PACIFIC TEAM

A - Young Kim
E - Elina Wetterblad
    Elyse Wong
    Therese Karlsson
C - Carolyn Galayda
    Chris Hall
    Ladislav Klic
The Team

Owners:
Hans Verhay & Eric Borchers

Time difference:
Palo Alto 11 am
Georgia 2 pm
Ljubljana 7 pm
Stockholm 7 pm
Project Site-SFSU

North
Existing Conditions
Proposed Orientation
Spatial Affinities

[Diagram showing spatial affinities with different colored connections and labels for security levels.]
• 1st Concept
First Architectural Concept

Mass Concept

Program Layout

Auditorium

Circulation Space

Public space

Faculty

Student

Auditorium
First Floor Plan
Second Floor plan
3D views

West side view
South-west side view

North side view
South-west side view
First Concept
  • Loading
  • Floor Layouts
  • Lateral Systems
  • Foundation
# Gravity Loading

per ASCE 7-05

<table>
<thead>
<tr>
<th>Dead Load</th>
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<tbody>
<tr>
<td>MEP</td>
<td>4 psf</td>
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<tr>
<td>Ceiling</td>
<td>6 psf</td>
</tr>
<tr>
<td>Partitions</td>
<td>20 psf</td>
</tr>
<tr>
<td>Steel Framing</td>
<td>15 psf</td>
</tr>
<tr>
<td>Concrete Elements</td>
<td>20 psf</td>
</tr>
<tr>
<td>Roof</td>
<td>20 psf</td>
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<tr>
<td>Cladding</td>
<td>25 psf</td>
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<tr>
<td>Composite Floor Deck</td>
<td>46 psf</td>
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<tr>
<td>Concrete P-T slab</td>
<td>150 psf</td>
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</table>

<table>
<thead>
<tr>
<th>Live Load (per room type)</th>
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<tbody>
<tr>
<td>Offices</td>
<td>50 psf</td>
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<tr>
<td>Assembly area- fixed seats</td>
<td>60 psf</td>
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<tr>
<td>Classrooms</td>
<td>40 psf</td>
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<tr>
<td>Access floor systems</td>
<td>100 psf</td>
</tr>
<tr>
<td>Stairs and exit ways</td>
<td>100 psf</td>
</tr>
<tr>
<td>Corridors</td>
<td>100 psf</td>
</tr>
<tr>
<td>Roof</td>
<td>20 psf</td>
</tr>
<tr>
<td>Restrooms</td>
<td>50 psf</td>
</tr>
</tbody>
</table>
Lateral Loading

Importance Factor = 1.0
Occupancy Category III

Wind
Exposure C
Wind Velocity = 85 mph
Velocity pressure, \( q_z = (0.00256V^2)K_zK_{zt}K_dI \)
Design Wind pressure, \( p = q_z(GC_p) \)
Lateral Loading

Earthquake ⇔ Controls!!

Site Class D
Seismic Design Category D
$S_s = 2.02$, $S_1 = 1.083$
$R = 8$ (Special Steel Moment Resisting Frame, Buckling Restraining Brace Frame)
$R = 6$ (Special Reinforced Concrete Shear Wall)

Seismic Base Shear:
\[
C_s = \frac{S_{DS}}{(R/I)}
\]
\[
V = C_s W
\]

Lateral Load Distribution:
\[
C_{vx} = \frac{(w_x h_x^k)}{\sum (w_i h_i^k)}
\]
\[
F_x = C_{vx} V
\]
Load Combinations

1.2D + 1.6L
1.2D + 0.5L + 1.6W
(1.2 + 0.2 S_{DS})D + 0.5L + 1.0E
→ 1.47D + 0.5L + 1.0E
0.9D + 1.0E
Composite Floor Deck

- **Vulcraft 3VLI20**
  - 3 ¼” concrete + 3” metal deck = 6 ¼” total depth
  - Lightweight Concrete (110pcf)
  - 46 psf
  - 3-span
  - Max sheet length 42’

[Omit any URLs or external references as they are not relevant to the content of the image.]
Pacific Team

1st Arch - Buckling Restrained Braced Frame

- BRBF
- Steel Column
- Cantilever
- Moment Connection

2nd Floor

3rd Floor
1st Arch - Buckling Restrained Braced Frame

BRBF
Asc = 9 in²
Beams W18x60
Columns W14x109

Beams W21x182
Columns W18x119

Base shear $V = 600$ K

$\Delta_{\text{roof}} = 1.75''$

$\text{IDR}_{\text{max}} = 0.005$

3VLI20 Vulcraft Composite Floor Deck
Typical Connections

Beam-to-Column:
Shear connection

3-Way Joint Connection

BRBF connection


Krawinkler, 2009.
1st Arch – Moment Resisting Frame

MRF connection

- MRF
- Steel columns
- Cantilever

1st Floor

Dimensions:
- 76’
- 38’
- 7’
1st Arch - Moment Resisting Frame

Base shear \( V = 600 \text{ K} \)

\( \Delta_{\text{roof}} = 5'' \)

IDR_{\text{max}} = 0.02

3VLI20 Vulcraft Composite Floor Deck

Beams W30x132
Exterior columns W24x146
Interior columns W24x207

Beams W21x182
Columns W18x119
Soil information

Colma Formation

SP-SM

Bearing Capacity: 3500 psf

Next to Liquefaction Zone

Water Table: 14’
1st Arch – Strip Footing

WF
Welded base plate to column

Base plate
Grout
Concrete slab ~4"

Anchor bolts

Total load: 33 kip/ft (480 kN/m)

Total load: 19 kip/ft (273 kN/m)

9.4 Feet
Transverse: # 9 bar spacing 7.2 inch
Longitudinal: 4 bars # 9

5.3 Feet
Transverse: # 6 bar spacing 7.7 inch
Longitudinal: 4 bars # 5

f’c: 6 ksi
f’s: 20 ksi

f’c: 6 ksi
f’s: 20 ksi
ARCHITECTURE

• 2nd Concept
Second Architectural Concept

Mass Concept

Precedent
Venissieux Mediatheque by Dominique Perrault

Learning process <-> Design

- Faculty
- Student
- Community
- Design to be porous
- Transfer Knowledge
- Become a local community anchor
First Floor plan
Section

West-East section

North-South section
Vision

Vertical Circulation

Enclosure

Interior views

University institute in Paris

Kunsthaus Bregenz

View of Corridor on the West side

View from Student office
3D views

West side view

South-west side view

South side view

South-west side view
• Second Concept
  • Floor Layouts
  • Lateral Systems
  • Foundation
2nd Arch - Moment Resisting Frame

- MRF
- Steel Column
- Cantilever
- Moment Connection
2\textsuperscript{nd} Arch - Moment Resisting Frame

3VLI20 Vulcraft Composite Floor Deck

- $\Delta_{\text{roof}} = 5''$
- IDR\textsubscript{max} = 0.02

MRF
- Beams W27x161
- Exterior columns W24x176
- Interior columns W24x229

Base shear, $V = 600$ K
Pacific Team

2nd Arch - Shear Walls

- Shear Walls
- Steel Column
- Cantilever
2nd Arch - Shear Walls

Concrete columns 16" x 16"

Post-Tension Concrete Slab 7" 1/2" diam, 7-wire strands at 16"

Beam depth = 24"
13 strands of 1/2" diam 7-wire strands

Base shear
V = 1300 K

Δroof = 0.8"

RC Shear Wall, t = 12"
Horiz shear reinf: #4 @ 12"
Vert flex reinf: 9 #10
2nd Arch – Strip Footing

Total load: 30 kip/ft (433 kN/m)

- $f'_c$: 6 ksi
- $f_s$: 20 ksi

- Transverse: #9 bar spacing 7.3 inch
- Longitudinal: 4 bars #8
CONSTRUCTION MANAGEMENT

• HVAC Overview
• Cost Estimate
• Schedule
• Logistics/Methods
Underfloor VAV

- High occupant comfort
- Less costly reconfiguration of spaces
- Better removal of contaminants from circulated air
- Poor performance if leakage exists

Active Chilled Beams

- Uses water for energy transport
- 1” pipe carries same amount of energy as 18x18” duct
- Smaller overall height
- Can contribute 4-14 LEED points
- Noise reduction
Decision Matrix

- Energy
- Comfort
- Air Quality
- Maintenance
- Cost

- Active chilled beams
- Underfloor VAV

Active Chilled Beams
Heat Source

Heater/Chiller
- Less expensive
- No excavation
- Less energy efficient

Flat collectors with Heat pump
- Uses more space
- Excavation needed
- Less expensive than earth taps

Earth Taps
- Less space usage
- Best geothermal energy usage
- The most expensive
Pacific Team

Decision Matrix

Cost

Energy

Space

Earth Taps

Flat collectors

Heater/Chiller

Flat collectors
Structural & MEP Impact on Excavation Depth: Arch Concept 1 - BRB System:

Deck: 6.25"
MEP: 12"

3rd Flr. Beams: 16.5"
2nd Flr. Beams: 18.5"
1st Flr. Beams: 22.7"

Auditorium
Classes
Offices

Excavate

9'-6"
12'

≈ 15'

9'
3' - 1"
3' - 5"
44' - 11"
30'
9'

2' - 11"
Structural & MEP Impact on Excavation Depth: Arch Concept 1 MRF System

Deck: 6.25"

MEP: 12"

All Perimeter Beams: 30"

Excavate

Auditorium

12'-4"

16'

15"

4'-25"

9'

4'-25"

9'

≈ 47 - 4"

MEP: 12"

All Perimeter Beams: 30"

Deck: 6.25"
Structural & MEP Impact on Excavation Depth: Arch Concept 2 MRF System

Deck: 6.25"
MEP: 12"

Large Perimeter Beams: 30"

Auditorium

Classes

Offices

Excavate

Using W27x161 will reduce excavation
Structural & MEP Impact on Excavation Depth: Arch Concept 2 Concrete System

- Post-Tension Slab: 7"
- MEP: 12"

Excavate

Auditorium

10' – 9"

All Beams Above Auditorium: 24"

Offices

9'

3' – 7"

Classes

9'

3' – 7"

Auditorium

16'

16'
Using active chilled beams for all the rooms except the auditorium and lobby (and maybe for 2 large classrooms). In these rooms we would only use air distribution, where we would pump air into the space along one or 2 walls (ducts would go from ceiling down to the floor where air distribution unit would be located. (we would like to ensure that air is distributed as low as possible).
Using active chilled beams for all the rooms except the auditorium and lobby (and maybe for 2 large classrooms). In these rooms we would only use air distribution, where we would pump air into the space along one or 2 walls (ducts would go from ceiling down to the floor where air distribution unit would be located. (we would like to ensure that air is distributed as low as possible).
Natural Ventilation: Vertical Air flow

West-East Section

Prevalent Winds From West

Ceiling Vents

STAIRS

HALLWAY

HALLWAY

HALLWAY

1st Floor

2nd Floor

3rd Floor

Floor Vents

Floor Vents

Open to Below

North Winds
Natural Ventilation: Vertical Air flow

West-East Section

Ceiling Vents

Prevalent Winds From West

Geothermal Duct

STAIRS

HALLWAY

HALLWAY

HALLWAY

North Winds

Prevalent Winds From North

1st Floor

2nd Floor

3rd Floor

Floor Vents

Open to Below

Floor Vents

Natural Ventilation: Vertical Air flow
Natural Ventilation: Cross Ventilation

North – South Section

- Ceiling Vent
- Floor Vents
- Main Hall

• Louvers
• Building Management System (BMS)
# Preliminary Cost Estimate

**Arch 1 Concept: BRBF**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Sub Total</th>
<th>Cost/Sf</th>
<th>% Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>FOUNDATION</td>
<td>$135,000</td>
<td>$4.03</td>
<td>2.23%</td>
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<tr>
<td>02</td>
<td>SUBSTRUCTURE</td>
<td>$230,000</td>
<td>$6.87</td>
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<td>03</td>
<td>SUPERSTRUCTURE EXTERIOR CLOSURE/ SHELL</td>
<td>$1,180,590</td>
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<td>19.54%</td>
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<tr>
<td>04</td>
<td>INTERIOR CONSTRUCTION</td>
<td>$713,310</td>
<td>$21.29</td>
<td>11.80%</td>
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<tr>
<td>05</td>
<td>CONVEYING SYSTEM</td>
<td>$115,000</td>
<td>$3.43</td>
<td>1.90%</td>
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<tr>
<td>07</td>
<td>PLUMBING</td>
<td>$268,000</td>
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<td>08</td>
<td>HVAC</td>
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<td>10</td>
<td>SITWORK</td>
<td>$576,050</td>
<td>$17.20</td>
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<td>INDIRECT COST</td>
<td>$6,042,670</td>
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<td>Overhead</td>
<td>15% $906,401</td>
<td>$27.06</td>
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<td></td>
<td>Fee</td>
<td>10% $604,267</td>
<td>$18.04</td>
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<td></td>
<td>Contingency</td>
<td>15% $906,401</td>
<td>$27.06</td>
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<td></td>
<td>TOTAL COST</td>
<td>$8,499,738</td>
<td>$252.53</td>
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**MEP = 30%**

**$8,500,000.00**
# Preliminary Cost Estimate

## Arch 1 Concept: MRF

### Building Gross Square Footage

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Sub Total</th>
<th>Cost/Sf</th>
<th>% Overall</th>
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<tbody>
<tr>
<td>FOUNDATION</td>
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<td>2.06%</td>
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<td>SUBSTRUCTURE</td>
<td>$230,000</td>
<td>$6.87</td>
<td>3.17%</td>
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<td>SUPERSTRUCTURE EXTERIOR CLOSURE/ SHELL</td>
<td>$1,543,285</td>
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<tr>
<td>INTERIOR CONSTRUCTION</td>
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<td>PLUMBING</td>
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<td>$8.00</td>
<td>3.69%</td>
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<tr>
<td>HVAC</td>
<td>$1,172,500</td>
<td>$35.00</td>
<td>16.14%</td>
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<tr>
<td>ELECTRICAL</td>
<td>$502,500</td>
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<td>6.92%</td>
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<tr>
<td>SITWORK</td>
<td>$617,550</td>
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<td>8.50%</td>
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### INDIRECT COST

<table>
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<th>% Overall</th>
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<tr>
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<td>Contingency</td>
<td>$1,087,430</td>
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### TOTAL COST

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<th>Description</th>
<th>Sub Total</th>
<th>Cost/Sf</th>
<th>% Overall</th>
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<tr>
<td>TOTAL COST</td>
<td>$10,164,349</td>
<td>$303.41</td>
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MEP = 27%

$10,200,000.00
## Preliminary Cost Estimate
### Arch 2 Concept: MRF

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<th>Item</th>
<th>Description</th>
<th>Sub Total</th>
<th>Cost/Sf</th>
<th>% Overall</th>
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<td>01</td>
<td>FOUNDATION</td>
<td>$180,000</td>
<td>$4.48</td>
<td>2.30%</td>
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<td>02</td>
<td>SUBSTRUCTURE</td>
<td>$230,000</td>
<td>$5.72</td>
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<td>03</td>
<td>SUPERSTRUCTURE EXTERIOR CLOSURE/SHLL</td>
<td>$1,786,450</td>
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<td>CONVEYING SYSTEM</td>
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<td>12.03%</td>
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<td>06</td>
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<td>$2.86</td>
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<td>07</td>
<td>HVAC</td>
<td>$321,600</td>
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<td>4.10%</td>
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<td>ELECTRICAL</td>
<td>$1,407,000</td>
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<td>10</td>
<td>SITWORK</td>
<td>$614,670</td>
<td>$15.29</td>
<td>7.84%</td>
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**INDIRECT COST**

- Overhead: 15% | $1,176,323 | $29.26
- Fee: 10% | $784,215 | $19.51
- Contingency: 15% | $1,176,323 | $29.26

**TOTAL COST** $10,979,013 | $273.11

**MEP = 30%**

**$1,050,000.00**

**$11,000,000.00**
## Preliminary Cost Estimate
### Arch 2 Concept: Concrete

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<td>$918,432</td>
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<td>06 PLUMBING</td>
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<td>$321,600</td>
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<td>07 HVAC</td>
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<td>$600,050</td>
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<td><strong>INDIRECT COST</strong></td>
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<td>Overhead</td>
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<td><strong>$24.39</strong></td>
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<td>Fee</td>
<td>10%</td>
<td><strong>$653,732</strong></td>
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<tr>
<td>Contingency</td>
<td>15%</td>
<td><strong>$980,598</strong></td>
<td><strong>$24.39</strong></td>
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<td><strong>TOTAL COST</strong></td>
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<td><strong>$9,152,244</strong></td>
<td><strong>$227.67</strong></td>
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**MEP = 34%**

**$9,200,000.00**
Cost Comparison

- Arch 1 Concept: BRBF - $8,500,000
- Arch 1 Concept: MRF - $10,200,000
- Arch 2 Concept: MRF - $11,000,000
- Arch 2 Concept: Concrete - $9,200,000

Budget: $7,500,000
$/SF Comparison

- Arch 1 Concept: BRBF - $253.00
- Arch 1 Concept: MRF - $303.00
- Arch 2 Concept: MRF - $273.00
- Arch 2 Concept: Concrete - $228.00
Pacific Team

1st architectural concept - Steel  1 Year  I  266 working days


Site preparation + Foundation
- Structural steel shell
- Exterior and interior walls
- MEP
- Outside Envelope
- Interior work
- Final Cleanup

2nd architectural concept - Concrete  1 Year, 1 month  I  292 working days


- Structural concrete shell
- Exterior and interior walls
- MEP
- Outside Envelope
- Interior work
- Final Cleanup
Moving Forward

MS Project
Scheduling

Moving to integrated solution

MS Excel
Cost estimate

VICO SOFTWARE
Integrating Construction

Constructor
Estimator
Control scheduling and management
5D Presenter
Site Approach

- Median Prevents Turn From North
- Fence & Slope Along North Side Prevent Access
- Requires travel through low-height tunnel under mall
- Not a Through Street

North
Traffic Control

Potential Area of Truck Turn-Around

Existing Library Annex Bldgs

Police Station

Existing Parking Garage

North
Concept 1 Logistics

- **Trailer**
- **Loading**
- **Staging & Recycling**
- **Fence**
- **Equipment Entrance**
- **Worker Entrance**
- **Secure Entrance**
Concept 2 Logistics

- Trailer
- Staging
- Recycling
- Loading
- Equipment Entrance
- Worker Entrance
- Secure Entrance
- Fence

North
TEAM PROCESS

- Process & Progress
- SimVision
Process & Progress

Synchronous Communication:

**Skype** – Audio and some textual

**Netmeeting & Recall** – Graphic visual & audio recording

**Vsee** - Video during Friday meetings

**QWAQ** – Team building

**DabbleBoard** – for real time graphic visual discussions during discipline specific meetings when netmeeting is unavailable
Asynchronous Communication:

**Google Group:**
- Tracks all communication
- Consolidates longer discussion threads and informal chatting in one spot
- Includes Calendar
- Easily allows Google Doc sharing

**Google Docs:**
- Allows multiple parties to view an edit
- Used for:
  - developing meeting agendas
  - tracking task list
  - sharing developing information and notes

**Oslo:**
- for sharing finalized information and files
Rules:

• Weekly update of task list (google docs)  
  (when, who, what, status, notes log includes links to further documentation)

• Standardized methods of:
  • Weekly meeting role assignments
  • Agenda organization
  • Documentation naming and sharing for oslo & Google docs
  • Sharing of all meeting minutes
  • Slide show development

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<th>Date Due</th>
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Process & Progress

• Improvement Moving Forward
  – Weekly multi-disciplinary meeting
  – Update task list more frequently
  – Post log from inter-disciplinary meetings
  – Leave Skype on when possible
  – More contact with owners & mentors
SimVision Model

Team organization and meetings
SimVision Model

Tasks
SimVision Position Backlog

Pacific Team

Architect
Structural
Two Day Backlog
FINAL PRODUCT

- Focal Points
- Spider Diagram
- Decision Matrix
- Recommendation
## Focal Points

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Recommendation

Thank You!

Questions?