TEAM

CAMILA HERNANDEZ
WENJIN SITU
LI DENG
ANNA BURISCH
NATHAN HILL
NIRUPAMA KUTCHARLAKOTA
CHRISTINE BAUMER

MEP
SE
SE
MEP
CM
CM
LCFM
OWNERS

MIKE MILLER
LUKE LOMBARDI
SARAH SAXON
CHRISTOPHER GÖRSCHE
JURE CESNIK
BIANCA MORELL
CONCEPT DECISION

OPTIONS

Bird Concrete  
Bird Steel /C  
Air Cube Concrete  
Air Cube Steel /C

CRITERIA

1. Challenge Integration  
2. Sustainability  
3. Integrated Solution  
4. Life Cycle Costs  
5. Site Relations  
6. Constructability  
7. Concept Clarity  
8. Flexibility & Adaptability  
9. Aesthetic Value  
10. Risk Management  
11. Prefabrication & Modularization

DECISION based on weighted criteria in cooperation with the owners
CONCEPT DECISION

RATING BY OWNERS AND TEAM

<table>
<thead>
<tr>
<th></th>
<th>Reached Points</th>
<th>Ratio to max. points</th>
<th>Annual Rent</th>
<th>Value for Cost*</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIRD-Concrete</td>
<td>192</td>
<td>48</td>
<td>880,000</td>
<td>58</td>
</tr>
<tr>
<td>BIRD-Steel/C</td>
<td>187</td>
<td>47</td>
<td>910,000</td>
<td>41</td>
</tr>
<tr>
<td>AIR CUBE-Concrete</td>
<td>293</td>
<td>73</td>
<td>830,000</td>
<td>124</td>
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<tr>
<td>AIR CUBE-Steel/C</td>
<td>291</td>
<td>72</td>
<td>850,000</td>
<td>109</td>
</tr>
</tbody>
</table>

* = Ratio to max. x (1Mio. $ - Annual rent) / 100,000
San Juan, Puerto Rico
LOCATION ON SITE

- Student Center
- Old School of Architecture
- Old Bleachers
- Faculty of Education
WEATHER CONDITIONS

Rainy Seasons

Hurricanes and Dust Storms

Humid Outdoor Air
Av. relative humidity: 76%

Wind

Average Sunlight Hours: 8 hrs

High Cooling Capacity Demand

SAN JUAN

Average temperatures

Average rainfall

January February March April May June July August September October November December

Average high temperatures Average low temperatures Rainfall (mm)
SOLAR CONDITIONS

March 10 am – 8 pm

June 8 am – 10 pm

December 11 am – 7 pm
WE WORK WITH THE CONDITIONS INSTEAD OF IMPOSING ON THEM
PROJECT CHALLENGES

CLIENT
AFFINITY

AIR
QUALITY

OPEN
AUDITORIUM

FACADE

EARTHQUAKE

HURRICANE

SCHEDULE
PROJECT GOALS
OPEN AUDITORIUM

(1938)

(2016)
GROUND LEVEL

Entrance

- Labs
- Small Classrooms
- Storage
- Vertical Circulation
- Mech Rooms
- Bathrooms
- Janitor’s Room
- Atrium
INTERMEDIATE LEVEL

- Students Offices
- Open Collaboration Space
- Storage
- Vertical Circulation
- Mech Room
- Bathrooms
- Janitor's Closet
FLOORPLAN ANALYSIS
WEST ELEVATION

NORTH ELEVATION
DESIGN STRATEGIES

DESIGN STRATEGIES: JANUARY through DECEMBER

1. Comfort (98 hrs)
2. Sun Shading of Windows (2579 hrs)
3. High Thermal Mass (33 hrs)
4. High Thermal Mass Night Flushed (0 hrs)
5. Direct Evaporative Cooling (0 hrs)
6. Two-Stage Evaporative Cooling (0 hrs)
7. Natural Ventilation Cooling (0 hrs)
8. Fan-Forced Ventilation Cooling (0 hrs)
9. Internal Heat Gain (0 hrs)
10. Passive Solar Direct Gain Low Mass (0 hrs)
11. Passive Solar Direct Gain High Mass (0 hrs)
12. Wind Protection of Outdoor Spaces (0 hrs)
13. Humidification Only (0 hrs)
14. Dehumidification Only (3648 hrs)
15. Cooling, add Dehumidification if needed (4984 hrs)
16. Heating, add Humidification if needed (0 hrs)

100.0% Comfortable Hours using Selected Strategies
(8760 out of 8760 hrs)

Comfort Zones show:
Summer clothing on right,
Winter clothing on left.

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ROOM ANALYSIS - FIRST FLOORS

Class rooms
Auditorium
Seminar rooms
Labs

=HIGH COOLING LOAD

STRATEGY

SOLUTION

+ Dessicant wheel
HVAC DESIGN

Chilled water

Classroom+Labs Ceiling supply and return

Auditorium UFAD
POTENTIAL FOR ADAPTIVE COMFORT

Climate Consultant 6.0
# ROOM ANALYSIS - SECOND FLOOR

<table>
<thead>
<tr>
<th>TYPE</th>
<th>STRATEGY</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>![Fan Icon]</td>
<td>Portable unit used during extreme weather conditions</td>
</tr>
<tr>
<td>Administration</td>
<td>![Paper Stack Icon]</td>
<td>Meet R2D2</td>
</tr>
</tbody>
</table>

= OCCUPANT CONTROL
NORMAL CONDITION

Office on second floor
# LOAD INFORMATION (GRAVITY)

<table>
<thead>
<tr>
<th>Function</th>
<th>Live Load (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>50</td>
</tr>
<tr>
<td>Corridor</td>
<td>100</td>
</tr>
<tr>
<td>Roof</td>
<td>40</td>
</tr>
<tr>
<td>Classrooms</td>
<td>40</td>
</tr>
<tr>
<td>Storage</td>
<td>250</td>
</tr>
<tr>
<td>Lab</td>
<td>200</td>
</tr>
<tr>
<td>Auditorium</td>
<td>100</td>
</tr>
</tbody>
</table>

**Soil Profile**

Bearing Capacity: 5000 psf
Earthquake
$S_s = 1.0\text{g}$
$S_1 = 0.4\text{g}$
Site Class C
Damping ratio = 5%
Base Shear = 979 kips

Hurricane
Hurricane season Jun-Nov
wind pressure = 70 psf
max. speed = 170 mph
Main Features
RC Moment Resisting Frame
Shear Wall Cores (Rocking shear walls)
10’ cantilevers all-sided
TYPICAL STRUCTURAL LAYOUTS

- Cantilever Regions
- Shear Wall 12"
- Int. Column 18” x 18”
- Ext. Column 16” x 16”
- Beams (Auditorium Long Span) 24”
- Beams (Cantilever & Core) 16”
- Reinforced Concrete Slabs 6”
FOUNDATION (RETAINING WALL)

Thickness: 18"
Ext Vert Bar: #7 @ 16"
Horz. stirrup: #5 @ 6'
10 ft Cantilever Region
Max. Disp. 1.18 in < L/360
DYNAMIC MODEL ANALYSIS

$T_1 = 0.215\text{s}$ (Torsion Dominate)  

$T_2 = 0.18\text{s}$  

$T_3 = 0.158\text{s}$

Max Disp.  

X direction 0.72 in  

Y direction 0.64 in
SPECTRA SEISMIC ANALYSIS

Amplified Max. Displacement = 2 in < L/360
Amplified Inter-Story Drift Ratio = 0.5% < 2%
NON-STRUCTURAL DAMAGE

WORTH 80% OF LOSS!
CONTROL NON-STRUCTURAL DAMAGE BY CONTROLLING DRIFT
EARTHQUAKE TECHNOLOGY (RESILIENT DESIGN)

Benefits:
- Self centering mechanism
- 50% reduced Base Shear
- Larger drift capacity
- Reduced residual drift after seismic event
**ROCKING SHEAR WALL DESIGN**  
*Based on ACI ITG-5.2-09*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Reinforcement Bar Size</td>
<td>#11</td>
</tr>
<tr>
<td>Total quantity of bars (equal number each side)</td>
<td>7</td>
</tr>
<tr>
<td>PT Strand diameter</td>
<td>0.5”</td>
</tr>
<tr>
<td># of stands</td>
<td>25</td>
</tr>
<tr>
<td>Concrete Strength (f'c)</td>
<td>5 ksi</td>
</tr>
<tr>
<td>Effective prestress after losses</td>
<td>175 ksi</td>
</tr>
<tr>
<td>PT Steel Strength (f_{py})</td>
<td>270 ksi</td>
</tr>
<tr>
<td>reinforcement yield strength</td>
<td>60 ksi</td>
</tr>
<tr>
<td>Total Prestress Force</td>
<td>1136 kips</td>
</tr>
</tbody>
</table>
RISK MANAGEMENT

Self centering shear wall

Reduced damages
Reduce risk of interruption of operations

-60%
($1,300,000)
Over 25 years

Risk
Strategy
Reduction of impact
Risk cost reduction
FACADE INSPIRATION
WINTER QUARTER: STRUCTURAL FACADE
DISCIPLINE INTERACTION

Why create new problems? Keep occupants in mind.
IMPLEMENTATION

STEEL

CONCRETE

ALUMINUM

HURRICANE PROTECTION

STRUCTURAL

AIR PURIFICATION

MATERIAL

COST
SOLUTION

80% Strength of Steel

30% Cheaper than Steel

15% Cheaper than Concrete

Locally Manufactured

Light & Easily Constructable

ALUMINUM
Façade Wall Section
1. Solar light bulb
2. Solar Energy Panel
3. Aluminium Frame
4. Steel Angle
5. Aluminium Panel #2
6. Glass Operable Louvers
7. Aluminium Panel #3
8. Cat-Walk Mesh
9. Cat-Walk
10. Pre-cast Concrete Slab
11. Green Planter Seating
12. Pre-cast Concrete Beam
HURRICANE PROTECTION STRATEGY

Exterior Aluminum Facade
Glass

Interior Impact Resistant
Storm Protection
VEROTech Glazing System

● Retains its properties when subjected to equivalent wind speed = 220 mph

● Stays intact after a simulation cycle forces of hours-long storm
HURRICANE PROTECTION (EXTERIOR)

WHY ALUMINUM?

● 2.5 x Lighter than Steel
● 80% Strength of Steel
● 30% Less Expensive
● Green: produced by electricity
● Corrosion Resistant
FACADE ANALYSIS ITERATION

- Minimum Thickness of Facade
- Optimize Voronoi openings
● Thickness 1 in
● Initial Speed of particles: 170 m/h
● Young’s Modulus: 10$^4$ ksi
● Element Type: Plate
● Thickness 3 in
● Initial Speed of particles: 170 m/h
● Young’s Modulus: $10^4$ ksi
● Element Type: Plate
LIFE CYCLE IMPACT - FACADE

RISK MANAGEMENT

Façade system

-25% ($250,000)

LIFE CYCLE COST

OPERATION & MAINTENANCE COST
-15% ($90,000)

REPLACEMENT COST

Over 25 years

SAVINGS

RISK MANAGEMENT

STRATEGY

RISK COST REDUCTION

Over 25 years

Over 25 years
AIR QUALITY CHALLENGE

HUMIDITY

FUNGUS

SAHARA DUST
MAKING THE INVISIBLE VISIBLE
INTENTION

ATTRACT  INFORM  EDUCATE
AIR POLLUTANTS

CO₂  HUMIDITY  POLLEN  SMALL PARTICLES  STORM WARNING  FUNGUS  SAHARA DUST
MINI AIR CUBE’S LOCATION
GREEN WALLS
1 Solar light bulb
2 Solar Energy Panel
3 Aluminum Frame
4 Steel Angle
5 Aluminum Panel #2
6 Glass Operable Louvers
7 Aluminum Panel #3
8 Cat-Walk Mesh
9 Cat-Walk
10 Pre-cast Concrete Slab
11 Green Planter Seating
12 Pre-cast Concrete Beam
PANEL COATING

SELF CLEANING

AIR CLEANING

ANTIBACTERIAL
SITE LOGISTICS - AIR QUALITY
SCHEDULE CONSTRAINTS

Hurricane Season
June- November

Construction Window
8 months
## CIP VS. PRECAST

<table>
<thead>
<tr>
<th>Cast-In-Place</th>
<th>Precast</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Longer Duration</strong></td>
<td><strong>Shorter Duration</strong></td>
</tr>
<tr>
<td>• Column: 4 Hrs + 24 Hrs</td>
<td>• Columns: 0.72 Hrs + 24 Hrs</td>
</tr>
<tr>
<td>• Beams: 6 Hrs + 24 Hrs</td>
<td>• Beams: 0.38 Hrs + 24 Hrs</td>
</tr>
<tr>
<td>• Shear Walls: 24 Hrs + 24 Hrs</td>
<td>• Shear Walls: 1 Hrs + 24 Hrs</td>
</tr>
</tbody>
</table>

(Formwork + Rebar + Concrete + Curing + Strip) | (Installation + Grouting)

**CIP 4 X Longer**
PRECAST JOINT BEAM / SHEAR WALL
PRECAST JOINT BEAM / SHEAR WALL

PTC® Creo®

Column Ties
Welded Plate
Connection Dowels
Bearing Plate
PRECAST JOINT BEAM / SHEAR WALL
SHEAR WALL OVERVIEW

- $l_w = 16 \text{ ft}$
- $h_w = 15 \text{ ft}$
- $h_w / l_w < 1$

Squat Wall
Shear Failure Dominates
SHEAR WALL MODELLING

With Precast Joint

- **Tip Force = 455 k on both sides**
- **Tip deflection: 2.7 in**

Ordinary Wall - without Supporting Platform
SYSTEM COORDINATION
SHEAR WALL DETAIL DESIGN

Horizontal

16'

15'

No. 10 @ 10”

No. 8 @ 10”

Longitudinal

6’

4’

6’

No.10’ @18”

No.6’ @18”

No.10’ @18”

No.6’ @18”
OFFSITE LOGISTICS

Site
EQUIPMENT

Site
- Esmo Gruas Hidraulicas
- BlueLine Rental

Cranes
Excavators and Man lifts
MATERIAL PROCUREMENT

- Site
- Marxuach Precast Solutions
- Steel and pipes Inc.
- Acha Trading - Interiors
- United Glass Co.
- Cemex
- Commercial Plastics Corp
- Tesoro en Maderas - Wood
- Vista systems- Curtain Wall
- ACR Systems - HVAC
- Clary Corporation - Electrical
- CED- PV modules
CONSTRUCTION SAFETY

SITE SAFETY

All Visitors and Contractors must report to Site Office to receive information and rules regarding this site.

Safety helmets must be worn
Safety footwear must be worn
High visibility jackets must be worn
No unauthorised persons allowed on this site

PELIGRO
ÁREA DE CONSTRUCCIÓN

CAUTION
MEN WORKING ABOVE

SMACNA
ZONING

ZONE A  3930 Sq.ft
ZONE B  6085 Sq.ft
Labs located on the ground floor.

Façade on the side of user entry completed.

Labs occupied by May 11th.

Temporary cooling provided for the labs.

Lab Areas cordoned off.
Pedestrian Entry for Labs
SITE LOGISTICS - EXCAVATION

- Excavate
- Pile Drive
- Excavate
- Bulldoze
- Compact
UTILITY LOCATIONS

- Water Supply
- Sewer Tie-In
- Electrical
CONSTRUCTION SCHEDULE
PHASING

BILLBOARDING- CONSTRUCTION SEQUENCE
4D MOVIE
## AIR CUBE - TVD

<table>
<thead>
<tr>
<th>Description</th>
<th>Estimated Value</th>
<th>Target Value</th>
<th>Value Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TOTAL</strong></td>
<td>$9,372,000</td>
<td>$9,776,000</td>
<td>$404,000</td>
</tr>
<tr>
<td>A Substructure</td>
<td>$1,355,000</td>
<td>$1,575,000</td>
<td>$220,000</td>
</tr>
<tr>
<td>B Shell</td>
<td>$1,482,000</td>
<td>$1,305,000</td>
<td>$(177,000)</td>
</tr>
<tr>
<td>C Interiors</td>
<td>$520,000</td>
<td>$545,000</td>
<td>$25,000</td>
</tr>
<tr>
<td>D Services</td>
<td>$1,995,000</td>
<td>$2,031,000</td>
<td>$36,000</td>
</tr>
<tr>
<td>E Equipment and Furnishing</td>
<td>$520,000</td>
<td>$500,000</td>
<td>$(20,000)</td>
</tr>
<tr>
<td>F Specialty Construction</td>
<td>$1,558,000</td>
<td>$1,940,000</td>
<td>$382,000</td>
</tr>
<tr>
<td>G Building Sitework</td>
<td>$715,000</td>
<td>$575,000</td>
<td>$(140,000)</td>
</tr>
<tr>
<td>H General Conditions</td>
<td>$1,227,000</td>
<td>$1,305,000</td>
<td>$78,000</td>
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</table>
STV EVOLUTION

Team Engagement

Facade Material
Concrete as Structural Material
Energy Analysis
PV Panels

Time

Water (kgH₂O)
Energy (MJ)
Carbon (kgCO₂e)

Target
Team
PHOTOVOLTAIC PANELS

Panel Coverage - **40% roof area**

Power Supply: 250 panels - **122,000 kWh**

Produce **1/3** of Total Energy Consumption

**17% Energy Cost Savings**
LIFE CYCLE MANAGEMENT

MONETARY ASPECTS

Construction Cost
Operations & M. Cost
Replacement Cost
Risk Cost
Financial Cost

MONETARY & NON-MONETARY BENEFITS

Social Aspects
Ecologic Aspects
Economic Aspects
Aesthetics

LIFE CYCLE COST
VALUE (FOR COST)

MINIMAL COSTS → Effective BALANCE → MAXIMUM VALUE

Project’s key determinants
OPEN AUDITORIUM – VALUE FOR COST ANALYSIS

**LIFE CYCLE COST**

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Construction Cost</td>
<td>$105,000</td>
</tr>
<tr>
<td>Operations &amp; M. Cost</td>
<td>$210,000</td>
</tr>
<tr>
<td>Replacement Cost</td>
<td>$16,000</td>
</tr>
<tr>
<td>Risk Cost</td>
<td>$35,000</td>
</tr>
<tr>
<td>Financial Cost</td>
<td>$31,000</td>
</tr>
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</table>

**Total LCC:** (over 25 years) $400,000

**VALUE**

<table>
<thead>
<tr>
<th>Aspects</th>
<th>Owner Weight</th>
<th>Rate (1-5)</th>
<th>Weighted Score</th>
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</thead>
<tbody>
<tr>
<td>Social Aspects</td>
<td>30</td>
<td>5</td>
<td>150</td>
</tr>
<tr>
<td>Ecologic Aspects</td>
<td>35</td>
<td>4</td>
<td>140</td>
</tr>
<tr>
<td>Economic Aspects</td>
<td>25</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>10</td>
<td>5</td>
<td>50</td>
</tr>
</tbody>
</table>

**Total score:** 430 points

**TRANSFER**

- **1 W. P. ≡ 1 Point**
- **1000$ ≡ 1 Point**

**117**

- Open for everyone
- Collaboration space
- Space for demonstration
- Reuse of old bleachers
- Ecological materials
- Additional space for events
- Increase in value of property
- High quality of stay
- Views to green landscape

**400 COST points**

**415 VALUE points**
LIFE CYCLE MANAGEMENT

STRATEGIES

▪ Utilize Cost Management and Value Engineering throughout the Design & Development Process
▪ Collaboration & Integration

REDUCE:
Productivity
Sustainability
Quality

IMPROVE:
▪ Floor plan analysis (Space Efficiency)
▪ Decision for alternatives based on life cycle assessment & Value for Cost approach
▪ Financial engineering
▪ Integrated risk management approach
LIFE CYCLE MANAGEMENT

VALUE FOR OWNER & USERS

SOCIAL
- Design according users needs
- Collaboration spaces
- Open auditorium
- Aesthetical value

ECOLOGIC
- LEED silver certification
- Low environmental impact
- Energy & water system optimization

ECONOMIC
- Additional Income
- Increased property value
- Increased attractiveness to students
- LCC reduction

MONETARY BENEFITS

Public sector comparator
PPP-Project -6%
Additional income -10%
Use of PV-system -4%
Atrium roof -1%
Financial engineering -4 %
Replacement & M. strategy -3 %

Rent reduction
$ 1,250,000

$ 917,000
# LIFE CYCLE COST

## Expenses

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total LCC (over 25 years)</td>
<td>$23,635,000</td>
<td></td>
</tr>
<tr>
<td>Construction Cost</td>
<td>$9,352,000</td>
<td>37%</td>
</tr>
<tr>
<td>Operations &amp; Maintenance Cost</td>
<td>$7,758,000</td>
<td>34%</td>
</tr>
<tr>
<td>Replacement Cost</td>
<td>$1,215,000</td>
<td>6%</td>
</tr>
<tr>
<td>Risk Cost</td>
<td>$2,609,000</td>
<td>11%</td>
</tr>
<tr>
<td>Financial Cost</td>
<td>$2,701,000</td>
<td>12%</td>
</tr>
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## Income

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Income (over 25 years)</td>
<td>$26,091,000</td>
<td></td>
</tr>
<tr>
<td>Rent for Building</td>
<td>$22,952,000</td>
<td>88%</td>
</tr>
<tr>
<td>Rentable Spaces</td>
<td>$712,000</td>
<td>9%</td>
</tr>
<tr>
<td>Rent for Cafe</td>
<td>$2,453,000</td>
<td>3%</td>
</tr>
</tbody>
</table>
REPLACEMENT & MAINTENANCE STRATEGY

Preventive maintenance program

**DETECT & CORRECT** problems before they occur

Maximize efficiency
Minimize excessive labor

Replacement STRATEGY

- **2035**
  - Interior fittings: $50,000
  - PPP contract (25 years)

- **2040**
  - Doors, Exterior, Mechanical & Electrical equipment, Elevators: $945,000
  - PV System, Security

- **2045**
  - Inner partitions, Openings, Ceilings: $220,000

11% reduced Replacement & Maintenance cost over 25 years
RISK MANAGEMENT

Self centering shear Wall - 60%

Façade system - 25%

Security system - 45%

Local materials Precast - 40%

REduced total risk cost $3,540,000 $2,600,000
ACCUMULATED CASH FLOW

- Annual Income
- Annual Outcome
- Accumulated Cash Flow

BREAK EVEN POINT
BUILDING RATING

LEED

- Integrative Process: 1 / 1
- Location & Transportation: 6 / 16
- Sustainable Sites: 7 / 10
- Water Efficiency: 5 / 11
- Energy & Atmosphere: 18 / 33
- Material & Resources: 5 / 13
- Indoor environmental quality: 10 / 16
- Innovation: 1 / 6
- Regional priority: 3 / 4

Total: 56 / 110

WELL BUILDING STANDARD FOR EDUCATIONAL FACILITIES

... focuses on the health and wellness impacts that buildings have on occupants.

ALL preconditions & 40% Optimization Features

Max: 16
Air: X
Water: X
Nourishment: X
Light: X
Fitness: X
Comfort: X
Mind: X

Silver
Gold
Platinum
COMMUNICATION

How the owner explained it
How the architect understood
How the engineer designed
How the CM managed
How the MEP planned
How the LCFM calculated
What the client really wanted

Different
Disciplines
Cultures
Knowledge
Personality

Different understanding

Clear and understandable conversation necessary
WHAT OUR CLIENT NEEDS IS WHAT WE ENVISION AND FINALLY DELIVER
GOAL SETTING

OWNER GOALS

SUSTAINABILITY-
TRIPLE BOTTOM LINE

MULTI-DISCIPLINARY
PROJECT SOLUTIONS

TEAM GOALS

THE BUILDING IS
A LANDMARK IN
UPR

PREFABRICATION &
MODULARIZATION

INTEGRATED SOLUTIONS
SUSTAINABILITY
RISK MITIGATION

FLEXIBILITY OF
DESIGN

MAXIMIZE
DAYLIGHTING
AND VIEWS

BUILDING MUST
RESPOND TO USER’S
NEEDS

MINIMIZE
DEPENDENCE ON
ELECTRICITY GRID
IMPACT ON DESIGN

- Cafeteria
- Collaboration spaces
- Indoor Auditorium
- Façade
- Open Auditorium
- Green walls

USERS

CLIENTS
DEFINITION

PROCESS
Understand clients needs

PRODUCT
Deliver the maximum value

SATISFACTION
Create memorable experience
STRATEGIES

INFORM

ENGAGE

EQUIP

IMPLEMENTATION

METRIC

5 Posts/week
7 Visitors/week

9 Comments/week
8 Surveys/period

4 #No. of decisions
ADVANTAGES OF WORDPRESS

1. PREFERENCES
   check at own time & level of detail

2. COMMENTS
   stay on page

3. NO overload of information
SURVEYS IN WINTER QUARTER

Big Idea I - Puerto Rican Parrot
Feb 2

Decision Matrix
March 1

Evaluation Winter Quarter
March 13

Average 4/6 Responses

Design Outcome
Criteria
Building Performance
Performance Scores
SURVEYS IN SPRING QUARTER

Preferences for Communication
March 22

User Survey
March 30

Evaluation Spring Quarter
April 24

Satisfaction Survey
May 3

Rating Air Cube Spring
April 29

Communication Protocol

Space Evolution

Performance Scores

Building Performance Scores
METRICS - WINTER QUARTER

Facebook Page Statistics

Week

Jan 29-Feb 5: Posts 5, Comments 4
Feb 5-Feb 12: Posts 4, Comments 3
Feb 12-Feb 19: Posts 6, Comments 2
Feb 19-Feb 26: Posts 4, Comments 2
Feb 26-Mar 4: Posts 8, Comments 8
Mar 4-Mar 11: Posts 4, Comments 4
Mar 11-Mar 18: Posts 1, Comments 1
Mar 18-Mar 25: Posts 2, Comments 2
METRICS - SPRING QUARTER

- 5 Posts/ Week
- 7 Visitors/Week
- 9 Comments/ Week
- 8 Surveys
CLIENT AFFINITY SCORES- TEAM ISLAND

Inform Scores: 19%
Engage Scores: 19%
Equip Scores: 24%

Winter Quarter Scores

Spring Quarter Scores
Overall Scores 21%

“This site kicks a**”

“I like the creative solutions and appreciate your effort to keep owners updates.”

“The Wordpress page really improved the overall communication.”
BUILDING PERFORMANCE EVOLUTION

CHALLENGE INTEGRATION
SUSTAINABILITY
INTEGRATED SOLUTION
LIFE CYCLE COSTS
SITE RELATIONS
CONSTRUCTABILITY
CONCEPT CLARITY
FLEXIBILITY & ADAPTABILITY
AESTHETIC VALUE
RISK MANAGEMENT
PREFABRICATION & MODULARIZATION

Weight  Criteria  Rating  Total Weighted Score

1  (average)  2  (good)  3  (very good)  4  (excellent)

Winter Quarter

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Rating</th>
<th>Reached Points</th>
<th>Ratio to Max. Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter Quarter</td>
<td></td>
<td>290</td>
<td>72%</td>
</tr>
<tr>
<td>Spring Quarter</td>
<td></td>
<td>330</td>
<td>83%</td>
</tr>
</tbody>
</table>

Total Weighted Score

140
Client EASE of communication is important

Understand client PERSONALITY hands-on

Information PREFERENCES

Avoid TOO MUCH information

LISTEN carefully

DELIVER on your promises
TEAM PROCESS

RECOGNIZE

DEDICATED EFFORT

THE ‘A’ TEAM

CM

SE

MEP

LCFM

CM

MEP

SE

A

A

TALK

LISTEN

UNDERSTAND

LEARN

TRUST
BIM COORDINATION

Modeling

AUTODESK® REVIT® 2016

Project Development

ETABS® 2015

DYNA MORE

ANSYS®
BIM INTERACTION

Clash Avoidance  Clash Detection  Coordination

AUTODESK® REVIT® 2016
SUMMARY CLIENT AFFINITY CHALLENGE

- Aligning **Goals** and Converging **Scores**
- Interactive **Wordpress Blog** - Ease of Client Dialogue
- **Dialogue** Established with Comment Threads
- **Surveys** to Collect Feedback
- **Customized** Information Delivery
SUMMARY AIR QUALITY CHALLENGE

- Clean Construction - Billboard at Construction Site
- Local Material
- Green Walls
- Sensors Placed Strategically to Collect Data
- Attract, Inform and Educate Users & Visitors!
SPECIAL THANKS TO

MENTORS
Humberto Cavallin
John Nelson
Glenn Katz
David Bentlett
Björn Wündsch
Norayr Badasyan
Elizabeth Joyce
Dorian Curcanu
Ronnie Piil Haagensen
Eric Borchers
Greg Luth
and many others...

OWNERS
Jure Česnik
Christopher Görsch
Luke Lombardi
Mike Miller
Bianca Morell
Sarah Saxon

PBL TEAM
Renate Fruchter
Flavia Grey
Maria Frank

Thank you! 謝謝！Danke! धन्यवाद! Gracias!
LESSONS LEARNED

Remember to take a step back.

Hello from the other side.

You can’t do it alone.

It is a process to discover true passion.

What is of the most value becomes more clear.

Every problem can be solved by talking to your team members.

Make things to work not to win.