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Learning Objectives

- The Design Process - Lessons Learned
- Optimize floor to wall ratio
- Super Insulated air-tight envelope
- Protect structure from thermal bridging
- Then - Downsize HVAC systems

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University of Illinois at Urbana-Champaign

• The Design Process - Lessons Learned

Re home

Solar House 07' Solar House 09'

| the competition | supporters | design development | gallery | team | contact us [donate](#)

University of Illinois Solar Decathlon 2011

For the 2011 Solar Decathlon competition, Team Illinois has designed the Re_home. For rapid assembly after a natural disaster, our solar powered home will demonstrate how environmentally aware living can be brought to the forefront of a community-led recovery effort.

To learn more about the home and our concept please scroll through the categories above.

Team Illinois & the competition

- 200 students
- 30 solar panels
- 8 kilowatts

News & updates

Nov. 23 2010
Currently the University of Illinois 2011 Solar Decathlon team is working, as it has throughout the entire design process, to successfully integrate... [Read more](#)

Dec. 4 2010
On Thursday, December 9th, students from Youth Build McLean County will make their 2nd visit to the UIUC campus.... [Read more](#)

Dec.29 2010
Team Illinois has completed a 1:24 scale house model and a computer-animated walkthrough to be presented.... [Read more](#)

3D Walkthrough

Re_

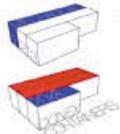
Re_act

Re_spond

Re_unite



For the 2011 Solar Decathlon competition Team Illinois has designed the Re_home. For Rapid assembly after a natural disaster, our solar powered home will demonstrate how environmentally aware living can be brought to the forefront of a community-led recovery effort.



STAGING DIAGRAM

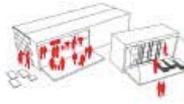
1. DISASTER FIRST RESPONSE

Manufactured unit is dropped in place with energy production equipment and communication technology, serving as a central hub for all disaster victims as well as a help center for disaster relief.



2. DISTRIBUTION CENTER

Unit 2 is dropped, filled with food, medical and relief supplies. When the units are arranged with a temporary energy, the central kitchen base distribution center for the delivered relief.



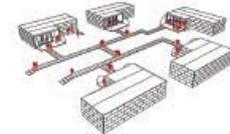
3/4. RESIDENTIAL ASSEMBLY

Unit 3 is dropped filled with exterior building panels. All three units are connected and residents are moved into the relief housing. Exterior panels are attached by the new residents, allowing them to take ownership of their new homes.



5. COMMUNITY DEVELOPMENT

Interior panels are used as a way of providing shared community facilities. The housing units, allowing small communities to be formed.



Community Connection is a progressive sustainable disaster relief strategy to be deployed in stages and facilitate the re-establishment of communities. After a natural disaster, more than just houses are lost; communities and livelihoods are torn away from disaster victims. The Community Connection project will provide aid throughout the continuing stages of disaster relief.

In the first stages of disaster relief, food, water, and medical treatment is required. A mechanical core, housed in a single ocean container, will be set up to provide power and potable water during the beginning stages of the disaster relief effort. A second ocean container, filled with food, supplies, and medical equipment will then be delivered. When this container is arranged with the first unit, a larger distribution point and communication center will be established.

Even after the initial phases of relief are complete, the infrastructure of a disaster area is still non-existent. The third phase of the staging process focuses on the redevelopment of homes and communities. A third smaller ocean container will be delivered and attached to the two larger containers on site, creating a single family home. A customizable panelized exterior will allow residents to create and install a unique look and function for their home. Vertical garden panels can be planted to provide food for the neighborhood while other panels will be used to create paths between neighboring units and encourage community interaction.

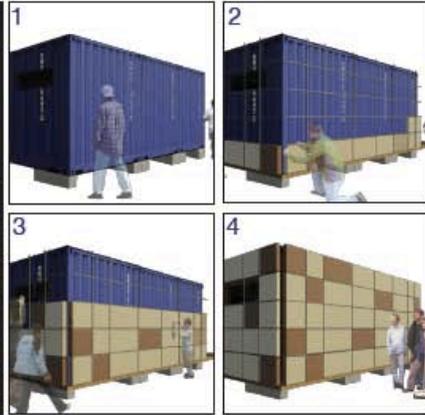
The single-family unit is designed with a large flip down deck to encourage community interaction. The walkbetween this deck and the large interior space can be opened allowing the living space to extend out onto the deck.

In disaster situations old communities are lost, but it is through the creation of new communities that people can overcome insurance-unfriendly odds. Community Connections will give disaster victims a base to form their communities and a sense of dignity from providing for themselves.



COMMUNITY CONEXION

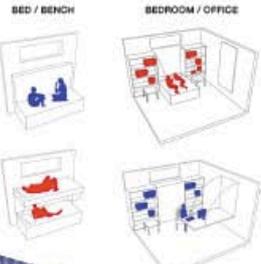
A Sustainable Disaster Relief Housing Prototype



INTERIOR ADAPTABILITY

The adaptability of the Community Connection home will extend to the interior as well. The interior furniture will be adaptable to the needs of the residents in all areas of the home. Sleeping areas will be used as productive space during the daytime and public spaces will adapt to provide extra sleeping areas during the evening hours.

These adaptability will allow the Community Connection home to accommodate the variety of family sizes present in any community.



GREEN ROOF

Aggregates on the roof container will provide moisture to the water plants for maintenance purposes as well as serving as an upper level surface for the residents.



ADAPTABLE WALL PANEL SYSTEM

A system of adaptable wall panels will be used to the exterior facade to allow adaptability. These panels can be a variety of materials including a multitude of finishes. The panels act as a rain and sun screen, protecting the exterior envelope of the structure.

FOLD DOWN DECK

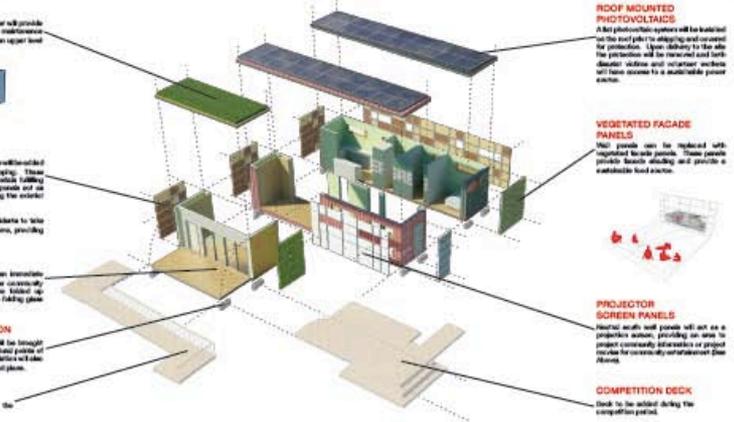
A fold down deck will provide an immediate outdoor parking space for the community residents. During evening, the folded up deck provides protection for the living spaces.

PORTABLE FOUNDATION

Portable building foundations will be brought on site to support the first attached panels of each ocean container. The foundation will also raise the building off of the ground plane.

ADA RAMP

ADA ramp to be installed during the later development of the project.



ROOF MOUNTED PHOTOVOLTAICS

A key photovoltaic system will be installed on the roof panels to allow for energy and to power the production. Upon delivery to the site the photovoltaic will be removed and the solar panels will have access to a sustainable power source.

VEGETATED FACADE PANELS

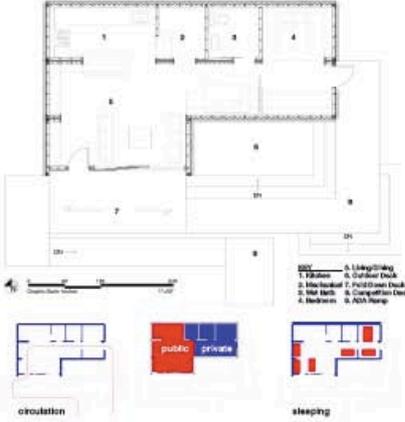
Wall panels can be replaced with vegetated facade panels. These panels provide thermal insulation and provide a sustainable food source.

PROJECTOR SCREEN PANELS

Projector walls will provide an on-site projection system, providing an area to project community information or project on-site for community information.

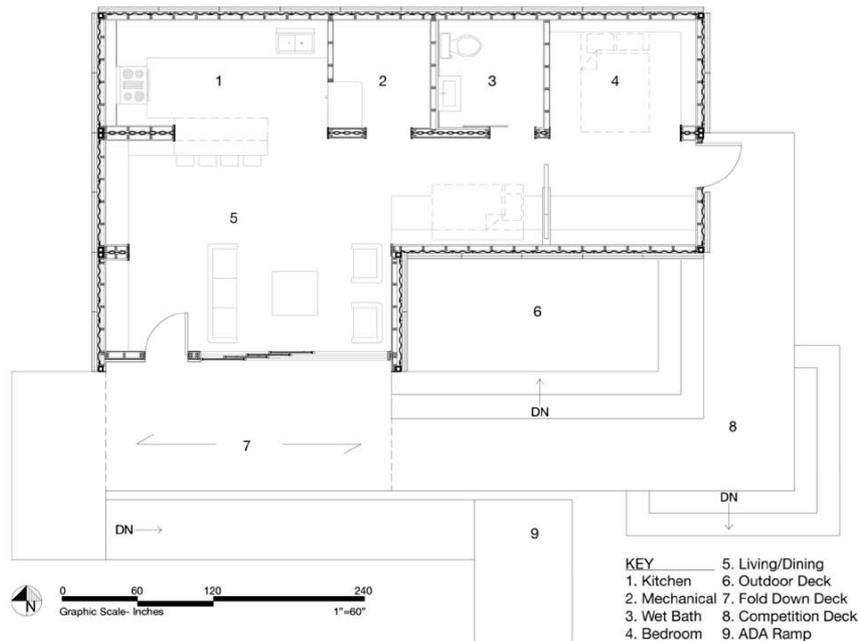
COMPETITION DECK

Deck to be installed during the competition phase.

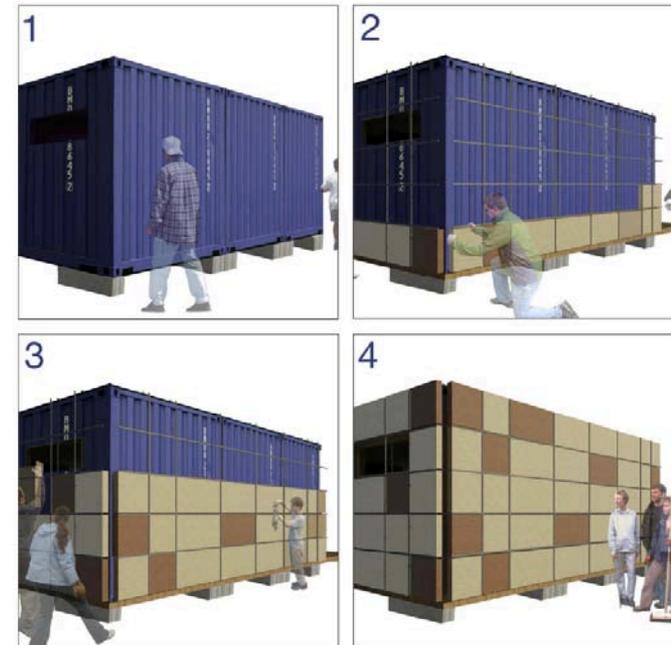




2. Optimal Structural System ?



1. Optimal Floor Plan ?



3. Exterior Insulation Strategy ?

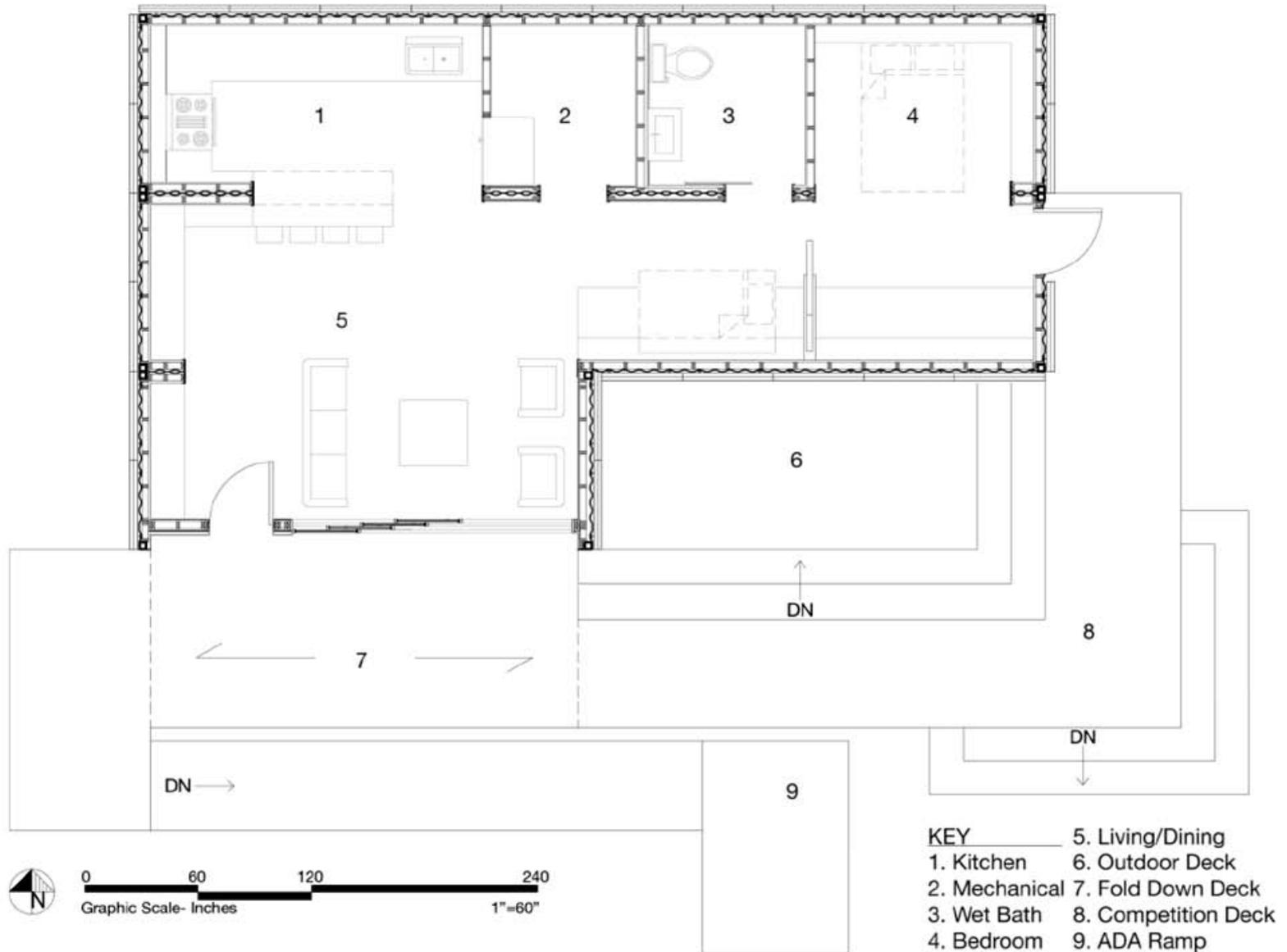
Re_name & design

Re_spond

8 - 10 tornadoes hit our region each year

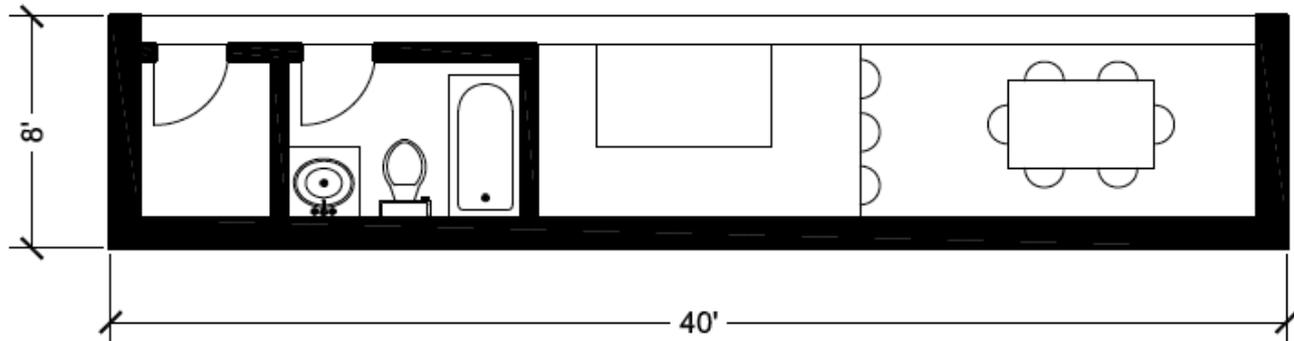
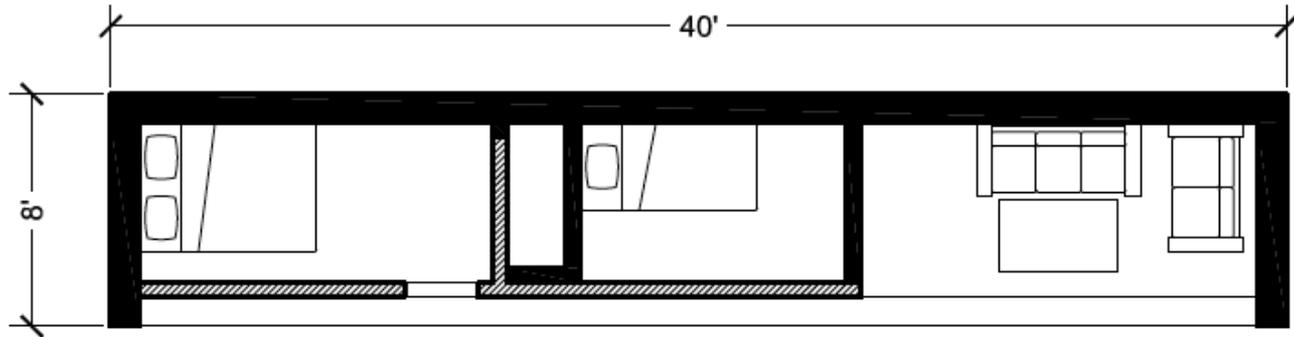


• Optimized Floor Plan ?



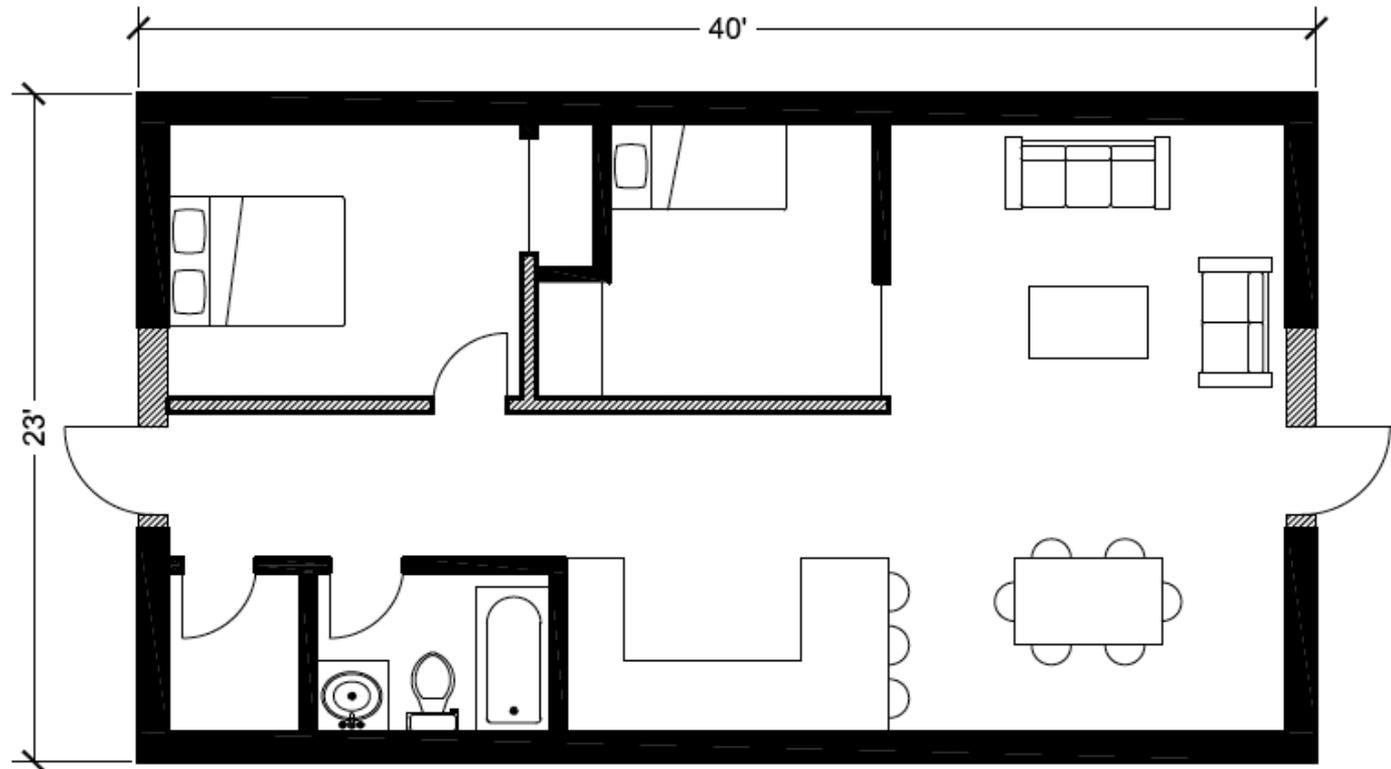
Week 2-4: Flip-Down / Flip-Up Folding Conex Container Concept

Individual Unit Floor Plans @ 1/4" = 1'-0"



Week 2-4: Flip-Down / Flip-Up Folding Conex Container Concept

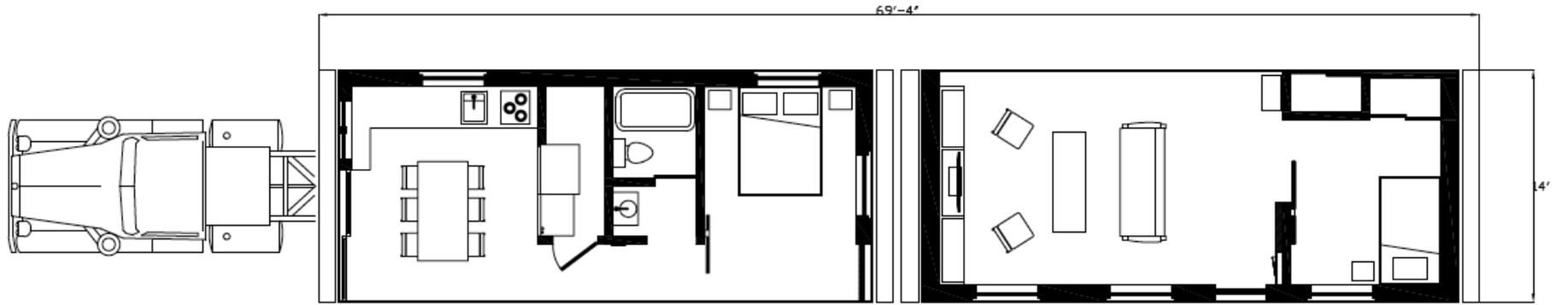
Combined Unit Plan (with unit 2 wall being flipped up to form roof) @ 1/4" = 1'-0"



Week 2-4: Flip-Down / Flip-Up Folding Conex Container Concept

Initial Concept Renderings

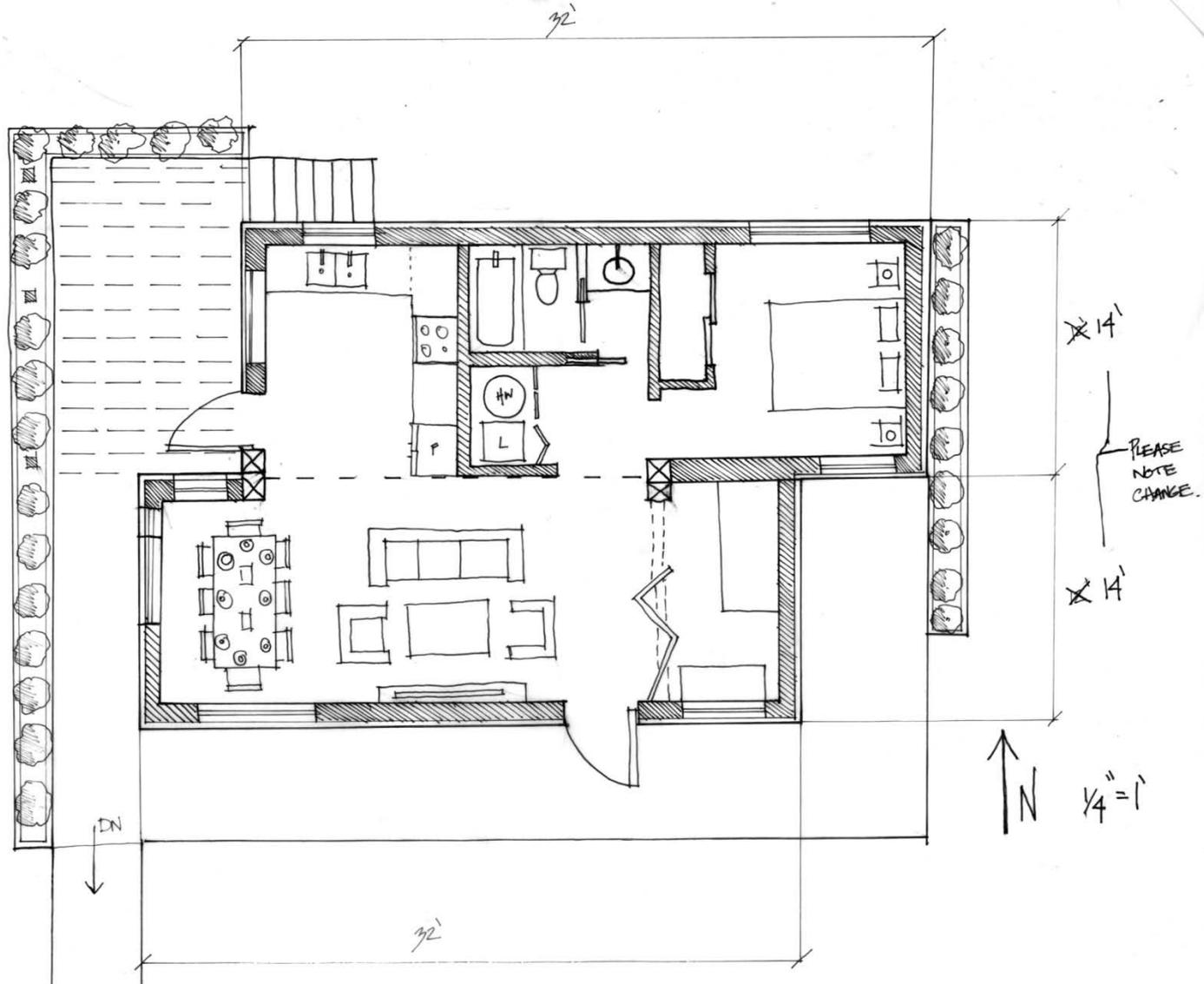




Week 9-10: Plan Development

Redeveloped Floor Plan

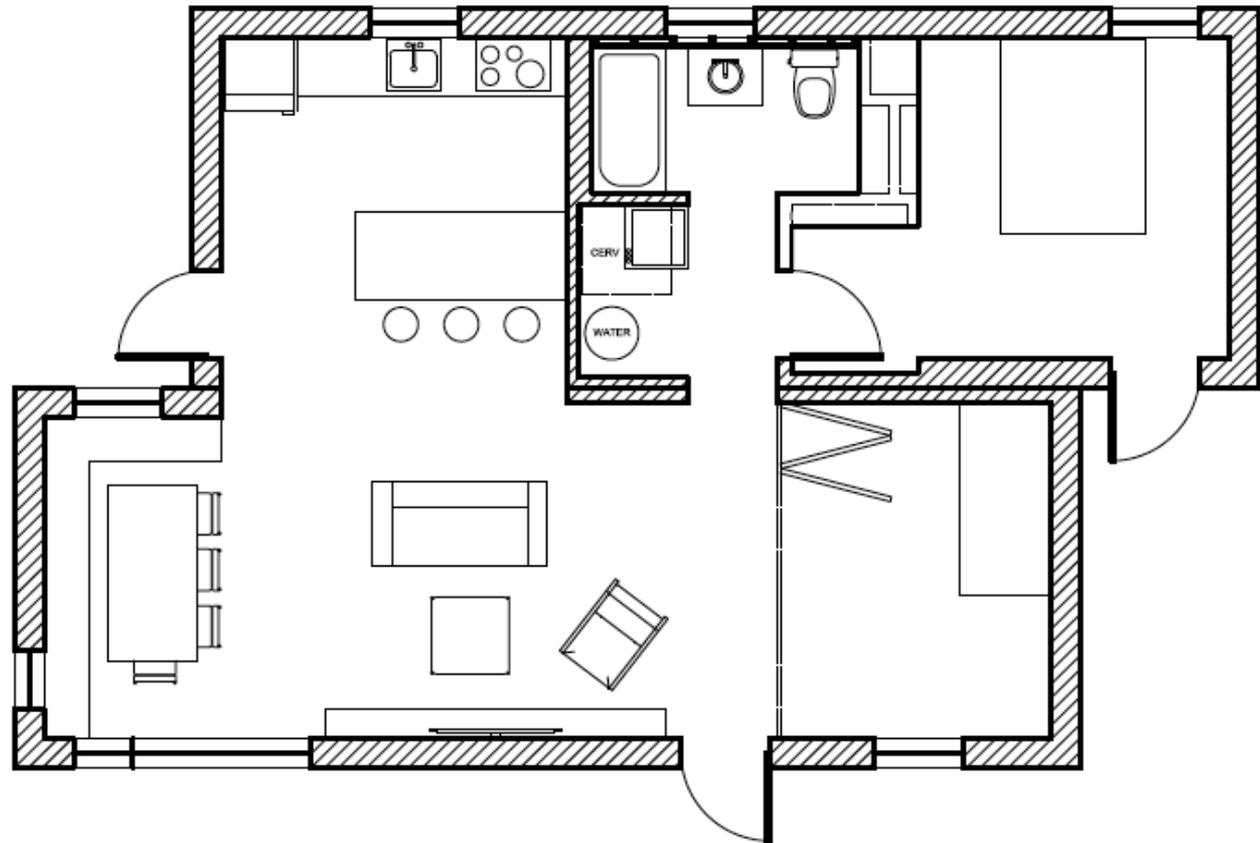
1/4" = 1'-0"



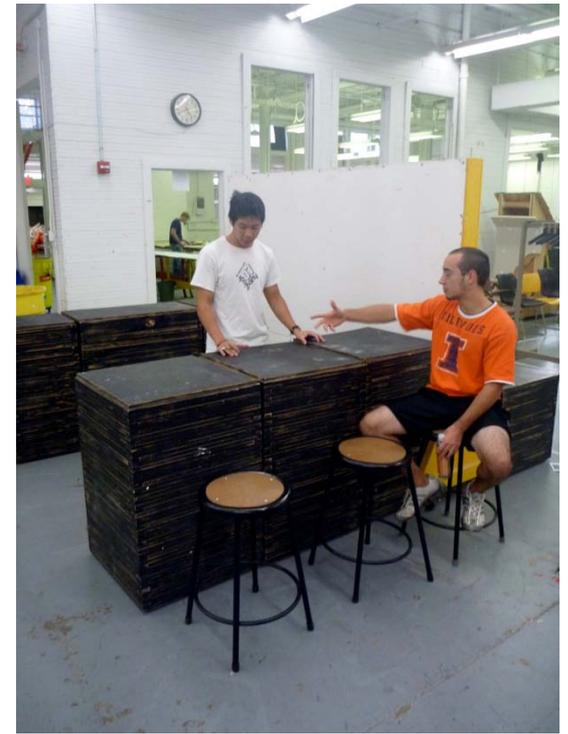
Week 9-10: Plan Development

Redeveloped Floor Plan

1/4" = 1'-0"



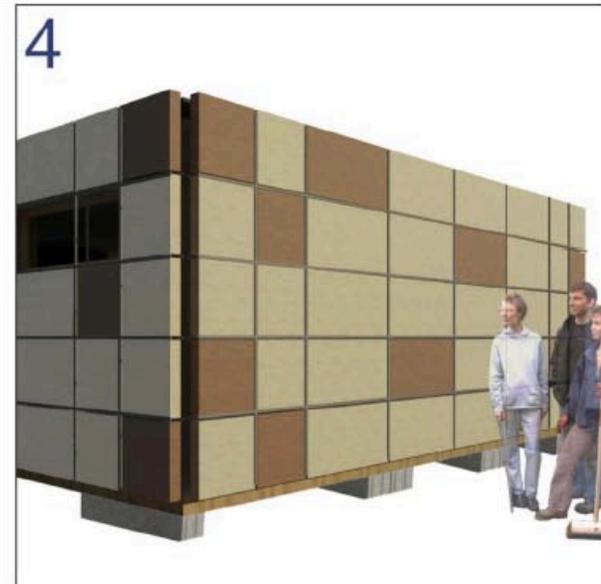
- Optimized Floor Plan



Re_Unite

- Optimized Floor Plan

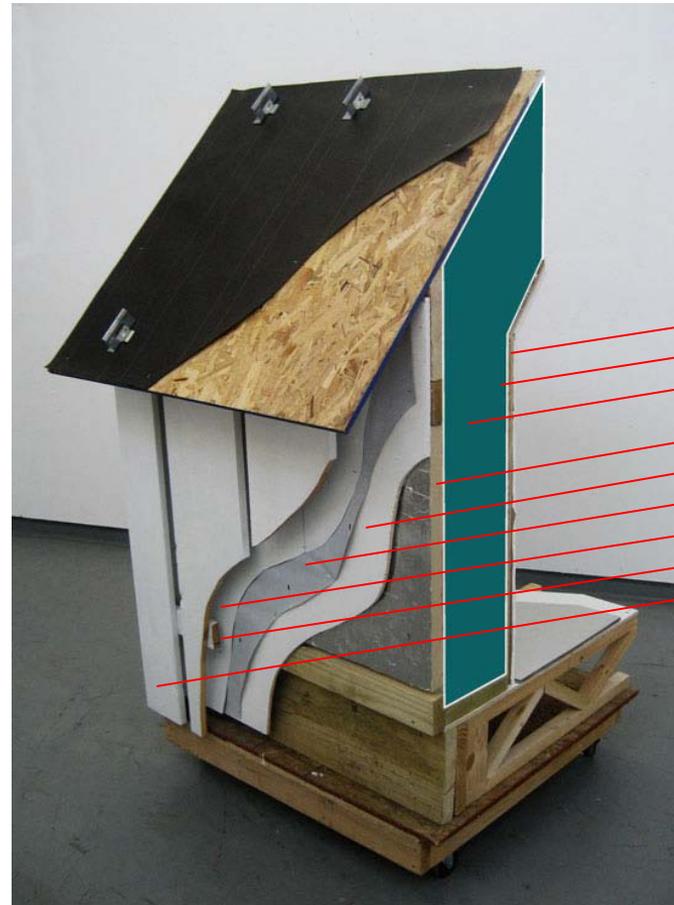
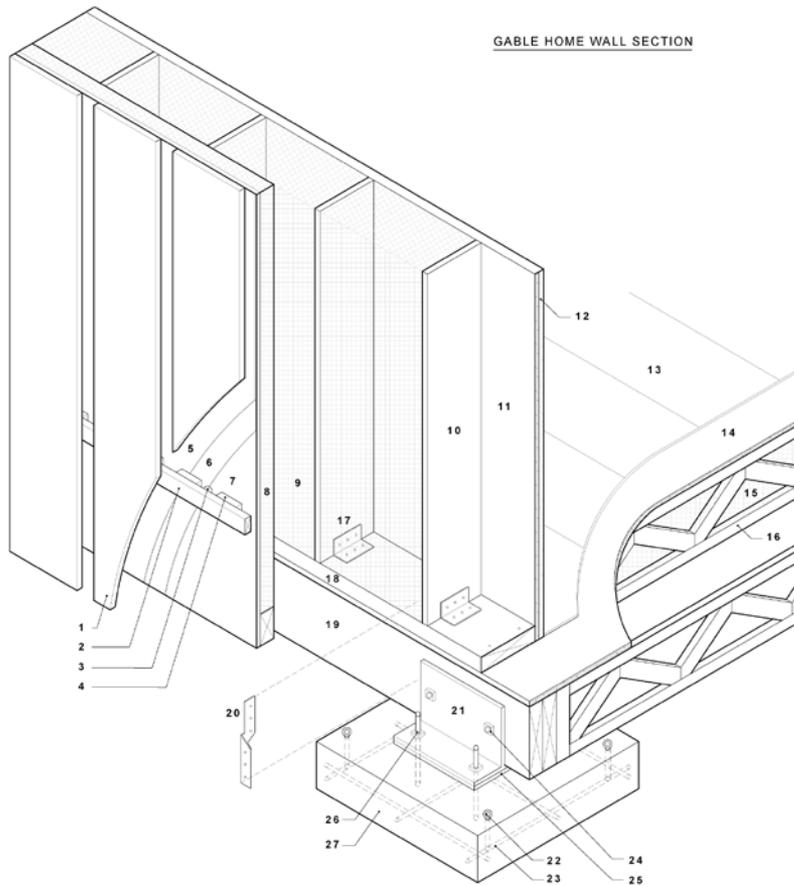
- Super Insulated Air-tight Envelope ?



- Super Insulated Air-tight Envelope



• Super Insulated Air-tight Envelope



Area Section 1

1. Gypsum Board
2. OSB
3. Foam
4. AIR
5. Rigid EPS
6. Plywood
7. Building wrap
8. "Cooling roof" steel sheet
9. Batten stand-off
10. Reclaimed Barn Boards

- Super Insulated Air-tight Envelope



2 pound closed cell rigid polyurethane spray foam

- Super Insulation



- Air-tight Envelope



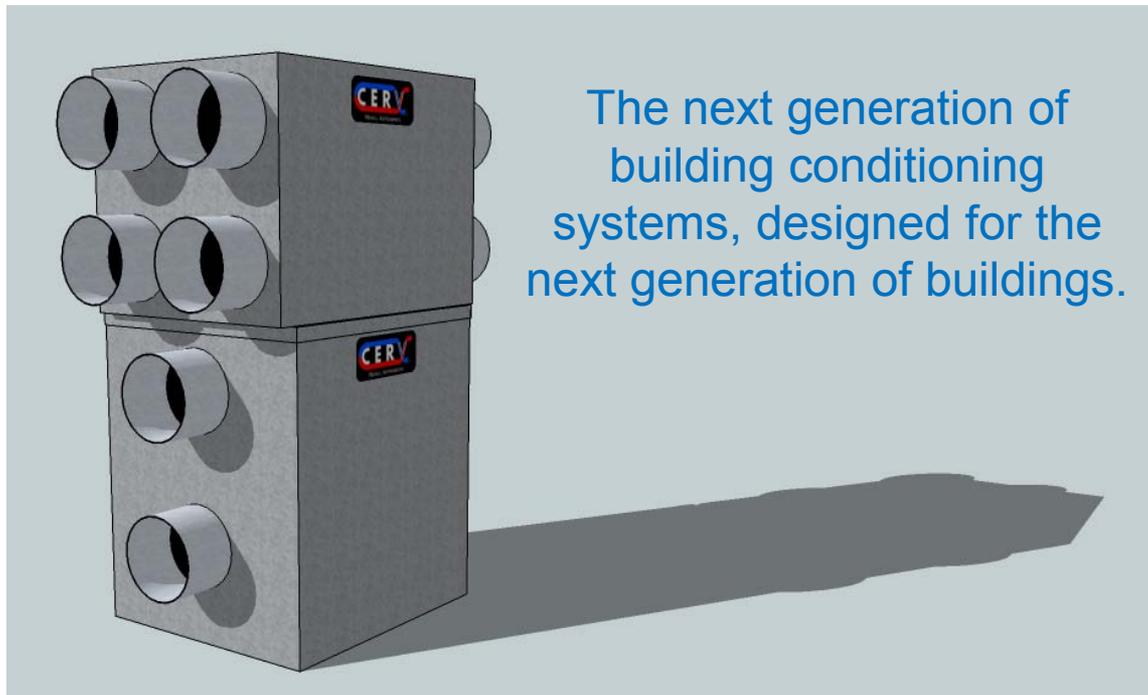
- Air-tight Envelope

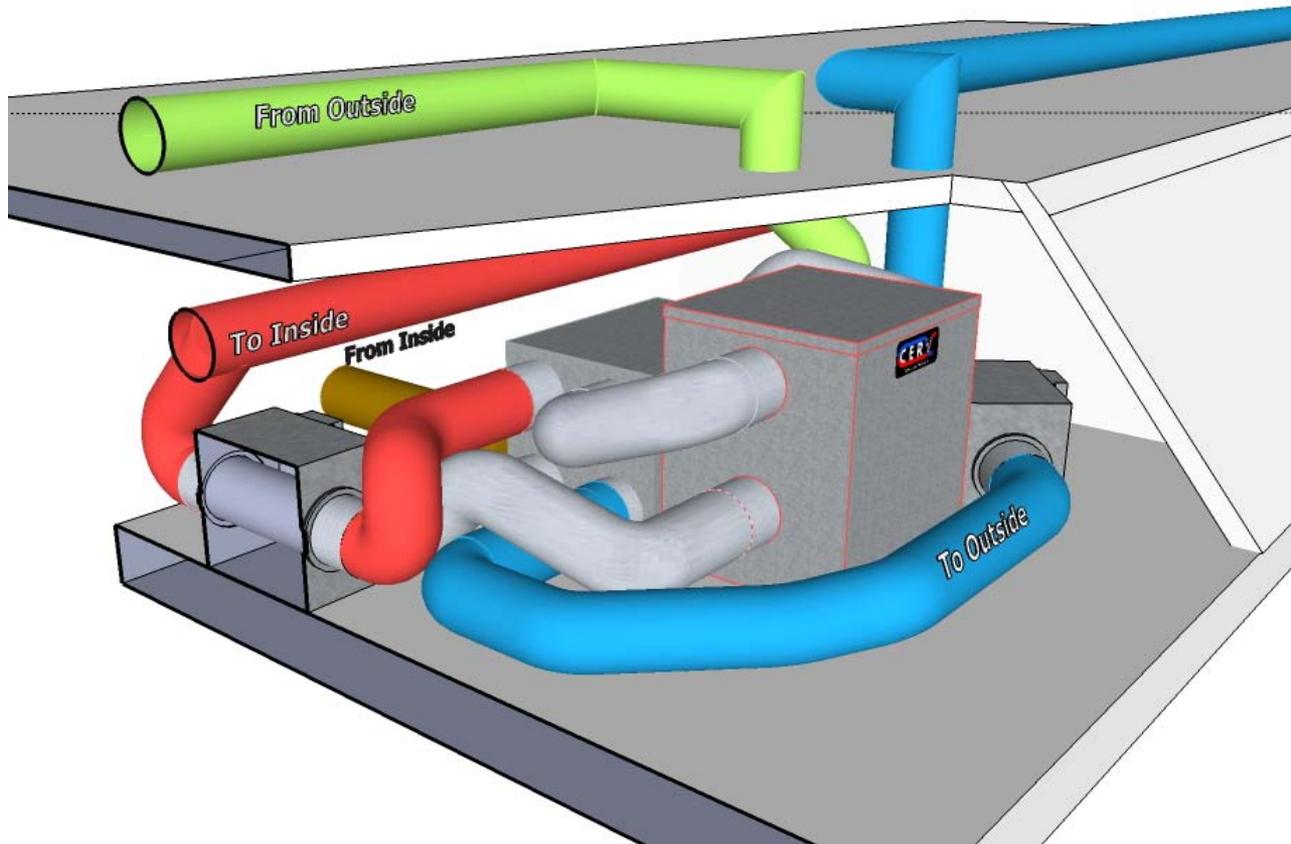


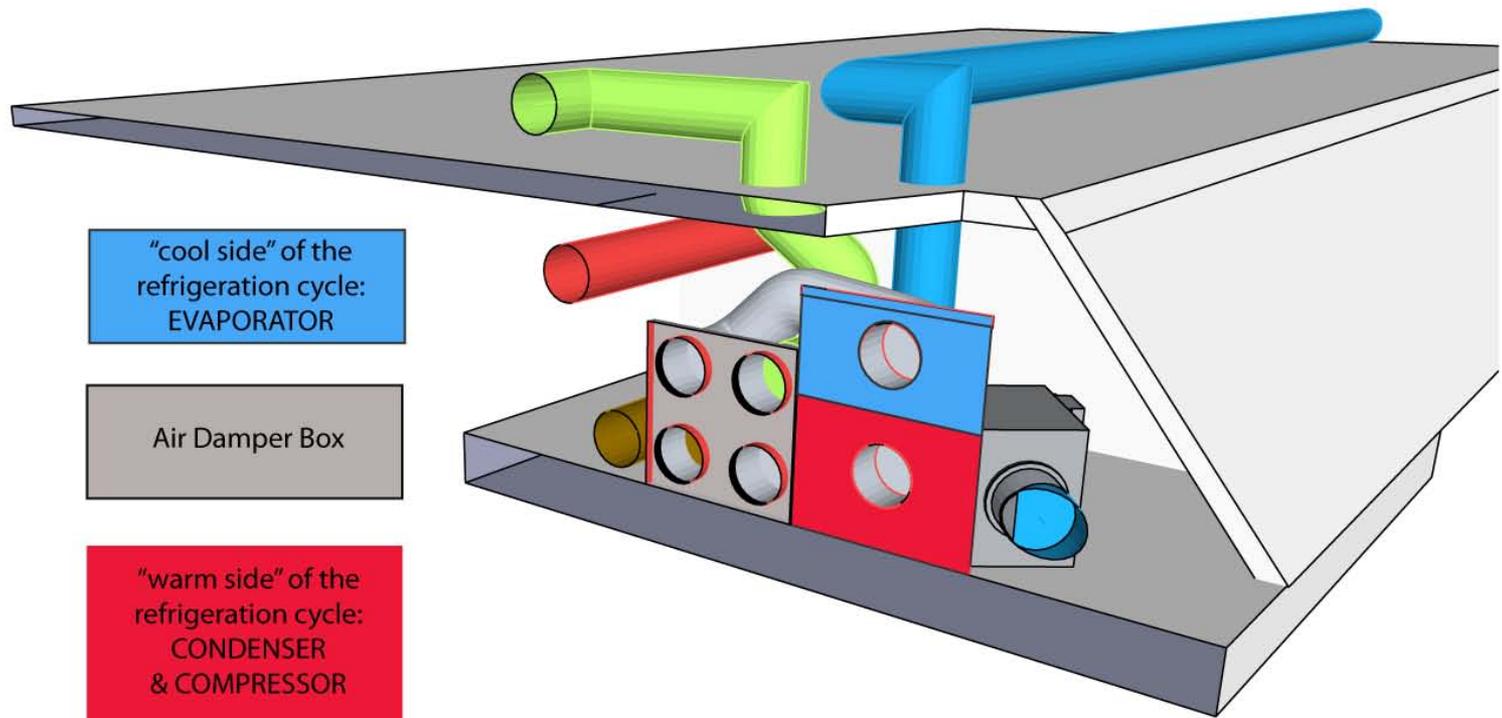
- With a Super Insulated Air-tight Envelope
- You can downsize your HVAC system

Specific Demands with Reference to the Treated Floor Area			
	Applied:	Monthly Method	Fulfilled?
Treated Floor Area:	45.3	m ²	
Specific Space Heat Demand:	14	kWh/(m²a)	Yes
Pressurization Test Result:	0.6	h⁻¹	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):	57	kWh/(m²a)	Yes
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):	10	kWh/(m ² a)	
Specific Primary Energy Demand Energy Conservation by Solar Electricity:	492	kWh/(m ² a)	
Heating Load:	25	W/m ²	
Frequency of Overheating:		%	
Specific Useful Cooling Energy Demand:	5	kWh/(m ² a)	
Cooling Load:	21	W/m ²	
		PH Certificate:	
		15 kWh/(m ² a)	
		0.6 h ⁻¹	
		120 kWh/(m ² a)	
		over 25 °C	
		15 kWh/(m ² a)	Yes

- With a Super Insulated Air-tight Envelope
- You can downsize your HVAC system



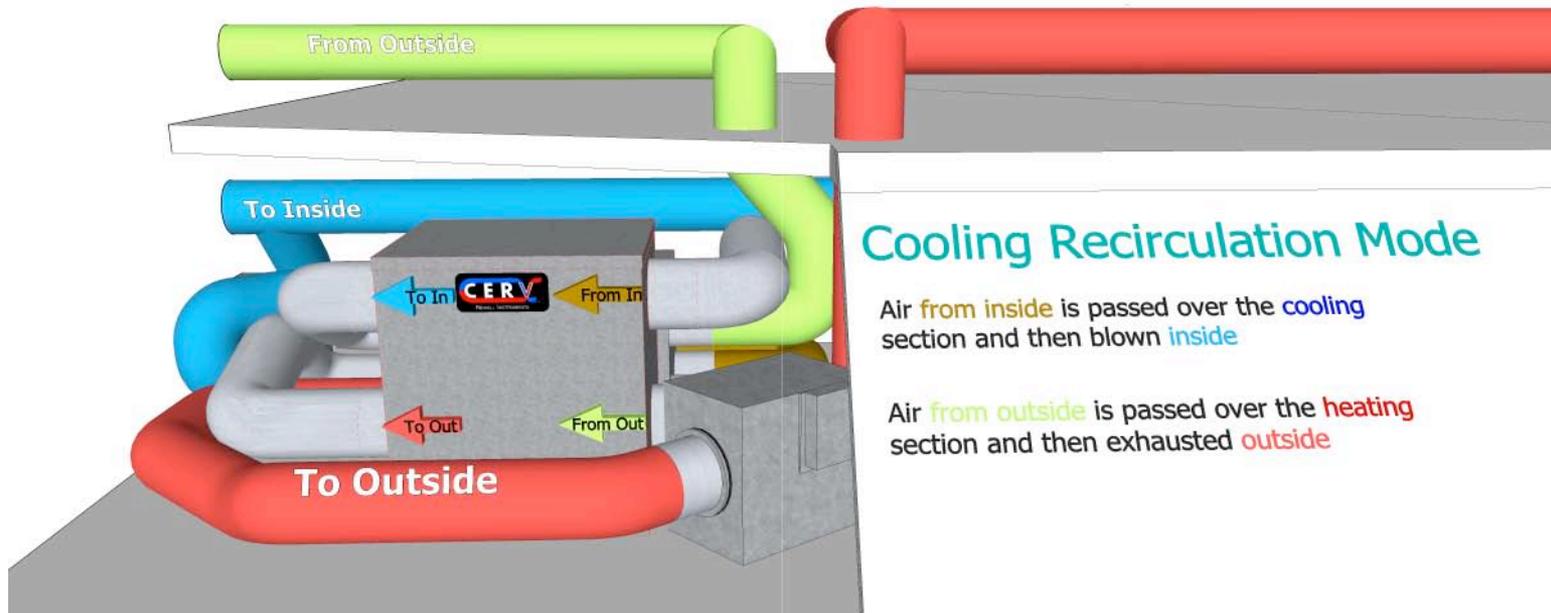
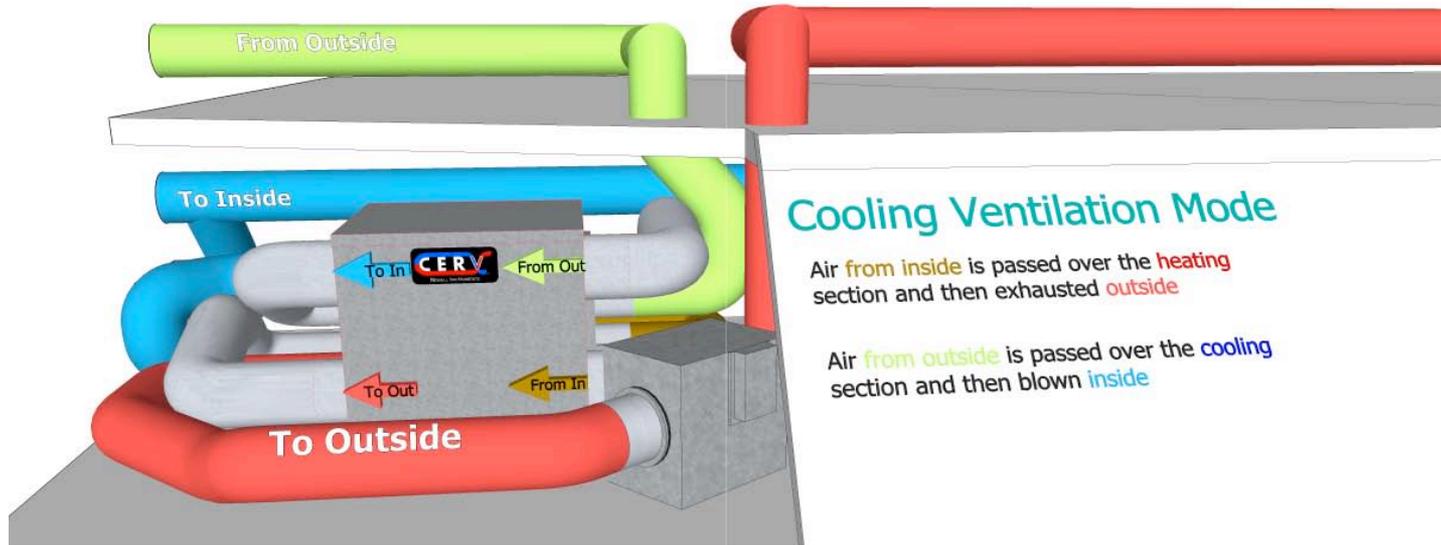


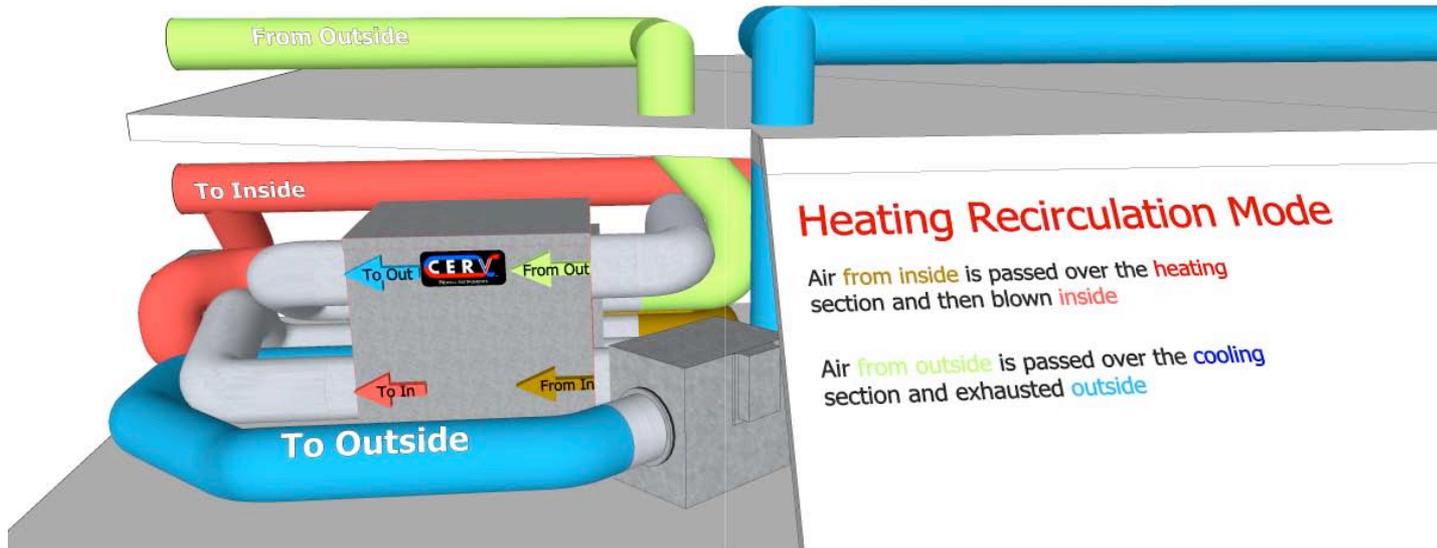


"cool side" of the
refrigeration cycle:
EVAPORATOR

Air Damper Box

"warm side" of the
refrigeration cycle:
CONDENSER
& COMPRESSOR

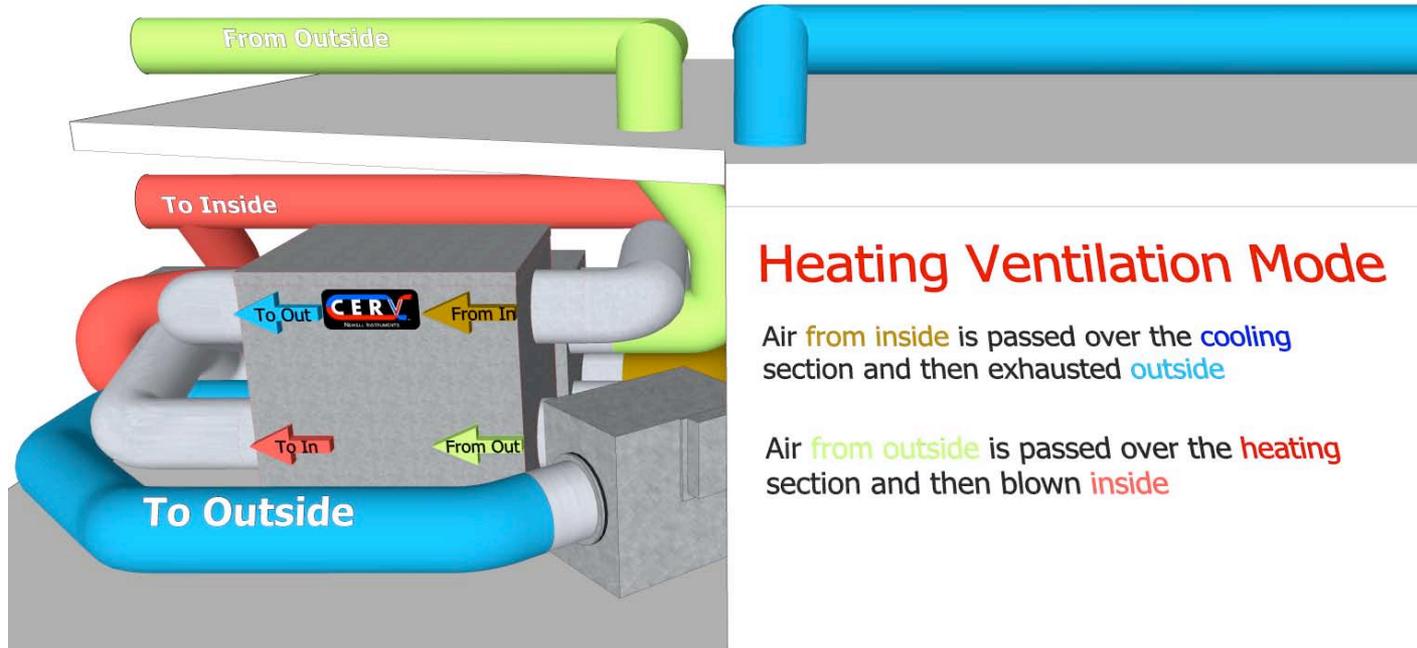




Heating Recirculation Mode

Air from inside is passed over the heating section and then blown inside

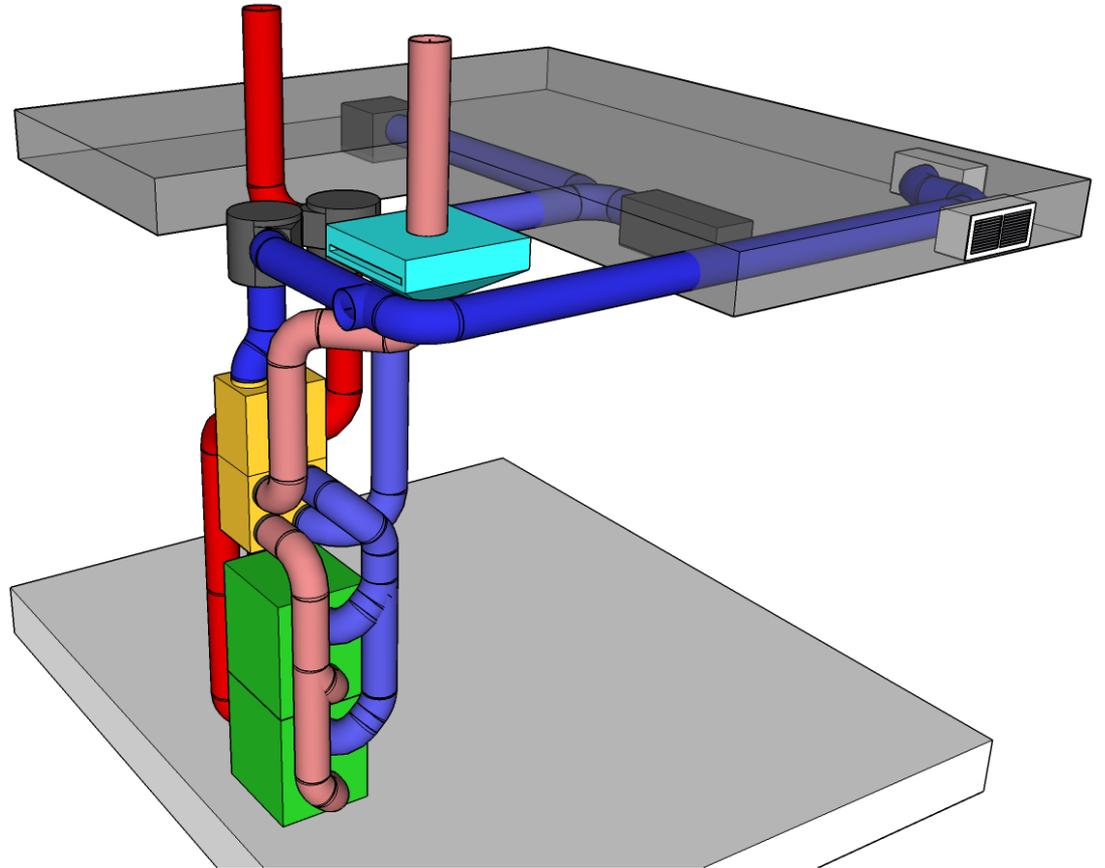
Air from outside is passed over the cooling section and exhausted outside



Heating Ventilation Mode

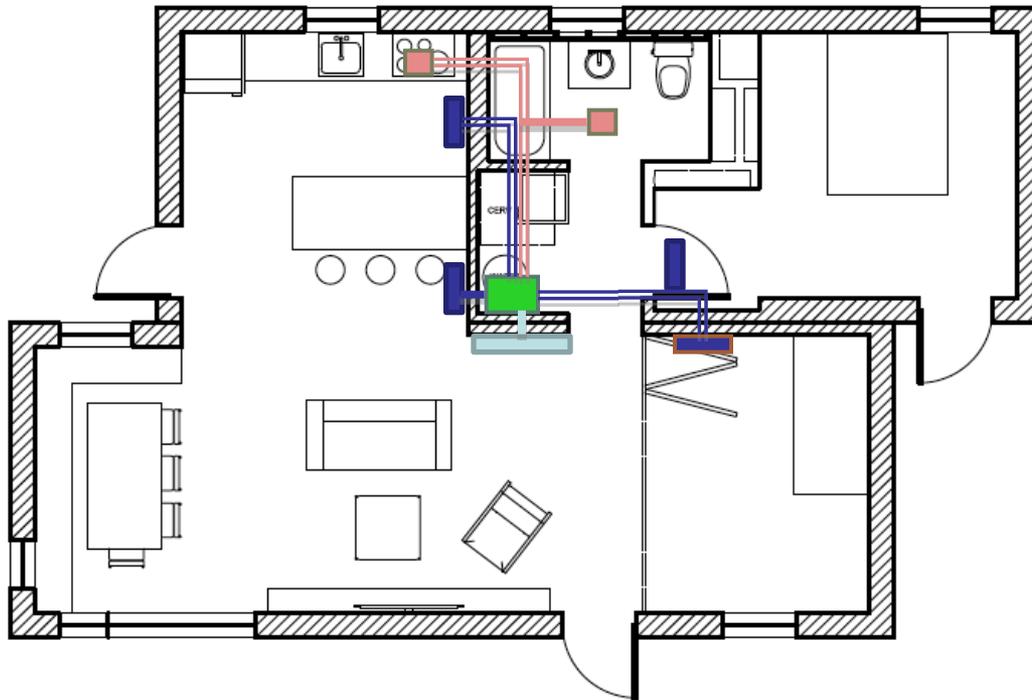
Air from inside is passed over the cooling section and then exhausted outside

Air from outside is passed over the heating section and then blown inside



Ventilation Locations

-  CERV Unit
-  Exhaust
-  Distribution Vents
-  Return Vent



Thank you for the opportunity to present the

Re_home

Any Questions?

**This concludes The American Institute of Architects
Continuing Education Systems Program**

<http://www.solardecathlon.illinois.edu/>

Thank you to our supporters and suppliers



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