Ridge 2010
Winter Presentation

Forest Peterson
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Plamen Ivanov
Gabriela Perez
Henning Roedel
Jaclyn Lee

EJ
EP
A
C
Site - University of Nevada, Reno

**Challenges**
- Earthquakes
- Gusts from the Sierra Nevada
- Large Diurnal Temperature Variation
- Cactus Collection
- Slope

**Advantages**
- Mid-Campus Location
- Views to South Campus
- Abundant sun
2-9 Solar Orientation
Public building entrances will need to maximize their orientation to the south and southwest to facilitate year-round use.

The existing library steps serve as a prime example of orienting and designing access to serve as informal seating, thus encouraging campus community interaction.

2-8 Informal Seating
Accessways, stairs, and other site features can provide informal seating areas and places of interaction.
Big Idea

Emphasizes on how technology and nature intertwine for fostering sustainability and the interaction it aids to provide

Goals:

• Sustainability Tech Integration
Sun Study

FROM BUILDUING’S SOUTHWEST FAÇADE:
JANUARY 21-DECEMBER 21 AT 1PM

Summer Solstice
Sun Angle= 73.9°

Winter Solstice
Sun Angle= 27°
Floor 1

Level: -16’-0”
Height: 16’-0” - 26’-0”

- Bathrooms
- MEP
- Storage
- Café
- Large Classrooms
- Auditorium
- Vertical Cores

Floor 1 diagram with dimensions and labels.
Floor 2

Level: 0’-0”
Height: 10’-0”

- MEP
- Storage
- Interaction Areas
- Seminar Rooms
- Small Classrooms
- Vertical Cores
- Instructional Labs
- Server Room
- Student Office Area
Floor 3

Level: +13′-0”
Height: 9′0″-11′0”

- Bathroom
- MEP
- Storage
- Faculty Offices
- Interaction/Lounge Areas
- Vertical Cores
North Façade

South Façade
East Façade

West Façade
A. Concrete wall that works in openings according to structural capacity

B. Pre-fabricated module photovoltaic, glass panels which would capture solar energy
Possible Glass Materials

- Nano-Gel Windows
- Eco Insulating Glass
- Triple Glazed Window
Second Floor Interaction Area
Steel

Floor 1
- Retaining Wall
- 16” Spread footing
- 8” Slab on grade

Floor 2 & 3
- 4 ½” NW 2VLI16 metal deck

Loads
<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Dead: self weight+ MEP</td>
<td>85 psf</td>
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<tr>
<td>Live: corridors</td>
<td>100 psf</td>
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<tr>
<td>EQ: base shear</td>
<td>538 kips</td>
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<tr>
<td>Wind: basic wind speed</td>
<td>100 mph</td>
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</table>
Steel

Cantilevers

- Floor 1 footprint
- Floor 2
- Floor 3
Steel - Load Path

Challenge Areas

Floor 2
- 26’-0” cantilever supported by 55’-6” auditorium span
- 14’-0” side cantilever attached to 26’-0” cantilever
Steel

Floor 2

Columns
- W12x 65
- W14x 170

Beams
- W14x 38
- W18x 50

Challenges
- W24x 84 Auditorium-span
- W36x 182 Cantilever beams
- W36x 247 Transfer girder
Steel - Lateral System

Typical Concentrically Braced Frames - HSS 6x6x1/2
Auditorium & Cantilever Solution

- Fully restrained moment connections
- No roof live load
- \( \Delta_{LL} \) of cantilever tip \( \sim 0.76 \) in

- W14x 170 columns
- W36x 182 cantilever beams
- Floor 2 to roof column
Steel

Beams

Girders

6.5” 14”

6.5” 14” 3.5” 8”

24”

6.5” 18”

6.5” 18” 7.5”

24”

36”
Concrete - Load Path

Challenge Areas

Floor 2

- 26’-0” cantilever supported by 55’-6” auditorium span

- Floor 2 to roof columns

- 14’-0” side cantilever attached to 26’-0” cantilever

View from top

View from under-side of slab
Concrete

Floor 1
- Retaining Wall
- 16” Spread footing
- 8” Slab on grade
Concrete

Floor 2

Gravity
10” Pre-Stressed Flat Slab
- 12”x12” Perimeter columns
- 14”x14” Interior columns
- 24”x48” Spandrel beams

Lateral
- 10” Shear Wall

Challenges
- 24”x48” Cantilevered beams
- 24”x24” Auditorium & Cantilevered beams
- Perforated Shear Wall
Concrete

Floor 3

Gravity
- 10” Pre-Stressed Flat Slab
- 12”x12” Perimeter columns
- 14”x14” Interior columns
- 24”x48” Spandrel beams

Lateral
- 10” Shear Wall

Challenges
- 24”x48” Cantilevered beams
- 24”x24” Beams
- Floor 2 to Roof columns
Concrete

Section AA

Section BB

48” deep beams
24” deep beams
10” thick shear wall
MEP primary ducts
Chilled Beam System coupled with Geo-Thermal Central Plant

- MEP rooms
- Primary Ducts
- Secondary Ducts
Soil Profile

Soil Profile applies to the low of the slope
Site Plan

- **Site Area**: 3.6 acres
- **Crane Space**: 2 locations
- **JIT delivery sites**: 5150 SF
- **Excavation Storage**: 700 CY
- **Assembly Fabrication**: 12000 SF
- **Recycling & Waste Control**: 6x20 CY bins
- **Parking**: 50-55 spots
- **Site Trailers**: 1000 SF
- **Restrooms**: 4 Units
- **Heat Relief Area**: 400 SF

**Site Plan Diagram**

- Cactus Gardens
- Building Footprint

**Map Details**

- Stadium Way
- 15th St
### Schedule Budget

**Critical Path**

**Milestone**

Duration: 365 days
Erection Sequence

Vertical Core
Milestone 1: Excavation Complete
Jun 7, 2015

Milestone 2: Rammed Earth Finished
Oct 5, 2015

Milestone 3: Building Complete
May 19, 2016
Big Idea

“Ridge” to Bridge

Emphasizes on the feeling of inhabiting the areas in between

Goals:

• Circulation
• Campus Connectivity
• Daylight Interaction
• Encourage Pedestrian Use
Sun Study

FROM BUILDUING’S SOUTHWEST FAÇADE:
JANUARY 21-DECEMBER 21 AT 1PM

Summer Solstice
Sun Angle= 73.9°

Winter Solstice
Sun Angle= 27°
Floor 1

Level: -30’-0”
Height: 16’-0”

- Bathrooms
- MEP
- Storage
- Large Classrooms
- Auditorium
- Vertical Cores
- Server Room
Floor 2

- Level: -10’-0”
- Height: 12’-0”

- Bathroom
- MEP
- Storage
- Interaction Areas
- Seminar Rooms
- Small Classrooms
- Vertical Cores
- Instructional Labs
- Student Office Area
- Tech Support
North Façade

South Façade
East Façade

West Façade
Main Stairway/Interaction Area

88’-0”

20’-0”
Second Floor Interaction Area
Second Floor Classroom
Façade Development

Façade arrangement

Façade without exposed structure

Façade with exposed structure
Floor 1
- Retaining Wall
- 30” Spread footing
- 8” Slab on grade

Floor 2 & 3
- 4 ½” NW 3VLI19 metal deck

Loads
- Dead: self weight + MEP: 95 psf
- Live: corridors: 100 psf
- EQ + soil: base shear: 4000 kips
- Wind: basic wind speed: 100 mph
Steel A

Floor 2

Columns
- W12x 45
- W14x 233
- W14x 159

Beams
- W12x 26
- W12x 30
- W18x 40

Challenges
- W24x 250 Auditorium-Span bms
- W27x 122 Perimeter Brace bms
- HSS 10x 10x ⅝ Slanted elements
Steel A

Floor 3

Columns
- W12x 45
- W14x 233
- W14x 159

Beams
- W12x 26
- W12x 30
- W18x 40

Challenges
- W24x 250 Auditorium-Span bms
- W27x 122 Perimeter Brace bms
- HSS 10x 10x ⅝ Slanted columns
- HSS 10x 10x ⅝ Perimeter braces
Steel A

Cantilever Solution

- Perimeter Trusses integrated into the façade
- HSS 10x 10x ⅝ diagonals
- Interior cross bracing for lateral support
Steel B

Floor 2 & 3
- 10" Shear Wall
- HSS cross braces

Floor 1
- Retaining Wall
- 30” Spread footing
- 8” Slab on grade

Lateral

Loads

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Value</th>
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<tbody>
<tr>
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<tr>
<td>Wind: basic wind speed</td>
<td>100 mph</td>
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Steel B

Floor 2

Columns
- 12x 45
- 14x 120
- 14x 159

Beams
- 12x 26
- 12x 30

Challenges
- 24x 250 Auditorium-Span beam
- 21x 122 Cantilever tie-back beams
- HSS 4-½ x 4 ½ x ¼ Slanted Columns

Lateral
- 10” Shear Wall
- HSS cross braces
Steel B

Floor 3

Columns
- W12x 45
- W14x 120
- W14x 159

Beams
- W12x 26
- W12x 30

Challenges
- W24x 250 Auditorium-Span beam
- W21x 122 Cantilever tie-back beams
- HSS 4- ½ x 4 ½ x ¼ Slanted columns

Lateral
- 10” Shear Wall
- HSS cross braces
Steel B - Load Path

Slanted Column Frames resist both lateral loads and cantilever loads.
Steel B - Load Path

Cantilever Solution

4 slanted-column frames
No roof live load
$\Delta_{LL}$ of cantilever tip: (1) 1.12" ($<L/360 = 1.42"$)  
(2) 0.75" ($<L/360 = 0.97"$)

- W14x 120 columns
- W21x 122 Cantilever beams
- HSS 4-½x 4-½x ¼ Slanted columns
MEP Distribution

Chilled Beam System coupled with Geo-Thermal Central Plant

- MEP rooms
- Primary Ducts
- Secondary Ducts
Soil Profile

Soil Profile applies to the low of the slope
### Site Plan

#### Cactus Gardens

#### Building Footprint

<table>
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<tr>
<th>Feature</th>
<th>Details</th>
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<tbody>
<tr>
<td>Site Area</td>
<td>3.6acres</td>
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<td>JIT delivery sites</td>
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<td>Heat Relief Area</td>
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<td>Parking</td>
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<td>Assembly Fabrication</td>
<td>12000 SF</td>
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<td>Site Trailers</td>
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<td>4 Units</td>
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<td>Crane Space</td>
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Schedule Budget

Duration: 365 days

Critical Path

Milestone ➔
Erection Sequence

Floor 1
Vertical Core
Main Staircase

Floor 2

Floor 3
Milestones

Milestone 1: Excavation Complete
Jul 23, 2015

Milestone 2: Water tight
Dec 8, 2015

Milestone 3: Building Complete
May 19, 2016
Construction Method Comparison

In-situ Concrete

Steel

Rammed Earth
Project Equipment - General

**Heavy material handling**
- Volvo L220F Hybrid
- JLG 723A

**Concrete pump**
- SANY 5253THB

**Excavation**
- Kamatsu PC200-8 Hybrid

**Material and Personnel Handler**
- Techno Drill 410

**Geothermal Drill-rig**
- SANY 5253THB

Heavy material handling, Excavation, Concrete pump, Techno Drill 410, JLG 723A, Volvo L220F Hybrid.
Concept 2B
Grove TM500E-2
45ton Truck Mounted-Hydraulic Crane

All Other Concepts
Link Belt HTC8675T
75ton Truck Mounted-Hydraulic Crane
Target Value Comparison

**PIXEL**

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<th>Component</th>
<th>Cost</th>
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<td>Services</td>
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**R2B**

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**Pixel Concrete Targets**

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<th>Component</th>
<th>Cost</th>
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<td>Sitework</td>
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<td>Services</td>
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**R2B Dual Targets**

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Budgeted Cost: $7.5 Million
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**Silver Accredited** 51 10 11 50-59
## Task List to Track and Manage Design Work

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<th>Task</th>
<th>What</th>
<th>By When</th>
<th>By Whom</th>
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**Burndown Feb 27 - Mar 5**

**Planned Work Distribution Feb 27 - Mar 5**
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<tr>
<th>SAT 02/27</th>
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<tbody>
<tr>
<td>Sketchup Model of Excavated Footprint</td>
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<tr>
<td>Cantilever Structural Brainstorm C2</td>
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<td>Create Concept 2 Architectural Plans</td>
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<table>
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<td>Distribution tree with steel</td>
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<tr>
<td>Struct/load path of Concept 1B</td>
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<td>Prepare Soil Profile Slide</td>
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**Legend**
- A
- EJ
- EP
- C

**Task List to Weekly Production Plan**
Meeting Dynamics - Beginning of Quarter

0:00:00  START

Logging-On
10 min
A
EJ
EP
C

0:10:00
Agenda Discussion
10 min
A
EJ
EP
C

0:20:00
Presentation 1
30 min
A
EJ
EP
C

0:50:00
Presentation 2
30 min
A
EJ
EP
C

1:20:00
Presentation 3
30 min
A
EJ
EP
C

1:50:00
Presentation 4
30 min
A
EJ
EP
C

2:20:00
Assign Work
10 min
A
EJ
EP
C

2:30:00
END

Discussion 10 min
Presentation 1 30 min
Presentation 2 30 min
Presentation 3 30 min
Presentation 4 30 min
Assign Work 10 min
Meeting Dynamics - End of Quarter

- **Standup** 10 min
- **Agenda Discussion** 10 min
- **Group Problem Solving** 30 min
- **Subgroup Session 1** 30 min
- **Subgroup Session 2** 30 min
- **Subgroup Session 3** 30 min
- **Recap Commitments** 10 min

**Agenda:**
- **0:10:00**
  - **0:10:00**
  - **0:10:00**

**Group Problem Solving:**
- **A**
- **EJ**
- **EP**
- **C**

**Subgroup Session 1:**
- **A**
- **EJ**
- **EP**
- **C**

**Subgroup Session 2:**
- **A**
- **C**

**Subgroup Session 3:**
- **A**
- **EJ**
- **EP**

**Commitments**
- **0:00:00**
- **0:20:00**
- **1:20:00**
- **1:50:00**
- **2:20:00**
- **2:30:00**
Work Week Dynamics - Beginning of Quarter
Work Week Dynamics - End of Quarter
Compromises

Architectural Vision

Structural Solution

Structural Problems

Discontinuous brace at cantilevers

Structural Compromises

Constructability Compromises
Opportunities

- Architectural Challenge
- Structural Engineering
- Construction

Architectural Opportunity → Constructability Challenge → Architectural Opportunity

Process – R2B
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<th>Steel</th>
<th>Concrete</th>
<th>Steel</th>
<th>Dual</th>
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Team Ridge Decision Matrix

Pixel A

Pixel B

R2B A

R2B B
THANK YOU