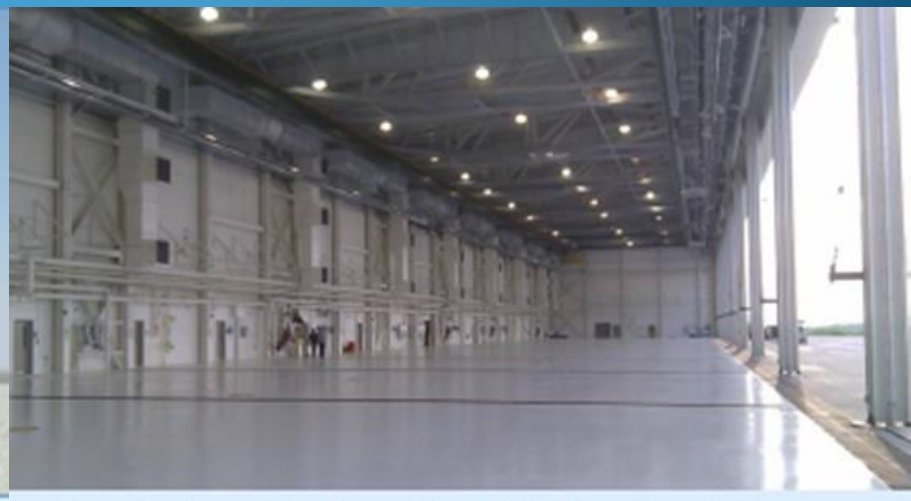


Figure C - Hangar Bay Actual Photo, MCAS New River, NC Hangar

BIM After Contract Award

- BIM utilized for virtual design and construction
- Fabrication models can provide accurate vision of final product

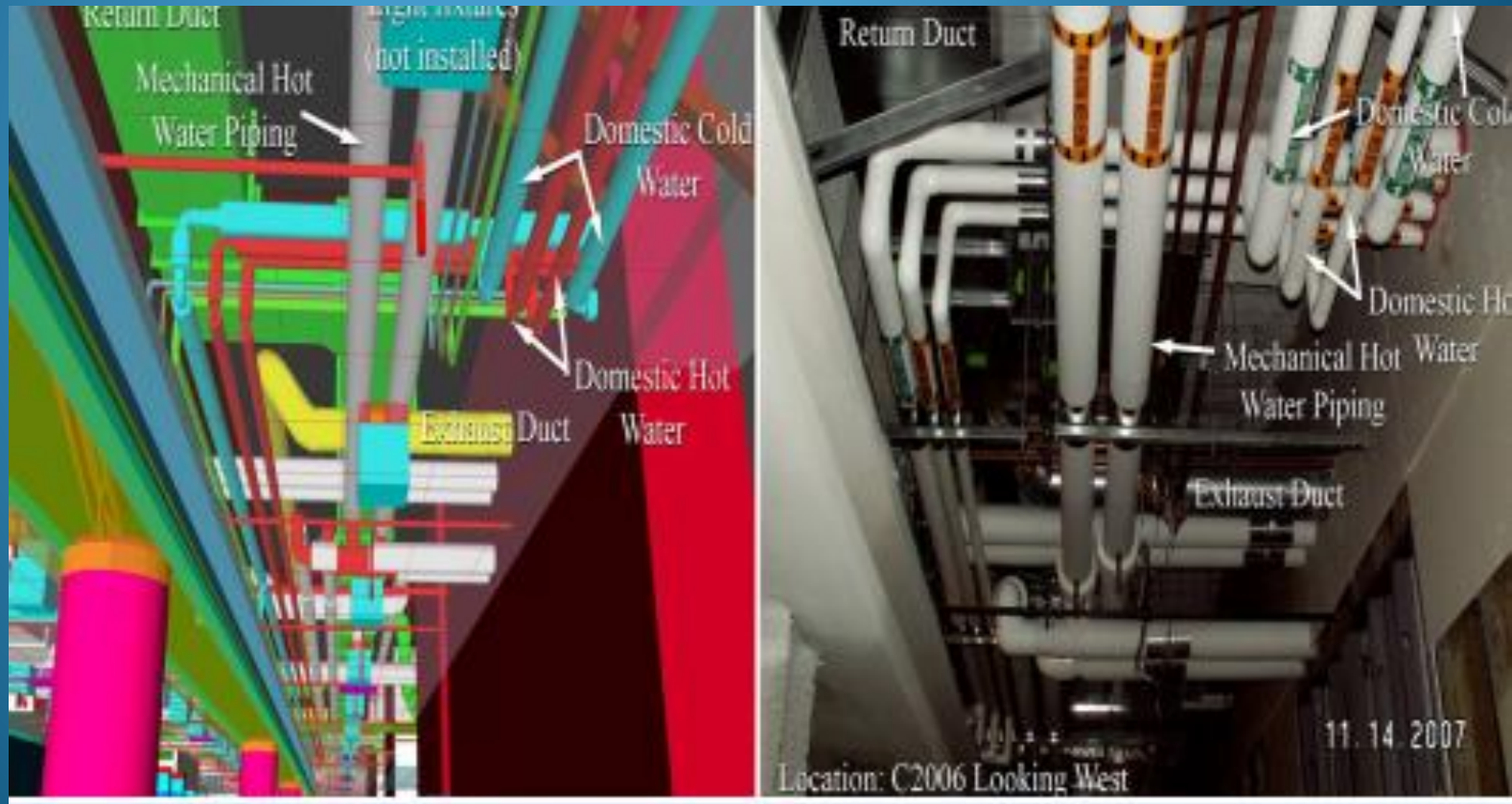
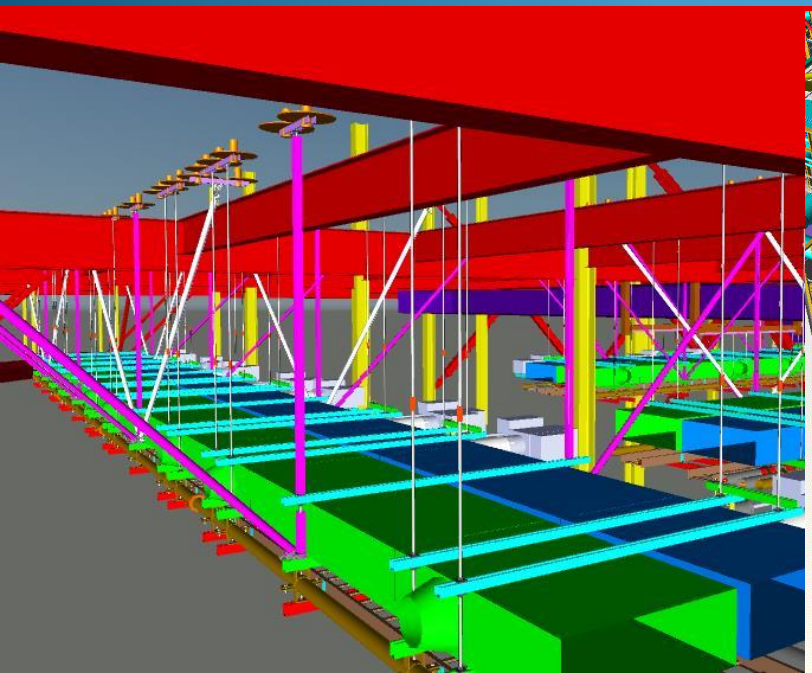
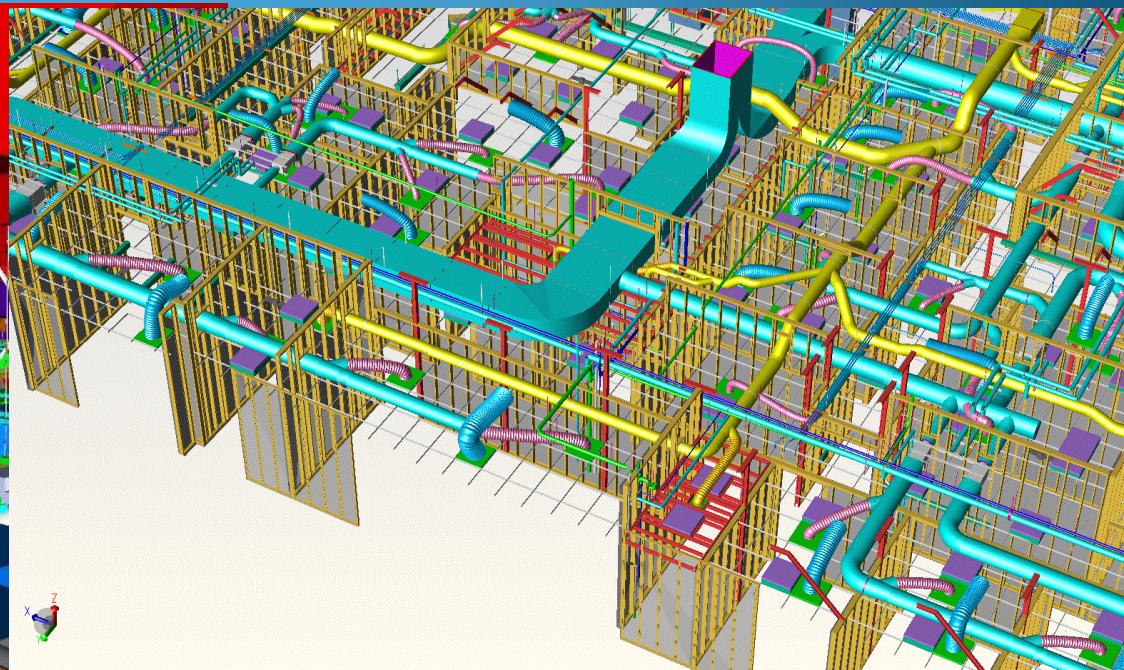


Figure 18 – MEP Systems Model, Martha Jefferson, VA Hospital

BIM After Contract Award

- 3-D MEP fabrication model allows for coordination with structure, architecture, and equipment
- Prefabrication reduces installation time and total construction schedule





Laser Scan to BIM Model Fly Through Video

BIM After Contract Award

- 4-D modeling produces visual schedules

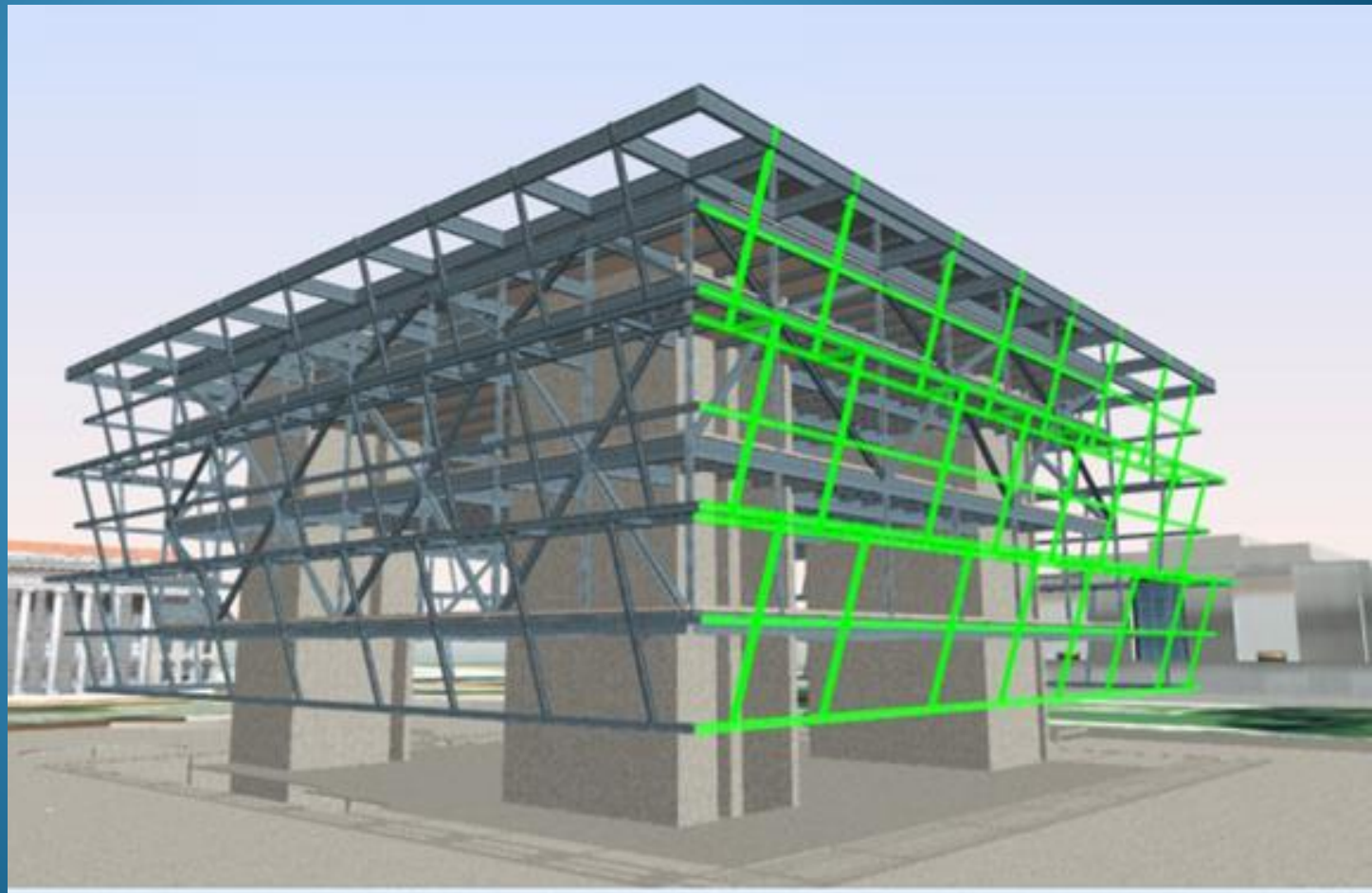


Figure 22 – Steel Construction Sequencing

BIM After Contract Award

- BIM modeling enhances construction scheduling

Figure 20 – Masonry Lift Model

BIM After Contract Award

- 3-D modeling produces virtual mockups
- 3-D viewer/virtual reality
- Virtual walk-through
- Establishes alignment and common understanding

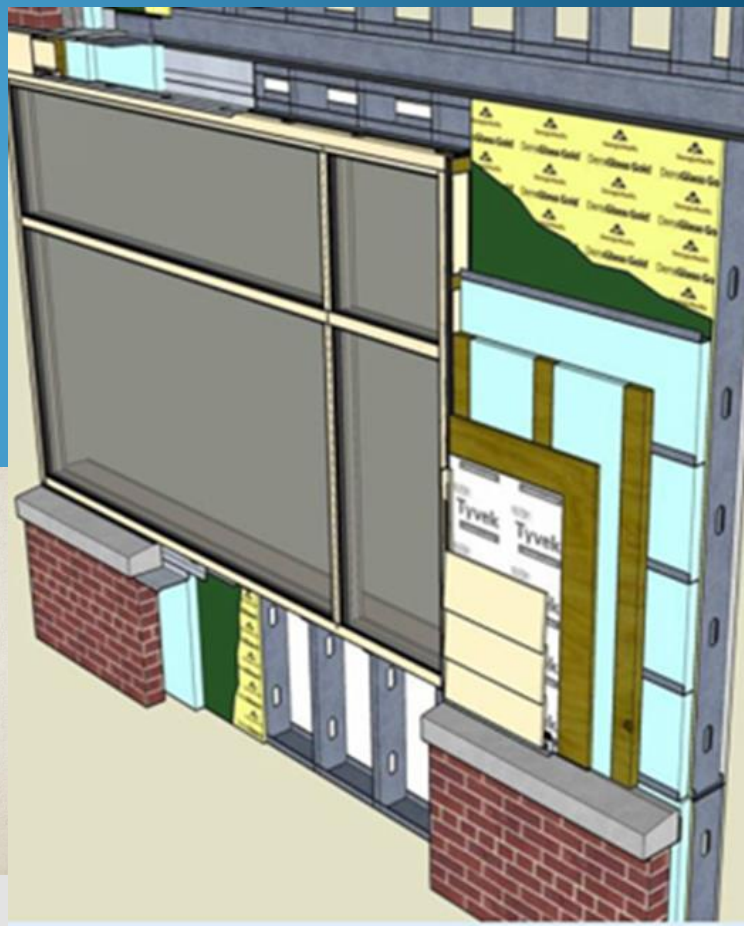


Figure 15 – 3-D Wall Mock-Up, Mt. Weather, VA FEMA Office

Jobsite 3-D Viewer Video

Project Closeout

- Develop and Update As-Built Model
- Space Management Report
- Operation & Maintenance Documentation

Figure 4 - Maintenance Management, University of Colorado Lab RC-II

High School Fly Through Video

BIM in D-B: Key Takeaways

- BIM is a key component in all phases of the design-build procurement process
- Effective communication/collaboration platform
- More accurate information leads to lower contingency and lower cost
- BIM/VDC reduces schedules through coordination and prefabrication
- BIM provides a cost effective tool for owner visualization
- Quicker decision from 3-D models

Questions?