IPRO 317
High Performance Green Homes

Design based in Green
Philosophy for a better future.

Sponsored by Jimmy Eng

Goals and Team Breakdown

- Task:
  - Designing a small scale sustainable and affordable condo building
- Goals:
  - Research and move beyond existing technologies
  - Collaborate and Communicate effectively

Phase 1: Research			
Materials	Existing Building	Site Analysis	Systems
Crystal	Melissa	Jeff	Brittanie
Elezar	Yehuda	Neal	Luca
Brian		Hiren	Mourda
Hasan		Jordan	Hazem
Adnan			Tagir
Shuaib			Shuaib
Kamal			Kamal

As-built Case Studies

Private Home
Wagner Zaun Architecture
Duluth, MN

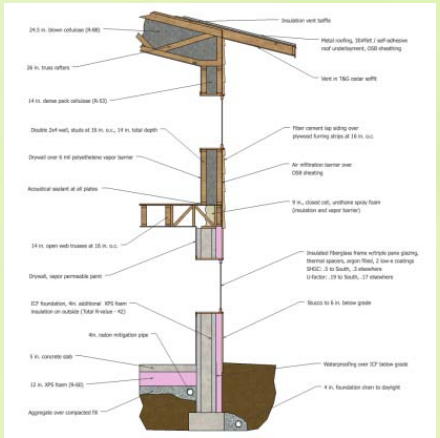
Bedrooms: 3
Baths: 2
Square footage: 2,660 sq. ft.
Annual Energy Use: 19.4MMBtu

Important Design Aspects
Super insulated
Walls = R53
Roof = R88
Foundation = R40

+ R60 (foundation wall)

Cellulose insulation

26-in.-deep parallel chord trusses in the roof construction. 24 in. of cellulose insulation



Private Home
Farr Associates
Chicago, IL

Square footage: 2,675 sq. ft.

Important Design Aspects
Concrete floor is a thermal mass to absorb the heat from the sun

Roof overhang is designed at such an angle to prevent direct sunlight from entering the home, thus requiring less cooling

PV system = 2-10 year payback
Evacuated tube solar heating = 6-12 year payback

As-built Case Studies

Zeta Communities

California

1,540 sf

2-bedroom/2-bath

LEED Platinum

Energy

Consumption :7852 kW/h

Production :7882 kW/h

R-30 Roof, R-22 Walls, R5 exterior rigid foam, R-22 Floor, Serious Materials Windows:

R-5 & R-7 Energy Star Rated

-50 percent less time compared with the typical design-and-build process.

-install cost $165/square foot (comparable to $250/square foot)

Habitat for Humanity/ NREL

2005 Colorado

1,200 sf

3-bedroom/2-bath

LEED Platinum

Energy

1st year: produced 24% more energy than consumed, and 12% the second year

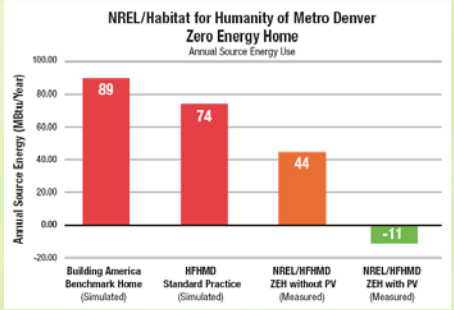
Passive solar elements

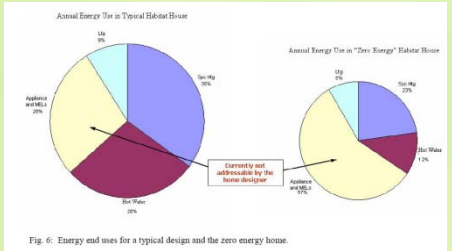
Super insulated:

R-40 Walls, R-30 Floor, ceiling R-60

-construction cost

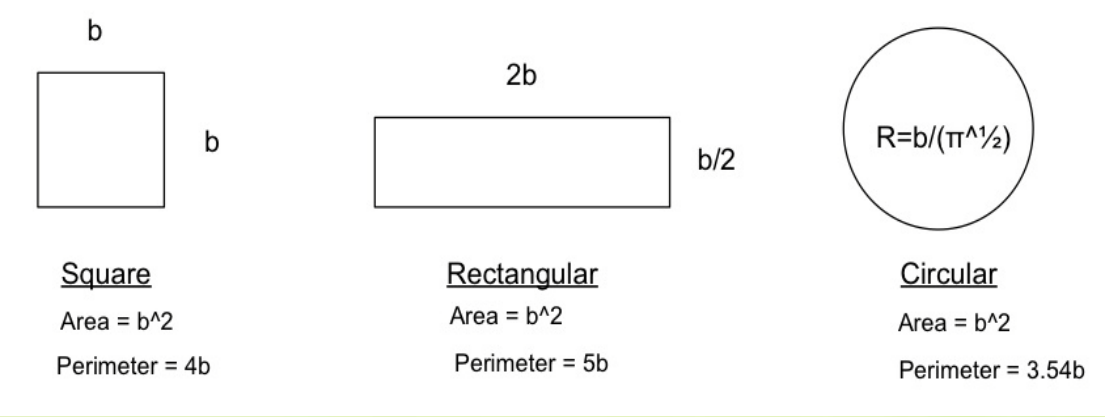
$90/square foot





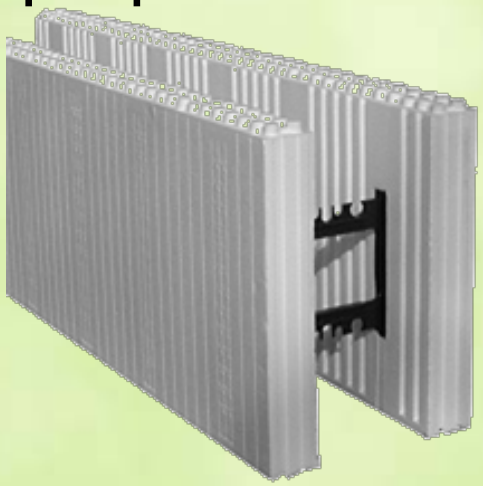
Structures Integration

- **Below Ground Unit**
  - Benefit from stable ground temperature
  - Consider soil properties and ground water table
  - Mat foundation or Spread footing
- **Structure**
  - Reduction of volume/mass for higher units
    - Natural convection
    - Structural stability
    - Reduction in vibrations from El
  - Reinforced concrete for slabs and foundation
  - Insulated concrete forms (ICF) else where
- **Sustainable Space Design**



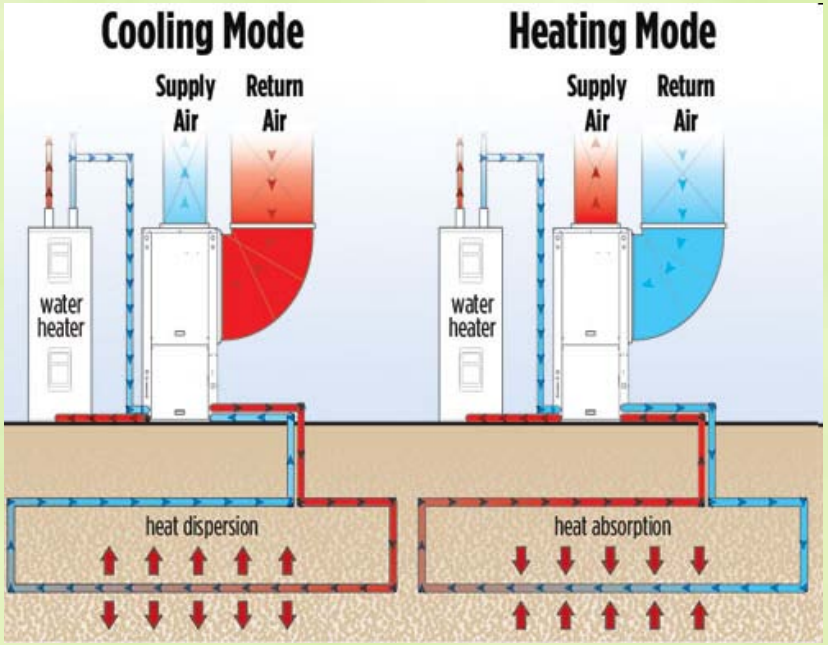
Building Form and Energy Research

- ICFs from Logix
- High impact green product
  - No thermal bridging
  - Constant R value for life
  - Wind rated up to 200 mph
  - Fire rated up to 4 hours
- Energy Sources
  - Solar
  - Wind
  - Hybrid
- Choosing Appropriate one



Mechanical Systems

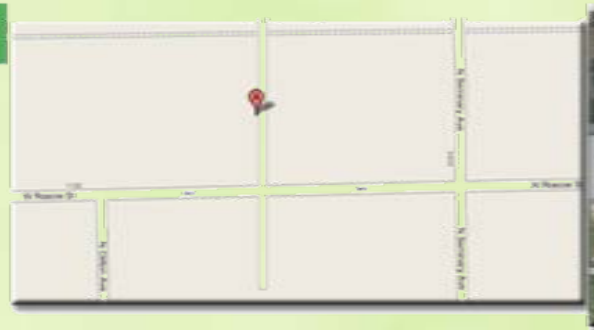
- Radiant Heat
  - Pex Tubing
- Geothermal Heat Pump/Turbine
- Indirect Heating
  - Condensing Boiler
- Led Lighting
  - Motion Sensors
- Plumbing
  - Grey water
  - Rain Capture



Site Analysis

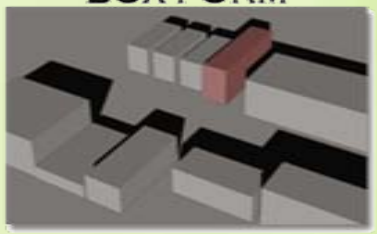
SITE ANALYSIS

1114 WEST ROSCOE
CHICAGO, ILLINOIS



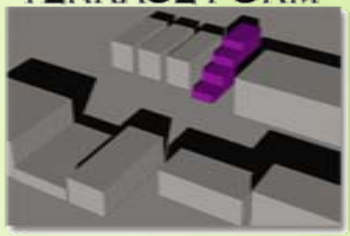
SUN STUDY
GENERATED FORMS

BOX FORM

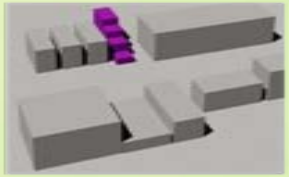


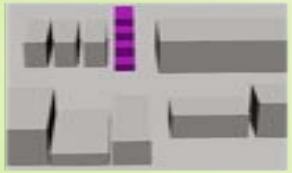
ATRIUM FORM

TERRACE FORM

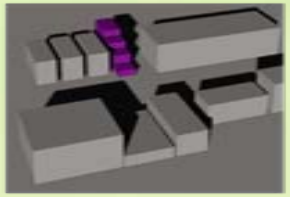


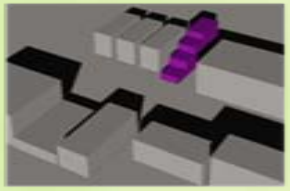
FINAL SUN STUDIES
TERRACE FORM





SUMMER





WINTER

netZERO

Obstacles and Future Plans

- Problems to Date
  - Site Issues
  - Group Size
  - Sub Group Communication
- Anticipated Challenges
  - Cost
  - Integrating Systems
- Concluding Research Phase
- Collaborate and implement Solutions
- Begin final Design phase