Lake Mendota
OPEN HOUSE INVITATION

May 8
FRIDAY
1-2pm
680 Park St
Madison, WI
Exterior
1. Level
1. Level
Lake View
<table>
<thead>
<tr>
<th>Rent $/Life Cycle</th>
<th>Cafe</th>
<th>Rentable Spaces</th>
<th>Carbon Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,100,000</td>
<td>1,000,000</td>
<td>900,000</td>
<td>800,000</td>
</tr>
</tbody>
</table>
The Story of Water

- **WARKA Water**
  - Transform Air into Water

- **Shading Fins**
  - Solid, Liquid, Vapour

- **The Beetle**
  - HYDROPHILIC Shell

- **King Abdullah University of Science and Technology (KAUST)**
  - DETAILS
Mechanical Room Picture
Warm and Cold Weather

Average max. humidity: 95 %
Average min. humidity: 42 %

Average max. temperature: 28 °C
Average min. temperature: -12 °C
Rain

Wind mostly from S-SW W-NW

Average yearly rainfall: 34.5 in
Average yearly snowfall: 38.2 in
Heating Issue
<table>
<thead>
<tr>
<th>Benefit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$97,000</td>
<td>$41,790</td>
</tr>
</tbody>
</table>

Savings over 25 year PPP Contract with Cogen $290,000
Heatpump

- Electricity: 124.000 kWh
- Heating: 19.000 Kwh

Cogen

- Electricity: 136.000 kWh
- Heating: 24.100 Kwh
2. Level
Small Classroom
CLT Benefits

Cross Laminated Timber

A

CM

MEP

LCFM
CLT Benefits

- Space Creator
- 6 times lighter than concrete building
- Thermal performance
- Revenue Enhancement
CLT PANEL
PREFABRICATION

LATENCY

Beam
CLT Floor Panel

START!

LATENCY

CLT Panel

Beam
CLT Floor Panel

DAY 2

LATENCY

CLT Panel

Beam
CLT Floor Panel

DAY 2

LATENCY

CLT Panel

Beam
CLT Floor Panel

DAY 3

LATENCY

CLT Panel

Beam
2. Level
Structural Plan- First Level
Cross Laminated Timber (CLT)

Parallel Layer

Perpendicular Layer

Strength Axis of CLT
Section Size

GLT Column 10 X 19

Bearing Wall
CLT SLT5 (6.66"")
Concrete (5"")

GLT Beam
Auditorium 8 ¾ X 28 ½

Shear Wall
CLT SLT5
Concrete (5”)

Floor
CLT SLT9
Concrete (5”)

 Typical 6 ¾
Roof 6 ¾
Cantilever 8 ¾ X 28 ½
CLT Connection

Panel to Panel

CLT

CLT

Half-Lapped

SLT 9 Panel
Thickness 12.18 in
CLT Connection

Wall to Wall

Self-tapping Driven
CLT Benefits - Lateral System
**Section Size**

- **GLT Column**: 10 X 19
- **Bearing Wall**: CLT SLT5 (6.66’’), Concrete (5’’)
- **Auditorium GLT Beam**: 8 ¾ X 28 ½
- **Typical GLT Beam**: 6 ¾ X 21
- **Roof GLT Beam**: 6 ¾ X 32 ½
- **Cantilever GLT Beam**: 8 ¾ X 28 ½
- **Shear Wall**: CLT SLT5, Concrete (5’’)
- **Floor**: CLT SLT9, Concrete (12.18’’)
- **Concrete**: 5’’
CLT Benefits
- Lateral System

CLT SLT5
- Thickness 6.66 in
- $V_r = 5812$ lbs/ft
CLT Benefits - Lateral System
Load Path

Lateral System
- Wall
- Floor Panel
CLT Benefits - Foundation
CLT Benefits - Foundation

Fill

- Fill
- \( \phi = 35^\circ \)
- \( \gamma = 125 \text{ PCF} \)

Silty Clay

- Silty Clay
- \( \phi = 41^\circ \)
- \( \gamma = 130 \text{ PCF} \)

Above Water Table

6 ft

6.5 ft
ETABS Analysis

Load Direction
Retaining Wall
Soil Pressure

Uniformed Shell Load

400
800
1200

Unit: psf
Nail Force

- 45 degree

Level 3 10*50 kips

Level 2 20*50 kips

Level 1 30*50 kips
Gravity Load

Combo Load
Roof 100 psf
Floor 120 psf
Deflection Result

Maximum Displacement:
- Gravity Load: 1.9 in
- Soil Pressure: 0.5 in

0.5 in
1.9 in
CLT Floor Panel – Staircase

Level 1  Level 2  Level 3
BIM Coordination
Clash Detection

- Model Integration
- Setting the Rules
- Resolving Clashes
- Clash Report
- Clash Review

Clash Detection Process:
1. Setting the Rules
2. Model Integration
3. Resolving Clashes
4. Clash Report
5. Clash Review
<table>
<thead>
<tr>
<th>Image</th>
<th>Clash Name</th>
<th>Status</th>
<th>Grid Location</th>
<th>Description</th>
<th>Date Found</th>
<th>Assigned To</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="MEP - Walls" /></td>
<td>MEP - Walls</td>
<td>Reviewed</td>
<td>H-4 : Level 1</td>
<td>Hard</td>
<td>2015/4/23</td>
<td>Ali, Cici, Lisa</td>
<td>#0 - NEIC - 2015/4/23 12:44.36 Assigned to Ali, Cici, Lisa Piping clashes with CLT Wall - this is the only clash between CLT Wall - MEP</td>
</tr>
<tr>
<td><img src="image2.png" alt="MEP - Floors" /></td>
<td>MEP - Floors</td>
<td>Reviewed</td>
<td>I-1 : Level 3</td>
<td>Hard</td>
<td>2015/4/23</td>
<td>Ali, Cici, Lisa</td>
<td>#0 - NEIC - 2015/4/23 12:29.26 Assigned to Ali, Cici, Lisa Do we need pre-modeled openings for things like this?</td>
</tr>
<tr>
<td><img src="image3.png" alt="MEP - Columns" /></td>
<td>MEP - Columns</td>
<td>Reviewed</td>
<td>A-3 : Level 2</td>
<td>Hard</td>
<td>2015/4/23</td>
<td>Ali, Cici, Lisa</td>
<td>#0 - NEIC - 2015/4/23 12:45.30 Assigned to Ali, Cici, Lisa These piping need to be moved, they directly hit the columns, multiple levels</td>
</tr>
<tr>
<td><img src="image4.png" alt="MEP in Floor" /></td>
<td>MEP in Floor</td>
<td>Reviewed</td>
<td>F-4 : Level 3</td>
<td>Hard</td>
<td>2015/4/23</td>
<td>Ali, Cici, Lisa</td>
<td>#0 - NEIC - 2015/4/23 12:47.16 Assigned to Ali, Cici, Lisa This seems to be the most severe clash, you need to coordinate this guys.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Approved - minor clashes" /></td>
<td>Approved - minor clashes</td>
<td>Reviewed</td>
<td>L-1 : Level 1</td>
<td>Hard</td>
<td>2015/4/23</td>
<td>Ali, Cici, Lisa</td>
<td>#0 - NEIC - 2015/4/23 12:47.41 Assigned to Ali, Cici, Lisa This seem to be minor clashes and are ok!</td>
</tr>
</tbody>
</table>
TERF
Structural Plan - First Level

Dimensions:
- 29' - 11"
- 22' - 3"
- 29' - 9"
- 27' - 7"

Measurements:
- 45' - 5"
Cantilever

18 ft
Cantilever Check

Displacement 4.8 in

Increase Beam Size 8 ¾ X 28 ½
3. Level
Atrium
“I’m much happier with the temperature with Comfy, especially in the seminar rooms.”
-Nick
3. Level
Student Lounge
Provide additional spaces/ Value for money

- Student Lounge
- Collaboration Area
- Cafe
Space efficiency

Maximum Rent $340$/SqFT
Maximum Rent $1$ Mio./Years
3. Level

[Diagram of a Level with various rooms and areas labeled]

- Atrium
- Bathroom
- Big classroom
- Circulation
- Egress
- Elevator shaft
- MEP Shaft
- Seminar room
- Storage
- Student lounge / group work
- Student office
Big Classroom
Schedule Overview
Schedule Overview

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough-In
- Finishes
- Program/Commission/Test and Balance
- Owner Move In
Schedule Overview

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough-In
- Finishes
- Program/Commission/Test and Balance
- Owner Move In

2019
- July 6/30, 7/7, 7/14, 7/21, 7/28
- August 8/1, 8/8, 8/15, 8/22, 8/29
- September 9/5, 9/12, 9/19, 9/26, 9/30
- October 10/6, 10/13, 10/20, 10/27
- November 11/3, 11/10, 11/17, 11/24, 11/30
- December 12/1, 12/8, 12/15, 12/22, 12/29
- January 1/5, 1/12, 1/19, 1/26
- February 1/13, 1/20, 1/27

2020
- February 2/2, 2/9, 2/16, 2/23

Owner Move In: 2/12
Schedule Overview

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough-In
- Finishes
- Program/Commission/Test and Balance
- Owner Move In

Timeline:
- 2019: July 6/30 to September 9/22
- 2020: September 9/29 to February 2/23
Schedule Overview

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough-In
- Finishes
- Program/Commission/Test and Balance
- Owner Move In

Timeline:
- 2019: July 23, August 7, 14, 21, 26, September 4, 11, 18, 25, October 2, 9, 16, 23
- 2020: January 5, 12, 19, 26, February 2, 9, 16, 23

Dates:
- 2019: September 29
- 2020: January 5, 12, 19, 26, February 2, 9, 16, 23

- Owner Move In: February 23, 2020
Construction activity pollution prevention

- Stabilized construction/access road (stone) | Budgeted: $100,000
- Construction entrance with „shaker plates“
- Super silt fence + fiber rolls
- Job site boundaries/fence
- Sediment trap

Schedule: During mobilization phase
Schedule Overview

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough-In
- Finishes
- Program/Commission/Test and Balance
- Owner Move In

2019

2020
Risk Management

- **Milestones Schedule**
  - Shortest Schedule, showing best Conditions

- **Identify Risky Tasks**
  - Excavation
  - Structure/Outdoor work
  - Material Delay

- **Risk Simulation**
  - Minimum
  - Mean Value
  - Maximum

- **Time Buffers**
  - Risk-management approach
Riskmangement

Milestones Schedule

|----------|----------|-----------|----------|----------|----------|----------|----------|

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough in
- Finishes
- Program/Commision
- MOVE IN
Risk Management

Milestones Schedule

- Identify Risky Tasks

|----------|----------|-----------|----------|----------|----------|----------|----------|

- Mobilize Excavation Structure Enclosure
- MEP Rough in Finishes Program/Commission
- MOVE IN
Risk Management

- Milestones
  - Schedule
- Identify Risky Tasks
- Risk Simulation
Risk Management

Milestones Schedule

- Jul-2019
- Aug-2019
- Sept-2019
- Okt-2019
- Nov-2019
- Dez-2019
- Jan-2020
- Feb-2020

Identify Risky Tasks

- Mobilize
- Excavation
- Structure
- Enclosure
- MEP Rough in

Risk Simulation

- ?
- MOVE IN

Time Buffers

- Program/Commission
- Finishes

@RISK

- MEP
- Rough in Finishes Program/Commission
Riskmangement

99% Probability
Finish before 08.04.2020
Admin Office
### Cost Estimate

<table>
<thead>
<tr>
<th>Item</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Conditions</td>
<td>15%</td>
</tr>
<tr>
<td>Concrete</td>
<td>2%</td>
</tr>
<tr>
<td>Thermo Moisture</td>
<td>40%</td>
</tr>
<tr>
<td>Openings</td>
<td>1%</td>
</tr>
<tr>
<td>Finishes</td>
<td>10%</td>
</tr>
<tr>
<td>Specialties</td>
<td>5%</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>3%</td>
</tr>
<tr>
<td>Plumbing</td>
<td>3%</td>
</tr>
<tr>
<td>HVAC</td>
<td>3%</td>
</tr>
<tr>
<td>Electrical</td>
<td>2%</td>
</tr>
<tr>
<td>Sitework</td>
<td>2%</td>
</tr>
<tr>
<td>Contingency</td>
<td>2%</td>
</tr>
<tr>
<td>Overhead &amp; Profit</td>
<td>2%</td>
</tr>
<tr>
<td>Inflation</td>
<td>2%</td>
</tr>
</tbody>
</table>

**Total Building Cost:** $8,270,000  
**Cost Per Square Foot:** $219
Loan Structure

Credit Score

DSCR

LLCR

DSCR required
Replacement Strategy

- 2020: Nano Coating - $37.500
- 2030: Interior Fittings - $180.000
- 2035: Major Replacement - $1.200.000
- 2040: Reserve Account generated through yearly Cash Flow
- 2045: Doors outside/inside

Reserve Account generated through yearly Cash Flow
Roof

Lake Mendota
Loss over 25 year PPP Contract with PV

$138,000
<table>
<thead>
<tr>
<th>Carbon (kgCO2e)</th>
<th>Energy (MJ)</th>
<th>Water (kgH2O)</th>
<th>Targets</th>
<th>Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electricity:</strong></td>
<td>35,000 kWh</td>
<td>Heating: 19,000 kWh</td>
<td>PV</td>
<td></td>
</tr>
<tr>
<td><strong>No PV</strong></td>
<td>124,000 kWh</td>
<td>Heating: 19,000 kWh</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Benefit**

**Cost**

**Why?**

**Why not?**
The Story of Water

WARKA Water

Transform Air into Water

Solid, Liquid, Vapour

Shading Fins

The Beetle

King Abdullah University

HYDROPHILIC Shell

DETAILS
Ethiopia
Capital city: Addis Ababa
Population: 94 million

Lack of Safe Water
60%

Infant Mortality Rate
6%

Living in Poverty
30%
Solid, Liquid, Vapour
Shading
The Beetle

The Hydrophilic Shell of the Beetle
The Beetle

RENDERING FINS
The Beetle

1. Nano Coat/Wood Protection
2. Inkjet Printing
3. Dopamine Solution
4. Polydopamine

Professor Peng Wang

Biological and Environmental Science and Engineering

King Abdullah University of Science and Technology
110,000 gal collected per year
86,000 Toilet Flushes per year
The Beetle

Data in $

- Water Collection Savings
- Initial Cost
- Replacement
- O+M Cost

Total Water use
- 858.885 gallons/year
- The Beetle 109.200 gallons/year
- Rainwater 200.655 gallons/year

Total Water use
- 858.885 gallons/year
- The Beetle 109.200 gallons/year
- Rainwater 200.655 gallons/year
Integrated Project Analysis

The Beetle

COGEN

PV

Heat-pump

Shading

- Not Integrated
- Integrated
- Big Idea
Savings over 25 year PPP Contract with Shading:
$2300 + 30% Duct Size Savings
Electricity: 103,000 kWh
Heating: 20,210 Kwh

Electricity: 124,000 kWh
Heating: 19,000 Kwh

Carbon (kgCO2e) vs. Energy (MJ) vs. Water (kgH2O)

Shading vs. No Shading

Benefit vs. Cost

Targets vs. Project
Value for Money over 1 year PPP Contract with the Beetle:

$3.400 for Academic Research
**Carbon (kgCO2e) | Energy (MJ) | Water (kgH2O)**

**Targets**

**Project**

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>With The Beetle</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Without The Beetle</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Electricity:**
- With The Beetle: 121,000 kWh
- Without The Beetle: 124,000 kWh

**Heating:**
- With The Beetle: 18,000 Kwh
- Without The Beetle: 19,000 Kwh

**Watercollection:**
- With The Beetle: 109,000 gallons
- Without The Beetle: 109,000 gallons