



SUSTAINABLE LIVE / WORK DEVELOPMENT

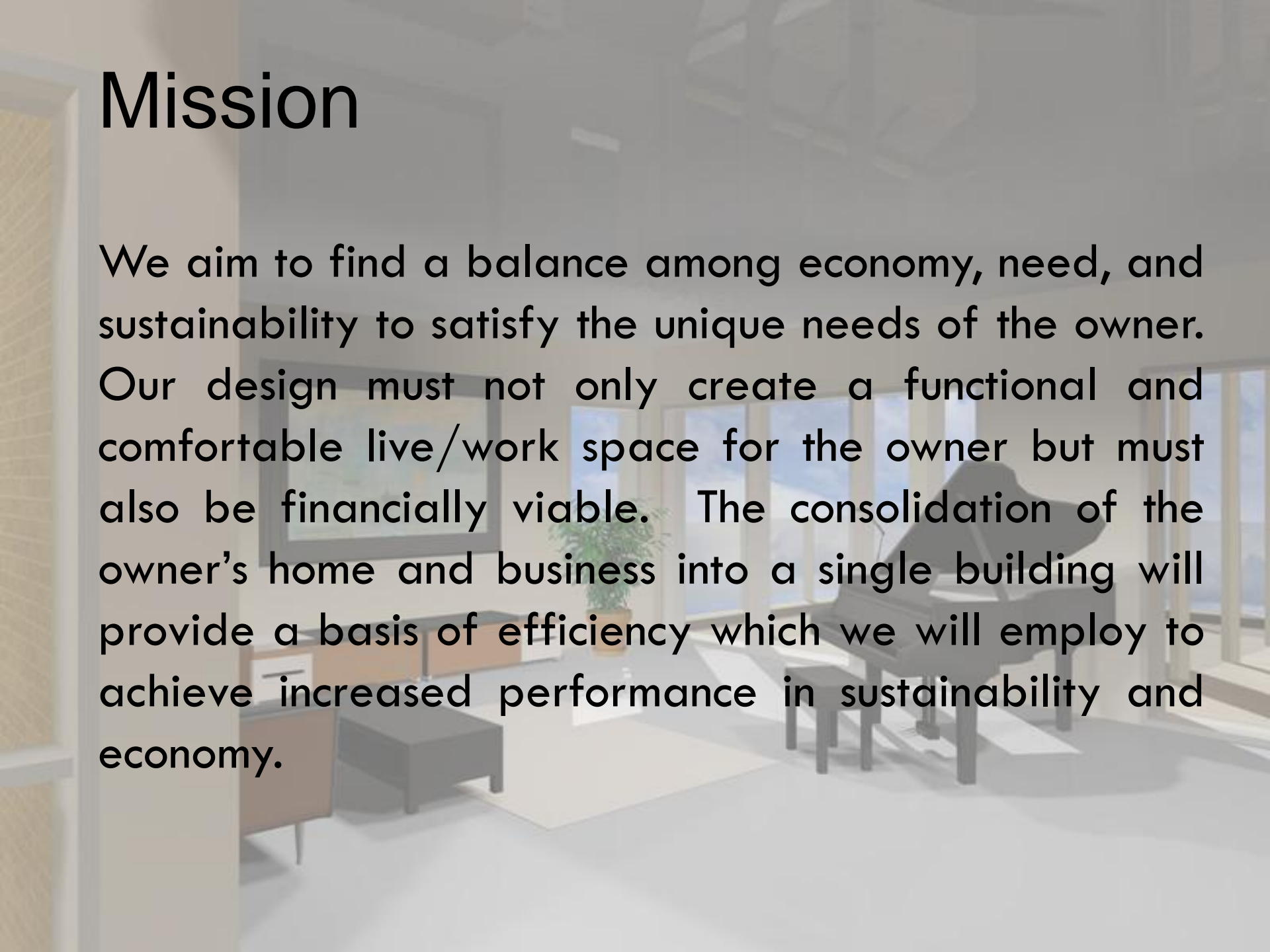
ENPRO 360 – GROUP BETA

Project Background

- Client seeking solution for previously acquired property in Oak Park
 - ▣ Building must accommodate client's business
 - Trading firm: 12-25 employees
 - ▣ Client is interested in a live / work solution
 - Client's residence must accommodate family of 7
 - Minimum size of 4,000 square feet
 - ▣ Ground floor retail recommended
 - ▣ Sustainability is a goal

Mission

We aim to find a balance among economy, need, and sustainability to satisfy the unique needs of the owner. Our design must not only create a functional and comfortable live/work space for the owner but must also be financially viable. The consolidation of the owner's home and business into a single building will provide a basis of efficiency which we will employ to achieve increased performance in sustainability and economy.



Goals

- Create groups to address various aspects of project
- Create a business plan
- Determine a scheme to meet the owners needs
 - ▣ Study possible uses on site
 - ▣ Compare possible schemes in terms of owner's needs, comfort, and economic benefit
- Create a schematic design of the building
- Determine construction methods and materials, including finishes
- Select mechanical systems to be utilized in building
- Design using sustainable practices and incorporate sustainable systems

Presentation Overview

- Team Organization
- Market Research
- Construction
- Building Systems
- Construction Cost
- Sustainability
- Business Plan / Economics
- Future Prospects
- Design



Building Systems Group

□ Objectives

- Engineer structure and select materials
- Engineer and design building systems
- Cost estimation of all built elements

□ Team Members

- Alejandro Aguilar, Architectural Engineering
- Leon Chan, Civil Engineering
- Joe Kerrigan, Architectural Engineering
- Bryan Zacharias, Architecture

Sustainability Group

- Objectives
 - ▣ Research sustainable technology and design
 - ▣ Design of sustainable systems
 - ▣ Analyze building performance
- Team Members
 - ▣ Aubrey Vander Heyden, Architectural Engineering
 - ▣ Michael Walters, Electrical Engineering

Business Plan Group

□ Objectives

- Correlate data from other groups
- Establish financial guidelines
- Develop Business Plan

□ Team Members

- Chinedu Azodoh, Electrical / Computer Engineering
Minor in Business
- Melissa Cheviron, Architectural Engineering

Design Group

- Objectives
 - ▣ Research Building and Zoning Codes
 - ▣ Design architectural elements
 - ▣ Develop presentation visuals
- Team Members
 - ▣ Jon Achs, Architecture
 - ▣ Yehuda Gutsein , Architecture
 - ▣ Madison Kelly, Architecture
 - ▣ Tyler Stellwag, Architecture

Preliminary Building Use Research



Preliminary Building Use Financial Summary

SCHEME	USE	CONSTRUCTION COST	35% DOWN ON CONSTRUCTION LOAN	IMMEDIATE RETURN ON INVESTMENT	RETURN ON INVESTMENT IN 10 YEARS	% IMMEDIATE RETURN	YEARS FOR FULL INVESTMENT RETURN
A	RB	\$1,423,516	\$498,231	\$373,000	\$673,000	26%	21.2
B	RBAA	\$1,824,271	\$638,495	\$373,000	\$1,252,600	20%	14.6
C	RBCC	\$3,306,197	\$1,157,169	\$1,822,000	\$2,122,000	55%	15.6
D	RBAH	\$3,384,072	\$1,184,425	\$922,000	\$1,511,800	27%	22.4
E	RBCH	\$3,581,243	\$1,253,435	\$1,646,500	\$1,946,500	46%	18.4
F	RBHH	\$3,856,289	\$1,349,701	\$922,000	\$1,222,000	24%	31.6


Preliminary Scheme Selection

- Scheme F *Revised*
- 4,500 square feet for owners residence possible
- Parking can be accommodated on site
- Actual construction cost is expected to be lower than this estimate



SCHEME	USE	CONSTRUCTION COST	35% DOWN ON CONSTRUCTION LOAN	IMMEDIATE RETURN ON INVESTMENT	RETURN ON INVESTMENT IN 10 YEARS	% IMMEDIATE RETURN	YEARS FOR FULL INVESTMENT RETURN
F Revised	RBHH	\$3,004,819	\$1,349,701	\$922,000	\$1,222,000	31%	24.6

Building Overview

- 
- 4th Flr: 2000 SF Residence
750 SF Outdoor
 - 3rd Flr: 2100 SF Residence
540 SF Outdoor
 - 2nd Flr: 2650 SF Office
 - 1st Flr: 1080 SF Retail
8 Parking Spaces
2 Car Garage

Construction Methods and Materials

□ Goals:

□ Cost effectiveness

- Cost estimation
- Affordable / money saving systems
- Do more with less
- Enforce budget

□ Sustainability

- Efficiency of energy and materials

Building Cost Overview

□ Summary of hard and soft costs

	Total	Total Incl. O&P	% of Total
Site Civil	\$21,658.60	\$25,183.40	2.52
Structural	\$330,107.60	\$430,601.41	43.10
Architectural	\$197,523.36	\$247,301.64	24.76
Electrical	\$121,025.39	\$147,828.00	14.80
Mechanical	\$124,755.00	\$148,067.00	14.82
TOTAL	\$795,069.95	\$998,981.45	100.00

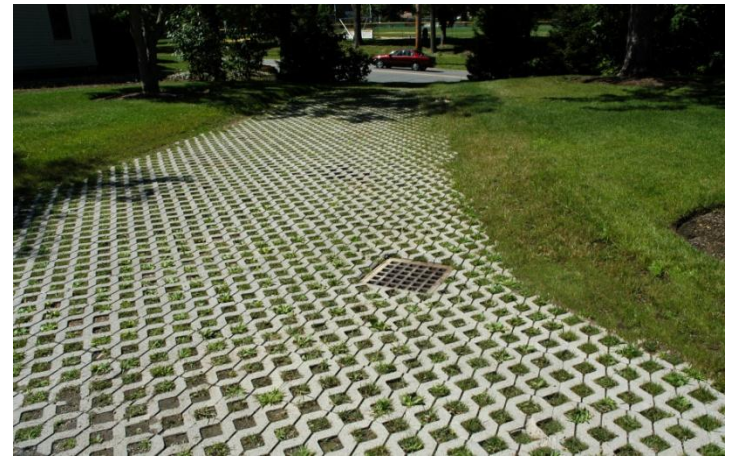
- Spaces are not built out

Sustainability

- Goals:
 - ▣ Reduce energy usage up front
 - Efficient / effective design
 - Energy conservation
 - Passive systems
 - ▣ Harness natural energy
 - Active systems
 - ▣ Affordability
 - Take advantage of incentives
 - Reduce energy costs

Site

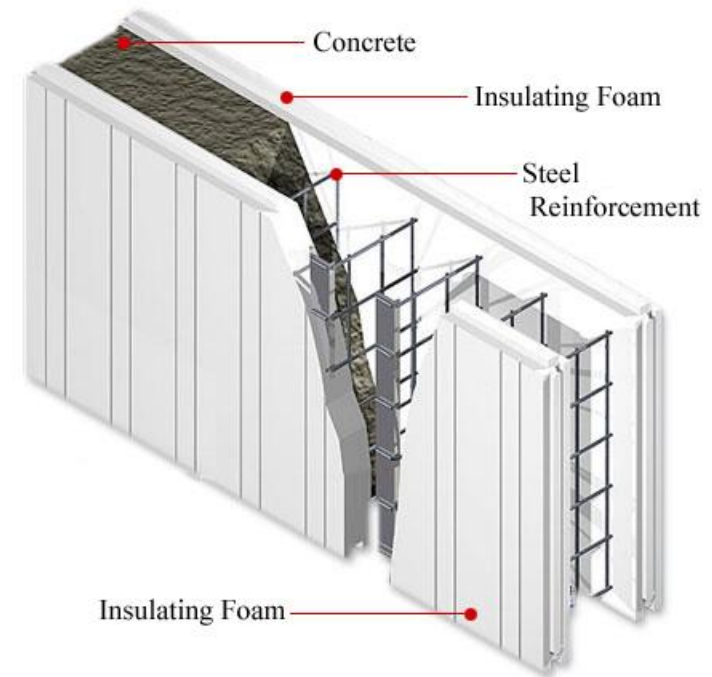
- Permeable Pavers
 - Reduces site runoff
 - Attractive
- Green Roof
 - Rainwater retention
 - Cools by evapotranspiration
 - Extends living space
 - Reduces heat island



Structure and Enclosure

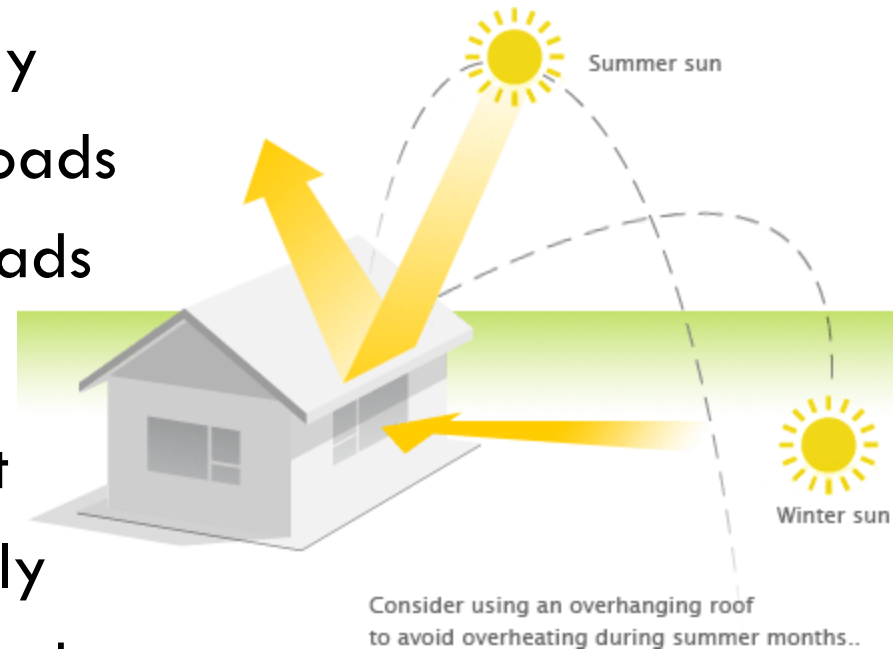
- Insulated Concrete Forms / Precast Concrete Planks
 - ▣ ICF's highly insulated
 - ▣ Reduce construction waste
 - ▣ Reduce construction time / cost

- Insulation
 - ▣ Reduces heating / cooling loads



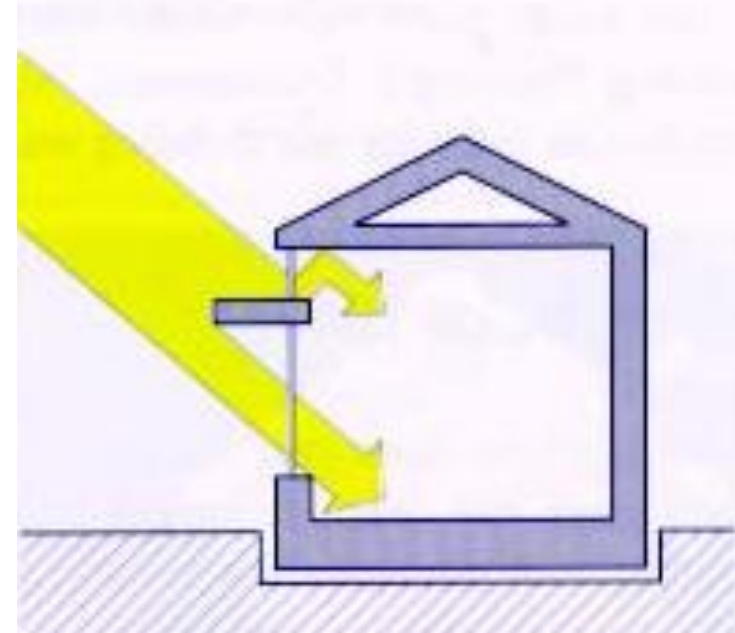
Passive Solar

- Sunshades
 - ▣ Controls sunlight seasonally
 - ▣ Reduces summer cooling loads
 - ▣ Reduces winter heating loads
- Thermal Mass
 - ▣ Retains heat from sunlight
 - ▣ Emits stored heat gradually
 - ▣ Reduces winter heating loads



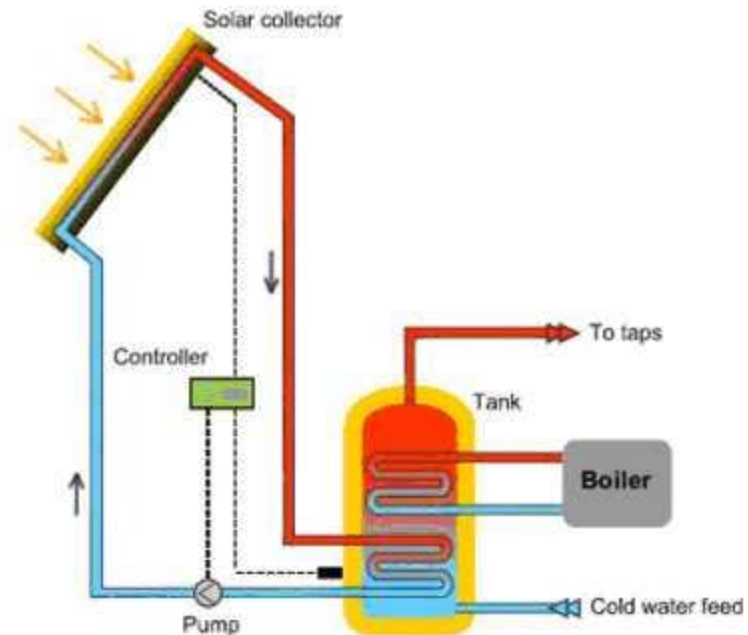
Daylight Harvesting and Controls

- High efficacy lighting
 - ▣ Lighting = $\frac{1}{2}$ total energy consumption
 - ▣ LED up to 8 times more efficient
- Daylight Harvesting
 - ▣ Southern exposure
 - ▣ Light shelves
 - ▣ Light well
- Lighting Controls and Zoning
 - ▣ Lighting sensors near windows
 - ▣ Adjusts automatically based on sun



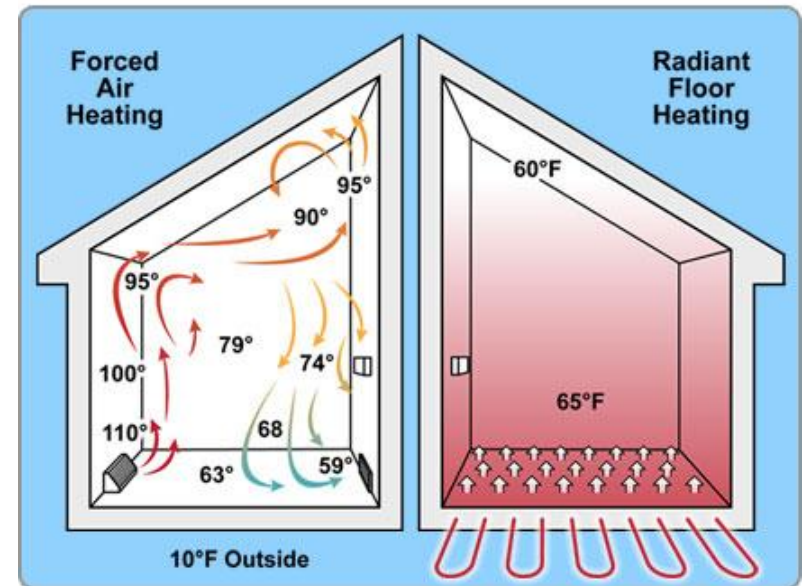
Active Solar

- Solar Thermal
 - Uses sun to heat water
 - Works all year round
 - Even on cloudy days
 - Couples well with radiant floor heating
 - Supplements hot water heater for household water needs



Radiant Floor Heating

- Highly efficient
- Increased comfort
- Low maintenance
- Can be zoned
- Couples well with solar thermal and concrete structure



Incentives

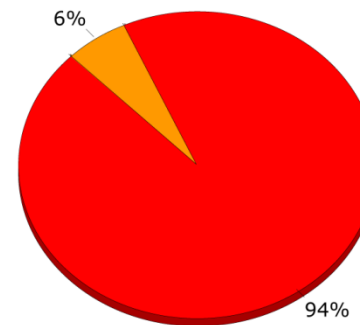
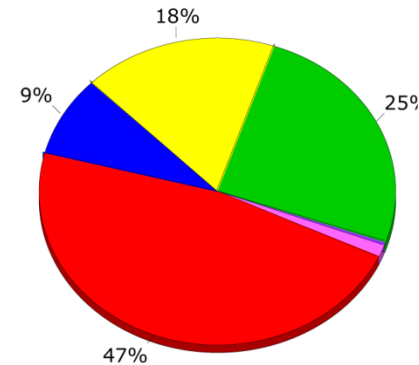
- Illinois - Residential Energy-Efficient Appliance Rebates
 - ▣ 15% point- of-sale
- Peoples Gas - Chicagoland Natural Gas Savings Program
 - ▣ Save \$750 on cost of insulation
 - ▣ Save approx \$750 on water heater and furnace
- Illinois Finance Authority Renewable Energy Project Financing
 - ▣ Provides tax-exempt bonds for commercial renewable energy projects
 - Passive Solar Space Heat, Solar Water Heat,
 - Amount varies by project

Building Performance Analysis

□ eQUEST

- Accurately simulates building performance
- Accurately compare systems
- Allows calculation of savings

	Electricity kWh (x000)	Natural Gas MBtu
Space Cool	10.64	-
Heat Reject.	-	-
Refrigeration	-	-
Space Heat	58.50	180.58
HP Supp.	-	-
Hot Water	-	11.29
Vent. Fans	1.50	-
Pumps & Aux.	0.45	-
Ext. Usage	-	-
Misc. Equip.	31.41	-
Task Lights	-	-
Area Lights	22.20	-
Total	124.71	191.87



Natural Gas

- Area Lighting
- Task Lighting
- Misc. Equipment
- Exterior Usage
- Pumps & Aux.
- Ventilation Fans
- Water Heating
- Ht Pump Supp.
- Space Heating
- Refrigeration
- Heat Rejection
- Space Cooling

Conclusions: Economic Benefit

ASHRAE 90.1 - Baseline

	Proposed	Total MBTU/ year
Total kWh	135010	667.9
Total kbtu	207080	
\$11.72/1000cf	\$2,358.58	
\$0.0834/kWh	\$11,259.83	
Total	\$13,618.41	

Final Design

	Proposed	Total MBTU/ year
Total kWh	112239	617.5
Total kbtu	180580	
\$11.72/1000cf	\$2,056.75	
\$0.0834/kWh	\$9,360.73	
Total	\$11,417.48	

TOTAL SAVINGS:

\$2,200 / year

or

\$66,000 /

30 year mortgage

+ Incentives

Business Plan / Economics

- Goals:
 - Create budget
 - Provides guideline for design
 - Attain good cost to quality ratio
 - Determine important areas to spend money
 - Save money through good design
 - Achieve quick return of investment
 - Harness all possible resources
 - Determine possibility for expansion

Construction Cost and Loans

- Cost of building: \$ 1,000,000
- 35% Down payment: \$ 350,000

	Total	Total incl O&P	% of Total
Site Civil	\$21,658.60	\$25,183.40	2.52
Structural	\$330,107.60	\$430,601.41	43.10
Architectural	\$197,523.36	\$247,301.64	24.76
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Sources of Income

□ Retail

▣ Rental of retail space

- \$4,000 / month

▣ Sale of retail space

- \$373,000

□ Home

▣ Sale of owner's current residence

- \$449,000

Savings

- Office
 - Current rent for office
 - \$2,500 / month
- Energy
 - Increased building performance
 - \$180 / month
 - Incentives
- Taxes
 - Consolidation of property

Financial Comparison

	PROPOSED LIVE / WORK DEVELOPMENT	TYPICAL HOME / OFFICE ARRANGEMENT
Property Cost	\$525,000	\$449,000
Construction Cost	\$1,000,000	
TOTAL COST	\$1,525,000	\$449,000
35% Down Payment	\$533,750	\$22,450
Loan Amount	\$991,250	N/A
Sale of House	\$449,000	N/A
MORTGAGE AMOUNT	\$542,250	\$426,550
MONTHLY EXPENSE		
Monthly Mortgage Payment	\$4,300	\$3,400
Utilities	\$950	\$440
Rent Collected	\$4,000	\$0
Business Rent	\$2,500	\$2,500
Commute	\$0	\$470
MONTHLY TOTAL	\$1,250	\$6,810
30 YEAR SUMMARY		
TOTAL MORTGAGE	\$1,500,000	\$1,232,000
TOTAL EXPENSES	\$342,000	\$3,410
TOTAL CREDITS	\$2,340,000	\$0
PROFIT / COST	\$498,000	\$1,235,410

Financial Comparison

- \$1,733,400 difference from average over 30 years
- Convenience - No commute
 - ▣ Average American spends 100 hours / year
 - ▣ Possibly sell car
 - ▣ All hours access between home and work
- Lower utility costs
- Profit can be reinvested

Future Prospects

- Continued development
 - Many similar sites
 - Scheme could be re-used with little modification
 - Profit margin can be increased with different building types



	POSSIBLE MIXED USE - NO OFFICE
Property Cost	\$525,000
Construction Cost	\$1,100,000
TOTAL COST	\$1,625,000
35% Down Payment	\$568,750
Loan Amount	\$1,056,250
Sale of House/Condo	\$1,169,000
INITIAL PROFIT	\$112,750
MONTHLY EXPENSE	
Monthly Mortgage Payment	\$0
Utilities	\$700
Rent Collected	\$8,000
Business Rent	\$2,500
Commute	\$470
MONTHLY TOTAL	\$4,330
30 YEAR SUMMARY	
TOTAL MORTGAGE	\$1,500,000
TOTAL EXPENSES	\$172,400
TOTAL CREDITS	\$2,992,750
TOTAL PROFIT	\$1,320,350

Design

□ Goals:

□ Study codes and site

- Maximize useable square footage on site
- Ensure feasibility

□ Sustainability

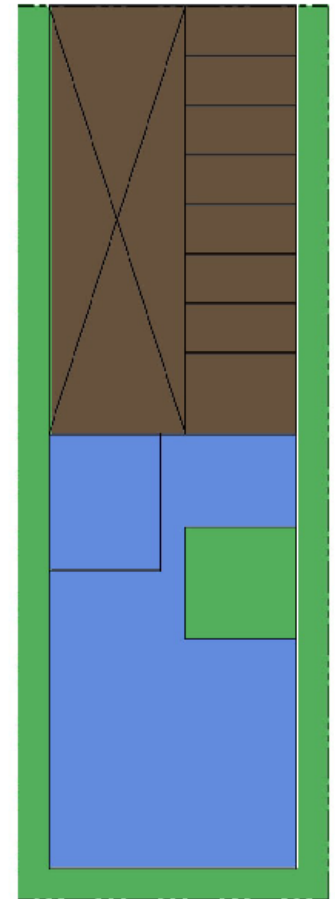
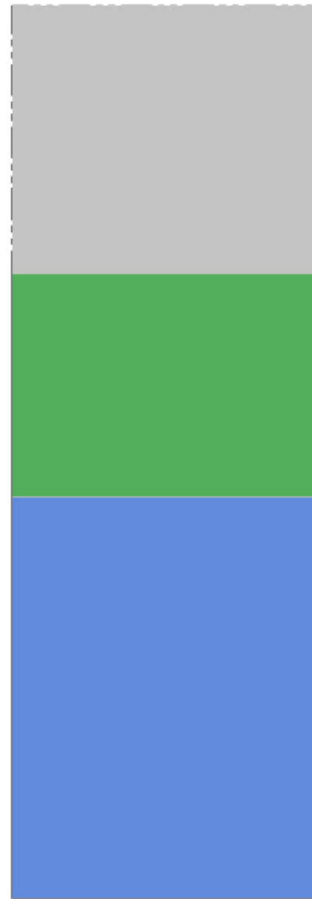
- Incorporate sustainable methods and materials

□ Good design

- Develop program
- Unique solution for owner
- Functional

Zoning and Site Analysis

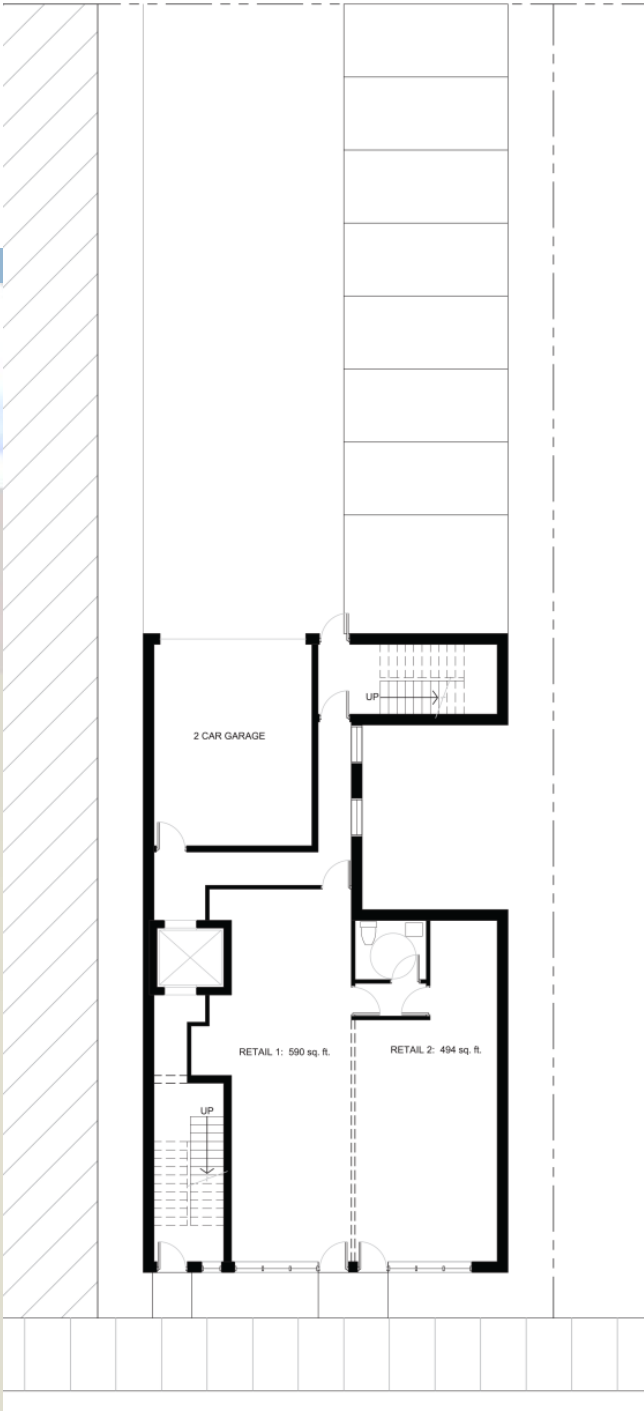
- Maximum lot coverage
- Maximum building size
- Green space
- Accommodate parking



Design

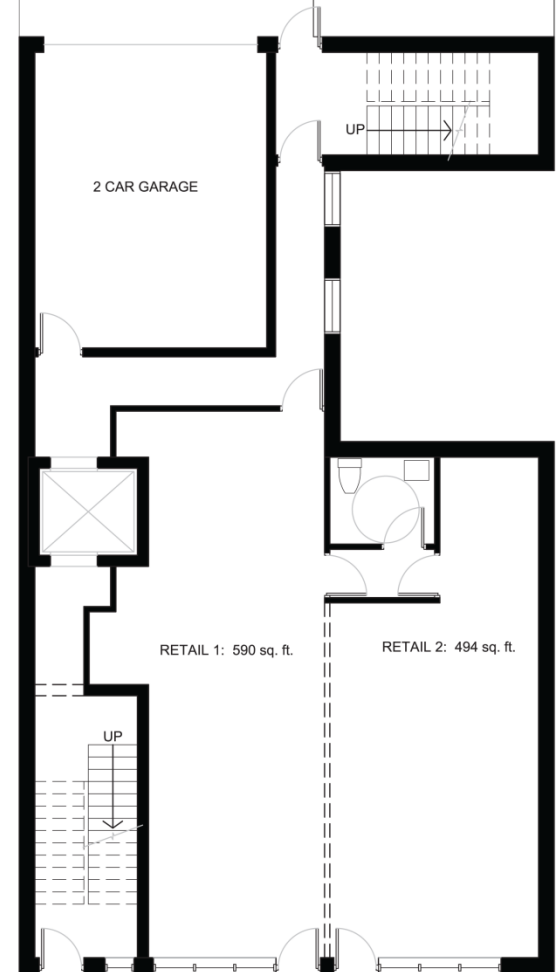
- Site Plan

- 8 parking spaces
- 2-car garage for owner
- Front and rear entrances



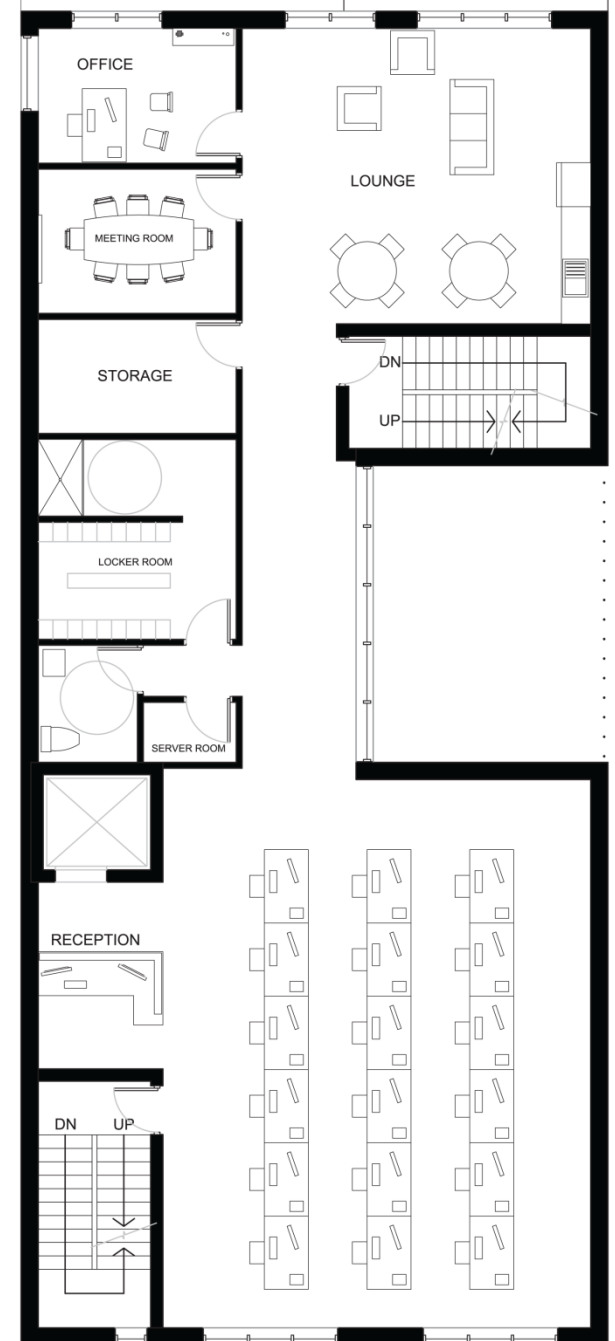
Design

- First Floor - Retail
 - 1080 SF retail space
 - Elevator for handicap accessibility



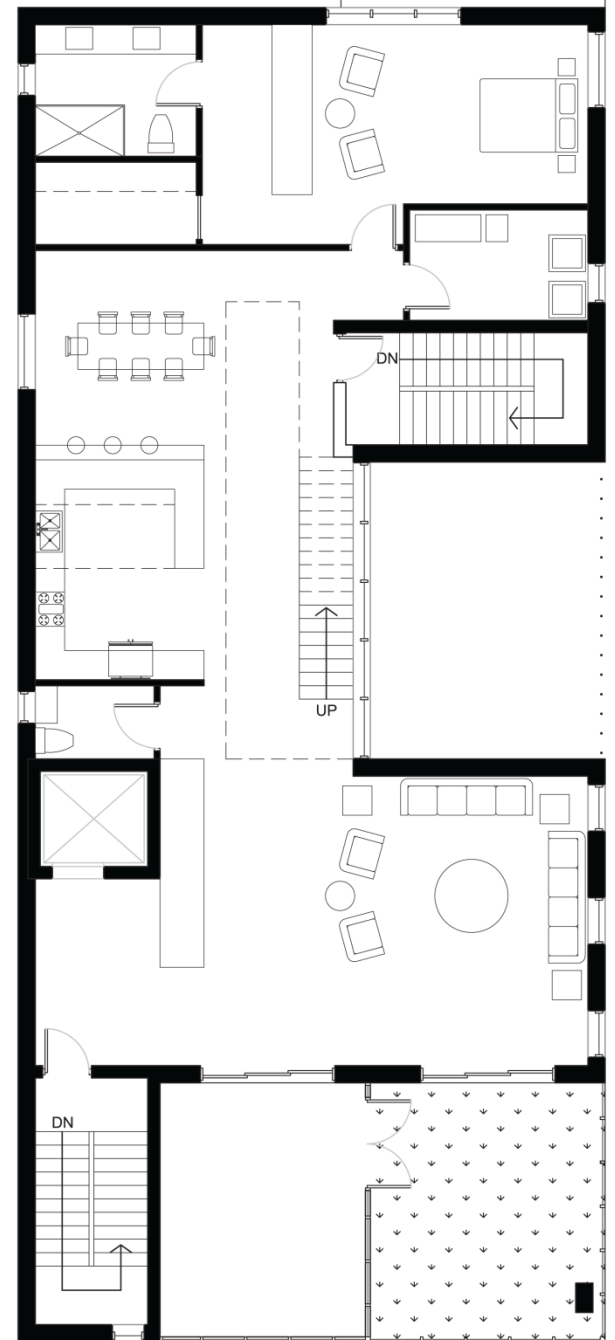
Design

- Second Floor - Business
 - 2,600 SF for owner's business
 - Room for 18 workstations
 - Private office, meeting room, kitchenette, lounge, server room, and locker room



Design

- Third Floor - Residence
 - 2,100 SF
 - Elevator access
 - Living, kitchen, dining, master bedroom, and laundry
 - 350 SF 3-Season room
 - 350 SF Outdoor terrace



Design

Fourth Floor

- 2,000

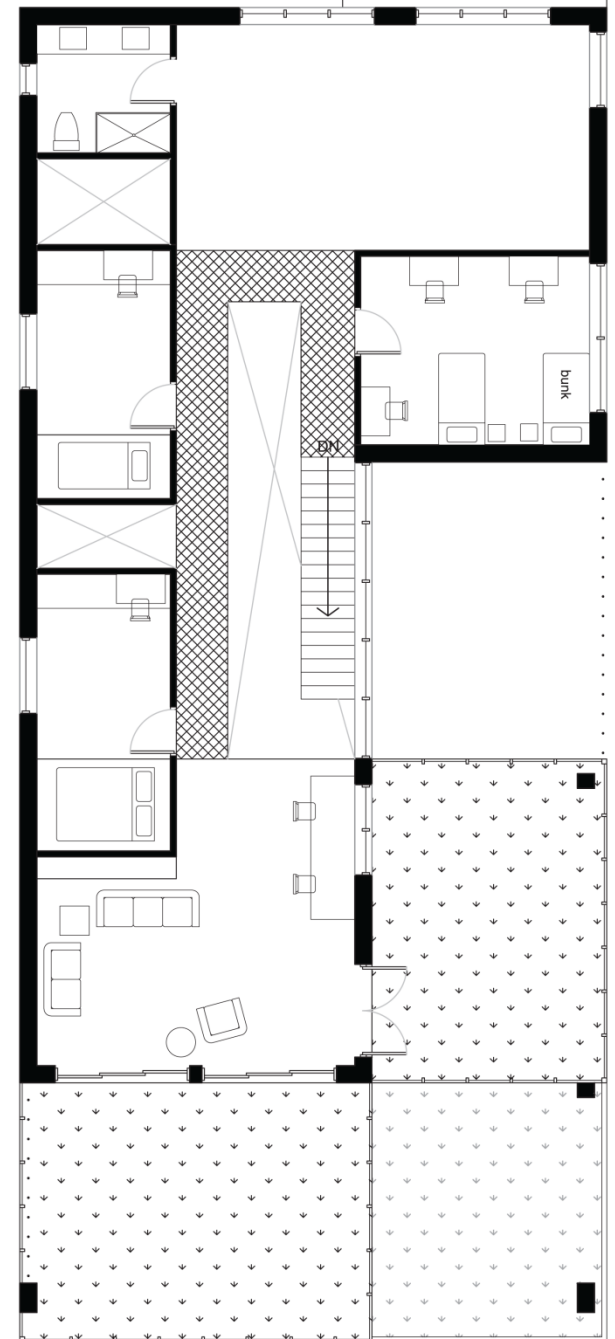
- Children's bedrooms and play space

- Family room

- Double height space

- 350 SF Green roof

- 350 SF Outdoor terrace



Benefits of Live / Work Development



□ Financial

- \$1.7 million advantage to current situation
- Great possibility for future expansion
- Even higher profit possible with varied schemes

□ Personal

- No commute = more free time
- Quick access between home and work
- Design customized to owner's needs

□ Social

□ Sustainable

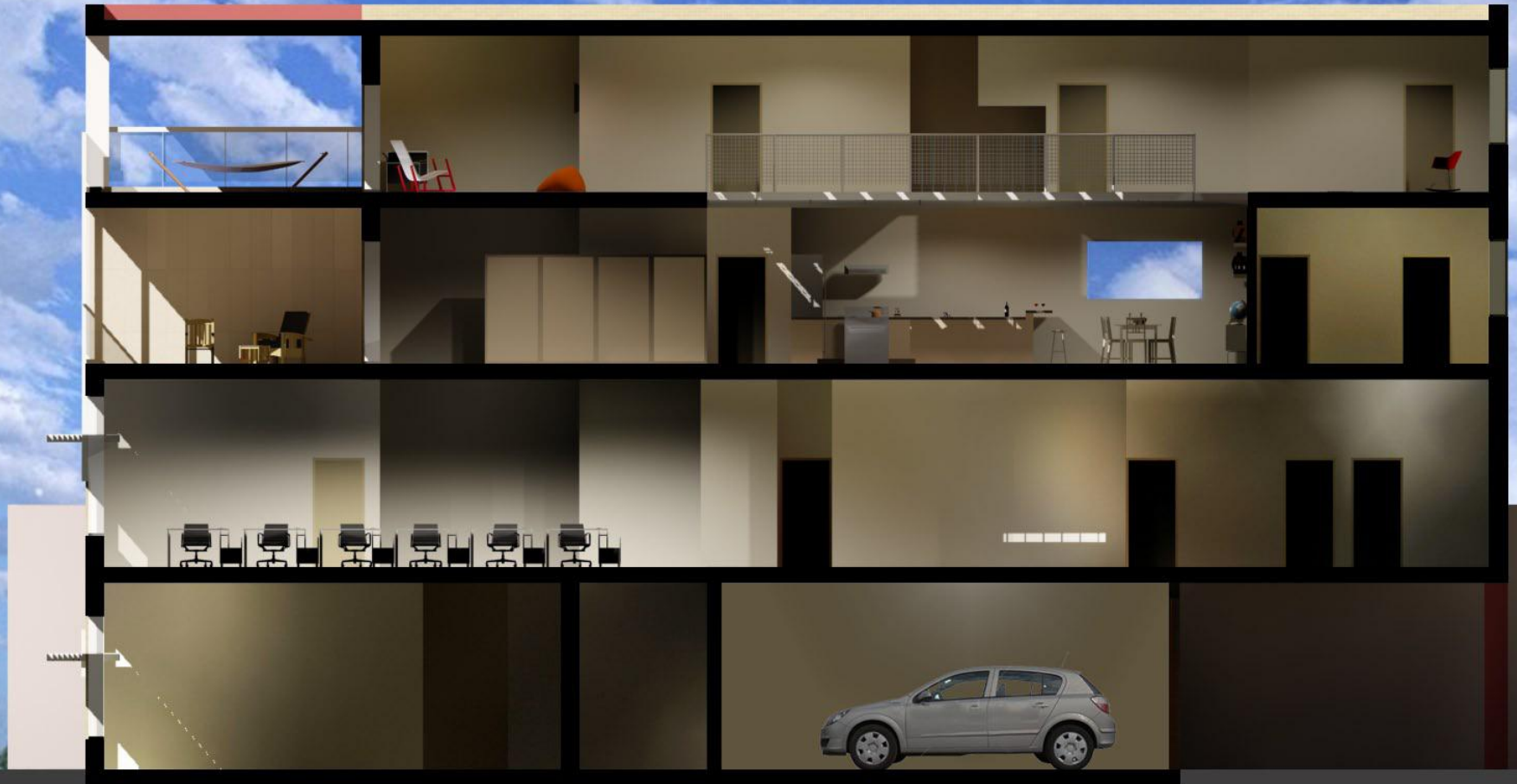
QUESTIONS?



East Elevation



Longitudinal Section



Office Interior



Living Room



Double Height Space



View from Living Room



Street View



Aerial View



South Elevation

