Atlantic Team 2011
Winter Presentation

Owners
Eric
Lauren

Architect
Maria

Engineer
Colin
Riam
Travis

Construction
Kim
Mike
Sebastjan

MEP
Anne-Laure

Colin
Kim
Anne-Laure

Eric
Lauren
Maria
Site Location
University of Wisconsin, Madison

Existing Water Science & Engineering Lab
Site Conditions
Madison, Wisconsin
Weather & Climate

Heavy Rain: June – August

Average High Temps: 84°F
Average Low Temps: 58°F
The Staircase

Site
The Staircase

Site

[Diagram showing various measurements and dimensions related to the staircase site.]
The Staircase
Interior Organization

- Students
- Faculty
- Public
The Staircase
1st Floor

- Auditorium
- Large Classroom
- Restrooms
- Mechanical/Technical Room
- Storage
- MEP shafts
The Staircase

3rd Floor

- Instructional Lab
- Server Room
- Seminar Room
- Small Classroom
- Student Offices
- Faculty Offices
- Faculty Lounge
- Senior Administration
- Administrative Assistants
- Restrooms
- Mechanical/Technical Room
- Storage
- MEP shafts

Dimensions:
- 110' in length
- 22', 16', 16', 22', 17'6" in width
- 35', 10', 9', 16', 15', 20', 105', 17'6" in height

N
The Staircase
Section North-South

Student Offices
Instructional Lab
Instructional Lab
Large Classroom

Auditorium

12'
12'
12'
48'
12'
The Staircase
Section East-West

Classroom
Classroom
Server
Auditorium
Office
Storage

12'
12'
12'
12'
48'
The Staircase
Influence of Other Disciplines

Engineers
floorplans vs. grid layout

position of the auditorium

Construction Managers
exact position of the building

exact position of the lab

MEP
positioning

adjustment Floor-ceiling height
## Loading Considerations

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Soil Considerations

Soil Profile

- Bearing Capacity 4 KSF
- High Water Table
- Excavation Needed

Fillet

\[ \phi = 35^\circ \]
\[ \gamma = 125 \text{ PCF} \]

Silty Clay

\[ \phi = 41^\circ \]
\[ \gamma = 130 \text{ PCF} \]
The Staircase
The Staircase
Load Path – Elevation View

Beam to Column
Column to Foundation

4@12'
105'
The Staircase
Load Path - Truss

- Typ. column loads
- Transfer girder loads
- Transferred column loads
The Staircase
Structural Overlay – 1st Floor

Steel
Columns
- W12x40
- W12x65

Lateral System
- C5x9 Braced Frame
- HSS6x6x1/4 Braced Frame

Reinforced Concrete
Columns
- 12”x12” (12#9s)
- 15”x15” (12#9s)

Lateral System
- 8” Shear Walls
The Staircase
Structural Overlay – 2\textsuperscript{nd} Floor

Steel

\textit{Columns}
- W12x40
- W12x65

\textit{Beams and Girders}
- W10x22
- W14x34
- W27x94

Reinforced Concrete

\textit{Columns}
- 12”\times12” (12\#9s)
- 15”\times15” (12\#9s)

\textit{Beams and Girders}
- 18”\times12” (10\#9s)
- 4’\times12” (30\#9s)
The Staircase
Structural Overlay – 3rd Floor

Steel
Columns
- W12x40
- W12x65

Beams and Girders
- W10x22
- W14x34
- 4’ Deep Truss

Reinforced Concrete
Columns
- 12”x12” (12#9s)
- 15”x15” (12#9s)

Beams and Girders
- 18”x12” (10#9s)
- 4’x12” (30#9s)
The Staircase
Structural Overlay – 4th Floor

Steel
Columns
- W12x40
- W12x65

Beams and Girders
- W10x22
- W14x34

Reinforced Concrete
Columns
- 12”x12” (12#9s)

Beams and Girders
- 18”x12” (10#9s)
The Staircase
Member Details

Reinforced Concrete
- 18”x12” (10#9s)
- 15”x15” (12#9s)

Columns
- 12”x12” (12#9s)
- 15”x15” (12#9s)

Beams and Girders
- 18”x12” (10#9s)
- 4’x12” (30#9s)
Contrast

Site
Contrast

Site
Contrast

Ideas

Introducing water...see how things work.

structure within a structure
Contrast
Change In Shape
Contrast

Entrance – Pulling Back a Curtain
Contrast

1st Floor

- Auditorium
- Large Classroom
- Seminar Room
- Technical Room
- Restrooms
- Storage
Contrast

2nd Floor

- Small Classrooms
- Instructional Lab
- Server Room
- Student Offices
- Mechanical Room
- Restrooms
- Storage

Dimensions:
- 38' x 76'
- 10' 7/8" x 10' 7/8"
- 7' 15/16"
Contrast

3rd floor

- Student Offices
- Faculty Offices
- Senior Administration
- Administrative Assistants
- Department’s Office
- Faculty Lounge
- Mechanical Room
- Restrooms
- Storage
Contrast

Section North-South

Faculty Offices
Instructional Lab
Auditorium

Student Offices
Seminar Rooms
Classrooms

15'
15'
45'
15'
Contrast

Section East-West

- Student Seminar
- Offices Room

15'
15'
45'
15'

system water collection  water collection system
exposed pipework exposed pipework system exposed pipework system exposed pipework system
ground water ground water ground water ground water ground water ground water ground water ground water

AEMC
Contrast
Influence of Other Disciplines

Engineers
common decisions

MEP
intensive discussions
Contrast
Contrast
Gravity Load Path
Contrast

Lateral Load Path – Steel

Moment Frame

Braced Frame
Contrast
Load Path – Concrete

- Lateral Load
- Gravity Load
- Resisting Forces
- False Cantilever
Contrast
Structural Overlay – Steel

The Box
- W12 X 53
- W12 X 72
- W16 X 57
- 12” Concrete Wall
- False Cantilever

The Cone
- W12 X 50
- W14 X 26
- W24 X 62
Contrast

Structural Overlay – Mixed

The Box (Concrete)
- 12” x 12”
- 16” x 16”

The Cone (Steel)
- W12 X 50
- W14 X 26
- W24 X 62
Contrast

Structural Overview – Steel

1st Floor

- **Straight Columns**
- **Slanted Columns**
- **Floating Columns**

- **Moment Frame**
- **Braced Frame**
Contrast

Structural Overview – Steel

2\textsuperscript{nd} Floor

- Straight Columns
- Slanted Columns
- Floating Columns

- Moment Frame
- Braced Frame
Contrast
Structural Overview – Steel

3rd Floor

- Straight Columns
- Slanted Columns
- Floating Columns

Moment Frame
Braced Frame
Contrast

Member Details – Beams

- 12x12
- 16 X 16
- 20” T Beam
- 24” Spandrel
- 12” Concrete Wall
- 6” One Way Slab

Diagram shows:
- 20” T Beam with 6 #8’s
- 24” Spandrel with 4 #8’s
- 12” Concrete Wall with 3 #9’s

Diagram also includes:
- 12" Concrete Wall
- 16 X 16
- 6” One Way Slab
Contrast

Member Details – Columns and Slab

- 12x12
- 16 X 16
- 20” T Beam
- 24” Spandrel
- 12” Concrete Wall
- 6” One Way Slab

Diagram:
- 8 #7's
- 12” or 16”
- #4's at 6”
- 14’
Contrast
The Staircase & Contrast

Steel Deck

- Maximum Span 15 FT
- Superimposed Load 130 PSF
- 18 gage with 4.5 IN of LW Concrete
Retaining Wall

- Height: 34'
- Width: 28'
- Depth: 3'
- Height below ground: 2'
- Width at ground level: 16'

Retaining Wall
Building Management Systems

- Mechanical Ventilation
- Chilled Beams
- Water Chilled/Hot System
- Open Loop Ground Source Heat Pump
- Air Handling Units (AHU)
Heating and Cooling
Groundwater Heat Pump

COP ~4

Well 1

Well 2

http://geoheat.oit.edu/toa/toa1task1.pdf
The Staircase
Air Handling Unit (AHU)

100’

400’’ × 94’’

25000 CFM

http://www.thermal-corp.com/Literature/Catalogues/Thermal_RT.pdf
The Staircase Elevation

- **Structural system**
- **MEP shaft**
- **Piping system**
- **Floor insulation**
- **Heated slab**
- **Chilled beam**
The Staircase
Floor to Ceiling – Concrete

Chilled Beam

18”x12”
The Staircase
Floor to Ceiling – Steel

Chilled Beam

W14x34
The Staircase
Water Distribution – 1st Floor
The Staircase
Water Distribution – 2nd Floor
The Staircase

Water Distribution – 3rd Floor

- Hot
- Cold

105'

110'
Contrast
Roof

GREEN ROOF

AHU

Water Collection
Contrast

Floor to Ceiling – Concrete

- Chilled Beam
- 24” Spandrel
- 6” Floor to Ceiling
- 11.5’ High
- 15’ High
Contrast
Floor to Ceiling – Steel

Chilled Beam

W16x57
Contrast

Water Distribution – 1st Floor

114'

Hot and Cold
Contrast

Water Distribution – 2nd Floor

- Instructional Lab
- Server Room
- Instructional Lab
- Small Class
- Restrooms/Technical Support
- Small Class
- Seminar
- Student Offices

Hot and Cold

114’
Contrast

Water Distribution – 3rd Floor
Site Access

- Tight Site
- Difficult Access

45’ Max Transportable Member

Primary Delivery Path

Secondary Delivery Path

Trees

Other University Buildings

Lake
Site Access
Delivery Path
Excavation Equipment

- EXCAVATOR (1X)
- DOZER (1X)
- DUMP TRUCK (2X)
- PILING RIG (1X)
Excavation

Temporary Retaining Wall

Excavation Cut
Steel Equipment

Mobile Crane

**Mobile Crane LTM 1095-5.1**

- **45’ Long Crane**
- **Heaviest Lift is 8 klbs**
- **8.9 klbs**
Concrete Equipment

- CONCRETE MIXER (4x)
- CONCRETE PUMP (1x)

Time calculated with: http://www.viamichelin.com/

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Schedule
Steel, Concrete & Combination

Start August 1st

Finish Foundation October 19th

Enclose Building June 1st

STEEL 282 DAYS

CAST IN PLACE CONCRETE 295 DAYS

COMBINATION 314 DAYS
Schedule

**Steel**

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**STEEL 282 DAYS**
Schedule
Concrete

CAST IN PLACE CONCRETE 295 DAYS

Site preparation
14 dnevi

Sub structure
65 dnevi

Columns, Slabs
125 dnevi

Columns #0 - 1/2
28 dnevi

Columns #0 - 2/2
28 dnevi

Slab: #1 - 1/2
28 dnevi

Slab #1 - 1/2
28 dnevi

Columns #1 - 1/2
28 dnevi

Columns #1 - 2/2
28 dnevi

Columns #2 - 1/2
28 dnevi

Columns #2 - 2/2
28 dnevi

Slab #2 - 1/2
28 dnevi

Slab #2 - 2/2
28 dnevi

Columns #3 - 1/2
28 dnevi

Columns #3 - 2/2
28 dnevi

Exterior walls
30 dnevi

Exterior walls #0
109 dnevi

Exterior walls #1
30 dnevi

Exterior walls #2
30 dnevi

Exterior walls #3
30 dnevi

Interior
30 dnevi

Interior walls, MEP, Ceilings, Floor finishes, etc. #0
40 dnevi

Interior walls, MEP, Ceilings, Floor finishes, etc. #1
110 dnevi

Interior walls, MEP, Ceilings, Floor finishes, etc. #2
40 dnevi

Interior walls, MEP, Ceilings, Floor finishes, etc. #3
40 dnevi

Exterior
## Schedule

### Concrete

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<th>Duration</th>
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<td>Floor Finishes, etc.</td>
<td>74 dnevi</td>
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---

[Diagram of construction schedule with milestones and durations]
Site Layout

- Pedestrian Walkway
- Site Fence
- Site Trailers
- Entrance
- Existing Building
- Road
Excavation

- Temporary Sheet Pile Wall
- Soil Cut
- Bulldozer, Hydraulic Excavator, Dump Truck

35°
Concrete Erection

Concrete Mixer and Pump
Steel Erection
Building Shell and Backfill

Finished Building

Backfill
# LEED Certification

<table>
<thead>
<tr>
<th>Category</th>
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<td>Sustainable Sites</td>
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<td>Water Efficiency</td>
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<td>Energy and Atmosphere</td>
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**LEED GOLD**
Sustainable Site
Water Efficiency
Energy And Atmosphere

Ground Source Heat Pump
Materials and Resources

Local Aggregate

Fly Ash
Economics in Design
Make Design Decisions Transparent

Steel Beams & Girders, Composite Slab
Steel Beams & Girders, Metal Deck/Concrete Fill
Steel Beams & Girders, Precast Hollow Core Floor (No Topping)
Steel Beams & Girders, Precast Hollow Core Floor (2'' Topping)
Reinforced Concrete Beams & Slab (One-Way)
Precast Beams & Hollow Core Floor (No Topping)
Precast Beams & Hollow Core Floor (2'' Topping)
Target Value Design
Establishing our Targets

1. Targets from Previous Years
2. Compare to RS Means SF
3. Revise Targets

First Estimate
Check Targets
Within Reason, so Re-Design
Target Value Design
Establishing our Targets

Atlantic-2009 Final

- Substructure: 6%
- Shell: 29%
- Interior: 10%
- Services: 29%
- Equip. & Furnishings: 4%
- Site Prep: 18%
- Indirect Cost: 5%

Atlantic-2010 Final

- Substructure: 9%
- Shell: 22%
- Interior: 15%
- Services: 12%
- Equip. & Furnishings: 33%
- Site Prep: 5%
- Indirect Cost: 33%

2010 Q4 - RS Means SF

- A Substructure: 5%
- B Shell: 24%
- C Interiors: 47%
- D Services: 21%
- E Equipment & Furnishings: 3%
- F Special Construction: 0%
Target Value Design
Targets Change

Target Values - 02/02/11

- Substructure
- Shell
- Interior
- Services (MEP)
- Equip. & Furnishings
- Site Prep

Target Values - 02/15/2011

- A Substructure
- B Shell
- C Interior
- D Services (MEP)
- E Equip. & Furnishings
- G Building Sitework
Estimates

Breakdown of Costs

Concrete

- A Substructure: 36%
- B Shell: 26%
- C Interior: 20%
- D Services: 10%
- E Equip. & Furnishings: 2%
- G Building Sitework: 9%
- Total: 100%

Steel

- A Substructure: 35%
- B Shell: 28%
- C Interior: 20%
- D Services: 2%
- E Equip. & Furnishings: 6%
- G Building Sitework: 9%
- Total: 100%

Target Values

- A Substructure: 40%
- B Shell: 25%
- C Interior: 19%
- D Services: 6%
- E Equip. & Furnishings: 5%
- G Building Sitework: 5%
- Total: 100%
Estimates

2015 Cost

- The Staircase - Concrete: $8,210,000.00
- The Staircase - Steel: $8,280,000.00
- The Contrast - Concrete: $8,570,000.00
- The Contrast - Steel: $8,720,000.00
- Budget: $7,500,000.00
Integrated Project Delivery

How do we integrate our knowledge?
# Integrated Project Delivery

Daily Updated Commitment List

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<tr>
<th>Need ID #</th>
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<th>For Whom</th>
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Notifybox

Do you want to check-out this file?

Password

Checkout  | Cancel
Communication

- Over 100 Waves
- Skype Office Hours
- No Email Policy
- Meeting Minutes Taken in Real Time in Wave

Communication

Screen Sharing

Real Time Presence of Teammates

Sketching In the Virtual World
Collaboration
What it Feels Like

Where are the Most Recent Floor Plans?

I Just Made a Small Change...

What?

That Costs Too Much.
Cooperation

What it Feels Like

We Need to Consider Excavation.

Where Shall We Place the Building on the Site?

And Drainage...

And Site Access.

What About the Neighboring Buildings...
## Decision Matrix

### The Staircase

#### Scale: -2 to 2 with 0 Neutral

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<th>Metrics</th>
<th>The Staircase</th>
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<td><strong>13</strong></td>
<td><strong>12</strong></td>
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Team Atlantic Presents
Contrast
What Worked
How to Improve

Worked:
• Skype Office Hours
• Skype Communication
• Meeting Minutes in Real Time in Wave
• NotifyBox (for Dropbox)

To Improve:
• Updating IPD Task List
• Task Transparency
• Meeting Set Deadlines
• Organizing and Responding to Waves
• Weekly Meeting Efficiency
Thank You!

All the Mentors

Glenn Katz
Martin Dembski

David Bendet
Lauren Scammell

Prof. Miranda
Marko Balant

Michael Pearson
Prof. Krawinkler

Prof. Miranda

Prof. Krawinkler

Josh Odelson
Renate
Tine Logonder
Willem Kymmel
Ivo Zagar

Prof. Borja
Prof. Nelson