Owner Driven BIM/Lean Transparency

Dianne Davis, AEC Infosystems
Danielle Arciero, Massport
Buy “Good Behavior” and Consistent Quality

- Define BIM Baseline
- Lean Collaboration
- Legal Structure
- Delivering for FM
Owners need to **DEFINE**

“Good Behavior”

Identify the What, How, When, Why, LOD, LOE to have reliable outcomes:

- BIM & Related Technologies
- Collaboration Process
- Information
- BIM to FM Deliverables
Better project delivery
Better decisions and outcomes
More coordination, fewer mistakes
Better asset information
Added value to managing building lifecycle

Repeatable Fact-Based
Lean Training

BIM Guide

Re-Write Contracts Manuals

Projects

CM@Risk Contract BIM Addendum

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US Coast Guard/ Shore Facilities Management
Massport

- Define a repeatable, fact-based, risk-adjusted, decision process
- Well understood actions with predictable outcomes to support facilities projects and mission
- Plan for success
Owners Need a Unified Strategy from Teams
WHY BIM AT MASSPORT
1.1 The MPA Facility Information Vision
1.2 BIM for Infrastructure and Horizontal Construction
1.3 Integrated Enterprise Technologies
1.4 The Design Technologies Integration Group (DTIG)

INTEGRATING INDUSTRY INITIATIVES FOR BIM SUCCESS
2.1 Lean Principles for Design and Construction
2.2 Importance of the BIM Uses - “Start with Why”
2.3 Model Level of Development (LOD)
2.4 Industry Data Standards

LEAN BIM COLLABORATION
3.1 Conditions of Satisfaction Meeting

THE BIM EXECUTION PLAN (BIMxP)
4.1 BIM Execution Plan Template
4.2 BIM Roles and Responsibilities

MODEL COLLABORATION ENVIRONMENT
5.1 BIM Development, Issue Resolution, Reviews and Approvals

MPA BIM FRAMEWORK
6.1 BIM Authoring Software
6.2 Model Structure
6.3 BIM Objects, Assemblies, Elements, and Components
6.4 View Naming and Model Navigation

BIM DATA INFRASTRUCTURE
7.1 Data Standards for MPA BIM
7.2 Model Data Requirements

DRAWING REQUIREMENTS FOR PAPER PRINTING & PUBLISHING
8.1 Drawing Content
8.2 Discipline Model Drawings
8.3 BIM Submissions and Document Deliverables
8.4 Model Submissions
8.5 Additional Model Drawing Submissions

GLOSSARY
See BIM Uses Document

APPENDIX A. BIM USES
9+ Industry Initiatives
What’s Trending
Create Integration
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Define Language

- Model Types
- Actions
- Deliverables
- Handoffs and Content
Open the Process
### Early Design
- Criteria Definition Model
  - LOD 100-200
  - Supports:
    - design process
    - design data tracking
    - cost estimating
    - coordination
- Construction Drawings
  - Disciplines as required:
    - Architectural
    - MEP
    - Structural
    - Life Safety
    - Communication, IT
- Coordination Drawings
  - LOD 300
  - Supports:
    - design process
    - design data tracking
    - construction documentation
    - specifications
- Design Intent Model
  - LOD 300
  - Supports:
    - design process
    - design data tracking
    - construction documentation
    - specifications

### Design
- Coordination Model
  - LOD 350
  - Supports BIM Construction
  - design coordination process
  - shop and fabrication models
  - construction documentation
  - scheduling and logistics
  - Communication, IT
- As-Built Drawings
  - LOD 350
  - Navisworks File contains multiple formats, shop and fabrication models

### Coordination Construction
- BIM Record Model
  - LOD 300
  - Supports BIM Construction
  - design coordination process
  - shop and fabrication models
  - construction documentation
  - scheduling and logistics
  - Communication, IT

### Project Handover
- Detailed Asset Inventory
  - Equipment and Components
    - Asset inspections
    - Asset maintenance and repair
  - High Level Asset Inventory
    - Buildings and Systems
    - Asset value
    - Asset condition
    - Asset recapitalization needs
    - Deferred maintenance

### DTIG Operations
- FM Building Master Drawings
  - Architectural
  - MEP
  - Life Safety
- BIM Record Model / FM Model
  - LOD 300
  - per BIM Use
    - Architectural
    - MEP
    - Structure
    - Functional Spaces

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**End in Mind**

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51 BIM Uses

- Outcome Driven
- Provides Baseline Understanding
- Incorporates Related Technologies
- Supports Process
Description
Potential Value
Resources Required
Team Competencies

- Description
- Responsibility
- Coordination
- Data Content
- Deliverables
- Software
- References
- Examples

Too Generic
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Existing Conditions</td>
</tr>
<tr>
<td>2.</td>
<td>Design &amp; Building System Engineering</td>
</tr>
<tr>
<td>3.</td>
<td>Analysis and Reporting</td>
</tr>
<tr>
<td>4.</td>
<td>Sustainability, LEED, Energy, Analysis</td>
</tr>
<tr>
<td>5.</td>
<td>Constructability and Review</td>
</tr>
<tr>
<td>6.</td>
<td>Documentation</td>
</tr>
<tr>
<td>7.</td>
<td>Commissioning and Handover</td>
</tr>
<tr>
<td>8.</td>
<td>Facilities</td>
</tr>
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</table>
1.3 Existing Conditions – Laser Scanning

**Description:** 3D laser scanning (based upon approved survey control points) produces dimensionally accurate and detailed 3D point clouds of existing facilities and assets. The point cloud data can be integrated into BIM authoring software for model development and Navisworks for review. Survey points allow the model and the scan to be accurately aligned to the State coordinate system for MPA use.

**Responsibility:** Laser scanning may be a sub-contracted part of the architect, constructor, or CM scopes of work, or to a third party. The MPA survey team may also provide laser scanning. MPA has approval.

- **Coordination Meeting for Survey Control Points:** A coordination meeting between MPA PM, the scanning party, the BIM Manager, and other responsible parties to schedule “survey control points” for laser scanning activities, scan creation, and model development.
1.3 Existing Conditions – Laser Scanning

- **BIM Development from the Point Cloud:** BIM production will follow Massport BIM Guide standards, and the LOD and model elements defined in the project BIM execution plan. Not all scanned elements will be modeled.

**Deliverables:** The 3D point cloud, BIM as specified in the BIMxP, Navisworks and .rvt file.

**Software:** Identify point cloud development software (editing and viewers) and deliverable specifications to Massport. Result must be suitable for use in Revit Architecture, MEP, as required for scanning and modeling scope. Identify software in the BIMxP.

**References:** MPA Survey Control Plan.pdf
Lean Tools
BIMxP

Operational Environment

Maintains
Unifies
Creates
Identifies
Focuses On

Conditions of Satisfaction & Program Requirements
Team Communication "Lingua Franca"
Enabling Technologies & Data Structures
Lean Process Flow to End Product

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The image presents a chart titled "Project BIM Uses" with columns for "Conceptualization" and "Criteria Definition." Each column has rows for "Start," "R/P Resp. Parties," and "End." The chart is structured to track the execution of BIM uses, with specific dates and responsibilities. The diagram includes annotations such as "Pull-Down Menu Dates for BIM Use Execution," "List of Project BIM Uses," "Project Phases," "Pull-Down Menu Responsible Party," "UniFormat/Omni LOD," "Document the BIM Uses," "Schedule," and "Model Review Submission."
<table>
<thead>
<tr>
<th></th>
<th>Conceptualization</th>
<th>Criteria Definition</th>
<th>Coordination</th>
<th>Implementation</th>
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<tr>
<td></td>
<td>Start</td>
<td>End</td>
<td>Start</td>
<td>End</td>
</tr>
<tr>
<td><strong>BIM Uses Number and Name</strong></td>
<td>12</td>
<td>2014</td>
<td>12</td>
<td>2014</td>
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<tr>
<td><strong>(From BIM Use Matrix) Identify Phase</strong></td>
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<tr>
<td><strong>BIM Use Name</strong></td>
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<td></td>
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<tr>
<td><strong>Laser Scanning - Existing Conditions</strong></td>
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### BIM Uses in Construction Packages

- **Project BIM Uses**
- **Conceptualization**
- **Criteria Definition**
- **Coordination**
- **Implementation**

<table>
<thead>
<tr>
<th>SES (OmniClass Table 31)</th>
<th>Conceptualization</th>
<th>Criteria Definition</th>
<th>Coordination</th>
<th>Implementation</th>
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<tbody>
<tr>
<td></td>
<td>Start</td>
<td>End</td>
<td>Start</td>
<td>End</td>
</tr>
<tr>
<td>JniFormat II (2010) &amp; OmniClass - gn Model Elements to Discipline lel</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>National Spaces (OmniClass Table 13)</td>
<td>100</td>
<td>A</td>
<td>100</td>
<td>A</td>
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<tr>
<td>Is in Red are Minimum Elements to track LOD</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>SUBSTRUCTURE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Foundations</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10 Standard Foundations</td>
<td></td>
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</tbody>
</table>

**LOD Start**: 2014 **As-Built**: 2015

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TEAM ORGANIZATION
Leadership, Facilitation, Co-Location by information, Focus Group Structure

COLLABORATIVE COMMUNICATION
Trust, Conditions of Satisfaction, Declare Breakdowns, Root Cause Analysis

LEAN FOUNDATION
Principles, Forms of Waste, Focus on Continuous Improvement

TOOLS
Last Planner System, “Big Room”, BIMxP, A-3, Target Value Design
Co-Location

- Not just by company
- By information development
- BIG Room with Conditions of Satisfaction
Addendum to CM@Risk Contract

- Model is the project’s primary Contract Document
- Certify Documentation from Model
- BIMxP is a deliverable throughout project and at turn-over
- ConRAC (little BIM)
- Terminal B Modernization (little BIM)
- CBIS
- Framingham Logan Express Garage
- Terminal C2E Connector (BIM/Lean)
- Term E Enhancement (BIM/Lean)
- Airline Relocation (Lean)
- West Garage Expansion (BIM/Lean)
Lean/BIM Projects

- Kick-Off with CoS
- BIM Uses
- BIMxP
- BIG-Room
- Look-Ahead

Lean Project Management
Risk Adjusted

Last Planner and BIM

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West Garage: Option 1
Upper levels extend over Hilton Bridge, park-on ramp
Total # of Spaces: +/- 1610

West Garage: Option 3
Speed ramp with garage is away from bridge
Total # of Spaces: 1440

West Garage: Option 5
Setback from Hilton, upper levels extend over Hilton Bridge
Total # of Spaces: 1530
BIM and Look Ahead

- Approved & Slated for Casting
- Casted
- Erected In Field
Look Ahead and BIM

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Asset Manager - BEST LOCATION and FORMAT
1. Background

As part of the West Garage construction, the design team needs to reconstruct the landscape between both the new 10-story garage and the 9/11 Memorial and along the street edge, between the Hilton parking lot and the Hilton. The design team had an initial presentation to MPA on 123, showing a fairly intensive landscape design around the entire garage. MPA requested the landscape be scaled back and minimized, where appropriate. These revised options represent two additional design studies at minimizing the planting and landscape. Pans of the original design and these two additional design options are attached to this A3.

2. Future State / Goal

The purpose of this analysis is to compare two different options for the landscape surrounding the memorial and between the new garage and Hilton Hotel. The goal is to select one option, so the landscape design can be finalized within the construction documents.

3. Problem Statement / Key Challenges

Landscape Design between the 9/11 memorial and garage
- The previous landscape, located between the Hilton parking lot and 9/11 wall, was fairly minimal and consisted of grass with a row of large bushes, ranging in height.
- The new landscape design needs to create more of a visual buffer between the garage and the memorial path. It also should help transition from the 9/11 story garage and smaller, more intimate memorial experience.

Landscape Design between the new garage and Hilton Hotel
- The previous landscape was minimal and consisted of grass with a few mature trees.
- The new landscape design should replace these trees and create a buffer for pedestrians walking from the Hilton parking lot to the hotel. The landscape along the southern edge of the garage should also relate and create a transition from the new landscape at the memorial.

Challenges for all options: A number of underground utilities and structures are located within these landscaped areas. Any new landscape needs to avoid these structures.

4. Analysis

Option 1a: Landscape at 9/11 Memorial
- Option 2a: Minimal Landscape at 9/11 Memorial

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater visual buffer between the garage and the memorial path.</td>
<td>More intensive landscape</td>
</tr>
<tr>
<td>Higher costs, due to more minimal landscape</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anticipated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$55</td>
</tr>
</tbody>
</table>

Option 1b: Landscape between Hotel & Garage
- Option 2b: Minimal Landscape between Hotel & Garage

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition between memorial landscape and Hilton road faces appropriate.</td>
<td>Lower costs, due to more minimal landscape</td>
</tr>
<tr>
<td>Higher costs, due to more intensive landscape</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Anticipated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5</td>
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</tbody>
</table>

5. Recommendation

6. Follow-up

Fact-Based Decision Process
### 4. Analysis

<table>
<thead>
<tr>
<th>Option 1a: Landscape at 9/11 Memorial</th>
<th>Option 2a: Minimal Landscape at 9/11 Memorial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Screenshot of Walkthrough</strong> (see attached movies for walkthrough of each option)</td>
<td><img src="image1.png" alt="Screenshot of Walkthrough" /></td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
</tr>
<tr>
<td>Greater visual buffer between memorial path and garage, screens the cars parked in the Hilton parking lot. This will allow for the experience of the 9/11 memorial to be focused inward, toward the memorial, and not toward the garage.</td>
<td>Lower costs, due to more minimal landscape</td>
</tr>
<tr>
<td>Small trees create a transition in scale between the memorial and garage.</td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
</tr>
<tr>
<td>Higher costs, due to more intensive landscape</td>
<td>No visual buffer between the garage and memorial. Cars are visible from the Hilton parking lot.</td>
</tr>
<tr>
<td><strong>Anticipated Cost</strong></td>
<td>$$</td>
</tr>
</tbody>
</table>
Object to Asset

Common Information Environment

BIM Data

Info/PDFs Reports

A/E/C Workflow

Info (O&Ms, PDFs)

FM Workflow

FM Tools

BIM

CAFM

CMMS

GIS

Outside Database

Links/Cloud

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Asset Manager - BEST LOCATION and FORMAT
Common Information Environment
Design Technologies Integration Group
CONTINUOUS IMPROVEMENT
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Thank-you