Green Building Design

THE TEAM:
Oluwasesan Aduroja
Fabian Aguilar
Sarah Althoff
Curtis Aubry
Chris Chock
Fransisca Dewi
Anna Dlugosz
Carlie Douglas
Sarah Olson
Lucas Rodgers
Jaimi Stroot
Alexander Walker

THE PRESENTERS:
Curtis Aubry
Lucas Rodgers
Chris Chock
Objective

- Explore the practical application of green building techniques and technologies in modern construction

- Apply these concepts and ideas in a theoretical building project

- Create a viable design solution to the current energy crisis
Energy Concepts

Passive energy solutions
- Double skin facade

Active energy solutions
- Fuel cells
- Solar panels
- Wind turbines
- Geothermal pumps
Energy Concepts

Double Skinned Façade
- Create space for hot air to rise out in summer, cold air to sink in winter
- Provide more space to insulate building

Fuel Cells
- Molten Phosphoric Acid fuel cells
- Commonly used in hospitals and manufacturing plants
- Expensive
Energy Concepts

Solar Panels
- Panels on building facades
- Panels required to be in series
  - if one cell isn’t working, properly, entire row is out

Wind Turbines
- Requires more studies of wind profiles through area

Geothermal Heat Pumps
- Heat pumps using heat exchangers below building to heat and cool building
Project Selection

- Building Type
  Residential
  Green Living
  High Rise
  Theoretical LEED Certification

- Site
  Local Community
  Personal Interest
  Familiar Climate
Team Breakdown

A. Architecture Design
B. Structural Analysis and Design
C. Foundation Analysis and Design
D. Water Use, Plumbing System and Drainage
E. Electrical and Communication Systems
F. Building Energy Sources, Solar Panels and Wind Turbines
G. Building Envelope
H. HVAC System
I. Landscaping
J. Fire Protection System
K. Security System
Design Influence

Hearst Tower

Folsom/Dore Apartments

Pearl River Tower

Mission Creek Senior Community

Atrera
Current Program

3 Bedroom

1 Bedroom

Studio

2 Bedroom

2 Bedroom
## Program Outline

### Residential Floors

Approx 100 units (4 per floor per tower)

<table>
<thead>
<tr>
<th>Type</th>
<th>Area (sf)</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studio</td>
<td>600 sf</td>
<td>x2</td>
</tr>
<tr>
<td>1 Bedroom</td>
<td>800 sf</td>
<td>x2</td>
</tr>
<tr>
<td>2 Bedroom</td>
<td>1000 sf</td>
<td>x2</td>
</tr>
<tr>
<td>3 Bedroom</td>
<td>1200 sf</td>
<td>x2</td>
</tr>
<tr>
<td>Laundry room</td>
<td>500 sf</td>
<td></td>
</tr>
<tr>
<td>Common Space</td>
<td>1500 sf</td>
<td></td>
</tr>
<tr>
<td>Elevator</td>
<td>500 sf</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>200 sf</td>
<td></td>
</tr>
<tr>
<td>Closets</td>
<td>100 sf</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>10,000 sf</td>
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### Retail Floor

Multiple Retail Units

<table>
<thead>
<tr>
<th>Type</th>
<th>Area (sf)</th>
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<tbody>
<tr>
<td>Common Space</td>
<td>2000 sf</td>
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<tr>
<td>Retail Units</td>
<td>9000 sf</td>
</tr>
<tr>
<td>Entrance Lobby</td>
<td>1500 sf</td>
</tr>
<tr>
<td>Security Desk</td>
<td>200 sf</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>600 sf</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13,300 sf</td>
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</tbody>
</table>
Site Analysis
Site Studies

Lighting/Shadow

Building Circulation
Landscaping Plan
Collaboration

Design must take into account engineering properties in the initial design to fully embrace the ability and usefulness of energy savings.

As a group we are working closely as Architects and Engineers early on in the project.

This is a shift from the traditional process of design, and illustrates the shifting dynamic of the building industry.
Mechanical

Green Concepts
- Geothermal Heating and Cooling
  - Uses heat of subsurface to heat or cool water
- Solar Cooling
  - Converts solar radiation to cooling energy
- Natural Convection
  - Using the Chimney effect, air is naturally drawn through the structure
Electrical

Green Concepts
- Lighting
  - Daylight
    - Controls
    - Sensors
    - Dimming Ballasts
  - Light wells
- Energy Efficient Fixtures and Appliances
- Power generation
  - Photovoltaic Cells
Plumbing

Green Concepts
• Greywater and Rainwater collection
  • Reuse of wastewater
  • Treat water to be useable
  • Cisterns for storage of water to be used:
    • Toilets
    • Irrigation
• Reduction of water load
  • Low flow and water efficient fixtures