Courtney Wong
SE Stanford

John Dodini
Appr Stanford

Diana Louie
CM Stanford

Sara Sundelin
CM KTH

Curtis Wong
SE Stanford

Karolina Ostrowska
A WUoT

THE EXPRESS WORLD
- Site Localization and Climate
- Biomimicry Inspiration
- Site Analysis
- Concept 1 – AEC
- Concept 2 – AEC
- Target Value Design
- Our Process
- Decision Matrix
SITE LOCALIZATION & CLIMATE
Local Temperature

Albuquerque, New Mexico, USA
35°06’N 106°36’W
DAY TIME

wind directions: N and S-E → NATURAL VENTILATION

NIGHT TIME

wind directions: W and S-W → NIGHT COOLING

LOCAL WIND CONDITIONS
- NATURAL VENTILATION
- LARGE OPEN SPACE
- BUILDING ORIENTATION
- ORGANIC FORM
- DESERT LOOK

Biomimicry Inspiration
TERMITE MOUND
SITE RELATED CONCERNS
SITE ANALYSIS
SURROUNDING

CENTRAL UNITED METHODIST CHURCH
SITE ANALYSIS
SURROUNDING

- Designed Bike Racks
- Meeting Place
- Bus Stops and Pedestrian Crossing
Concrete plant 15 min

Hospital 5 min

Construction equipment 10 min

Cement supplier 11 min

LOCAL COMPANIES
SITE ACCESS

- Pan American Fwy
- Central Ave
- Dr Martin Luther King Jr Ave
- University Blvd
TERMITE ENTERPRISE
BUILDING ORIENTATION

BOXY PART
FACING NORTH

CURVED PART
FACING SOUTH
REVISED FOR STRUCTURAL REASONS

FORM EVOLUTION
VERSION 01
FORM EVOLUTION
VERSION 01
REVISED FOR AESTHETICAL REASONS

FORM EVOLUTION
VERSION 02
REVISED FOR FUNCTIONAL REASONS

FORM EVOLUTION
VERSION 03
FUNCTIONAL ORGANIZATION
FIRST FLOOR
EGRESS SCHEME

FIRST FLOOR

GROUND FLOOR

UNDERGROUND
SECTIONS
SECTION B-B
SUN ANALYSIS
06:00 AM
SUN ANALYSIS
08:00 AM
SELF-SHADING

SUN CONTROL
FOLDING SHUTTERS

SUN CONTROL
WHITE ROOF

SUN CONTROL
NATURAL VENTILATION

- SINGLE SIDED VENTILATION ON PERIMETER
- CROSS VENTILATION THROUGH OPEN SPACES
AUTOMATED VENTS

USER OPERABLE VENTS

NATURAL VENTILATION
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
DUCTWORK SCHEME

FIRST FLOOR

GROUND FLOOR

UNDERGROUND
MATERIALS INSPIRATION
STUCCO WALLS
MATERIALS INSPIRATION
STONE VENEER
TERMITE ENTERPRISE
EXTERIOR VIEW
TERMITE ENTERPRISE
INTERIOR INSPIRATIONS
TERMITE ENTERPRISE
INTERIOR VIEWS
TERMITE ENTERPRISE
INTERIOR VIEWS
Different shapes and dimensions between floors
Boxy + Curvy design
Large Openings

Floor-to-floor height limitations
First Floor cantilevers
Organic structure – irregular bays
Structural Alternatives: POST-TENSIONED CONCRETE and CELLULAR BEAMS
POST-TENSIONED CONCRETE

LFRS: Concrete Moment Frames

Tendons alleviate cantilevers

No beams + less columns = architectural freedom

Longer spans with thinner slab

Auditorium
Two-way slab with drop panels
Un-bonded tendons
Slab thickness: 12”
Square Footings: 12’ x 12’, 3.5’ deep

Worst Columns:
- Underground: 20” x 20”
- Ground Floor: 17” x 17”
- First Floor: 9” x 9”
LFRS: Eccentrically Braced Frames

CELLULAR BEAMS

Biomimicry inspiration

Good MEP integration
CELLULAR BEAMS

UNDERGROUND

Typ. Floor Beam: LB 27x35/40
Typ. Roof Beam: LB 18x16/30
Floor Girder: LB 45x108/116
Auditorium Girder: LB 45x90

GROUND FLOOR

Roof Girder: LB 36x68
Worst Column: W14x61
Square Footings: 12.5’ x 12.5’
4.5’ deep

FIRST FLOOR
## POST-TENSIONED CONCRETE VS. CELLULAR BEAMS

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TERMITE ENTERPRISE
STRUCTURAL COSTS

TARGET VALUE
$850,000

$1,110,000
$1,070,000
$1,030,000
$990,000
$950,000
$910,000
$870,000
$830,000

PT Concrete VS. Cellular Beam
INVERTED MOUND
INVERTED MOUND BUILDING ORIENTATION
REVISED FOR FUNCTIONAL REASONS

FORM EVOLUTION
VERSION 01
FUNCTIONAL ORGANIZATION
UNDERGROUND
FUNCTIONAL ORGANIZATION
GROUND FLOOR
FUNCTIONAL ORGANIZATION
FIRST FLOOR
EGRESS SCHEME

FIRST FLOOR

GROUND FLOOR

UNDERGROUND
SECTIONS
SECTION A-A
SECTIONS
SECTION B-B
SUN ANALYSIS
10:00 AM
SUN ANALYSIS
12:00 PM
SUN ANALYSIS
04:00 PM
SUN ANALYSIS
06:00 PM
• SINGLE SIDED VENTILATION ON PERIMETER
• CROSS VENTILATION THROUGH OPEN SPACES
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
NATURAL VENTILATION
NIGHT COOLING
DUCTWORK SCHEME

FIRST FLOOR

GROUND FLOOR

UNDERGROUND
INVERTED MOUND ELEVATIONS
INVERTED MOUND
INTERIOR VIEWS
INVERTED MOUND
INTERIOR VIEWS
INVERTED MOUND
INTERIOR VIEWS
- 65’ span over Auditorium
- Atrium of varying size between floors
- Regular bay sizes
- Overhanging First Floor
Structural Alternatives: BUBBLEDECK and STEEL COMPOSITE DECK
LFRS: Concrete Shear Walls

Large slab depth of 20 inches
Typ. Slab Thickness: 13.5”
Auditorium Slab Thickness: 20”
Square Footings: 6’ x 6’, 2’ deep

Worst Columns:
- Underground: 6’ x 6’
- Ground Floor: 9’ x 9’
- First Floor: 11’ x 11’
FOUNDATION PLAN

- Spread footings for columns
- Continuous footings for shear walls

FOUNDATION SOLUTION
INVERTED MOUND
EASY BUBBLEDECK INSTALLATION
LFRS: Eccentrically Braced Frames

STEEL COMPOSITE DECK

Potential MEP problems

High constructability
STEEL COMPOSITE DECK

Typ. Floor Beam: **W14x22**

Typ. Roof Beam: **W12x19**

Typ. Girder: **W24x55**

Square Footings: **7’ x 7’**, **3’ deep**

Worst Columns:

- Underground: **W12x35**
- Ground Floor: **W12x35**
- First Floor: **W12x35**
### BUBBLE Deck vs. STEEL COMPOSITE DECK DECK

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<td><strong>422 kip</strong></td>
<td>75 psf</td>
<td>100 psf</td>
<td><strong>190 kip</strong></td>
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<td><strong>296 kip</strong></td>
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<td>100 psf</td>
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<td><strong>126 kip</strong></td>
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**STEEL COMPOSITE DECK DECK**

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<th>Floor</th>
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<tr>
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<td><strong>126 kip</strong></td>
<td><strong>126 kip</strong></td>
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**INVERTED MOUND LOADING CRITERIA**
INVERTED MOUND
STRUCTURAL COST BREAKDOWN
INVERTED MOUND
STRUCTURAL COSTS

Target Value
$850,000

BubbleDeck VS. Steel Composite Deck
What Next?

TARGET VALUE DESIGN
Value of Money

- **Base Cost**
- **ROI = 0.8%**
- **Inflation = 4%**

**Construction Cost**

- **Jan-12**: $8,500,000
- **Jan-12**: $8,500,000
- **Jan-13**: $8,500,000
- **Jan-14**: $7,293,192
- **Aug-15**: $7,293,192

**Year**

- Jan-12
- Jan-12
- Jan-13
- Jan-14
- Aug-15

**OVERALL GRANT**
Budget on August 2015: $7.3M
OUR TARGET: $7.1M

Value of Money

- Base Cost
- ROI = 0.8%
- Inflation = 4%
# Rating of Importance

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<td>Building Location on Site</td>
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<td>10</td>
<td>8.5</td>
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<td></td>
<td>Exterior Enclosure (Façade)</td>
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<td>9</td>
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<td></td>
<td>Roof</td>
<td>8</td>
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<td>7.5</td>
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<td>Exterior Enclosure (Walls)</td>
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<td>B. Shell</td>
<td>Interior Finishes (Partitions, Floors, Doors)</td>
<td>8</td>
<td>9</td>
<td>8.5</td>
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<td>C. Interiors</td>
<td>Energy Efficiency</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<td>Indoor Air Quality</td>
<td>9</td>
<td>8</td>
<td>8.5</td>
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<td>Elevators</td>
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<td>8</td>
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<td>7</td>
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<td>D. Services</td>
<td>Auditorium Furnishing</td>
<td>9</td>
<td>6</td>
<td>7.5</td>
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<tr>
<td></td>
<td>Classroom Furnishing</td>
<td>9</td>
<td>6</td>
<td>7.5</td>
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<td>Special or Distinguishing Features</td>
<td>10</td>
<td>7</td>
<td>8.5</td>
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<tr>
<td>F. Specialty Construction</td>
<td>Landscaping</td>
<td>7</td>
<td>8</td>
<td>7.5</td>
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<tr>
<td>G. Building Sitework</td>
<td>Contingency</td>
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<td>8</td>
<td>7.5</td>
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</table>

**OWNERS’ VALUES**
Target Values Changing to Reflect Better Understanding of Costs
SUMMARY OF STRUCTURAL COST
BREAKDOWN OF SUMMARY COSTS
TARGET VALUE
$7.1 MILLION

SUMMARY OF TOTAL COSTS
Start Construction by Aug 3, 2015

Milestone 1: Enclosed building by Jan 1, 2016

Milestone 2: Access to labs by Apr 30, 2016


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<th>2015</th>
<th>2016</th>
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<td>Month</td>
<td>Aug</td>
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<td>Activities</td>
<td>Site preparation, excavation, foundation slab, floors, facade &amp; roof</td>
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**Three Key Milestones**
Cellular Beams

<table>
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<tr>
<td>2</td>
<td>Sitework</td>
<td>25 days</td>
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<td>5</td>
<td>Substructure</td>
<td>45 days</td>
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<tr>
<td>8</td>
<td>Shell</td>
<td>40 days</td>
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<tr>
<td>11</td>
<td>Services</td>
<td>105 days</td>
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<tr>
<td>15</td>
<td>Interior</td>
<td>95 days</td>
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<tr>
<td>16</td>
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<tr>
<td>22</td>
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<td>55 days</td>
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<tr>
<td>28</td>
<td>Level 1</td>
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<tr>
<td>34</td>
<td>Equipment and Furnishing</td>
<td>30 days</td>
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<tr>
<td>35</td>
<td>Level 0</td>
<td>5 days</td>
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<td>38</td>
<td>Level 1</td>
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<tr>
<td>41</td>
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<td>47</td>
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Post-Tensioned

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## LEED OBJECTIVES

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<td>Total</td>
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**LEED GOLD - 66 POINTS**
IMPLEMENTATION TO ACHIEVE
OUR TEAM PROCESS
TASKS PULLING SESSION
MEETING ROOM
TARGET VALUE DESIGN ROOM
BIOMIMICRY WALL

MAIN GOAL:
IMPLEMENTATION AND VENTILATION

SOLUTIONS:
"RIGID FACADE" - perforated wall
"LAYERED FACADE" - double skin facade with movable shading or louvers

MAIN ASSUMPTION:
VERIFIED BY THE USE OF A LOT OF SMALL VENTS PER A METER SQUARE OR MORE DROPS

MATERIALS

MUDMIXES

STONE VENEER

INSULATION & GLAZING

WOOD
MEETINGS: WORK VS. PLAY BALANCE
BORROW BOOK: Green Roofs (from Renate)

Notes
add notes

Assignee  John D

Projects  Concept 1 - MEP Considerations

Due Date  Today

Tags  |  Attach a file

Followers  Diana  John D

Activity Feed
Diana created task.  Yesterday
Diana added to Concept 1 - MEP Considerations.  Yesterday
Diana changed the due date to January 26.  Yesterday
Diana assigned to John D.  Yesterday
John D marked complete.  Yesterday

Comment

TASK MANAGEMENT: ASANA.COM
Limited to Video Files
Karolina Ostrowska

**Stereoscopic House by pencil office**
The Stereoscopic House, pool on one side, ocean on the other. See more: [http://ow.ly/9sPtP](http://ow.ly/9sPtP)
The Stereoscopic House, pool on one side, ocean on the other. See more: [http://ow.ly/9sPtP](http://ow.ly/9sPtP)
By: Architizer

Diana Louie

Hoss Nasser, Sinan Mihelčič: this is what Karolina had in mind for incorporating the "special wood cutout" idea. Using wooden shutters for the curtain walls, and even cutting out special designs on these shutters. What do you guys think?? Thanks!

**WORLD ARCHITECTURE - BIOTECHNICAL FACULTY by Arhitektura Krušec**
[worldarchitectur.blogfa.com](http://worldarchitectur.blogfa.com)

**WORLD ARCHITECTURE - BIOTECHNICAL FACULTY by Arhitektura Krušec**

FACEBOOK
Curtis Wong: be there in a sec
Diana Louie: concept 1: PT concrete, cellular beams; concept 2: bubbledck, regular steel
Courtney Wong: https://www.surveymonkey.com/s/SBYXH5Q

Friday, March 09, 2012
John D.: Karo & Sara you are anticipating a meeting between us right?
Karolina: why is that?
SUNDAY – FORMAL MEETING
Working together to formulate our Decision Matrix
increased instruction lab size by moving into corridor, corridor now has width of 6 ft

moved curved wall to fit column here

moved outer wall upwards to grid line

143

A + E

Coordination
Collaboration
Communication

SUB-GROUP MEETINGS: GoToMeeting
DECISION MATRIX
## DECISION MATRIX

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<th>Bumblebee</th>
<th>Box</th>
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<td>Post-tensioned</td>
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<tr>
<td>Design (interior) space</td>
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<td>3</td>
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<tr>
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<td>MEP Installation / Compatibility</td>
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<tr>
<td>Structural Cost</td>
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<td>Sustainability</td>
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<tr>
<td>Biomimicry</td>
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<tr>
<td>Overall Preference</td>
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<tr>
<td>Team Score</td>
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<td>75</td>
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<tr>
<td>Combined Owner Score</td>
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<td>88</td>
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<tr>
<td>Total Overall Score</td>
<td><strong>95</strong></td>
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WINNER!

INVERTED MOUND

TERMITE ENTERPRISE
CELLULAR BEAMS
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  – Sinan Mihelčić

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