The UW Capital Projects Office and NW Construction Consumer Council

Present:

“Changing Project Delivery at the UW through Innovation, Integration, and Adoption of MC/CM and EC/CM”

PACCAR Hall, the Gordon Kloft Classroom
June 22, 2011
Program Outline

Implementing COBie & Project Delivery Innovations - Part 1
- Eric Smith, Director of Major Projects, UW CPO

Integration of the Project Team – Part 2
- Will Dann, THA Architects
- Troy Bloedel, Lease Crutcher Lewis
- Steve Tatge, UW CPO

Case Study and Panel Discussion: MC/CM & EC/CM – Part 3
- James Thomas, GLUMAC
- Judi Ebmeyer, GLUMAC
- Len Klein, GLUMAC
- Dave Nehren, Hermanson
- Tim Nelson, Nelson Electric
- Brett Magnuson, UW CPO
Implementing COBie & Project Delivery Innovations - Part 1

- Eric Smith, UW CPO, Director, Major Projects Group
Innovation Integration

Process
- Design-Build
- DBOM
- GC/CM
- IPD-ish
- Early Subs
- Design Assist
- Target Value Design
- Facilities Mgmt

Technology
- BIM
- Laser Scan
- Tablet Computers
Thank you to our project partners!
Ben Hall/R & T: Inspirational Learning Moment

- Idea in 2003 became a reality in 2006
  
  Genesis to build a lab building competitive with the private market.

  Became an inspiration and example of how process & technology can enable Innovation & Integration.

- Process: DBOM
  
  Started with Design-Build integrated Design & Construction.

  Expand to O&M – Responsibility & accountability for design, quality, life cycle, etc.
Ben Hall/R & T: *Inspirational Learning Moment*

- **Technology: BIM 3D & 4D**

  BIM proved design assumptions to skeptical owner.
  
  - *Enabled by DBOM process*

  BIM during construction.
  
  - *Underground As-Builts eased utility agency concerns*
  
  - *4D improved planning and coordination*

    Logistics
    
    Subcontractors
    
    Safety
Ben Hall Images
Applying Technology to GC/CM

- GC/CM is UW primary method on major projects
- Trade coordination: First BIM use; now standard
- Other technologies
  - Laser scanning
  - Tablet Computers
- On-site document posting and access
BIM in Trade Coordination

- William H. Foege Building
- Harborview Bond Program
- Health Sciences H-Wing
- Washington Dental Services Center for Early Childhood Oral Health
- UW Tacoma Joy and Tioga Library Buildings
- Clark Hall
- Denny Hall
- Johnson Hall
- Guggenheim Hall
- UW Tower Data Center
- PACCAR Hall
- Molecular Engineering
- Student Housing
- Health Sciences J-Wing
- UWMC Expansion
Exploded view of Design Models

Slide 13
Design Model used for building sectional studies – North Section
Design Model used for mechanical coordination - Penthouse
99% of beam penetrations were shop fabricated as a result of early coordination.

- Estimated savings = $120,000
- 242 penetrations added
- 127 modified size or location

- Building architecture preserved by maintaining ceiling heights and keeping MEP hidden despite a great deal of open structure. LMN Architects, structural teams, and the M/E design team attended meetings as needed and collaborated with Sellen to resolve issues early and avoid costly changes later in construction.
4D Modeling was used to communicate which walls would remain and to illustrate excavation to the design team.

4D Modeling resulted in shoring being incorporated into the design prior to bidding.

4D modeling was used to identify conflicts between drilled piers and existing foundations and were incorporated into our bid instructions so that these
Trimble Unit
Trimbler’s
UW Denny Hall Laser-Scan Surveying

- 3D “Laser Scanning”
  Millions of points
  Sub-millimeter accuracy
  Capture photos and reflectance

- Preconstruction – Verification of existing conditions/as-built

- Construction – Utilize for BIM coordination in the field and O&M
UW Denny Hall Laser Scan revealed a number of discrepancies with as-built documentation.
3D of the UWMC Expansion foundations “before”
3D of the UWMC Expansion foundations “after”
3D model resolved many constructability issues only possible through an iterative, digital process. The model turned into the fabrication drawings.
Ruggedized Tablets in the Field:

- Safety
- Quality Control
- Punchlist
- Future – BIM Integration
Electronic Plan Table

Photo shows the plan in the background, and a Window opened with an RFI that is linked via the plan view.
Electronic Posting in the Field
Design Assist/BIM Charrette – UWMC Expansion Project
UWMC Expansion Design Assist

**Investment**
- Net fee to Mechanical/Electrical Subs $190,000

**Return**
- Finish 10 weeks early – direct construction savings $1,900,000
- Start revenue 10 weeks early – added UWMC Margin $3,500,000
- Change Orders avoided $300,000

**TOTAL RETURN** $5,700,000

**Return on investment** $30/$1
UW Bothell Phase 3: *Pulling it all together*

- Embracing IPD principles
- Form team early
  - GC/CM at design start
  - Early subcontractors – MC/CM and EC/CM
- Target Value Design
- Plan, design and build in 3D model
- Design assist
- Streamline process
BIM for Facility Management
“Design for Maintenance”

Courtesy of Birgitta Foster

ecobuild america
Sustainable, High Performance & Technology Solutions for the Built Environment
“I have put in service request...to find a solution to meeting the relief needs of the building, perhaps another exhaust fan can be used....Please discontinue any Preventative Maintenance to this exhaust fan.”
Levels of FM Engagement

- Link the BMS to the BIM models/O&M information
- Critical for post occupancy performance

- Software or method to link BIM models to O&M information
- Process to update as necessary

- Electronic project information (O&M, Warranties, CAD/BIM files, etc)
- Well thought out structure
- “Foundation” of FIM
COBie case study

Foster School of Business Phase II

$41.8M project cost; 63,000 GSF classroom/admin.
Our current O&M data transfer...

“Here’s your building - good luck!”
Data is lost with each phase...

Graphics credit: Brigitta Foster
Less hunting for info, more wrench time

Studies have estimated waste due to O&M management at $0.23/GSF/Year

UW has about 20M GSF...$4.6M/year

Other studies indicate the cost may be higher still
## The UW COBie Pilot

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Contracting Phase</th>
<th>Information Captured</th>
<th>Case Study Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>Programming</td>
<td>Space Program</td>
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<td></td>
<td></td>
<td>Product Program</td>
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<tr>
<td>Design</td>
<td>Documents</td>
<td>Early Design</td>
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<td>Schematic Design</td>
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<td>Coordinated Design</td>
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<td>Design Reviews</td>
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<td>Specification</td>
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<td>Product Discovery</td>
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<td>Construction</td>
<td>Bidding</td>
<td>Bid Inquiries</td>
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<td></td>
<td>Selection</td>
<td>Preparation and Submittal Review</td>
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<td></td>
<td>Installation</td>
<td>Install Products</td>
<td>✔️</td>
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<tr>
<td></td>
<td></td>
<td>Inspect Products</td>
<td>✔️</td>
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<td>Punch List</td>
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<td>Commissioning</td>
<td>Capture Parts Data</td>
<td>✔️</td>
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<td></td>
<td>Capture Warranty Data</td>
<td>✔️</td>
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<td></td>
<td>Capture Maintenance Data</td>
<td>✔️</td>
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<tr>
<td></td>
<td></td>
<td>Capture Systems Data</td>
<td>✔️</td>
</tr>
</tbody>
</table>
### The COBie Template

#### Fan Schedule

<table>
<thead>
<tr>
<th>Tag</th>
<th>Description</th>
<th>BAS / Design</th>
<th>QTY</th>
<th>CFM</th>
<th>S.P.</th>
<th>Notes</th>
<th>Voltage</th>
<th>UL IPS</th>
<th>Component Class</th>
<th>COBie ID</th>
<th>COBie Tag</th>
<th>Create Date</th>
<th>Create Time</th>
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</thead>
<tbody>
<tr>
<td>70-1</td>
<td>Exhaust Fan</td>
<td>AM-250/500-2</td>
<td>8000</td>
<td>800</td>
<td>3/4 HP</td>
<td></td>
<td>280V/500A</td>
<td>0</td>
<td>Exhaust</td>
<td>BF</td>
<td>F1-1</td>
<td>3/25</td>
<td>10:10</td>
</tr>
<tr>
<td>61-3</td>
<td>Exhaust Fan</td>
<td>AM-250/500-2</td>
<td>8000</td>
<td>800</td>
<td>3/4 HP</td>
<td></td>
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</tbody>
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**EXHAUST FANS**
Implementation Plan

• Needs assessment: What types of information does FS need and in what format?

• Analyze current processes for data capture (capital projects), data exchange and data processes (facilities services)

• Design and test COBie processes for data capture (capital projects), data exchange and data processes (facilities services)
“Keep the model alive”

- Training
- Maintenance scheduling and checklists
- Product Data
- Design for Maintenance
- Integration with Facilities Mgmt. software