Atlantic Team
Spring presentation 7th May 2010

Martin
Engineer

Frank
Engineer

Lauren
Construction Manager

Rith
Engineer

Astrid
Architect

Lena
Construction Manager

Architecture Engineering Construction management
Architecture
Engineering
MEP
Construction
Integrated Project Delivery
University of Wisconsin, Madison, USA
Site is in the middle of:

- Rigid building grid
- Wood
- Lake

Building is a drop in between
### Decision Matrix

<table>
<thead>
<tr>
<th></th>
<th>The Link (Concrete)</th>
<th>The Link (Steel)</th>
<th>Corn Silos (Concrete)</th>
<th>Water Rings (Steel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Simplicity of Structural Design</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Sustainability</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Site Disturbance</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Costs</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Symmetry</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Length of Schedule</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>IPD</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Feeling</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Owners Preference</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>20</strong></td>
<td><strong>21</strong></td>
<td><strong>38</strong></td>
<td><strong>32</strong></td>
</tr>
</tbody>
</table>
A drop in water

Water Science and Engineering lab

Grand view towards lake

Access tower

Slanted facades
Increase SqFt

Atrium
Ventilation and light

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Storage 500/530SqFt
Auditorium 2000/1870SqFt

Economic efficiency

A → MEP
Auditorium
2000/1870SqFt

MEP 0/60SqFt

Restrooms 0/150SqFt

Large classroom

800/600SqFt

Student offices

1200/1300SqFt (300 shared space)

Server room

800/160SqFt

Technical support

100/80SqFt

Sustainable reuse

C → A
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Floorplan Second Floor

- MEP 0/70 SqFt
- Restrooms 0/160 SqFt
- Instructional lab 2000/1400 SqFt
- Student offices 1200/1300 SqFt (300 shared space)
- Small classroom 2000/1700 SqFt
- Seminar rooms 200/150 SqFt

Economic efficiency
Sustainable performance
Floor plan
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- MEP 0/75SqFt
- Restrooms 0/210SqFt
- Faculty offices 3600/3000SqFt
- Head chair office 300/350SqFt
- Senior adm. Offices 300/150SqFt
- Adm. Assistants 75/70SqFt
- Faculty lounge 1000/2300SqFt

Efficient use of space
Sustainable performance
Foster nearby environment

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A E MEP C Section AA

44' 0"
37' 6"
23' 11"
11' 10"
0' 5"
-9' 9"

30'
Sustainable interaction
Economic efficiency
Economic efficiency
Sustainable performance
Concrete with wave pattern
Green wall with local plants
Architecture
Engineering
MEP
Construction
Integrated Project Delivery
- Dead Loads
  - Composite Slab → 45 psf
  - roof → 15 psf
  - MEP, ceiling, cladding → 30 psf
  - façade elements → 55 psf

- Live Load
  - 100 psf

- Snow Load
  - 20 psf

- Wind Load
  - 26 psf

- Earth pressure
Water Table & Height Requirement

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Raft foundation 2'

Water Table
Trusses for radial beams:
- Increased clear height
- Improved energy efficiency

Variable radial beam size:
- Save 1’ height per floor
- Less costly than trusses

Remove 4 inner columns:
- Increase aesthetic value
- Improve circulation

Evolution of Gravity System
- Increased flexibility
- Effective use of resources
- Create mix uses

Effective sustainable architecture
Concrete Shear Wall
• Moment Frames: Inner Ring Beams & Outer Ring Beams
• Concrete Shear Wall
• Moment Frames: Inner Ring Beams

Create Mix Uses
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Composite Columns
→ HSS 14x0.625

Inner ring beams
→ HSS16x12x5/8
→ 12”x12” Concrete
Composite columns
→ HSS14x0.625

Radial beams
→ W24x55/ W12x58

Inner ring
→ HSS16x12x5/8
→ 12”x12” Concrete

Outer ring
→ W14x26

Filler beams
→ W12x26/ W16x36

Shear walls
→ 8”
Composite columns
→ HSS14x0.625

Radial beams
→ W24x55 / W12x58

Inner ring
→ HSS16x12x5/8
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→ W14x26

Filler beams
→ W12x26/ W16x36

Shear walls
→ 8”
- Maximum deflection for the radial beams: \( \frac{L}{240} \approx 2.1'' \)

- Maximum deflection for the columns: \( 0.02h \approx 12'' \)
Maximum deflection of 2.3” > 2.1”

→ 1.5” cambering

Economic Efficiency
Effective use of resources
Radial beam
W24x55

Small radial beam
W 12x58

Composite column
HSS14x0.625

→ beam reduction for MEP

Economic Efficiency
Effective use of space
Architecture
Engineering
MEP
Construction
Integrated Project Delivery
Control Variable Air Volume System (VAV):

- Controllable room temperature.
- Energy efficient: could be turned off in any room, when not in use.

Heating and Cooling Facility:

- West Campus Cogeneration Facility.
- University Central Heating and Cooling System.
Second Floor

Third Floor
• Total Cooling Air Flow: 19,000 CFM
• Largest Ducts:
  - 1.5’ x 1.5’ (First Floor)
  - 19” Diameter (Second and Third Floor)
Wall/Window Recommendation:

• Heavy Concrete 6” (2%)
• U21 3 Piece Glass with Argon(22%)
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Engineering
MEP
Construction
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Site Logistics Plan

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Lake

Parking lot

Forest

Library

The only access
Just-in-Time Delivery

- Optimized scheduling of material delivery
- Reduced on-site storage space

Reduction in:
- Site Disturbance and Material Waste

Diagram showing reduced storage areas:
- 200x50 ft
- 90x40 ft
Mobile vs. Tower Crane
- Small site forces use of tower crane
The site

Steel

Ready-mix concrete

<table>
<thead>
<tr>
<th>Material</th>
<th>Distance</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>8 miles</td>
<td>17 min</td>
</tr>
<tr>
<td>Ready Mix Concrete</td>
<td>7 miles</td>
<td>17 min</td>
</tr>
<tr>
<td>Precast Concrete</td>
<td>62 miles</td>
<td>1 h 13 min</td>
</tr>
<tr>
<td>Doors</td>
<td>81 miles</td>
<td>1 h 34 min</td>
</tr>
<tr>
<td>Windows</td>
<td>89 miles</td>
<td>1 h 43 min</td>
</tr>
</tbody>
</table>

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Material transportation route

Minimal Transportation

A E MEP C Material transportation route
Prefabricated Wall Panels
- Double layered wall construction with insulation
- Reduced on-site construction time
- Reduced site congestion

Local Precast Manufacturer strongly recommended against pre-installing the windows in the panels – too difficult to safely transport
Black circles represent export files
MODIFICATION

Black circles represent export files

Error: Unspecified error
Source: Microsoft OLE DB Provider for ODBC Drivers
Description: [ATI][OpenRDA ODBC]Invalid statement: insert statement.
Error returned from engine: VDB.Insert; hResult=0x80040030
(PMSDK_E_NOTNULL: missing required value for field);
EOleSysError=Insert new CALENDAR: Values are required for day_hr_cnt,
week_hr_cnt, month_hr_cnt, year_hr_cnt
Error number: 0x80040030

Navisworks

REVIT

Excel

Vico Control
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Final BIM Integration Plan

Tocoman iLink4 for Autodesk Revit 2010

Vico Control 2009 - Atlantic Team - Wisconsin (LS Schedule_v3.050410.dpp) - [Design mode]

Atlantic Team - Wisconsin (LS Schedule_v3.050410.dpp): Flowline view

Atlantic Team - Wisconsin (LS Schedule_v3.050410.dpp): Gantt view

Detailed Cost

Cost - Labour

Cost - Equipment

56
0.44

0.4
0.87

0.12
0.01

47
6.05

A E MEP C Final BIM Integration Plan
TOTAL COST: $7.3 Million

High Cost Items:
* Structural System - $430,000
* Precast Wall Panels - $270,000
* Curtainwall - $360,000
* Windows - $141,000
Foundation:
Finished: Week 7
(06/22/15)

Steel Erection:
Finished: Week 11
(07/14/15)

Weather Tight:
Finished: Week 21
(10/22/15)

Total Duration:
10.5 months
(05/01/15 to 03/11/16)
Architecture
Engineering
MEP
Construction
Integrated Project Delivery
Team Communications

- Zero Email Policy (Minor exception = Renate and owners)
- Communication: Google Wave (Discussion), Dropbox (file sharing), Wiki (Information/Decisions)
- Weekly Group Meetings: GoToMeeting (Skype as backup), Recall
- Rotating Schedule for the Facilitator and Recorder
- Regular Meetings with Owners
- Weekly 'Visible' Meetings: to be available for online interaction, discussions and questions
- Individual Team Member Waves: to provide daily updates on progress and notification of files added to Dropbox or wiki
- Web 3.0: Teleplace – Model Clash Detection

AEC MEP Integrated Project Delivery
Integrated Project Delivery (IPD) is a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction.

- AIA California Council '07

OUR APPROACH

- Track Progress
  - Transparency of Task Completion
- Successful Completion of Project Requirements
  - Optimized Collaborative Scheduling

Atlantic team
### Winter Quarter Review

#### Circular Flow of Activities

<table>
<thead>
<tr>
<th>Architect</th>
<th>Engineers</th>
<th>Construction Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Continuous Process

- Finalize Concept A
- Plans of Concept A
- Concept A Sketching
- Circular Flow of Activities
# SPRING QUARTER

## 1. EXCEL Checklist

<table>
<thead>
<tr>
<th>Activity</th>
<th>By Whom</th>
<th>Estimated Finish Date</th>
<th>Actual Finish Date</th>
<th>Estimated Hours to Complete</th>
<th>Actual Hours to Complete</th>
<th>Hours Accuracy</th>
<th>Reason for Delay?</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facades in Revit</td>
<td>Astrid</td>
<td>07-Apr-10</td>
<td>15-Apr-10</td>
<td>3.0 hours</td>
<td>45.0 hours</td>
<td>Under Estimated</td>
<td>Revit, had to learn the programme, and it's very</td>
<td>YES</td>
</tr>
<tr>
<td>Preliminary Estimate &amp;</td>
<td>L &amp; L</td>
<td>08-Apr-10</td>
<td>30-Apr-10</td>
<td>10.0 hours</td>
<td>45.0 hours</td>
<td>Under Estimated</td>
<td>Learning Programs, Software Glitches</td>
<td>YES</td>
</tr>
<tr>
<td>Inner walls, stairs etc in Revit</td>
<td>Astrid</td>
<td>09-Apr-10</td>
<td>14-Apr-10</td>
<td>5.0 hours</td>
<td>16.0 hours</td>
<td>Under Estimated</td>
<td>Actually went a bit faster than expected, but had to change</td>
<td>YES</td>
</tr>
<tr>
<td>Run Energy Simulation</td>
<td>Rit</td>
<td>10-Apr-10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Detailed Sizing of Gravity System</td>
<td>Frank &amp; Martin</td>
<td>11-Apr-10</td>
<td></td>
<td>5.0 hours</td>
<td></td>
<td></td>
<td>We are still working on this. Hopfully we finish on April 30</td>
<td>NO</td>
</tr>
<tr>
<td>Detailed Sizing of LL Resisting System</td>
<td>Frank &amp; Martin</td>
<td>11-Apr-10</td>
<td></td>
<td>5.0 hours</td>
<td></td>
<td></td>
<td>We are still working on this. Hopfully we finish on April 30</td>
<td>NO</td>
</tr>
</tbody>
</table>

Transparency of tasks
Inadequately shows team interactions
2. Re-Tried Vico Control

- Time Consuming to Create
- Unable to Visualize Detailed Interaction Between Tasks and Individuals
- Difficult to Read with Large Number of Tasks
- Does NOT Track As-Built Tasks Easily
3. EXCEL Chart

- Transparency of tasks
  - Inadequately shows team interactions
- Hatched Coloring for Completed Tasks
- Shows parallel tasks
- Still inadequately displays team interaction
- Does NOT capture sequential or reciprocal tasks

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SPRING QUARTER

4. VISIO Flow Chart

Diamond for Intermediary, Discipline Specific Milestone

Thick Border for Completed Tasks

Red Lines For Potential Reciprocal Tasks
SPRING QUARTER

Architecture Hours

- Estimated Hours to Complete
- Actual Hours to Complete

- WQ Project Documentation
- Meeting: David Bendet
- Document mtg: David Bendet
- Exterior Modeling REVIT
- Interior Modeling REVIT
- Sections
- Sustainable Lighting Details
- Floorplans
- Detail of Facade, Living Wall etc
- Visuals
- Site
- Context
- References
- Concept

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Our IPD Journey
Trends Discovered:
1. Many tasks scheduled as sequential were forced to become parallel due to the fast-track nature of the project and increased interaction among disciplines.
2. Between April 6th and 11th, tasks took a LOT longer than expected.
3. Visual representation of progress interaction is limited to larger, broader tasks to avoid clutter.

Our Journey
SPRING QUARTER

IPD Lessons Learned:

- Establishing an extensive TO-DO list at the beginning helps to reinforce and clarify project requirements.

- Nothing goes as originally planned – instead, it is important to always know what still needs to be finished and to constantly replan...and then replan again.

- Planning estimated finish dates should incorporate many iterations of design.
IMPROVEMENTS FROM WINTER QUARTER

• Level of communication
• Greater bonding
• Communicated in shorter intervals
• Greater interaction with mentors
LESSONS LEARNED

• Just-in-time sequencing of tasks.
• Direct communication makes everything clearer.
• Be more understanding and open-minded to new ideas.
• Communicating across disciplines with a common language.
Thank you!

Terima Kasih!

Ar kun!

Thank you!

Tak!

Vielen Dank!

Tack!