Innovation & Integration in Project Delivery

NWCCC Annual Conference
November 17, 2010
Innovation & Integration

- Learning through partnerships
- Project examples
- Our Shared Future
Thank you to our project partners!
Innovation Integration

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

Technology
- BIM
- Laser Scan
- Tablet Computers
Ben Hall/R & T: Inspirational Learning Moment


- 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*
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
Combined view of Design Models
Exploded view of Design Models
Structural Design Model

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Design Model used for mechanical coordination - Penthouse
Design Model used for mechanical coordination – Mechanical Room
Design Model used for building sectional studies – North Section
Design Model used for classroom layout and design studies
Design Model used for sun studies – Sun Path Analysis
Design Model used for sun studies - Solar Shading Study
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.
Paccar Hall 4D Modeling

- Drawings of the site conditions and excavation were utilized to reveal conflicts that enabled LMN Architects to design supplemental shoring prior to bidding the work.

- 4D modeling was a tool used to communicate the complexity and phasing of the work. This resulted in minimal change orders on complex excavation and structural scopes of work.
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 issues did not become change orders.
Savery Hall As-Built
Savery Hall - Structural As-Built
Savery Hall - Structural As-Built
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 Surveying

**UW Denny Hall Laser Scan revealed a number of discrepancies with as-built documentation.**
Laser Scanning at HSC J1/J2 Microbiology Renovation:

- **Preconstruction - Verification of existing conditions**
  - Included with bid documents to enhance detail for the demo/installation of new cooling coils beyond 2D prints.
  - Improved accuracy of bid pricing.
HSC J1/J2 Microbiology Renovation Digital Mockup

3D model resolved many constructability issues only possible through an iterative, digital process. The model turned into the fabrication drawings.
HSC J1/J2 Microbiology Renovation Digital Mock-up

Ruggedized Tablets in the Field:

- SAFETY
- QUALITY CONTROL
- PUNCHLIST
- FUTURE – BIM INTEGRATION
Integration of QC & Safety in the Field with the use of Tablets:

- Use of Web-Enabled Project Management Software with iPad, tablet PC, or smart phone
  - Increases Efficiency of recording and tracking issues by eliminating redundancy
  - Software Integrates the entire team into one database – GC, Owner, Subs, Designers
  - Construction Document/Specification at your fingertips

- Current Use at HSC J1/J2 Microbiology Renovation
  - Safety – Complete Daily Safety Audits and Share any Issues with the Entire Team
  - QC – Checklists created in the field to track compliance with the documents and University standards
  - Punch List – Created in the field, shared via email, back punch in the field

- Future – Integration of BIM in the field to facilitate procurement and quality control
UWMC Expansion Project

3D of the UWMC Expansion foundations “before”
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UWMC Expansion Project

3D of the UWMC Expansion foundations “after”
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
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
NE Exterior Perspective
Injury Free Construction: Site Logistics

Sketch Up model used to coordinate site logistics and schedule.
Mass Excavation & Shoring

Topographical survey integrated with building mass excavation for use in:
1. Determining shoring quantities
2. Determining mass excavation quantities
3. Constructability and cost feasibility to team
Quantity Take-offs: Revit through Innovaya into Timberline
50% SD Estimate: Structures

- Highly accurate quantity take-off
- Format allows expedited A/E review & reduces duplication

 Rather than manually completing the quantity take-off for the SD 50% estimate, Lewis added the structural design elements so the model could be utilized for estimating.
Field Investigation During Preconstruction

UWB3/UWB2 As-built confirmation study of existing UWB2 building footings

- Used to locate control points for UWB3
- Confirm new UWB3 footings are coordinated with UWB2 existing footings

UWB3

Revit Model Input

UWB2

2D AutoCAD As-Built
Communication Tools

- Digital Submittals: Bluebeam
- Collaborative Team Site: SharePoint
  - Shared Document Posting
  - Meeting Notices
  - Submittals
  - Progress Photos
  - Site Delivery Coordination
- Remote Meeting Collaboration: GoToMeeting
Innovation and Future Work

- Husky Stadium Renovation: Developer Model
- Husky Baseball Park: Design-Build
- Harborview Hall Demolition: Design – Demolish
- West Campus Housing: GC/CM
It’s all about *our shared future*

A defining moment for the state of Washington
UNPRECEDENTED decline in state funding

- The UW lost 30% of state funding
- Per student funding has been cut to 1990 levels
- Tuition now surpasses state support for the first time
UW is a major part of Washington’s economy

Total Economic Impact for the State of Washington (in billions):

- Direct: $4.0
- Indirect: $5.1
- Total: $9.1

- UW Medicine: 45%
- UW Research: 33%
- UW Operations: 22%
UW creates jobs

69,803 jobs are supported by the UW
- 27,921 direct jobs
- 41,882 indirect jobs

3rd largest employer in state
- Boeing
- Microsoft
- UW

6.1% of the total labor force in Seattle
UW is the state’s best investment

$1.00 in State Investment

$22.56 is generated in the Statewide Economy
EDUCATION matters.

Higher education means opportunity and economic security.

**College-educated citizens:**
- Get jobs
- Stay out of jail
- Don’t rely on social services
- Vote
- Give back to their communities
- Create jobs
UW alumni stay here

- 75% of UW alumni stay in Washington to live, work, and raise families
- Over 213,000 alumni live in Washington — more than the population of Spokane or Tacoma
- #1 “Best state for keeping college grads” — Forbes Magazine, March 2009
We must act. NOW.

Now is the time renew our commitment to solving our toughest challenge in higher education. Our children are worth it, and our economic future depends on it.
UW’s proposal

- Protect state investment in public higher education.

- Allow the University greater capacity to manage its revenues and operations.
You can help by educating others.

- **Make higher education a priority.** We all have a stake in the UW. Our kids are worth it, and our economy depends on it.

- **Protect public funding for higher education.** It’s not about the UW, it’s about a better future for our kids and the state.

- **Allow the UW greater ability** to manage its resources and operations. We are a part of the solution—help us help you.
Working together, we can secure the future of our children and the future of Washington.
Innovation & Integration

Open for Questions/Discussion

Thank you!