Who we are!

Team Central

Mike

Ana

Sebastian

Seattle - US
Atlanta - US
San Juan - PR

Aalborg - DK
Weimar/Berlin - DE

Stanford - US

Albert - Ap
Amy - MEP
Chris - SE
Sophia - SE
Olga - CM
Bjorn - A
Tim - LCFM
Location – Site Context

General

- Working Path
- Site
- UCLA Campus Buildings
- Parking
- Leisure
- Greek Life
- Residences/Dorms
- Westwood
Radial outward views from our site

Location – Views from Site

Gayley Ave.

Le Conte Ave.
**Location – Climate**

### Average Annual Precipitation

- **January**: 2.5 inches
- **February**: 3.5 inches
- **March**: 2.0 inches
- **April**: 1.5 inches
- **May**: 0.5 inches
- **June**: 0.2 inches
- **July**: 0.1 inches
- **August**: 0.1 inches
- **September**: 0.5 inches
- **October**: 1.0 inches
- **November**: 2.0 inches
- **December**: 3.0 inches

Total Annual Precipitation: 14.93 inches

### Wind Rose

- **WSW**: 12%
- **SW**: 10%
- **SW**: 8%
- **S**: 6%
- **SSW**: 4%
- **SW**: 2%

### Solar Potential

- **Direct Normal Radiation (BTU/h per ft²)**

### Average Monthly Temperature

- **January**: 55°F
- **February**: 58°F
- **March**: 60°F
- **April**: 62°F
- **May**: 65°F
- **June**: 70°F
- **July**: 75°F
- **August**: 75°F
- **September**: 70°F
- **October**: 65°F
- **November**: 60°F
- **December**: 55°F
Risk Category III
Seismic Design Category D

- 0 ft - Surface
- Sandy Soil
- 5ksf Bearing Capacity
- -15 ft - Water Table

Soil Profile

Seismic Hazard Map

Los Angeles

So. Calif. Earthquake Center (SCEC)
**Big Idea**

**OASIS**

**MERRIAM WEBSTER DICTIONARY DEFINITION:**
1) An area in a desert where there are water and plants
2) A pleasant place that is surrounded by something unpleasant
3) Something that provides refuge, relief, or pleasant contrast

**HOW DOES AN OASIS INFLUENCE OUR DESIGN?**

**VEGETATION**
- Provides food for inhabitants and animals
- Supply food for users & produce PV

**INTERACTION**
- A focal point for trade and human gathering
- Space for physical and virtual collaboration & social meeting places for users

**SHADING**
- Date trees provide shade for other plants and shrubs to grow
- Building facade and shape should provide shade to users from direct sunlight

**PROTECTION**
- Lined trees protect against violent winds and sand
- Building provides shelter for the users from noise and air pollution

**LIFE**
- Symbol of energy and vitality amidst the barren desert
- Icon of sustainability and growth in the urban sprawl of Los Angeles

**WATER**
- Foundation that provides nutrients for sustaining life, originates from underground
- Used to maintain the comfort of users and grow plant life

**ISOLATION**
- Located in the middle of the desert away from other natural resources & of engineering building located away from other educational facilities on campus

**NURTURE & REPLENISH**
- Caravans must travel to refill water and food supplies
- Healthy environment supplies nutrients to users and provides relaxing spaces
L – Shape

Architect
In the city of Los Angeles ...

The building focus inwards and Protect ...

The Oasis
13  Orientation and plaza

Oasis - inspiration

Building from South West

Building and plaza seen from North
1. Floor

- Cafe
- Elevator
- Instructional Lab
- Large Class Room
- MEP Room
- Open Space
- Restroom Men
- Restroom Women
- Server Room
- Storage
- Technical Support
2. Floor – The Atrium
South facade

South office

Keiger dynamic facade

South Facade close-up
Structural Engineers
<table>
<thead>
<tr>
<th>Floor</th>
<th>Dead Load (psf)</th>
<th>Live Load (psf)</th>
<th>Earthquake Load (kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3\textsuperscript{rd} floor</td>
<td>90</td>
<td>60</td>
<td>170</td>
</tr>
<tr>
<td>2\textsuperscript{nd} floor</td>
<td>90</td>
<td>60</td>
<td>340</td>
</tr>
<tr>
<td>1\textsuperscript{st} floor</td>
<td>90</td>
<td>60</td>
<td>510</td>
</tr>
</tbody>
</table>
- Beam W24x84
- Column W14x283
L-Shape Steel Alternative - 1st Floor

- W14x283 Column
- W14x53 Column
- W16x31 Beam
- W18x40 Girder
- Moment Frame Beam W24x84
L-Shape Steel Alternative - 3rd Floor

- **W14x283 Column**
- **W14x53 Column**
- **W16x31 Beam**
- **W18x40 Girder**
- **Moment Frame Beam W24x84**
- **Steel Trusses**
• Auditorium Roof
44LH09 Steel Trusses
Allowable duct size: 26” Round, 21x21 Square, 17x27 Rectangle
Fully Composite Slab system
- 2VLI19 slab
  3.25” LWC + 2” steel deck
  total deck depth = 5.25”
- W16x31 beam
  with 1.25” camber &
  54 shear studs
- W18x40 Girder
  with 1.5” camber &
  64 shear studs
Total weight of the building: 2463 kips
Bearing Capacity of Soil: 5ksf

12” thick retaining wall

8” slab on grade

8” x 8”x15” spread footing
<table>
<thead>
<tr>
<th>Floor</th>
<th>Dead Load (psf)</th>
<th>Live Load (psf)</th>
<th>Earthquake Load (kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; floor</td>
<td>145</td>
<td>60</td>
<td>217</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; floor</td>
<td>145</td>
<td>60</td>
<td>433</td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; floor</td>
<td>145</td>
<td>60</td>
<td>650</td>
</tr>
</tbody>
</table>
L-Shape Concrete Alternative - 1st Floor

- Column
- Shear Wall
L-Shape Concrete Alternative - 3rd Floor

Column

Shear Wall
Prestressed Flat Plate Slab

Two way slab behavior
10 inch thick

Tendon spacing:
- 5 inches at the column strip
- 25 inches at the middle strip

12”x12” Concrete Square Column
18” Column Capitals
2-Way Waffle Slab
18” deep, 36” rib spacing
• 12” thick concrete shear wall in both directions
• Designed for base shear 650kip
Total weight of the building: 7324 kip
Bearing Capacity of Soil: 5ksf

12” thick retaining wall

8” slab on grade

10” x 10”x18” spread footing
<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Steel</th>
<th>Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetics</td>
<td>✔ ✔ ✔</td>
<td>✔</td>
</tr>
<tr>
<td>Cost</td>
<td>$2.8 million</td>
<td>$2.3 million</td>
</tr>
<tr>
<td>Constructability</td>
<td>✔ ✔ ✔</td>
<td>✔</td>
</tr>
<tr>
<td>Local availability</td>
<td>✔ ✔ ✔</td>
<td>✔ ✔</td>
</tr>
</tbody>
</table>
Mechanical Electrical Plumbing
Summer Equinox Solar Radiation:

Winter Equinox Solar Radiation:

Wind Pattern:

Building Orientation:
Shading Analysis - L-Shape

**Summer Solstice – 12PM**
- Shade from cantilever

**Summer Solstice – 3PM**
- Shade from facade

**Winter Solstice – 12PM**
- Solar panel exposure

**Winter Solstice – 3PM**
- Shade from neighboring building
Shading Analysis - L-Shape

Summer Solstice – 3PM

Winter Solstice – 3PM
1. Insulate – Highly insulated roof and walls

2. Shade
   - Shading façade will cover zones when maximum direct sunlight level is exceeded OR when indoor temperature is rising with solar gain
   - Cantilever on Southern face
   - Shading façade can retract when temperature in zones drops

3. Natural Ventilation
   - Night flushing through atrium

4. Thermal Mass
   - Increase the amount of thermal mass in floors and roof (PCM roof lining and in S+W walls)
Impact of Blackwater Reuse

Impact of Water-Saving Measures

Reuse Demand = ~2 kGal/day
is greater than
Greywater Availability = ~1.4 kGal/day
Tanks sized to treat approximately 3.5 kGal/day

6’x36’ for Living Machine treatment tanks
Cost of Tank: $390,000
Cost of Water in Los Angeles: $12/gal
Savings per Year: $17,000
Simple Payback Period: 22.8 years

Payback period is longer than desired, but with CA droughts and low water availability in Los Angeles, the tank would be a valuable asset (more value for money for owners)
## HVAC Options - L-Shape

<table>
<thead>
<tr>
<th>Heating</th>
<th>Cooling</th>
<th>Ventilation</th>
<th>Supply</th>
<th>Return</th>
<th>Auditorium + Large Classrooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convective Trench</td>
<td>VAV UFAD</td>
<td>VAV Economizer</td>
<td>Plenum</td>
<td>Ducts</td>
<td>VAV UFAD</td>
</tr>
<tr>
<td>Radiant Floor Slab</td>
<td>Chilled Ceiling Panels</td>
<td>DOAS</td>
<td>Overhead Ducts</td>
<td>Ducts</td>
<td>VAV UFAD</td>
</tr>
</tbody>
</table>
OPTION 1:

**Convective Trench:**
+ Heating delivered to perimeter where needed
+ Easier to replace/maintain
  -- Raises floor height

**VAV:**
+ Uses chilled water from cogen
+ Better with open floor plan
+ VAV box per room allows for good/responsive user controls
  -- Increase in floor sandwich

OPTION 2:

**Radiant Floor Slab:**
+ Increased thermal comfort
+ Thinner floor sandwich
  -- More difficult to maintain/change

**Radiant Ceiling Panels:**
+ Increased thermal comfort
+ Thinner floor sandwich
  -- Chilled water from cogen would have to be heated before being delivered to panels (less efficient)
  -- Upper limit on cooling capacity
Option 2 - Convective Trench + VAV UFAD

Max duct size: 22”
Average Duct Size: 6”-10”
Supply: UFAD + Convective Trenches (in-floor)
Return: Overhead Ducts

BLUE SERVICED BY UFAD VAV
Max duct size: 22”
Average Duct Size: 6”-10”
**Supply:** Radiant Floor + Ceiling, DOAS Overhead Supply

**Return:** Overhead Ducts

**First Floor**

**Second Floor**

**Third Floor**
PV Panels tilted at 34 degrees South

Skylights for natural daylighting
In the L-Shape, 100% of *grid demand* is offset by PV generation. The rest of the energy will come from the UCLA cogen plant.
DD – Shape

Architect
In the city of Los Angeles ...

The building is embracing
Siteplan

Gayley Ave

Le Conte Ave
3. Floor

- Administrative Assistants
- Department Chair's Office
- Elevator
- Faculty Lounge
- Faculty Office
- Large Class Room
- MEP Shaft
- Open Space
- Restroom Men
- Restroom Women
- Senior Administration Office
- Stairs
- Storage
South Facade

West Facade

North Facade

East Facade
Views of the building

View from South West

View from North East

View from South West
Structural Engineers
CBF + MF
Base Isolator: Friction Pendulum Bearing
San Andreas Fault:
In the next 30 years
6.7 magnitude: 99.7%
7.5 magnitude: 46%
<table>
<thead>
<tr>
<th></th>
<th>FLOOR SHEAR</th>
<th>TOTAL WEIGHT OF STEEL USED IN BEAMS AND COLUMNS</th>
<th>BUILDING DAMAGE</th>
<th>DOWN TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>WITHOUT BASE ISOLATOR</td>
<td>320kip</td>
<td>183tons</td>
<td>40-50%</td>
<td>6+ Months</td>
</tr>
<tr>
<td></td>
<td>160kip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WITH BASE ISOLATOR</td>
<td>124kip</td>
<td>137tons (save 25%)</td>
<td>5%</td>
<td>1- Month</td>
</tr>
<tr>
<td></td>
<td>64kip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Dead Load (psf)</td>
<td>Live Load (psf)</td>
<td>Earthquake Load (kip)</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>----------------</td>
<td>-----------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; floor</td>
<td>90</td>
<td>60</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; floor</td>
<td>90</td>
<td>60</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; floor</td>
<td>90</td>
<td>60</td>
<td>480</td>
<td></td>
</tr>
</tbody>
</table>
### AT THE BASE
- Reduced lateral loads for the entire building, easier to design

### AT THE BOTTOM OF SECOND FLOOR
- Less soil removal, no seismic moat required
<table>
<thead>
<tr>
<th></th>
<th>Building Period</th>
<th>Effective Damping</th>
<th>Storey Drift Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Base Isolator</td>
<td>0.2s</td>
<td>5%</td>
<td>0.8%</td>
</tr>
<tr>
<td>With Base Isolator</td>
<td>2.5s</td>
<td>35%</td>
<td>0.2%</td>
</tr>
</tbody>
</table>
DD-Shape Steel Alternative - 2nd Floor
DD-Shape Steel Alternative - 3rd Floor
Above the isolator: Designed for reduced shear
   Beam:   W16x31
   Column: W14x53

Below the isolator: Designed for unreduced shear
   Beam:   W24X84
   Column: W14X283
Auditorium: steel truss 20LH06
Rest of the building: steel composite floor with lightweight concrete
Total weight of the building: 2353 kips
Bearing Capacity of Soil: 5ksf

12” thick retaining wall

8” slab on grade

8” x 8” x 15” spread footing
DD-Shape Steel Alternative - Load Path
<table>
<thead>
<tr>
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<th>Dead Load (psf)</th>
<th>Live Load (psf)</th>
<th>Earthquake Load (kip)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd floor</td>
<td>55</td>
<td>60</td>
<td>58</td>
</tr>
<tr>
<td>2nd floor</td>
<td>55</td>
<td>60</td>
<td>115</td>
</tr>
<tr>
<td>1st floor</td>
<td>55</td>
<td>60</td>
<td>230</td>
</tr>
</tbody>
</table>
Auditorium roof
• Inversed Queen post Truss (combine wood post and steel rod)

- 1: Wood post
  b=12” d=15” L = 4’
- 2: Wood beam
  b=12” d=15”
  L = 47’, 44’ and 41’
- 3&4: Steel Rod (in tension)
  D=3.2”
Total depth of Queen post is around 5’
• Wood Trusses & Wood Joists

24” depth
4x2 Lumber

• 2x12 joist with o.c 16”
• Cross Laminated Timber 4”

• 6 Times lighter than concrete
• Cost competitive against steel and concrete
• Reduce overall construction time
• 1/3 thinner than concrete, shallower floor sandwich
## DD-Shape Comparison

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Double Diamond Shape</th>
<th>Steel (with base isolation)</th>
<th>Timber</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aesthetics</strong></td>
<td>✔✔✔</td>
<td>✔✔</td>
<td>✔✔</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>$3.0 million</td>
<td>$3.1 million</td>
<td></td>
</tr>
<tr>
<td><strong>Constructability</strong></td>
<td>✔✔</td>
<td>✔✔</td>
<td>✔✔</td>
</tr>
<tr>
<td><strong>Local availability</strong></td>
<td>✔✔✔</td>
<td>✔✔</td>
<td>✔✔✔</td>
</tr>
</tbody>
</table>
Major Challenges:
• Unaligned wall in architect plan, no place to hide column
• Limited floor sandwich height
• Intense seismic zone

Solutions:
• Talk to our architecture, with compromises from all disciplines(A,E and MEP), reaches optimized solution
• Use effective floor system to minimize the height of floor sandwich( Using composite slab, trusses for ducts to go through)
• Use large amount of lateral resisting systems in our building shear wall, CBF, Moment Frame
• Use base isolator for LCFM’s concern, to minimize the damage and cost of our building after a major earthquake.
Mechanical Electrical Plumbing
• Blackwater treatment

• PV roof structure

• HVAC design alternatives

<table>
<thead>
<tr>
<th>Heating</th>
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<th>Ventilation</th>
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<tr>
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<tr>
<td>Radiant Floor Slab</td>
<td>Chilled Ceiling Panels</td>
<td>DOAS</td>
</tr>
</tbody>
</table>
Summer Equinox Solar Radiation:

Winter Equinox Solar Radiation:

Wind Pattern:

Site Orientation:
Summer Solstice – 12PM

Winter Solstice – 12PM

Summer Solstice – 3PM

Winter Solstice – 3PM
8’x36’ for Living Machine treatment tanks
Max duct size: 28"
Average Duct Size: 6”-10”

Option 1 - DOAS + Radiant Ceiling/Floor

- Radiant Floor Slab
- Structure - 1’
- Overhead Distribution Ducts & Return Ducts - 1’
- Radiant Ceiling Panels - 4”

Chilled/Heated Water from Cogen Plant

Return
Supply
Supply: Radiant Floor + Ceiling, DOAS Overhead Supply
Return: Overhead Ducts
Option 2 - Convective Trench + VAV UFAD

**Max duct size: 28”**

**Average Duct Size: 6”-10”**
Supply: UFAD + Convective Trenches (in-floor shown in blue)
Return: Overhead Ducts
Impact of PV Generation - DD-Shape

How do we get to net-zero energy?

- Smaller roof area for PV will make this goal more challenging
- Look into innovative methods for energy consumption
  - More accurate energy modeling
DD-Shape Wood = Best Option

DD-Shape performs better because there are fewer solar panels + no shading system
Energy Comparison

All options relatively equal, except concrete

<table>
<thead>
<tr>
<th>Material</th>
<th>L-Shape</th>
<th>Concrete</th>
<th>Steel</th>
<th>DD-Shape</th>
<th>Wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAV</td>
<td>53%</td>
<td>1514%</td>
<td>53%</td>
<td>53%</td>
<td>53%</td>
</tr>
<tr>
<td>Radiant</td>
<td>55%</td>
<td>1517%</td>
<td>56%</td>
<td>56%</td>
<td>56%</td>
</tr>
</tbody>
</table>
Water Comparison

All options are over the target, concrete is worst

<table>
<thead>
<tr>
<th></th>
<th>Steel</th>
<th>Concrete</th>
<th>Steel</th>
<th>Wood</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-Shape</td>
<td>307%</td>
<td>3839%</td>
<td>305%</td>
<td>303%</td>
</tr>
<tr>
<td>DD-Shape</td>
<td>307%</td>
<td>3839%</td>
<td>305%</td>
<td>304%</td>
</tr>
</tbody>
</table>

VAV

Radiant
Construction Manager
Construction Site Access

- Easy access, 1.7 miles from 405 interstate
- Hospital next to the site
- Available Parking
- Space for Workers
- Bus stop next to the site 2/302
Available materials
## Equipment Selection

### Mobile Crane Monthly Rate

<table>
<thead>
<tr>
<th>Rough Terrain</th>
<th>Tonnage</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Ton</td>
<td>120</td>
<td>$16,200</td>
<td>$27,000</td>
</tr>
<tr>
<td>130 Ton</td>
<td>130</td>
<td>$17,550</td>
<td>$29,250</td>
</tr>
</tbody>
</table>

### Liebherr LTM 1160

- **Excavator & Mini-Excavator**
  - **Bucket Capacity:** 1-1/2 C.Y.
  - **Fuel Type:** Diesel, 325 HP
  - **Monthly Rate:** $8,175

### Telehandler

- **Capacity:** 1,800 lbs
- **Bucket size:** 1-1-1/4 C.Y.
- **Quick release options:** w/ forks
- **Net engine power:** 95 H.P.
- **Monthly Rate:** $2,575
**Equipment Selection**

**Dump truck:** 16 ton, 12 C.Y. payload, 400 H.P.
**Type:** Various manufacturers
**Rental rate charged:** $2,900 per month or per load if owner-operated

**Pump Size:** 32-38 m boom
**Rate charged:** $160.00 per hour
**Cub meter pumped:** $7.00 / cubic m
**Supplier:** PERI USA  
**Type:** Aluminium/Steel/Wood  
**Slab/Wall Formwork System:** Maximo or Trio  
**Scaffolding System:** Up  
**Column System:** Vario or Trio  
**Monthly Rental Rate:** $TBD  
**Distribution:** Rental / Truck
### Steel Design

<table>
<thead>
<tr>
<th></th>
<th>ESTIMATED VALUE</th>
<th>TARGET VALUE</th>
<th>VALUE DELTA</th>
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</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td>$7,500,000</td>
<td>$9,000,000</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>A Substructure</td>
<td>$300,000</td>
<td>$720,000</td>
<td>$420,000</td>
</tr>
<tr>
<td>B Shell</td>
<td>$2,800,000</td>
<td>$2,810,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>C Interiors</td>
<td>$1,000,000</td>
<td>$1,360,000</td>
<td>$360,000</td>
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<tr>
<td>D Services</td>
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<td>E Equipment and Furnish</td>
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<td>G Building Sitework</td>
<td>$430,000</td>
<td>$450,000</td>
<td>$20,000</td>
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<td>H General Conditions</td>
<td>$60,000</td>
<td>$630,000</td>
<td>$30,000</td>
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### Concrete Design

<table>
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<td>$720,000</td>
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<tr>
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</tr>
<tr>
<td>D Services</td>
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<tr>
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<tr>
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</table>
L-Shape Schedule

Key Milestones
1. Dewatering completed
2. Shell completed
3. Early access to the lab completed
4. Project completed
Total 333 days

Concrete Design

Key Milestones
1. Dewatering completed
2. Shell completed
3. Early access to the lab completed
4. Project completed
Total 337 days

Steel Design

Key Milestones
1. Dewatering completed
2. Shell completed
3. Early access to the lab completed
4. Project completed
Total 333 days
Security Gate
Storage Area
Waste Recycling Area
Pedestrian Zone for Workers
Construction Fence
Rest Area, Eco Restrooms
Site Trailers
Parking Lots (Limited)
On-Time Delivery
Place for Mobile Crane
Truck/Car Wash Zone
Security Gate
Truck Path

Site Entry
Entry for Workers
## Steel Design

<table>
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<tr>
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<th>Value Delta</th>
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<tbody>
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<td>$8,000,000</td>
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<tr>
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<td>$30,000</td>
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<tr>
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## Timber Design

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<td>$320,000</td>
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<tr>
<td>E Equipment and Furnishing</td>
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<td>F Specialty Construction</td>
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<tr>
<td>G Building Sitework</td>
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<tr>
<td>H General Conditions</td>
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<tr>
<td>Key Milestones</td>
<td>DD – Shape Schedule</td>
<td>CM</td>
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<tr>
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<td>---------------------</td>
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<tr>
<td>1. Dewatering completed</td>
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</tr>
<tr>
<td>2. Shell completed</td>
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</tr>
<tr>
<td>3. Early access to the lab completed</td>
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<td>4. Project completed</td>
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<tr>
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<td>1. Dewatering completed</td>
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</tr>
<tr>
<td>2. Shell completed</td>
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<tr>
<td>3. Early access to the lab completed</td>
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<td>4. Project completed</td>
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<tr>
<td>Total 323 days</td>
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Life Cycle Financial Management
## Building Program

### Building Program Requirements

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<th>Rooms</th>
<th>Quantity</th>
<th>SqFt each</th>
<th>SqFt total</th>
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</thead>
<tbody>
<tr>
<td>faculty offices</td>
<td>20</td>
<td>180</td>
<td>3600</td>
</tr>
<tr>
<td>department chairs offices</td>
<td>1</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>senior administration offices</td>
<td>2</td>
<td>150</td>
<td>300</td>
</tr>
<tr>
<td>administrative assistant</td>
<td>4</td>
<td>75</td>
<td>300</td>
</tr>
<tr>
<td>faculty lounge</td>
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<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>student offices</td>
<td>20</td>
<td>60</td>
<td>1200</td>
</tr>
<tr>
<td>auditorium</td>
<td>1</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>large classrooms</td>
<td>2</td>
<td>800</td>
<td>1600</td>
</tr>
<tr>
<td>student offices</td>
<td>20</td>
<td>60</td>
<td>1200</td>
</tr>
<tr>
<td>auditorium</td>
<td>1</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>large classrooms</td>
<td>2</td>
<td>800</td>
<td>1600</td>
</tr>
</tbody>
</table>

### L-Shape

- SqFt total: 3750, Percent: 104%
- SqFt total: 3691, Percent: 103%

### DD-Shape

- SqFt total: 3861, Percent: 103%
- SqFt total: 349, Percent: 116%

### Total assignable SqFt (NASF)

- 18000

### Net Usable SqFt (NUSF)

- 28412

### Ratio (NASF/GSF)

- 60%

### Total gross SqFt (GSF)

- 30000

### Building Program Requirements

- cafe: 1286 NASF
- restroom: 1102 NON-ASF
- mechanical rooms: 1000 NON-ASF
- circulation area: 7225 NON-ASF

### LCFM

- Total assignable SqFt (NASF): 18000
- Net Usable SqFt (NUSF): 28412
- Ratio (NASF/GSF): 60%
- Total gross SqFt (GSF): 30000

---

**Notes:**

- NASF: Net assignable space (functional area).
- NON-ASF: Non-assignable space.
- LCFM: Level of Constructive Function Matching.

---

**Graph:**

The graph illustrates the distribution of space requirements for various rooms, with bars indicating the square footage for L-Shape and DD-Shape designs. The tallest bars represent the spaces with the highest sq ft requirements.
Risk of new Standards
The 2030 Challenge Energy Reduction

Natural Risk – Earthquake

California Area Earthquake Probabilities

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<tr>
<th>Magnitude</th>
<th>30-Years Probability</th>
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<td>6,7</td>
<td>&gt;99%</td>
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<tr>
<td>7,0</td>
<td>94%</td>
</tr>
<tr>
<td>7,5</td>
<td>46%</td>
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<tr>
<td>8,0</td>
<td>4%</td>
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</table>

* U.S. Geological Survey (USGS)
### Natural Risk - Earthquake

<table>
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<th>Base Isolation</th>
<th>Conventional</th>
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<tr>
<td>Insurance Coverage</td>
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<tr>
<td>Deductible</td>
<td>15%</td>
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</tr>
<tr>
<td>Yearly Premium</td>
<td>$20,000/$1M</td>
<td></td>
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<tr>
<td>Yearly Premium (BI)</td>
<td>$10,000/$1M</td>
<td></td>
</tr>
<tr>
<td>L-Shape Steel (value)</td>
<td>$6.7M</td>
<td></td>
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<tr>
<td>Deductible</td>
<td>$1.0M</td>
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### 1994 Northridge Earthquake Magnitude 6.7
- **UCLA**
- **Insurance Coverage** 85%
- **Deductible** 15%
- **Yearly Premium** $20,000/$1M
- **Yearly Premium (BI)** $10,000/$1M

### L-Shape Steel (value)
- **Deductible** $1.0M
- **Yearly Premium** $176,000
- **Yearly Premium (BI)** $134,000
- **Yearly Deductible Cover** $42,000

### Value for Team and Owner
- **$2.5 Million**
- **Break even point** 4 years

### Yearly Premium
- **$10,000**
- **$67,000**
- **$69,100**

### Yearly Deductible Cover
- **$2,100**
- **$42,000**
- **$2,100**

### Yearly Premium (BI)
- **$134,000**
- **$176,000**
- **$134,000**
- **$176,000**

### Value for Team and Owner
- **$300,000**

### Break even point
- **4 years**

### Yearly Premium (value)
- **$134,000**
- **$176,000**
- **$134,000**
- **$176,000**

### LCFM
<table>
<thead>
<tr>
<th>Concrete</th>
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<th>DD-Shape</th>
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<td>Water Efficiency</td>
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<td><strong>66</strong></td>
<td><strong>66</strong></td>
<td><strong>Total</strong></td>
<td><strong>65</strong></td>
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</table>

Concrete, Steel, Timber, and Steel materials used in the construction of L-shape and DD-shape buildings.
Meetings
Once a Week
Subgroups
Kick Off
Weekly
Collaboration 30%
Communication 60%
Coordination 10%
Coordination 20%
Communication 30%
Collaboration 50%
Daily Stand Ups
Meetings
Once a Week
Subgroups
Team Process Development
Professions
Meetings
Once a Week
Subgroups
Meetings
Once a Week
Subgroups
Peer Review
Peer Review
Cris
Meetings
Once a Week
Subgroups
Winter Presentation
Team CENTRAL
Meetings
Once a Week
Subgroups
Meetings
Once a Week
Subgroups
Meetings
Once a Week
Subgroups
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<th>Rooms</th>
<th>Quantity</th>
<th>SqFt each</th>
<th>SqFt total</th>
<th>Percent SqFt total</th>
<th>SqFt total</th>
<th>Percent SqFt total</th>
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<td>3600</td>
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<td>3614</td>
<td>100%</td>
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<td>347</td>
<td>116%</td>
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<td>108%</td>
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<td>75</td>
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<td>322</td>
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## Decision Matrix

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<th>4</th>
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<td></td>
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<tr>
<td>poor</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>average</td>
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<tr>
<td>excellent</td>
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### Team

<table>
<thead>
<tr>
<th></th>
<th>AVG. WEIGHT</th>
<th>L-Shape Concrete</th>
<th>L-Shape Steel</th>
<th>DD-Shape Timber</th>
<th>DD-Shape (B) Steel</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>100 POINTS</td>
<td>WEIGHTED POINTS</td>
<td>WEIGHTED POINTS</td>
<td>POINTS</td>
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<td>17</td>
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<td>4</td>
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<tr>
<td>Construction</td>
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<td>21</td>
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<td>Operation</td>
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<td>39</td>
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### Reached Points vs. Maximum Points

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### Ratio to Maximum Points

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<td>82%</td>
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<td>60%</td>
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<td></td>
<td>7,9</td>
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### Value for Costs

<table>
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<th>Points</th>
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<tr>
<td>Building program</td>
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<tr>
<td>Funkonality &amp; Flexibility</td>
<td>55</td>
</tr>
<tr>
<td>Building quality</td>
<td>46</td>
</tr>
</tbody>
</table>

### Team Performance

- Building program: 39 points
- Funkonality & Flexibility: 34 points
- Building quality: 52 points
- Construction: 28 points
- Operation: 18 points
- Ecologic: 34 points
- Sustainability goals: 28 points
- Earthquake safety: 67 points
- Big idea: 20 points
- Building design: 52 points
Team Central Presents:

Winning first concept:

The L-SHAPE

“where the building protects and orientates the views towards the oasis (the plaza)”

THANK YOU to all Mentors, Renate and our Owners for comments, help and feedback during past quarter