PROJECT: 357

ENPRO 357

Green Building Design Concept & Integration
Team Alpha

• **Faculty Advisors:**
  – Steve Beck, Jeffery Budiman, Mark Snyder

• **Team Leaders:**
  – Andrew Bossemeyer (Arch), Aneta Ustupska (ArchE)

• **Student Members:**
  – Ryan Bouck(Arch), Jorge Chavez (Arch), Guadalupe Cortes (ArchE), Brett McQuillan(ArchE), Robert McLuckie (Arch), Beth Nielsen (ArchE), Alex Ong (CE), Issac Plumb (Arch), Timothy Ranttila(EE/CPE), Michael Warnes (Arch)
Introduction

- OPPORTUNITY: To design a mixed use development for the Oak Park area
- CLIENT: Owns nearby house and leases commercial space for his business
- OBJECTIVE: To develop a mixed economically feasible & sustainable prototype for the development
- PROBLEM: To meet the needs of the client while keeping in mind a larger client base of the community
PROJECT: 357
LAYOUT OPTIONS

RESIDENCE
CONDOS
COMMERCIAL
RETAIL
PARKING

BUSINESS PLAN
MIXED USE LIVE WORK BENEFITS

• Convenience
• Efficient use of time and money due to overlap of operations
• Smart financial investment
• Community and cultural sensitivity
• Activates urban areas during more hours of the day
• Reduces auto dependence
• Minimizes carbon footprint
GREEN BUILDING BENEFITS

Economic benefits:  
Life-Cycle savings from:  
• Energy & lighting efficiency  
• Water efficiency  
• Materials efficiency  
• Employee productivity  
• Employee health

Health and community benefits:  
• Improve air, thermal, and acoustic environments  
• Enhance occupant comfort and health  
• Minimize strain on local infrastructure  
• Contribute to overall quality of life

BUSINESS PLAN

ENPRO 357: GREEN BUILDING DESIGN
838 Madison St, Oak Park

Client Needs
Commercial space of 2,000 sf
Single family residence for 7 with large outdoor space
Leasable commercial, retail, and residential spaces

CLIENT DESIGN

ENPRO 357: GREEN BUILDING DESIGN
4-Story mix used building
Retail: 824 sf
Commercial: 3,478 sf
Condo: 4,300 sf
Residence: 4,300 sf

CLIENT DESIGN
SECOND FLOOR

CLIENT DESIGN

ENPRO 357: GREEN BUILDING DESIGN
FOURTH FLOOR

CLIENT DESIGN

ENPRO 357: GREEN BUILDING DESIGN
CLIENT DESIGN

ENPRO 357: GREEN BUILDING DESIGN
Double Wall Detail

- Precast concrete wall panel with R-21 insulation value
- 2 1/2” Concrete Wythes

T-Slab Detail

Building Systems

ENPRO 357: GREEN BUILDING DESIGN
A Passive Solar Water Heater
B Ground Source Heat Pump
C Radiant Heated Floors
D Chilled Beam Ceilings
EFFICIENT HEATING AND COOLING

Radiant Heated Floors

Chilled Beam Ceilings

BUILDING SYSTEMS

ENPRO 357: GREEN BUILDING DESIGN
ENERGY REDUCTION TECHNOLOGIES

Passive Solar Hot Water Heating

- Solar collector
- Controller
- Pump
- Boiler
- Tank
- Cold water feed
- To taps

Ground Source Heat Pump

BUILDING SYSTEMS

ENPRO 357: GREEN BUILDING DESIGN
SYSTEM BUYBACK TIMELINE

Radiant Heated Floors vs. VAV Central Forced Air
3-5 years

Chilled Beam Ceilings vs. VAV Central Forced Air
3-5 years

Passive Water Heating vs. Hot Water Boiler
5-7 years

Ground Source Heat Pump vs. Condensers
5-10 years

Solar Panels vs. Central Generation (not used)
40+ years
ENERGY SAVINGS

Electric Consumption (kWh)

Gas Consumption (Btu)

BUILDING SYSTEMS

ENPRO 357: GREEN BUILDING DESIGN
COST SAVINGS

Monthly Utility Bills ($)
BUSINESS STRATEGY

$ BONUS $

HOME

$ WORK $

$  

FINANCING

ENPRO 357: GREEN BUILDING DESIGN
### ENPRO 357: GREEN BUILDING DESIGN

### BUDGET

<table>
<thead>
<tr>
<th>Project Costs</th>
<th>Total:</th>
<th>Per sf</th>
<th>% of Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Hard Costs</strong></td>
<td>$ 3,240,007</td>
<td>$ 178</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total Land Costs</strong></td>
<td>$ 1,855,620</td>
<td>$ 102</td>
<td>57%</td>
</tr>
<tr>
<td><strong>Total Soft Costs</strong></td>
<td>$ 500,000</td>
<td>$ 27</td>
<td>15%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$ 884,387</td>
<td>$ 48</td>
<td>27%</td>
</tr>
</tbody>
</table>

#### Div 3 - Concrete

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
<th>Per sf</th>
<th>% of Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Concrete Foundations</td>
<td>$ 11,440</td>
<td>$ 1.33</td>
<td>0.7%</td>
</tr>
<tr>
<td>Precast Concrete Panels</td>
<td>-</td>
<td>-</td>
<td>0.0%</td>
</tr>
<tr>
<td>Concrete Topping</td>
<td>-</td>
<td>-</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

#### Div 4 - Masonry

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
<th>Per sf</th>
<th>% of Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMU Bearing Walls</td>
<td>$ 154,440</td>
<td>$ 18.00</td>
<td>9.0%</td>
</tr>
<tr>
<td>Masonry Veneer</td>
<td>$ 154,440</td>
<td>$ 18.00</td>
<td>9.0%</td>
</tr>
</tbody>
</table>

#### Div 5 - Steel

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
<th>Per sf</th>
<th>% of Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Steel</td>
<td>$ 143,000</td>
<td>$ 16.67</td>
<td>8.4%</td>
</tr>
<tr>
<td>Misc Ornamental Iron</td>
<td>$ 35,000</td>
<td>$ 4.08</td>
<td>2.0%</td>
</tr>
<tr>
<td>Light Gauge Metal Framing</td>
<td>-</td>
<td>-</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

**Total for Div 3 - Concrete:** $ 498,320 | $ 58.08 | 29.1%  

**Total for Div 4 - Masonry:** 
- CMU Bearing Walls: $ 154,440 | $ 18.00 | 9.0%  
- Masonry Veneer: $ 154,440 | $ 18.00 | 9.0%  

**Total for Div 5 - Steel:** 
- Structural Steel: $ 143,000 | $ 16.67 | 8.4%  
- Misc Ornamental Iron: $ 35,000 | $ 4.08  | 2.0%  
- Light Gauge Metal Framing: - | - | 0.0%  

**Total:** $ 395,480 | $ 21.68 | 17.6%  

### FINANCING
## PROFORMA

### Effective Gross Income:

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined Rent Income</td>
<td>$310,901</td>
<td>$326,446</td>
<td>$342,768</td>
<td>$359,907</td>
<td>$377,902</td>
</tr>
<tr>
<td>Parking Income</td>
<td>$10,800</td>
<td>$11,340</td>
<td>$11,907</td>
<td>$12,502</td>
<td>$13,127</td>
</tr>
<tr>
<td>Other Income</td>
<td>$600</td>
<td>$630</td>
<td>$662</td>
<td>$695</td>
<td>$729</td>
</tr>
<tr>
<td>Concessions</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
<td>$-</td>
</tr>
<tr>
<td>Vacancy and Credit Loss</td>
<td>$(12,892)</td>
<td>$(13,537)</td>
<td>$(14,213)</td>
<td>$(14,924)</td>
<td>$(15,670)</td>
</tr>
<tr>
<td><strong>Effective Rental Income</strong>:</td>
<td><strong>$309,409</strong></td>
<td><strong>$324,879</strong></td>
<td><strong>$341,123</strong></td>
<td><strong>$358,179</strong></td>
<td><strong>$376,088</strong></td>
</tr>
</tbody>
</table>

### Direct Capitalization Summary:

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective Rental Income:</td>
<td>$309,409</td>
<td>$324,879</td>
<td>$341,123</td>
<td>$358,179</td>
<td>$376,088</td>
</tr>
<tr>
<td>Operating Expenses:</td>
<td>$(111,387)</td>
<td>$(116,957)</td>
<td>$(122,804)</td>
<td>$(128,945)</td>
<td>$(135,392)</td>
</tr>
<tr>
<td>Net Income (NOI):</td>
<td>$198,022</td>
<td>$207,923</td>
<td>$218,319</td>
<td>$229,235</td>
<td>$240,697</td>
</tr>
<tr>
<td>Debt Service</td>
<td>(126,360.26)</td>
<td>(126,360.26)</td>
<td>(126,360.26)</td>
<td>(126,360.26)</td>
<td>(126,360.26)</td>
</tr>
<tr>
<td>Cashflow above Debt Service</td>
<td>71,661.35</td>
<td>81,562.44</td>
<td>91,958.57</td>
<td>102,874.51</td>
<td>114,336.25</td>
</tr>
</tbody>
</table>

**Divided by cap rate:**

- 9.5%
- 9.0%
- 8.6%
- 8.1%
- 7.7%

**Indicated Value as stabilized:**

- $2,084,438
- $2,303,853
- $2,546,363
- $2,814,402
- $3,110,654

### FINANCING
### Sources and Uses

<table>
<thead>
<tr>
<th>Sources</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Loan (65% LTC)</td>
<td>$ 2,106,004</td>
</tr>
<tr>
<td>Equity (35% LTC)</td>
<td>$ 1,134,002</td>
</tr>
<tr>
<td>Projected Sales Revenue</td>
<td>$ 3,110,654</td>
</tr>
<tr>
<td>Cashflow above debt service</td>
<td>$ 462,393</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Uses</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Costs</td>
<td>$(3,240,007)</td>
</tr>
<tr>
<td>Repayment of Construction Loan</td>
<td>$(2,106,004)</td>
</tr>
<tr>
<td>Repayment of Equity</td>
<td>$(1,134,002)</td>
</tr>
<tr>
<td>Developer Profit (Client Savings)</td>
<td>$(333,041)</td>
</tr>
</tbody>
</table>

$ 6,813,054 $ (6,813,054)

### Investment Analysis

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Investment Amount</td>
<td>$ 1,134,002</td>
</tr>
<tr>
<td>Total Return Amount</td>
<td>$ 3,110,654</td>
</tr>
<tr>
<td>Total Holding Period</td>
<td>6.0</td>
</tr>
<tr>
<td>Cash-on-Cash return</td>
<td>29%</td>
</tr>
<tr>
<td>IRR</td>
<td>18.3%</td>
</tr>
</tbody>
</table>

FINANCING
PROJECT: 357