ATLANTIC 13
SPRING PRESENTATION 5/10
Climate conditions

Atlantic
Atlantic Snow conditions

(inches)

<table>
<thead>
<tr>
<th>Month</th>
<th>Snowfall (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>10.9</td>
</tr>
<tr>
<td>Feb</td>
<td>7.9</td>
</tr>
<tr>
<td>Mar</td>
<td>8.1</td>
</tr>
<tr>
<td>Apr</td>
<td>2.5</td>
</tr>
<tr>
<td>May</td>
<td>0</td>
</tr>
<tr>
<td>Jun</td>
<td>0</td>
</tr>
<tr>
<td>Jul</td>
<td>0</td>
</tr>
<tr>
<td>Aug</td>
<td>0</td>
</tr>
<tr>
<td>Sept</td>
<td>0.3</td>
</tr>
<tr>
<td>Oct</td>
<td>0</td>
</tr>
<tr>
<td>Nov</td>
<td>10.6</td>
</tr>
<tr>
<td>Dec</td>
<td></td>
</tr>
</tbody>
</table>

Wind speeds (km/h):
- 0-10 km/h
- 10-20 km/h
- 20-30 km/h
- 30-40 km/h
- Over 40 km/h

Wind directions:
- North
- South
- East
- West

Wind hours:
- 0-10 hours
- 10-20 hours
- 20-30 hours
- 30-40 hours
- Over 40 hours

Legend:
- Green: Snowfall
- Blue: Wind direction
- Purple: Wind speed
- Black: Wind hours
### Decision Matrix

<table>
<thead>
<tr>
<th>Economic</th>
<th>boat</th>
<th>steel</th>
<th>wood</th>
<th>steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>construction</td>
<td>building costs</td>
<td>10,00%</td>
<td>62</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>prefabrication</td>
<td>18,00%</td>
<td>71</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>short schedule</td>
<td>13,00%</td>
<td>74</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>room program</td>
<td>15,00%</td>
<td>77</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>flexibility</td>
<td>17,00%</td>
<td>81</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>constructability</td>
<td>22,00%</td>
<td>75</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>challenging structure</td>
<td>5,00%</td>
<td>75</td>
<td>68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ecologic</th>
<th>boat</th>
<th>steel</th>
<th>wood</th>
<th>steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>nature impact</td>
<td>reliability on structure</td>
<td>27,00%</td>
<td>67</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>environmental friendly structure</td>
<td>37,00%</td>
<td>86</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>natural material</td>
<td>36,00%</td>
<td>87</td>
<td>57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social</th>
<th>boat</th>
<th>steel</th>
<th>wood</th>
<th>steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>building quality</td>
<td>indoor quality</td>
<td>30,00%</td>
<td>85</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>fresh air ventilation</td>
<td>25,00%</td>
<td>87</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Natural Lightning</td>
<td>27,00%</td>
<td>80</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>natural views</td>
<td>18,00%</td>
<td>80</td>
<td>86</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Collaboration</th>
<th>boat</th>
<th>steel</th>
<th>wood</th>
<th>steel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>collaboration space</td>
<td>15,00%</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>atrium</td>
<td>18,00%</td>
<td>74</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>connection between interior &amp; exterior</td>
<td>25,00%</td>
<td>80</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>connection to the hill</td>
<td>15,00%</td>
<td>78</td>
<td>73</td>
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<tr>
<td></td>
<td>inside experience</td>
<td>20,00%</td>
<td>91</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>representation of University</td>
<td>7,00%</td>
<td>88</td>
<td>87</td>
</tr>
</tbody>
</table>

The total sum for wood is 78,35, for steel is 75,54 for boat, and 73,57 for wave.
Frog in a pan
**Value for money**

**To WHOM are we bringing value?**

- Chin, CEE Professor
  - Home office in this building
  - Researches fluid dynamics & lake ecosystems

- Carol, CEM Professor
  - Home office elsewhere, teaches classes here
  - Researches energy consumption and occupants’ impacts

- Tyler, CEE Graduate Student
  - Holds office hours here

- Nolan, CEE Undergraduate Student
  - Has classes here

- Kyle & Melissa
  - Future Badgers
**WHAT** values are we bringing?

- User perspectives
- Low Life-cycle costs

**HOW** are we bringing them?

- Trade-offs and value engineering
Leapfrog & Value for money

DeVap System

Smart System
- Living Laboratory
- Utilities Contract

LCC-TVD
- User Perspectives
- BIManywhere
Location

Muir Woods
Muir Knoll viewing platform

To the campus
Flow of students

Atlantic - ARCH
Program schematics

- faculty offices
- senior offices
- department chair's office
- assistants
- study offices
- seminar rooms
- large classrooms
- small classrooms
- instructional labs
- server room
- tech. support
- storage room
- entrance
- auditorium
- administration
- education
- experiment
- student
- storage
Floor distribution

- seminar room
- student office
- meeting space
- faculty office
- instructional lab
- collaboration space
- hall
- storage
- toilets
- MEP room
- auditorium
- large classroom
- small classroom
Multipurpose stairs
Second floor

- hall
- storage
- toilets
- instructional lab
- collaboration space
- auditorium
- large classroom
Open collaboration space
Virtual reality

Atlantic - ARCH
Touch transparent walls
West view
Meeting spot
Collaboration space
Roof terrace

Atlantic - ARCH
Roof garden

Atlantic ARCH
Structural engineering
### Loads

<table>
<thead>
<tr>
<th>Floor</th>
<th>Live (psf)</th>
<th>Dead (psf)</th>
<th>Snow (psf)</th>
<th>Wind (kip)</th>
<th>E (kip)</th>
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</thead>
<tbody>
<tr>
<td>Roof (Assembly)</td>
<td>100</td>
<td>45</td>
<td>23.1</td>
<td>24.45</td>
<td>21.97</td>
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<tr>
<td>Roof</td>
<td>20</td>
<td>45</td>
<td>23.1</td>
<td>24.45</td>
<td>21.97</td>
</tr>
<tr>
<td>3rd floor</td>
<td>57.82</td>
<td>45</td>
<td></td>
<td>46.96</td>
<td>19.34</td>
</tr>
<tr>
<td>2nd floor</td>
<td>68.27</td>
<td>45</td>
<td></td>
<td>45.48</td>
<td>9.67</td>
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<tr>
<td>1st floor</td>
<td>84.45</td>
<td>45</td>
<td></td>
<td>22.74</td>
<td></td>
</tr>
</tbody>
</table>

- **Load cases**
  - 1.4D
  - 1.2 D + 1.6L
  - 1.2 D + 1.6L + 0.8W
<table>
<thead>
<tr>
<th>Arch</th>
<th>MEP</th>
<th>CM</th>
<th>SE</th>
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<tbody>
<tr>
<td>Aesthetics</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Strength</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Stiffness</td>
</tr>
<tr>
<td>(compared to</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Stiffness</td>
</tr>
<tr>
<td>the truss)</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Stiffness</td>
</tr>
<tr>
<td>Truss</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Strength</td>
</tr>
<tr>
<td>Open Web Joist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aesthetics</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Stiffness</td>
</tr>
<tr>
<td>(compared to</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Stiffness</td>
</tr>
<tr>
<td>the truss)</td>
<td>✓ Duct Penetration</td>
<td>✓ Constructability</td>
<td>✓ Stiffness</td>
</tr>
<tr>
<td>Wood Beam</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arch</td>
<td>MEP</td>
<td>CM</td>
<td>SE</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
<td>---------------------------</td>
<td>------------------------------</td>
</tr>
</tbody>
</table>
| Wood I Beam         | Aesthetics (compared to wood joist) | Duct Penetration | Constructability | Strength
|                     |                |                           | Stiffness | Dimension |
| Wood Joist          | Aesthetics ✔   | Duct Penetration ✔        | Constructability ✔           | Strength
|                     |                |                           | Stiffness | Dimension |
| Exposed Connection  | Aesthetics ✔   |                           | Constructability ✔           | Strength
|                     |                |                           | Stiffness | Dimension |
| Hided Connection    | Aesthetics ✔   |                           | Constructability ✔ (compared to the exposed connection) | Strength
|                     |                |                           | Stiffness | Dimension |
Load path

Atlantic SE
Floor Plan

1st Level

- Column 15”X15”, Glulam
- Truss 3 1/2’ Deep, Glulam (Top/Bottom Chord 6”X8”, Web 5”X6”)
- Joist 6 3/4”X7 1/2”, Glulam
- Shear Walls 8” Thick, Glulam

Large Classroom
Auditorium
2nd Level

- Column 15”X15”, Glulam
- Truss 3 1/2’ Deep, Glulam (Top/Bottom Chord 6”X8”, Web 5”X6”)
- Auditorium Truss 6’ Deep, Glulam (Top/Bottom Chord 6”X8”, Web 5”X6”)
- Joist 6 3/4”X15”, Glulam
- Auditorium Joist 3 1/8”X7 1/2”, Glulam
- Shear Walls 8” Thick, Glulam
3rd Level

- Column 15”X15”, Glulam
- Truss 3 1/2’ Deep, Glulam (Top/Bottom Chord 6”X8”, Web 5”X6”)
- Auditorium Truss 6’ Deep, Glulam (Top/Bottom Chord 10”X12”, Web 5”X6”)
- Joist 6 3/4”X15”, Glulam Auditorium Joist
- 3 1/8”X7 1/2”, Glulam Shear Walls 8” Thick, Glulam Shear Walls
Coordination Between SE and Arch

• The structural column is in front of the door
• Realize the architectural design was not updated
Coordination Between SE and MEP

- Select truss to enable MEP ducts can go through
- Negotiate the dimension of truss and allocation of ducts

Typical Joist 6 3/4”X15”, Auditorium Joist 3 1/8”X7 1/2”
Top/Bottom Chord 6”X8” on 1st & 2nd Floor, 10”X12” on 3rd Floor
Diagonal Web 5”X6”
Duct 12”X12”

8’ 6” on 1st and 2nd Floor
9’ on 3rd Floor
### Typical Framing

- **Joist**: 6 3/4”X15”
- **Truss Chord**: 10”X11.5”
- **Truss Diagonal**: 6”X8”
- **Column**: 15”X15”

### Framing Above Auditorium

- **Joist**: 3 1/8”X7 1/2”
- **Truss Chord**: 10”X11.5”
- **Truss Diagonal**: 5”X6”
- **Column**: 15”X15”
Etabs Analysis

- 3D Structural Model
- Gravity system
- Lateral resistance system
ETABS Results

<table>
<thead>
<tr>
<th>Element</th>
<th>Deflection (in)</th>
<th>Limit (in) D+L/240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truss 32´</td>
<td>1.46</td>
<td>1.6</td>
</tr>
<tr>
<td>Truss 58´</td>
<td>1.91</td>
<td>2.9</td>
</tr>
</tbody>
</table>
### Structural Analysis

<table>
<thead>
<tr>
<th>Element</th>
<th>Axial Load (kips)</th>
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<tbody>
<tr>
<td>Interior Column</td>
<td>271</td>
</tr>
<tr>
<td>Exterior Column</td>
<td>166</td>
</tr>
<tr>
<td>Brace (T)</td>
<td>67</td>
</tr>
<tr>
<td>Brace (C)</td>
<td>58</td>
</tr>
<tr>
<td>Top Chord (C)</td>
<td>155</td>
</tr>
<tr>
<td>Bottom Chord (T)</td>
<td>133</td>
</tr>
</tbody>
</table>
Structural Analysis

- Shear Wall
- Crosslam 8”
- $F_{\text{max}} = 270k$
- $V_{\text{max}} = 68.25k$
- $F_v = 0.175$ ksi
- $F_c = 2.75$ ksi
Connections

- Beam-truss connection
- A490 2 bolts d= 5/8"
- Angle L 5x5x 5/16 (Shear)
- Rn = 15 kips per bolts
- Bolts in shear
• Truss Connections
• 4 bolts A490 d= ¾”
• L 5x 3x 5/16
• Rn bolts = 27.8 kips
• Bolts in shear and tension
Connections

- Truss Connection
- 7 bolts A490 d= 3/4”
- 5/8” plate
- Rn= 27.8 kips
- Bolts in shear and tension
• Truss-Column
• 8 bolts A490 d= ¾”
• L 5x 3x 5/8
• Rn bolts = 27.8 kips
• Bolts in shear
Cross Lam 2 ½”-Structure

- Cross-layered construction
- Reduce carbon footprint
- Ready to assemble system

Finish 1 ½”

- Wear Layer
- Paper Layer
- Balance Layer
Mat Foundation

8” Shear Wall

4’X4’X1’Base

2’ Foundation Slab

0’ Fill
6.5’ Fill
10’ Fill
30’ Silty Clay

Soil Profile
Max Soil Load: 520 KSF
Max O. Moment: 12.5 k·ft/ft
Design | Collaboration | CM | LCFM | Workflow | Challenges

MEP engineering
Chilled Beams

- Lower fan energy
- Wider comfortable temperature range

VAV in spaces with high flux

- Reacts to changes quicker than chilled beams
- Underfloor in auditorium
• DeVap system
  • Remove humidity with desiccant
  • Cool evaporatively
  • New technology studied by NREL
  • Possible link to solar thermal
MEP System – Hydronic System
STV – Energy Modeling

Performance Relative to Life Cycle Impact Targets

<table>
<thead>
<tr>
<th>Impact</th>
<th>Target</th>
<th>Project</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon (kgCO2e)</td>
<td>6,737,582</td>
<td>14,960,913</td>
<td>222%</td>
</tr>
<tr>
<td>Energy (MJ)</td>
<td>158,937,616</td>
<td>235,431,004</td>
<td>148%</td>
</tr>
<tr>
<td>Water (kgH2O)</td>
<td>276,291,000</td>
<td>207,569,384</td>
<td>75%</td>
</tr>
<tr>
<td>Ozone (kgCFC11ɛ)</td>
<td>-</td>
<td>8.75E-01</td>
<td>-</td>
</tr>
</tbody>
</table>

Winter Quarter STV: Too High
Existing technologies - Savant
Existing technology - Nest
Existing technology – Gira
Smart system scheme

Sensors (temperature, air flow, humidity, sound, video, wireless devices, air pressure, etc)

Switches (shading, light, power, whiteboards, projectors, sound devices, etc)

Local central units

Main control room with server

Administrative web interface

Smartphone interface

Remote PC control

Administrator

Employee

Student

Professor

Visitor
We save up to 17% or $330,000 in 25 years in overall utility and maintenance with this system.
Saving power
Personalized system

5 minutes per task = 87.5 hours per year
25 years and 200$ per hour = $437,500
Floor Sandwich
Facade
Winter presentation facade
EcoClad

- Durable
- UV protection
- 15-year warranty
- Based in Madison
- FSC-Certified recycled fiber
Façade

Winter quarter
Curved in horizontal and vertical direction

Spring quarter
Curved only in vertical direction

Prefabrication
Limited to 6 different types – 3 ways of curving and 2 materials

1st floor Elements
2 types

2nd floor Elements
2 types

3rd floor Elements
2 types

4’ wide

12’ high
Over 17% Savings in O & M
2% Savings in rental payments per year
(lowered by $5,400.00 per year)
Construction Impacts, GWP

GWP, kgCO₂e

Construction Impacts, GWP

More Glass  Less Glass

- MEP
- Structure
- Façade
- Floors, Roof, Interiors
Use Phase Impact, GWP

More Glass  Less Glass

Thermal Energy  Electricity Use

GWP, kgCO2e

0  500000  1000000  1500000  2000000

Aesthetics & views // Energy & first cost impacts
Road access

- **Small road**
- **30 ft wide road**
- **50 ft wide turnabout**
- **20 ft wide road**
- **Steep and narrow turn**
- **Bump-out for trucks**
- **SITE**

Colors:
- Yellow - Critical
- Red - Avoid
- Green - Ok
**Cat 320D L Hydraulic Excavator**

Net Flywheel Power 148.0 hp
Operating Weight 44820.0 lb

**Price**
850 USD/day  
2300 USD/week

**Cat 226B Series 3 Skid-Steer Loader**

Net Flywheel Power 56.0 hp
Rated Operating Capacity 1500.0 lb

**Price**
200 USD/day  
600 USD/week

**Truck mounted concrete pump M 42-5**

140m³/h
<table>
<thead>
<tr>
<th></th>
<th>Mobile</th>
<th>Tower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Flexibility</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Mobilization</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Operation speed</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Space needed</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

Conclusion: Mobile crane chosen

LTM 1090-4.1

Max. lifting capacity 179’ lbs at 8 ft rad.
Telescopic boom 36 ft - 164 ft
Radius needed 145 ft
Foundation
Mat foundation with concrete footings
**Columns**
Temporary support needed to hold columns in place
Trusses and joists
Stabilize the structure with trusses, joists and shear walls
Finalize
Continue on with trusses, joists, walls and floors
Erection sequence

Furthest Pick
Curved column in top corner

Heaviest Picks
Curved columns - 2 kilopound
• (4d video)
Atlantic CM

Production Strategy - Material suppliers

**Ecoclad, Facade elements**

- **Distance:** Madison area
- **Estimated Time:** -

**ACH Foam Technologies, Wood**

- **Distance:** 72.2 miles
- **Estimated Time:** 1 hour 19 min

*Distances marked: 75 miles, 350 miles*
Interior Wall—N-Wall

Alternatives to traditional drywall

- Reusable
- Lightweight
- Moveable
- Easy configuration
- Minimal workplace disruption
- Acoustically sound
Production Strategy - Prefabrication

- 3’ and 5’ high trusses
- CLT shear wall elements
- 36’ glulam columns
- Glulam joists
BIM - File Hierarchy

0. BIM
1. ARCH
2. SE
3. MEP
4. LCFM
5. CM
   Archive
   (etc.)

3dicc
Arch
CM
MEP
Navisworks
SE
Clash Detection – 3DICC
Clash Detection – Navisworks

- Model integration
- Clash detection tests
- Setting rules to approve logical clashes
- Saved viewpoints with comments
- Clash detection meetings
- Clashes resolved
MEP Ducts going through trusses; trusses; Trusses webs are sticking out.
BlManywhere – QR Code

Atlantic CM
<table>
<thead>
<tr>
<th></th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
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<tbody>
<tr>
<td>General Conditions</td>
<td>M1</td>
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<td></td>
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<tr>
<td>Substructure</td>
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<tr>
<td>Shell Enclosed</td>
<td></td>
<td>M3</td>
<td></td>
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<tr>
<td>Inter. and Serv.</td>
<td></td>
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<td>M4</td>
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<tr>
<td>Commissioning</td>
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</tbody>
</table>

Money assigned to water resistant coating on all wood

Total of 12.1” of rain during shell erection
Schedule

Critical time during construction

- **1.4** Services
  - 1st floor services
    - HVAC: 15 days
    - Air handling unit: 10 days
    - Pumps: 5 days
    - Electricity: 10 days
    - Plumbering: 5 days
    - Elevator: 5 days
  - 2nd floor services
    - HVAC: 15 days
    - Electricity: 10 days
    - Plumbering: 5 days
    - Elevator: 5 days
  - 3rd floor services
    - HVAC: 25 days
    - Electricity: 10 days
    - Plumbering: 5 days
    - Elevator: 5 days
  - Roof
    - Elevator: 5 days
    - Solar panels: 5 days
- **1.5** Interiors
  - 1st floor interiors
    - Internal walls: 15 days
    - Wall painting: 10 days
    - Flooring: 10 days
    - Tiling: 2 days
  - 2nd floor interiors
    - Internal walls: 15 days
    - Wall painting: 10 days
    - Flooring: 10 days
    - Tiling: 2 days
  - 3rd floor interiors: 55 days
- **1.6** Interiors
  - 1st floor interiors
    - Internal walls: 15 days
    - Wall painting: 10 days
    - Flooring: 10 days
    - Tiling: 2 days
  - 2nd floor interiors
    - Internal walls: 15 days
    - Wall painting: 10 days
    - Flooring: 10 days
    - Tiling: 2 days
  - 3rd floor interiors: 55 days
- **1.7** Interiors
  - 1st floor interiors
    - Internal walls: 15 days
    - Wall painting: 10 days
    - Flooring: 10 days
    - Tiling: 2 days
  - 2nd floor interiors
    - Internal walls: 15 days
    - Wall painting: 10 days
    - Flooring: 10 days
    - Tiling: 2 days
  - 3rd floor interiors: 55 days
- Less prefabrication of shell
- Services and Interiors will take longer

Still make it in time, **finished 25th of April 2016**
<table>
<thead>
<tr>
<th></th>
<th>ESTIMATED VALUE</th>
<th>TARGET VALUE</th>
<th>VALUE DELTA</th>
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<tbody>
<tr>
<td><strong>A Substructure</strong></td>
<td>$433,980</td>
<td>$594,000</td>
<td>$160,020</td>
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<td><strong>B Shell</strong></td>
<td>$2,301,423</td>
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<td><strong>C Interiors</strong></td>
<td>$1,359,123</td>
<td>$1,210,091</td>
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<td><strong>E Specialty Construction</strong></td>
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<td><strong>F Building Sitework</strong></td>
<td>$455,000</td>
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<td>$185,636</td>
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<td><strong>G General Conditions</strong></td>
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<td><strong>TOTAL</strong></td>
<td>$7,860,496</td>
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**Wood with Active Chilled Beams**

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<th>TARGET VALUE</th>
<th>VALUE DELTA</th>
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<td><strong>C Interiors</strong></td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>$8,369,493</td>
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Design | LCFM | Workflow | Challenges

→ Cash flow
## Combining TVD and LCC

### Category: C. Interiors

#### Interior Walls
- **Room**: N-Vol
  - Unit: LF
  - Total Cost: $150.00

- **Office**: Movable Walls
  - Total Cost: $160.00

#### Interior Doors
- **CD20100100**: Single-Glass, 66” x 84” (23% for glass)
  - Total Cost: $39

- **CD20100110**: Double-Glass, 72” x 84” (25% for glass)
  - Total Cost: $19

- **CD20100100**: Single-Flush, 36” x 84”
  - Total Cost: $3

#### Other
- **Mold Protection of Wood**: Total Cost: $10

### Category: Stair Construction
- **C2010100590**: Stair, CP concrete, flooring, 20 risers, 2 nosing
  - Total Cost: $133.876

### Category: Wall Finishes
- **SF6**: 95% paint, 5% ceramic tile
  - Total Cost: $3.11

### Category: Floor Finishes
- **General Spaces**: Hardwood
  - Total Cost: $10.00

#### Toilet Finishes
- **Floor Finish**: Tiles
  - Total Cost: $8.37

#### MEP Rooms
- **Floor Finish**: Tiles
  - Total Cost: $8.37

### Target Value Calculation
- **Original TVD**: $1,212,966
- **Atlantic Team**: $1,210,000

**Value Delta**: $(32,966)
### Combining TVD and LCC

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>LINE ITEM DESCRIPTION</th>
<th>COST DATA</th>
<th>LIFE EXPEC.</th>
<th>O &amp; M</th>
<th>QUANTITY</th>
<th>UNIT</th>
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<tr>
<td>C. INTERIORS</td>
<td></td>
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<td><strong>Interior Doors</strong></td>
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<td>Ea</td>
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<td>574</td>
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<td>SF p103</td>
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<td>p321</td>
<td>Hard wood</td>
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<td>Toilets</td>
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<tr>
<td>p314 (3255)</td>
<td>Tiles</td>
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<td>$ 4.43</td>
<td>1.94</td>
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<td>MEP rooms</td>
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<td></td>
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<tr>
<td>p314 (3255)</td>
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<td>S.F</td>
<td>$ 4.43</td>
<td>1.94</td>
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<td><strong>C3030 Ceiling Finishes</strong></td>
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Inserting new columns (linked to facility management database)
TVD is combined with LCC and gives first impression of future O & M Costs
Atlantic - LCFM

Cash Flow

Cash Flow Cumulated

Break Even

Expenses  Income  Cash Flow Cumulated
Rent

Atlantic

Savings over 17 %
Cash Flow

Atlantic - LCFM

PPP Rent
Income
Replace
Risk charge
Expenses
Atlantic - LCFM

Loan structure

$7,000,000.00

$6,000,000.00

$5,000,000.00

$4,000,000.00

$3,000,000.00

$2,000,000.00

$1,000,000.00

$0.00

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

loan
DSCR
LLCR
DSCR required

Atlantic - LCFM

Loan structure
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<tr>
<td>Water Efficiency</td>
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<tr>
<td>Energy &amp; Atmosphere</td>
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<tr>
<td>Material &amp; Resources</td>
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<tr>
<td>Indoor environmental Quality</td>
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</tr>
<tr>
<td>Innovation &amp; Design Process</td>
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<tr>
<td>Sum</td>
<td>72</td>
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</table>
Utilities Sharing Contract

Typical Practice

- Predicted vs. actual energy not reliable
- Split incentives for utilities

Leapfrogging:

- Heavily monitor energy use
- Share profit/loss on utilities

Target Value

- Shared Profit
- Shared Loss

Shared Profit
Rent Charge Alternatives
USD/yr x000

With Contract
Without Contract

- 20% risk on energy performance
- $5,000/yr utilities
- $25,000/yr carbon tax
Utilities Sharing Contract

Stipulations

• Tenant only responsible for occupant & plug loads
  • Heavy commissioning of building envelope and equipment

• Ownership team will educated occupants

• 5-yr rampup period
  • “Target” starts high, decrease gradually to modeled value
Team Process Development

Atlantic
Team Meetings

General Communication

Video Calls

Team Meetings

Screen sharing

Sketching

Task assignment

Organization

Note Taking

Brainstorming

File Sync

Commenting
The startup

Atlantic ARCH
<table>
<thead>
<tr>
<th>Hardware</th>
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<th>price ($)</th>
<th>total ($)</th>
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<td>wifi router/access point</td>
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<td>1,750</td>
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<tr>
<td>central computer</td>
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<td>3,960</td>
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<td>additional hardware</td>
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<tr>
<td>total</td>
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<td></td>
<td>40,254</td>
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</table>
Be clear with communication; meeting time is precious.

Compromises can sometimes result in better solutions.

It’s important to know when to make concessions and when to be stubborn.

Always think from many perspectives when resolving conflicts.

Complex problems are easier to solve in a team.

Make sure everyone is aware of your perspective from your discipline.

Use pull planning and develop early metrics.

Communicating at the right moment is key to success.

Make sure everyone is aware of your perspective from your discipline.
Thank You!

Thanks to all Mentors, Faculty, and Participants!

It has been a great pleasure working with and getting to know all participants.

Sincerely,
Team Atlantic 2013

Anja Jutraž
Clyde Tatum
Daniel Gonzales
David Bendet
Eduardo Miranda
Emile Hamon
Fernando Castillo
Fredrik Wincent
Glenn Katz
Greg Luth
Maria Frank
Mike Miller
Miloš Todorevič
Renate Fruchter
Sanja Štimac
Stefan Soderberg
Wendy Taniwangsa
Willem Kymmell
… and many more!