Designing through Disaster

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What designs can be implemented into making emergency structures that are readily available after a natural Disaster strikes?

Problem Statment

Thesis Abstract

This thesis project is about how we can provide a cost and time effective source of emergency housing for those just effected by a natural disaster. Natural disasters rarely a have a warning signal to them, and even when they do there is no way of predicting what the damages will be. Within a split second thousands of people can be left homeless.

With a simple yet effective design, people in high disaster zones like Minneapolis, MN can live in emergency housing while the rubble is pushed away, and permanent homes are built. After permanent houses are built the temporary structures can be taken down and used again for another natural disaster that is about to destroy another community.

Key words: Emergency Housing, Natural Disasters, Homeless, Temporary Structures, Permanent Housing

Statement of Intent

Project Typology:
Emergency Housing

Claim:
Rebuilding communities recently destroyed by a natural disaster, by having victims, and workers come together and construct cost and time effective structures that are welcoming yet effective for the victims to temporarily reside in.

Premises:
Architects, and engineers, who are the workers, come together to fight a problem of destruction and loss by rebuilding a destroyed city. Emergency structures are built and dispersed to victims of the storm. The community members are able to learn how to construct the structures from the workers, to later build and help others in need. The non prepared victims of the natural disaster have been thrown into a state of homelessness and exposes them to a state of helplessness in a matter of seconds. As Kate Stohr (2006), founder of Architecture for Humanity, states, “Whether in countries rich or poor, nature has proved that no feat of engineering can completely shield a city from the rumblings of the earth or the rising of its waters.” (p.34)

Theoretical Premise:
Through the work ethic and technique of the workers combining the emotional drive and need of the victims there is purpose and direction to build and recreate a community torn apart by a natural disaster.

Project Justification:
We really do not know when a natural disaster is going to strike, or where. All we do know is that when it does, we have no way of protecting ourselves from its path. From all of this we are able through the power of design and skill rebuild the damages. We cannot bring back what was lost, but we can try to design and build a new beginning. Taking all the bad and creating them into milestones that we will conquer.

History

1881: **The American Red Cross** was founded

1906: **The great fire and earthquake** of San Francisco

1906 +1 month: **40,000 people** were still **living in tents**

1909: 5,343 cottages were in use, and the **last camp of tents was closed down**

1930: **The Housing Act was passed** in England, which was aimed for **government subsidized housing**

1934: **200,000 people in England were** unable to afford housing and were **displaced** from the inner city to the suburbs.

The United States created the National Housing Act to help 10's of thousands of people evicted from their homes, to be homeowners once again.

From the National Housing Act came the Federal Housing Administration that created **mortgage plans**, which increased home ownership from 40% in 1930's to 67% in 2006.

1939-1945: **World War 2** expressed the desperate **need of emergency housing**. In this time frame also was the start to many **new organizations like NGO's** (nongovernmental organizations), **Oxfam**, **USAID** (United States Agency for International Development)

1949: **The post war building boom**, and the **Housing Act**, which in the end had a negative effect and caused **"Vertical Slums"**

Around the 1930's: The **Self- Help Movement** was started, which encouraged home owners to get involved in the building process of their homes.

1976: **Habitat for Humanity was established** to help build homes for low income families and to teach them about building construction

From the 1970's: **CDC's** (Community Design Centers) **have been set** up for people to come, learn, and get architecture and planning services for free.

1999: **Architecture For Humanity** was founded

In the future:

By **2015** there will be a **54% increase of the number of people affected by a natural disaster**, according to the Oxfam International.

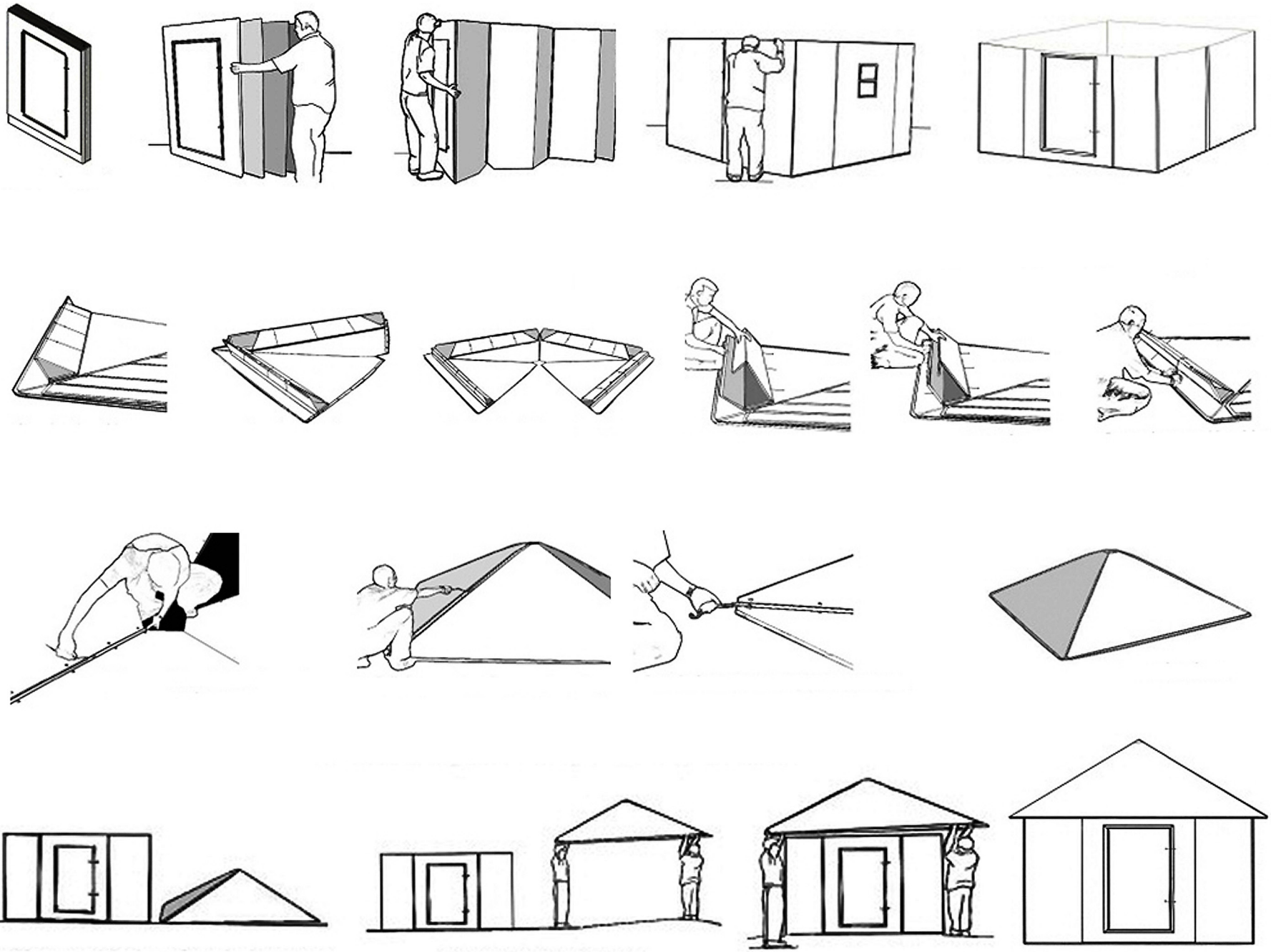
CRED International Disaster Database the number of reported **natural disasters has gone up from 903** in the 1970□s, **1,824** in the 80□s, **2,971** in the 90□s and **4,485** in the 2000□s.

In **2007 the Red Cross reported 160 million individuals** that needed **housing assistance** because of a **natural disaster**.

Minnesota has **27 tornados** for an annual average.

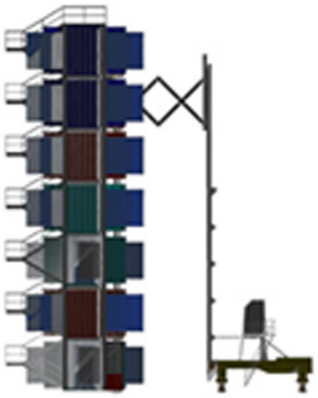
Case Studies

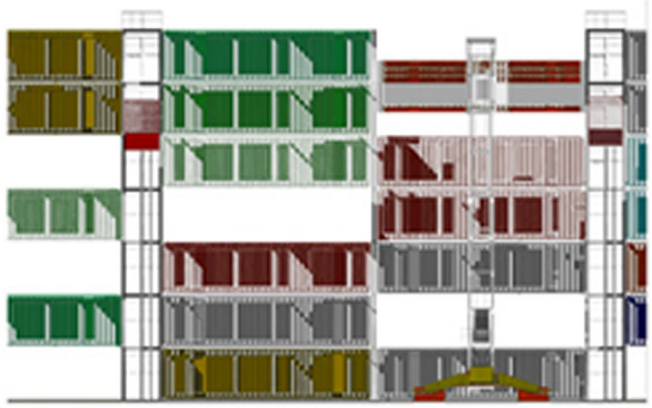

Global
Village
Shelters




Mobile
Dwelling
Unit

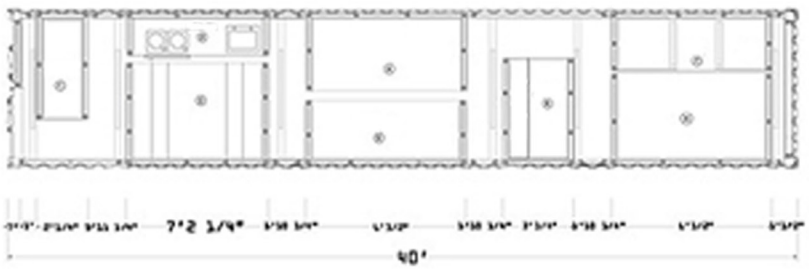
Front Elevation



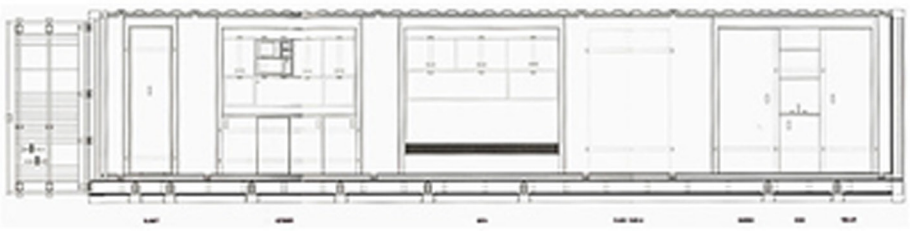


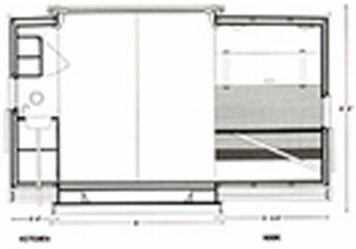
Back Elevation

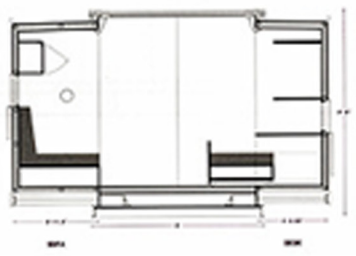
Closed Plan

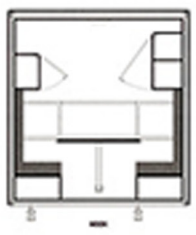


Open Plan



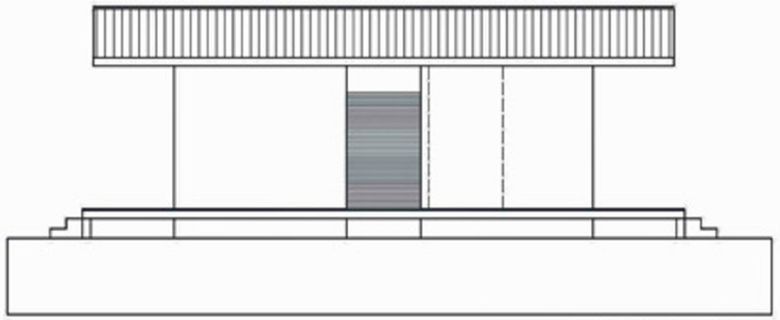




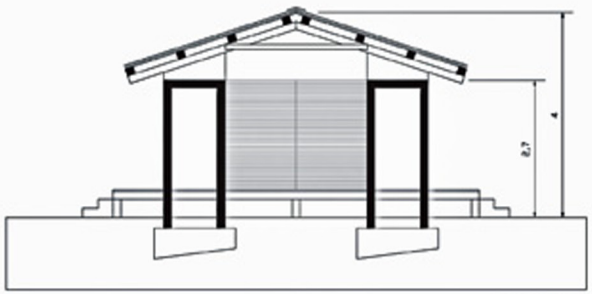



Safe
(R)
House

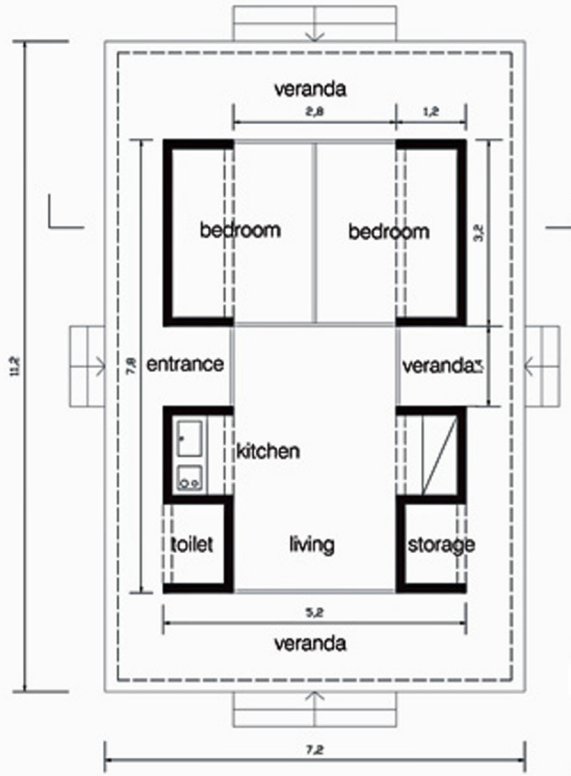
Front Elevation



Side Elevation



Section

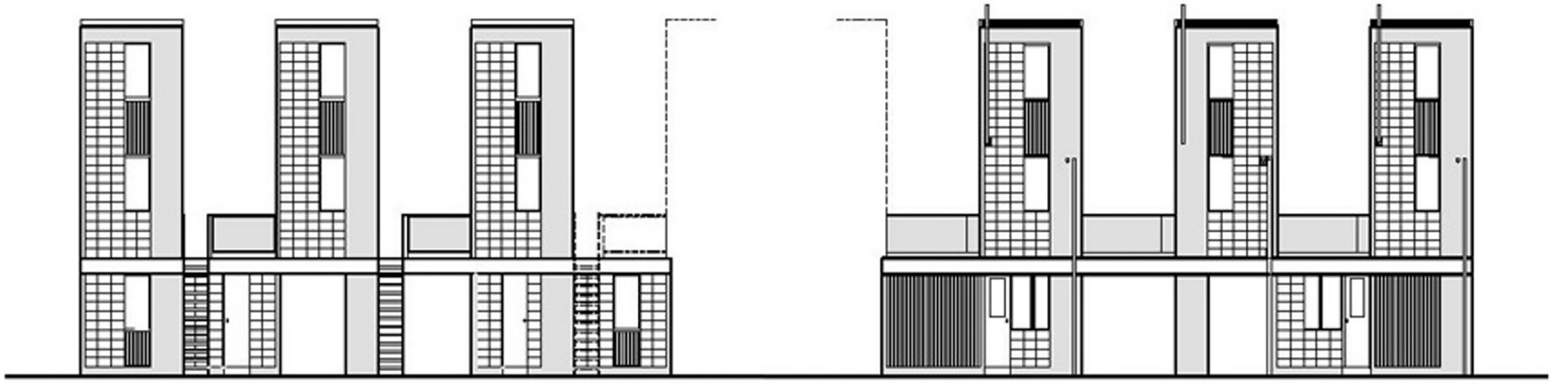


Plan

scale 1:100

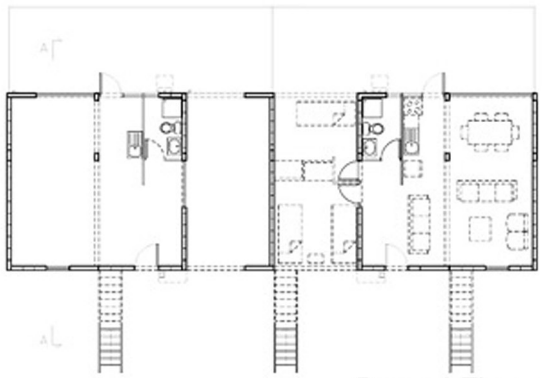
Quinta Monroy

Soical Housing Complex

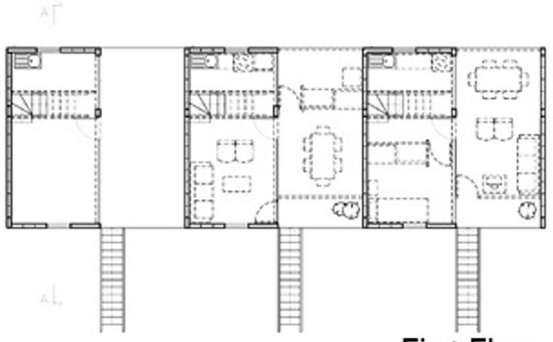


Front Elevation

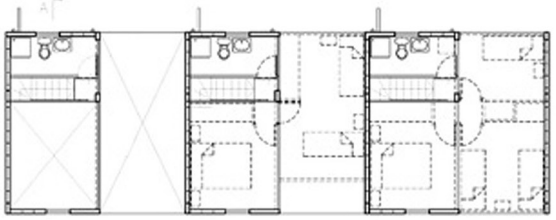
Back Elevation



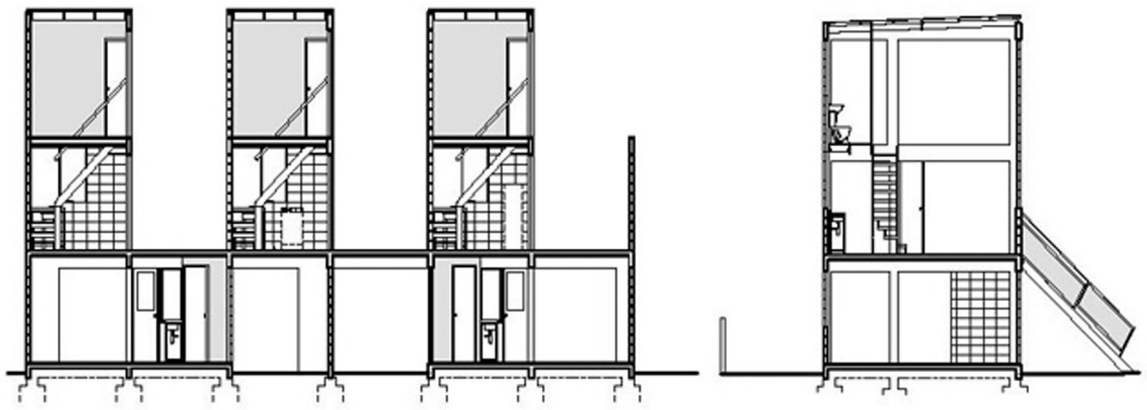
Ground Floor



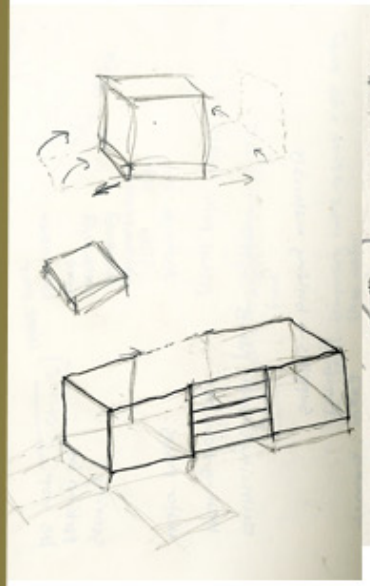
First Floor

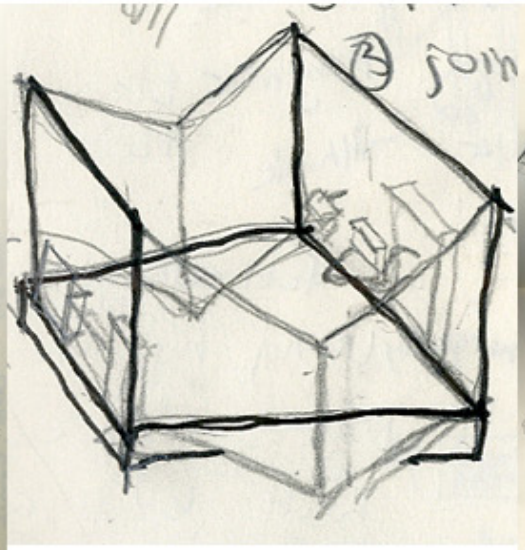


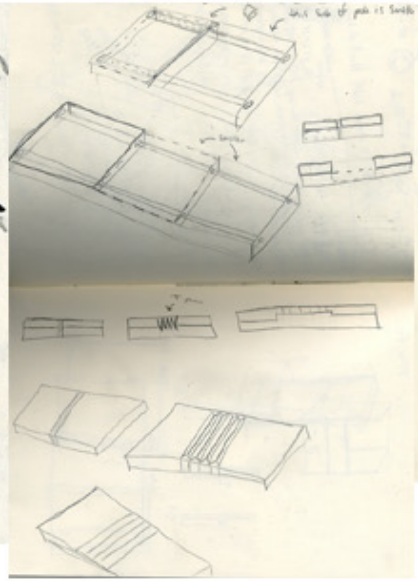
Second Floor

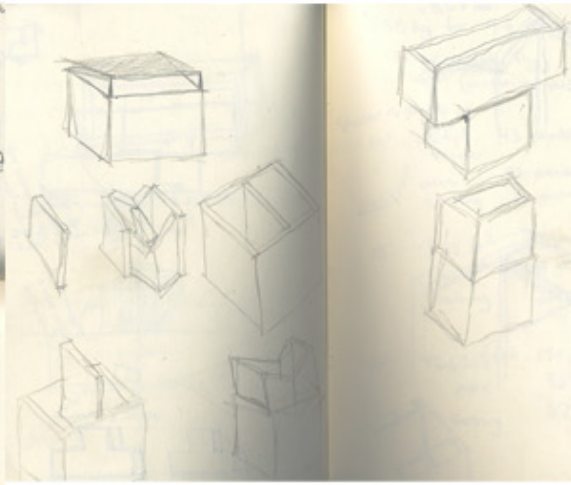


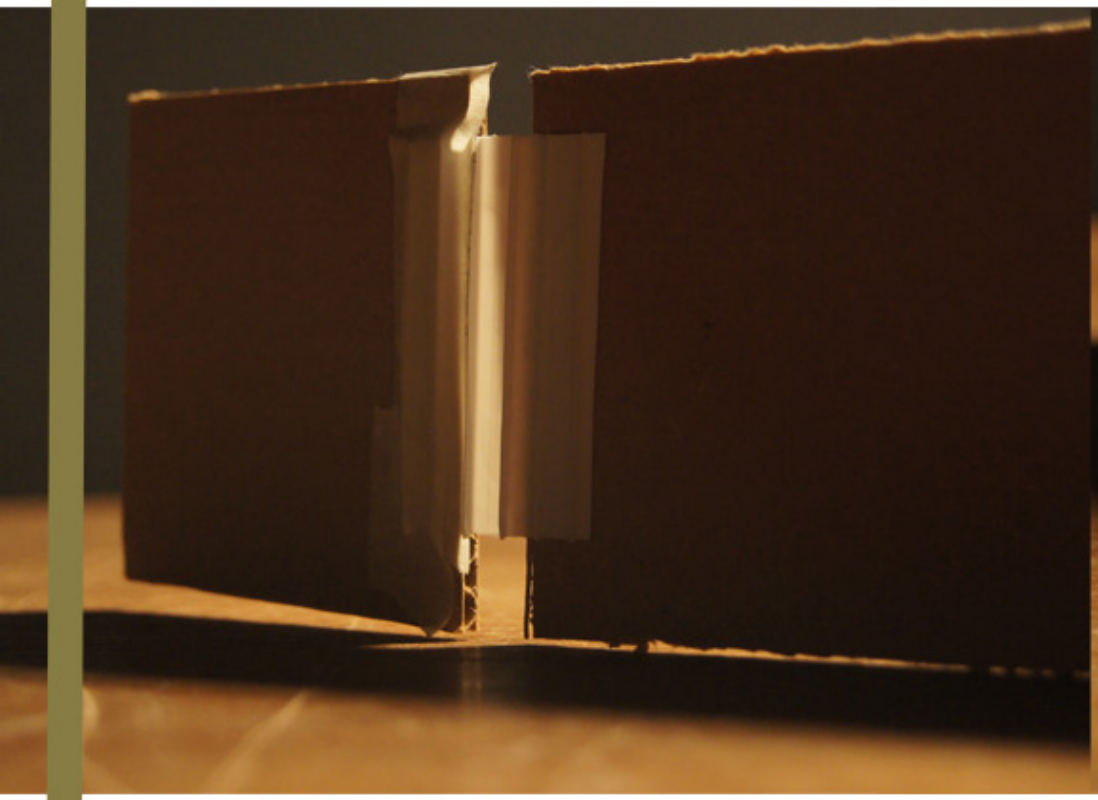
Process

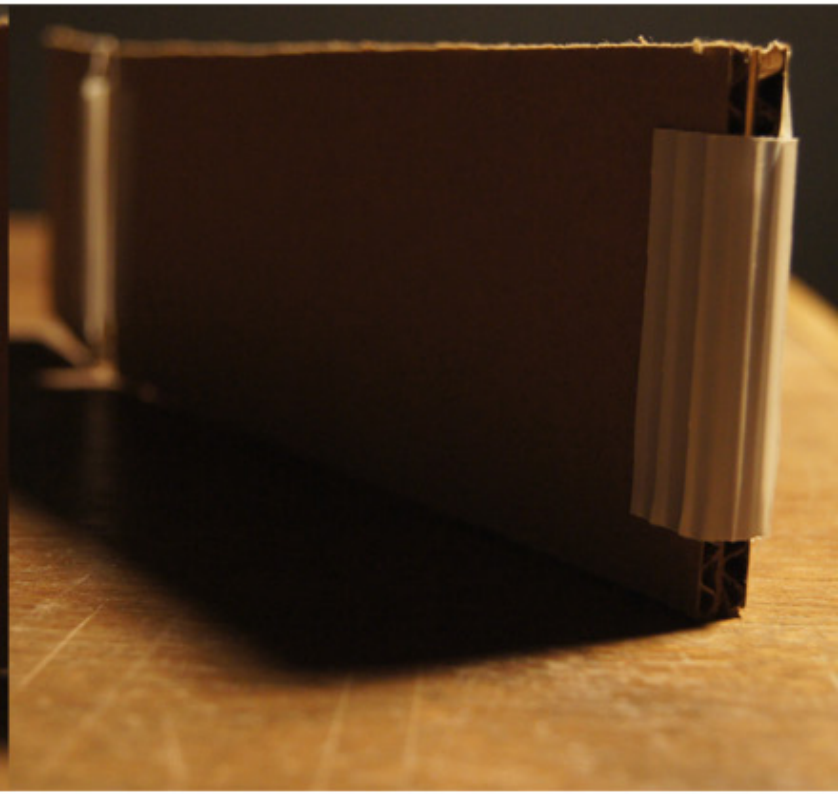


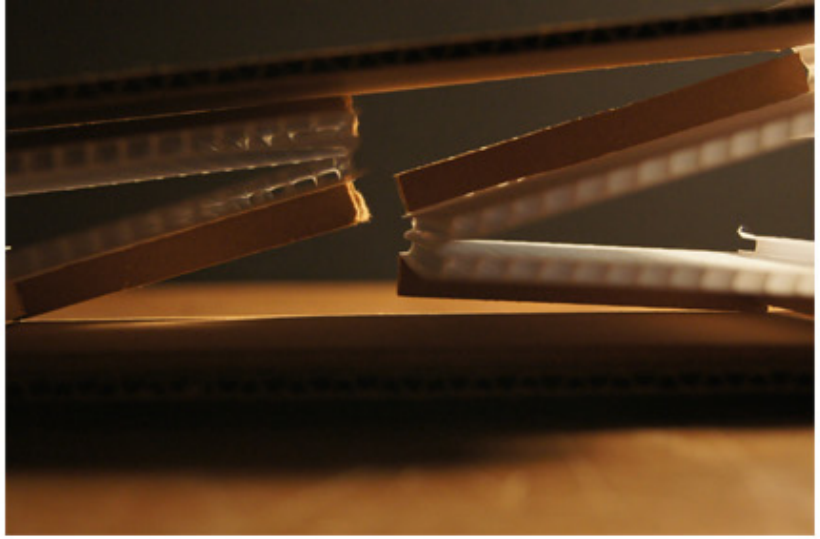


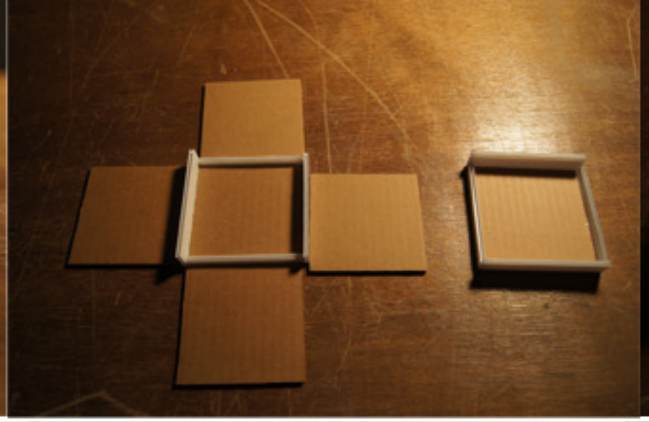


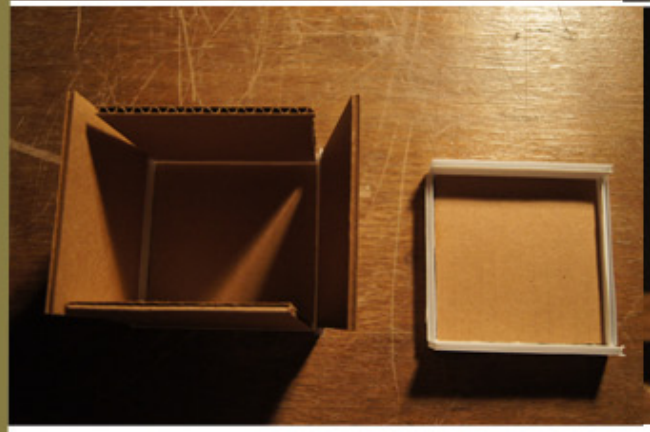
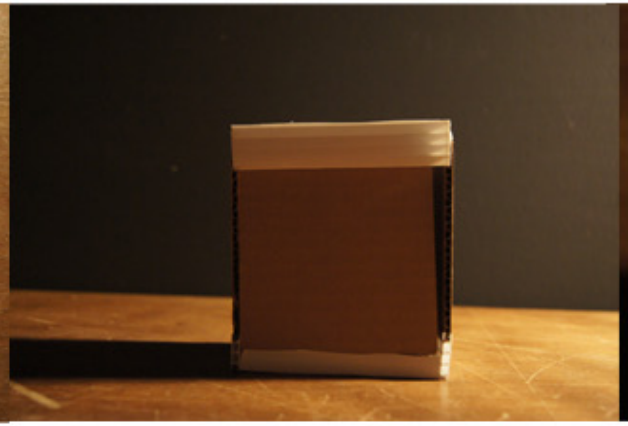
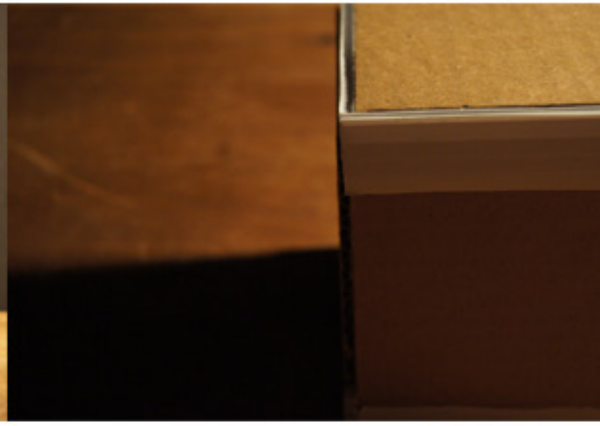
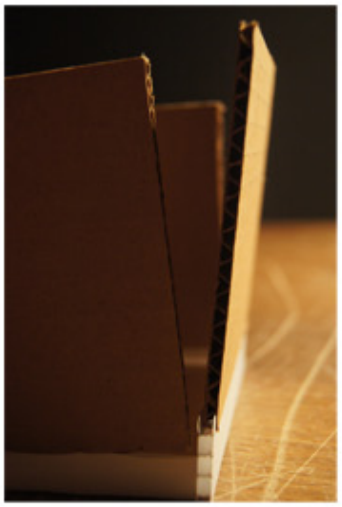








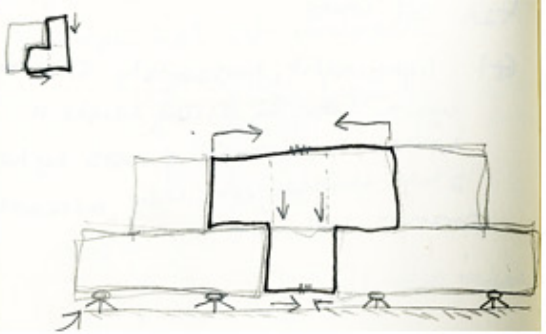


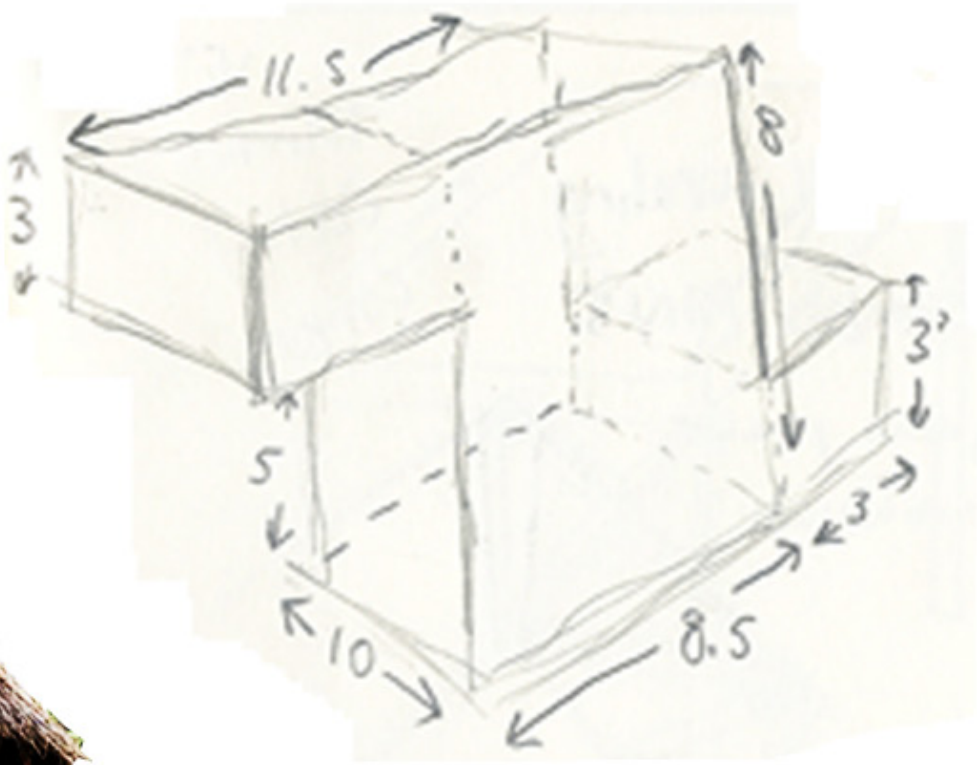








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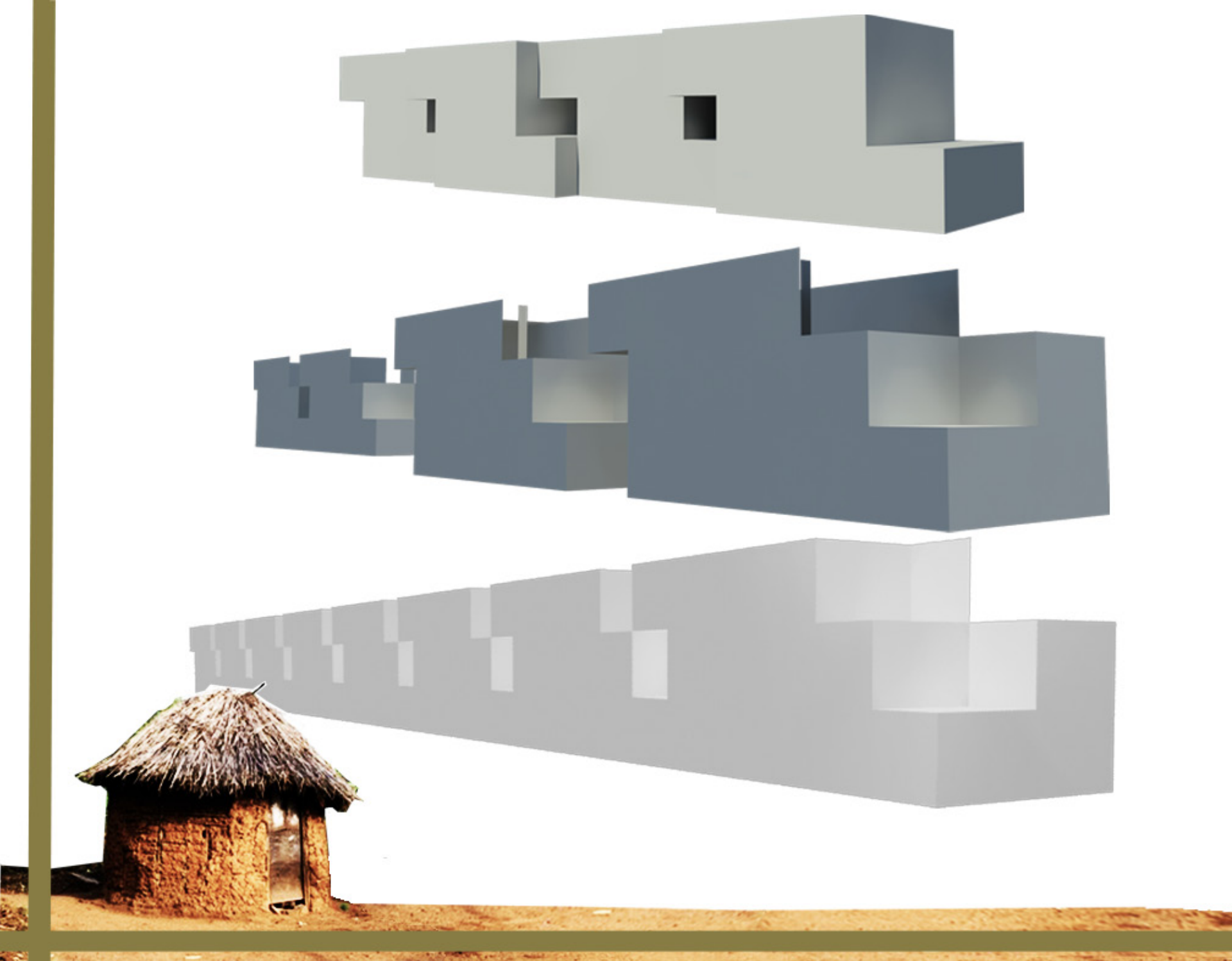
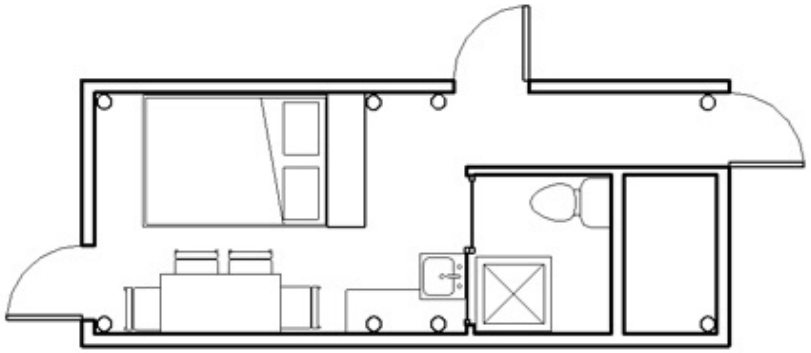
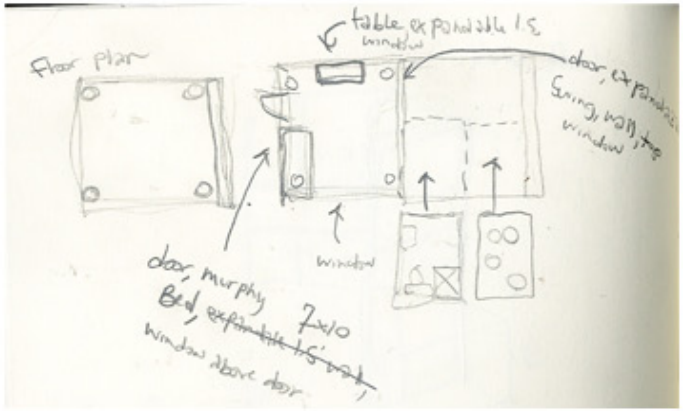
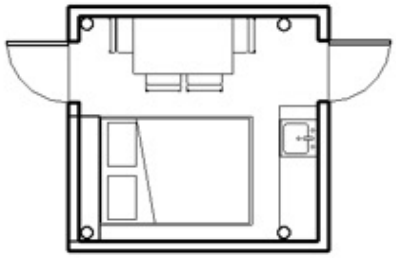
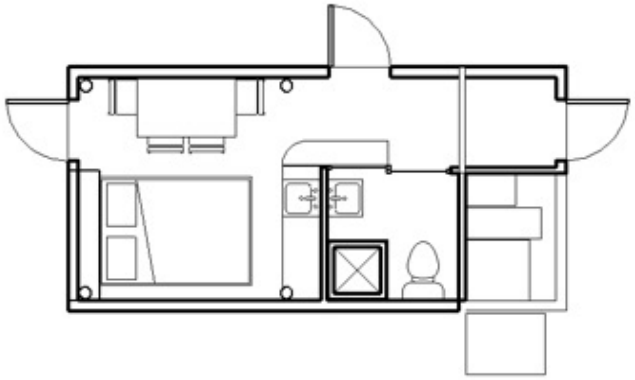


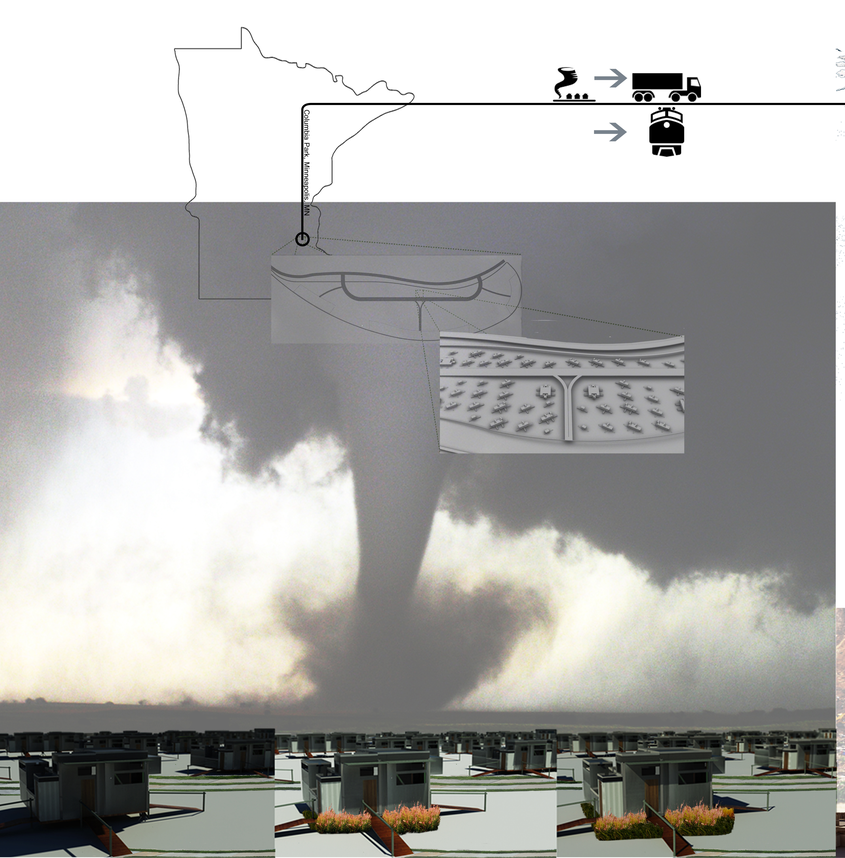


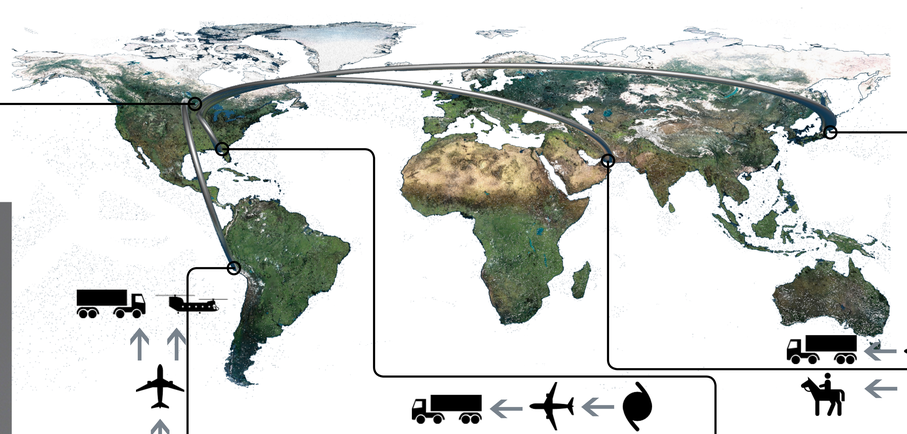

floor plan
table expandable 1.5
window
door, murphy
Bed, expandable 1.5' wall,
window above door
7x10
window

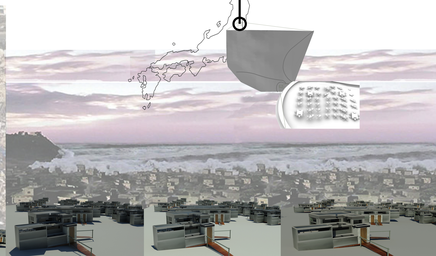




Site Information







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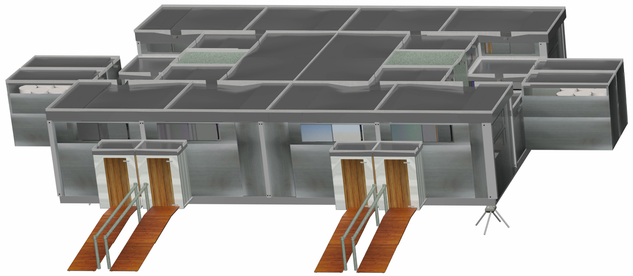
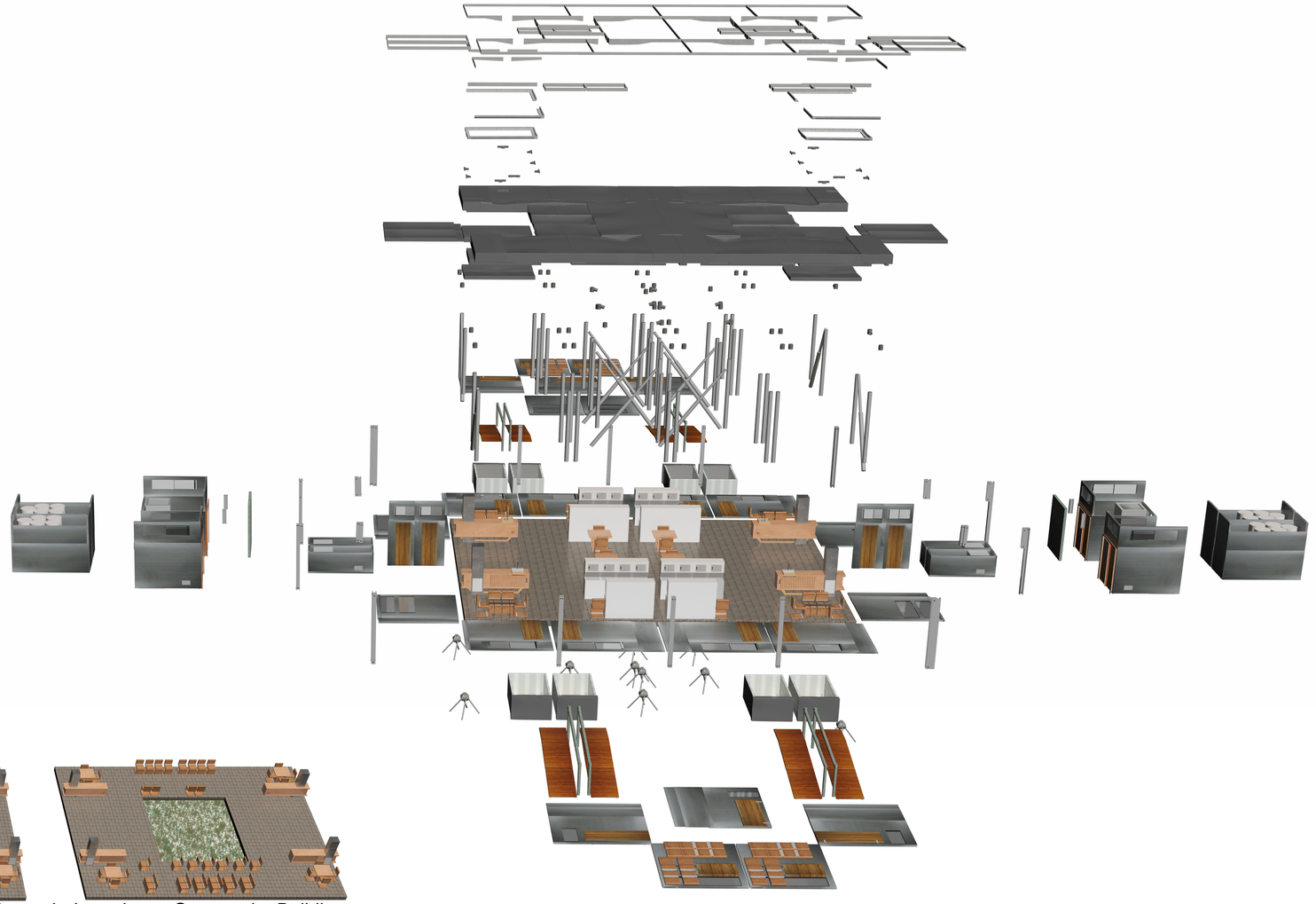
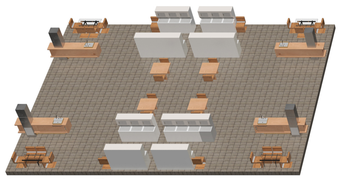
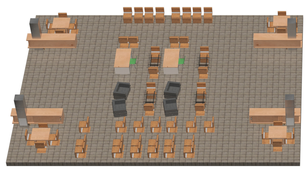
Designing Disaster Through



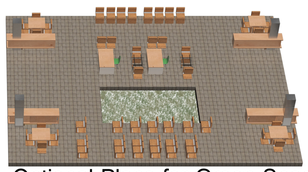




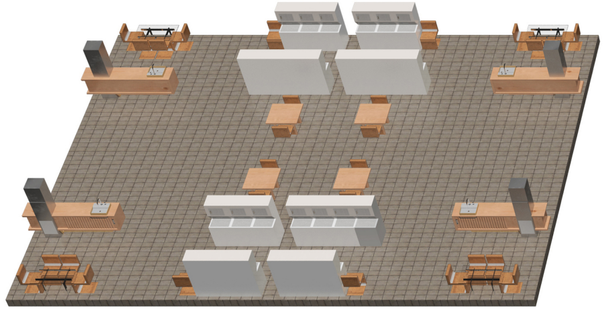
Laundry Room



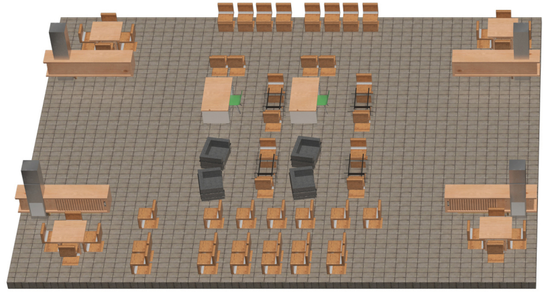
Community Building



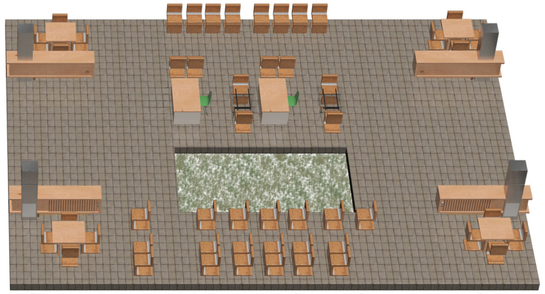
Optional Plans for Green Space in Laundry or Community Building

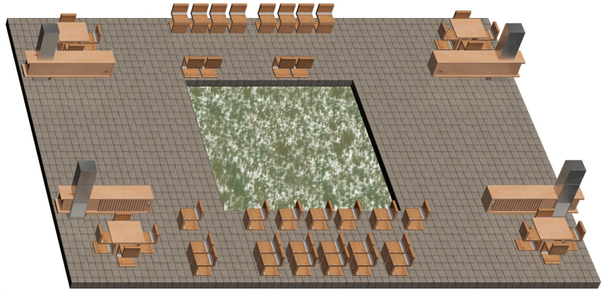


Laundry Room

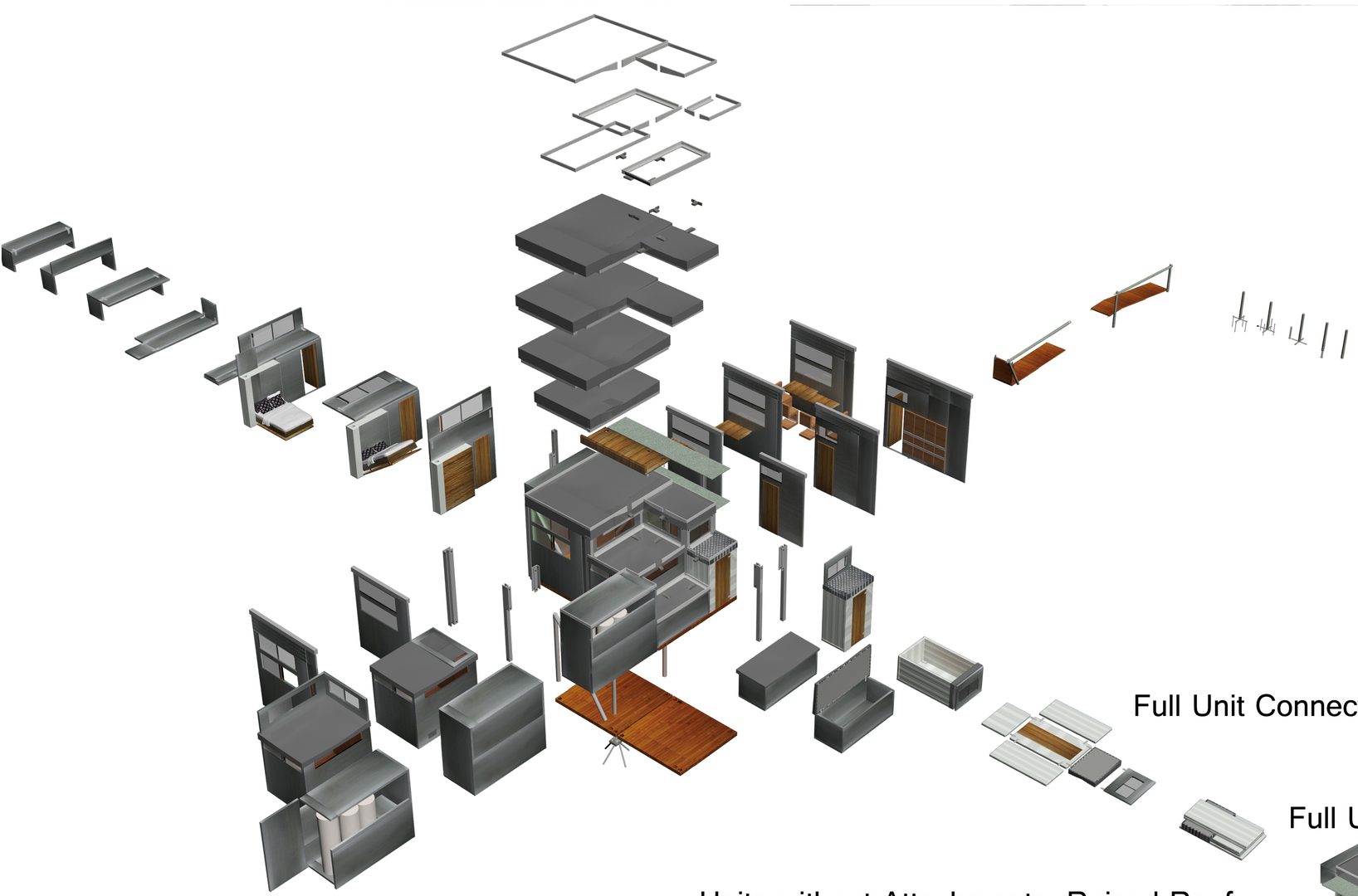


Community Building





Optional Plans for Green Space in Laundry or Community Building



Numbers:

Size of a Single Unit when Shipped: 8’6”x10’x4’6”
Size of Unit when Constructed: 8’6”’x10’0”x10’ up to 10’x12’6”x10’

Number of Units per Semi Truck: ≈15-18 units
Size of Semi-Truck: 8’6”x 13’6”x ≈50’-80’

Number of Units per Cargo Car: ≈16-20
Size of Cargo Car: 9’6”x13’x≈ 80’-100’

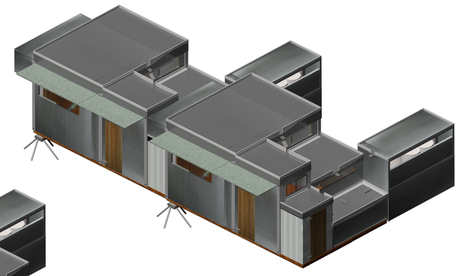
Size of Tanks:
Water Tank: (for a family of four averaging 30 gallons a person per day)
120 gallon tank: 2’6”x2’6”x3’
Grey Water Tank: 3’x1 ¼’x1 ¼’
Black Water Tank: 2’x 1 1/3’x 1’

Population Compared to Number of Units:

	Population	Possible # of Units on Site	# of Beds (4 beds per unit)
Minneapolis:	382,578	220	880
New Orleans:	343,829	1360	5440
Pucallpa, Peru:	206,859	280	1120
Muzaffarabad, Pakistan:	19,748	70	280
Sendai, Japan:	1,031,704	440	1760

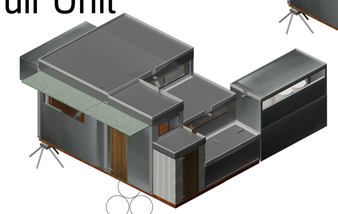
*Note: All locations have secondary sites to compensate for larger natural disasters that cause the need for more units.

2 Full Units Connected

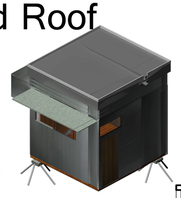


Full Unit Connected to Smaller Unit

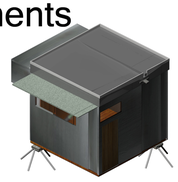
Full Unit



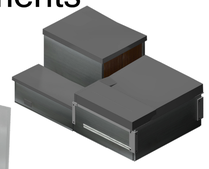
Units without Attachments, Raised Roof



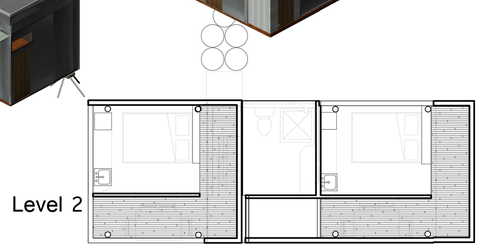
Unit without Attachments

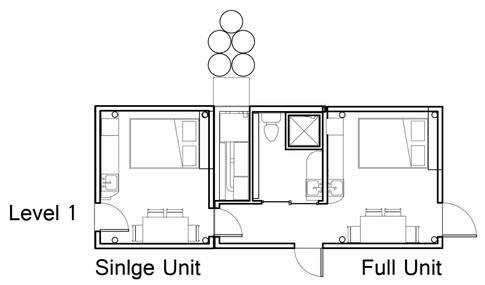


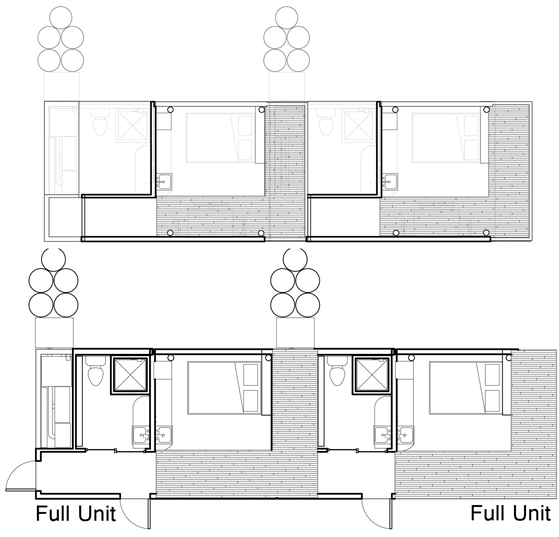
Units as Shipped with Bathroom & Electrolyzer Unit Attchments



Units Shipped by Semi Truck







Numbers:

Size of a Single Unit when Shipped: 8'6"x10'x4'6"
Size of Unit when Constructed: 8'6"'x10'0"x10' up to 10'x12'6"x10'

Number of Units per Semi Truck: ≈15-18 units
Size of Semi-Truck: 8'6"x 13'6"x ≈50'-80'

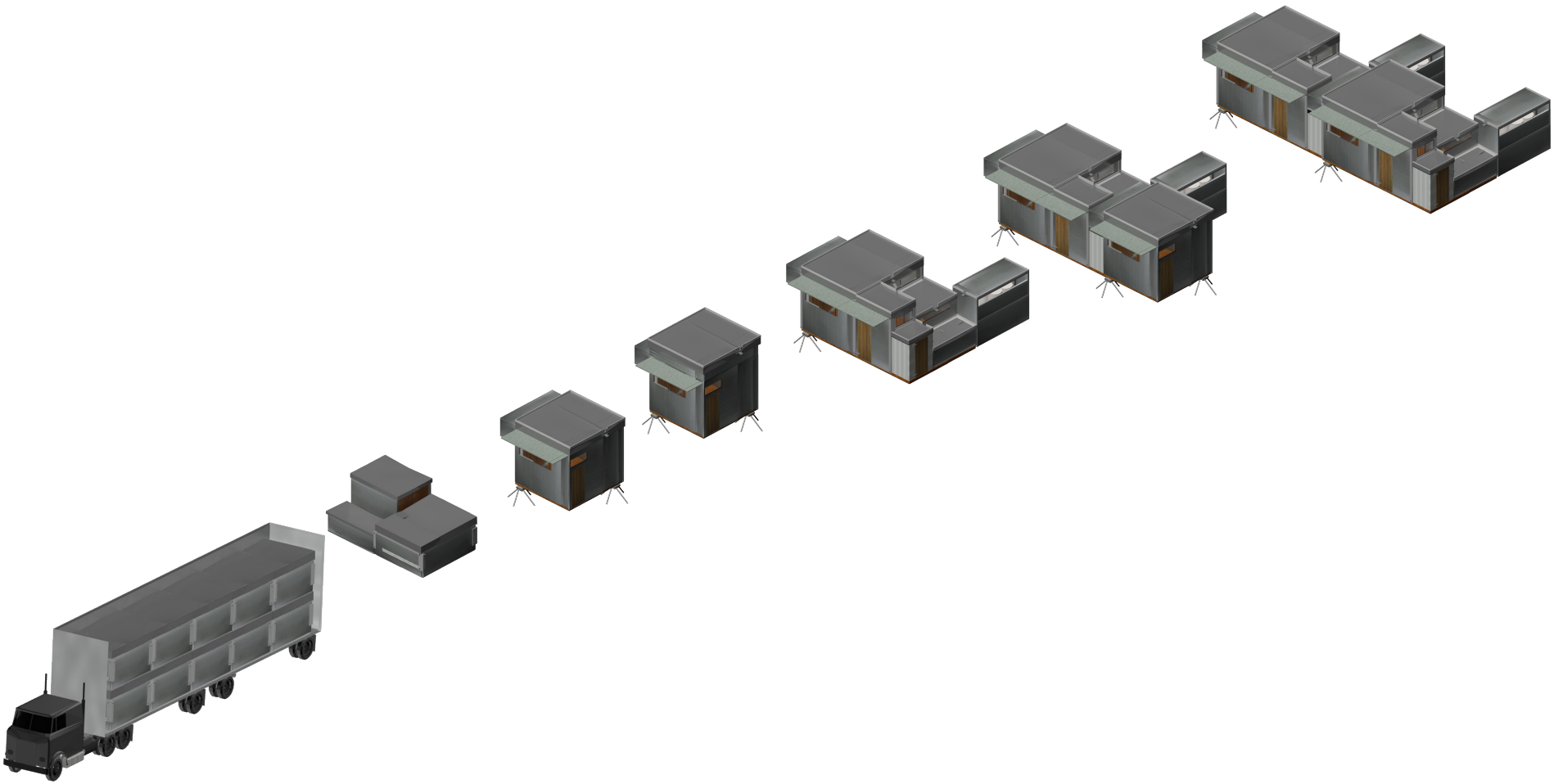
Number of Units per Cargo Car: ≈16-20
Size of Cargo Car: 9'6"x13'x≈ 80'-100'

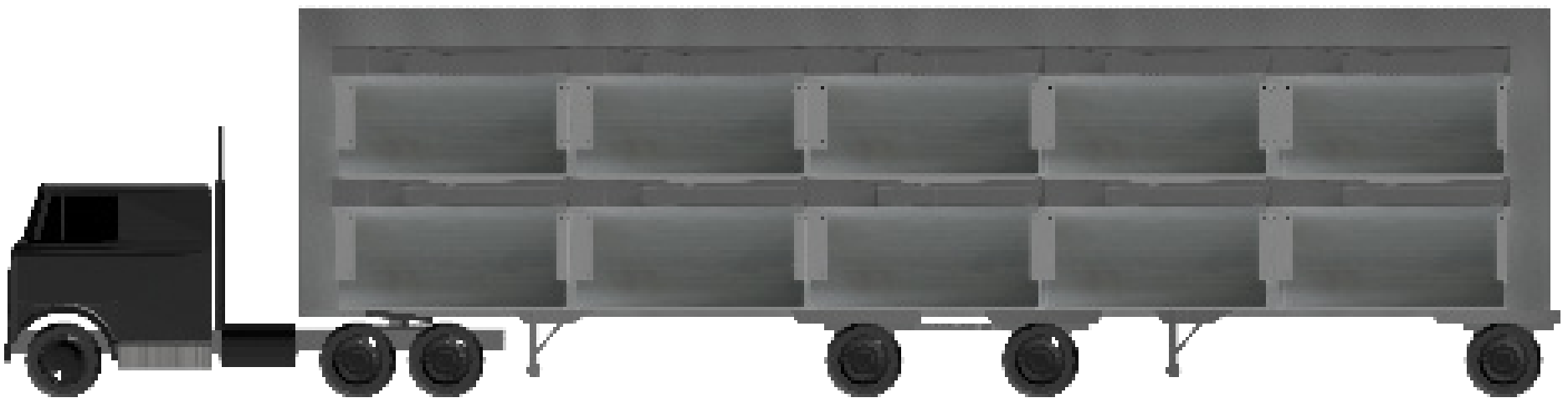
Size of Tanks:
Water Tank: (for a family of four averaging 30 gallons a person per day)
120 gallon tank: 2'6"x2'6"x3'
Grey Water Tank: 3'x1 ¼'x1 ¼'
Black Water Tank: 2'x 1 1/3'x 1'

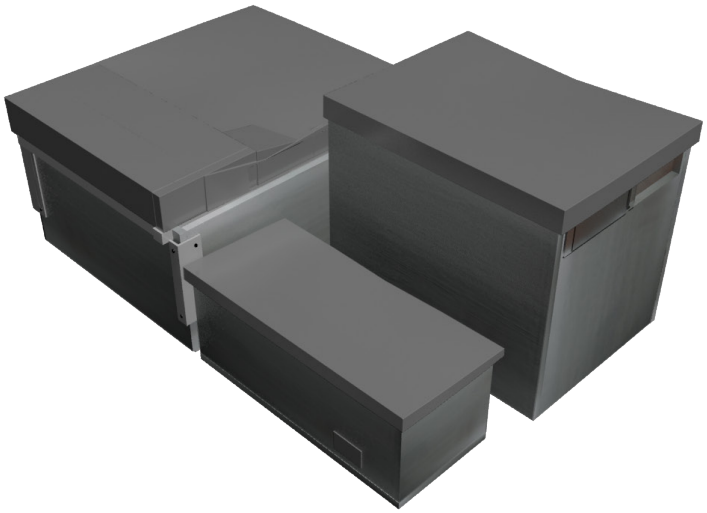
Population Compared to Number of Units:

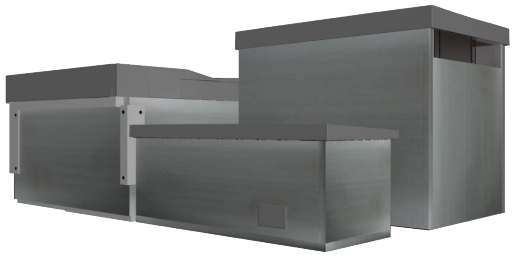
	Population	Possible # of Units on Site	# of Beds (4 beds per unit)
Minneapolis:	382,578	220	880
New Orleans:	343,829	1360	5440
Pucallpa, Peru:	206,859	280	1120
Muzaffarabad, Pakistan:	19,748	70	280
Sendai, Japan:	1,031,704	440	1760

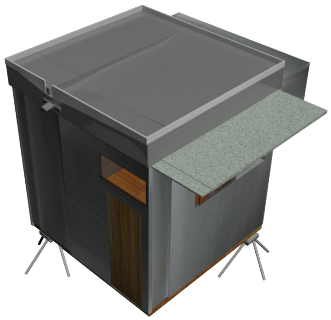
*Note: All locations have secondary sites to compensate for larger natural disasters that cause the need for more units.

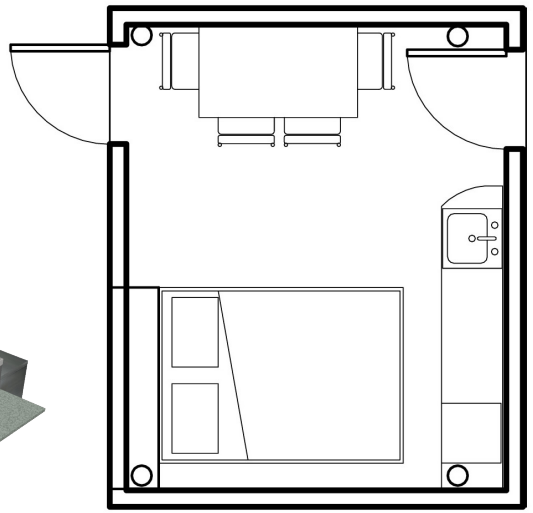


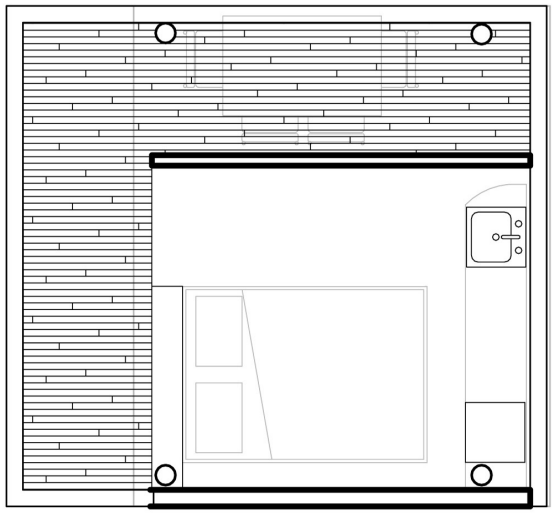


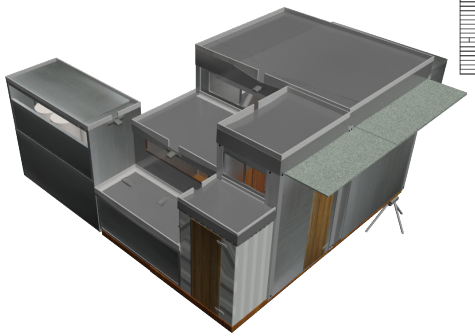


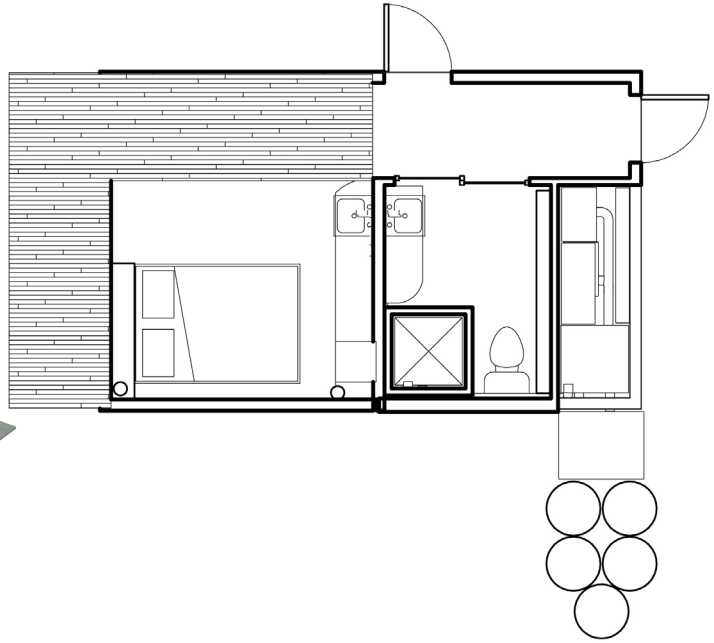


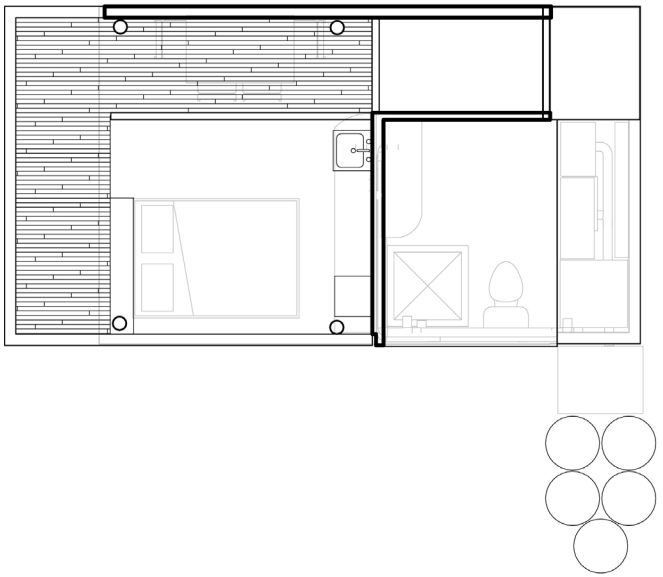


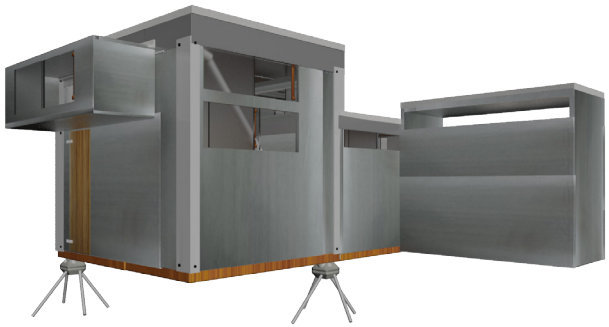


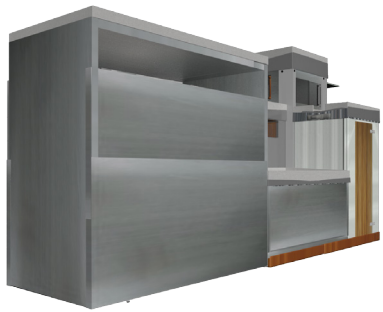


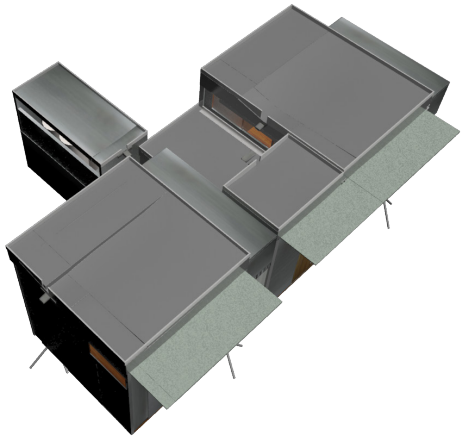


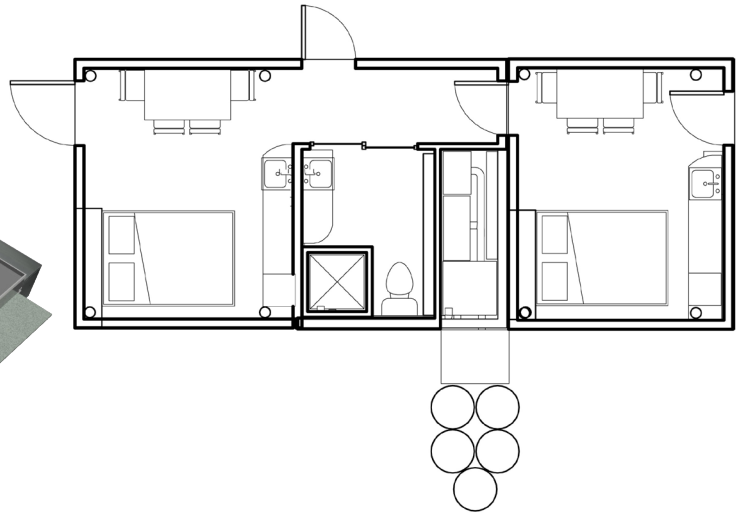


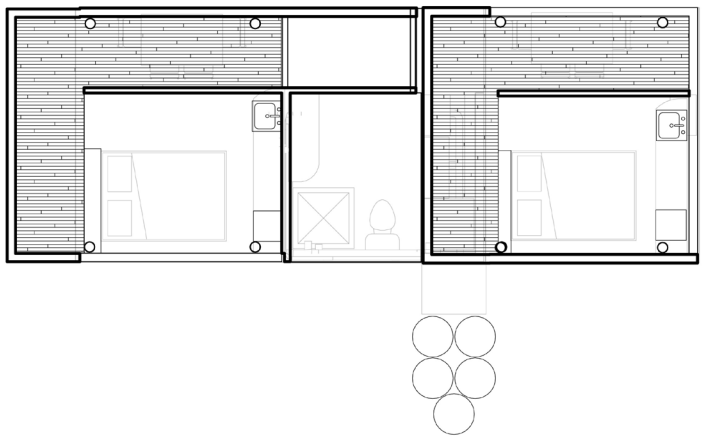


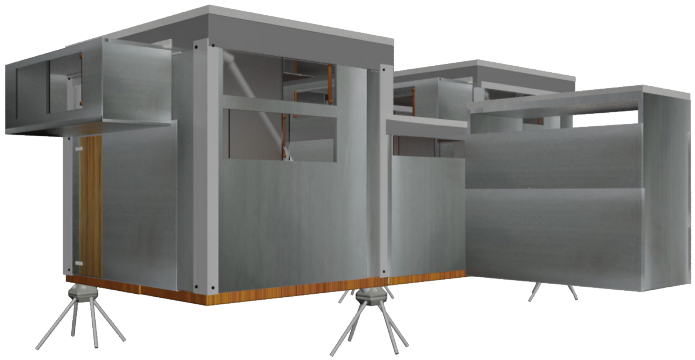


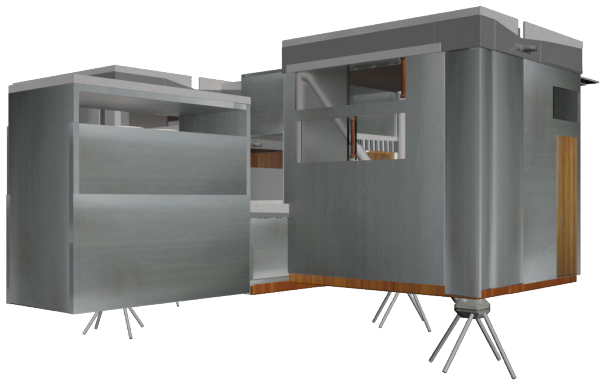


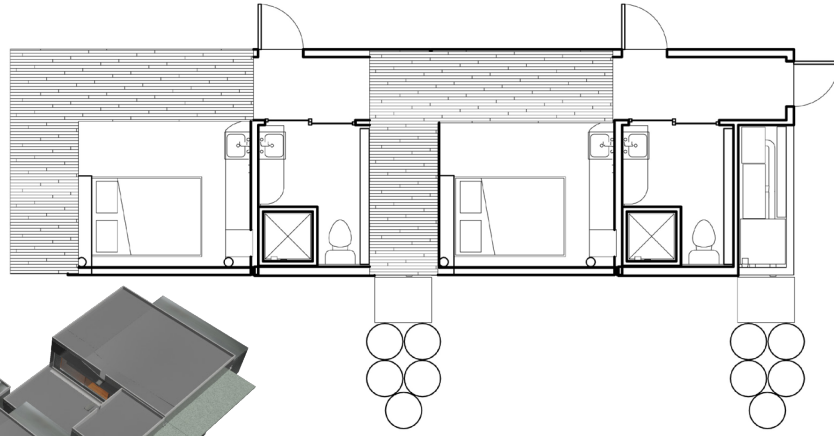


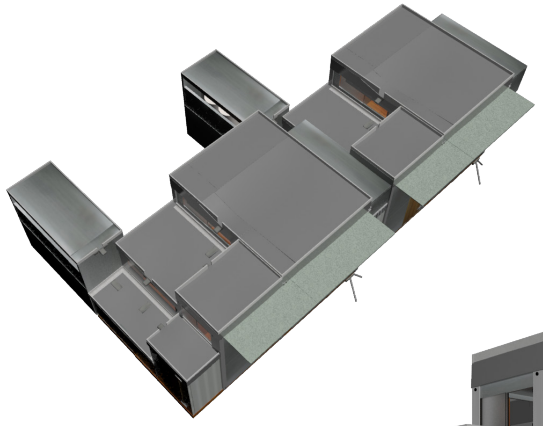


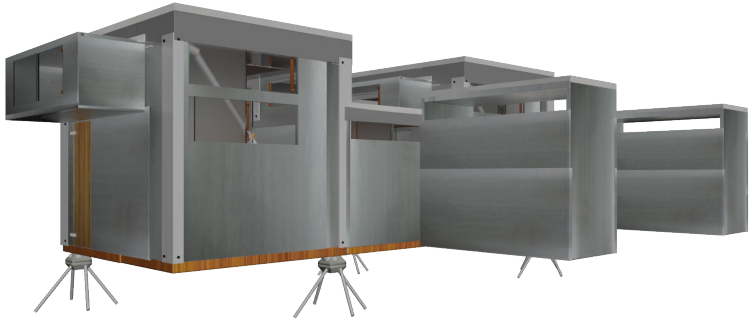


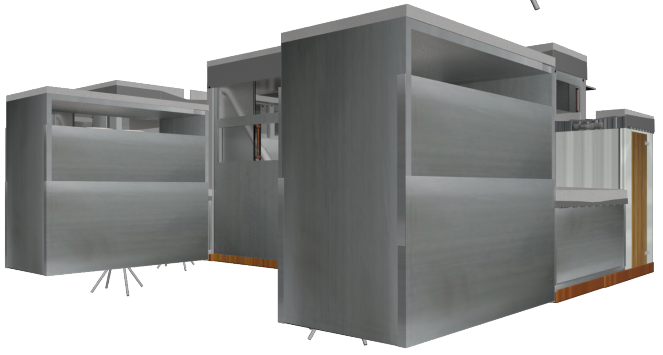


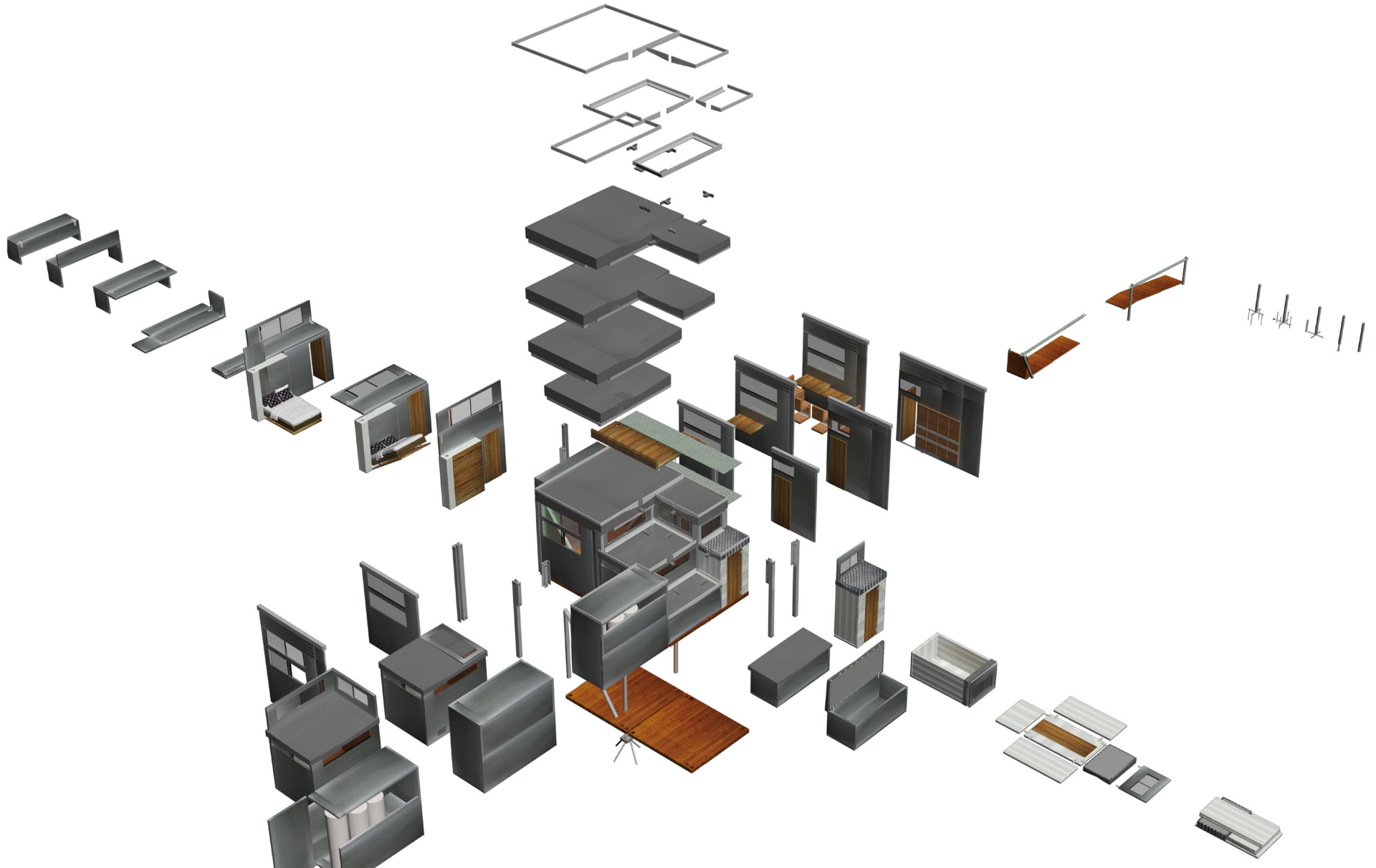


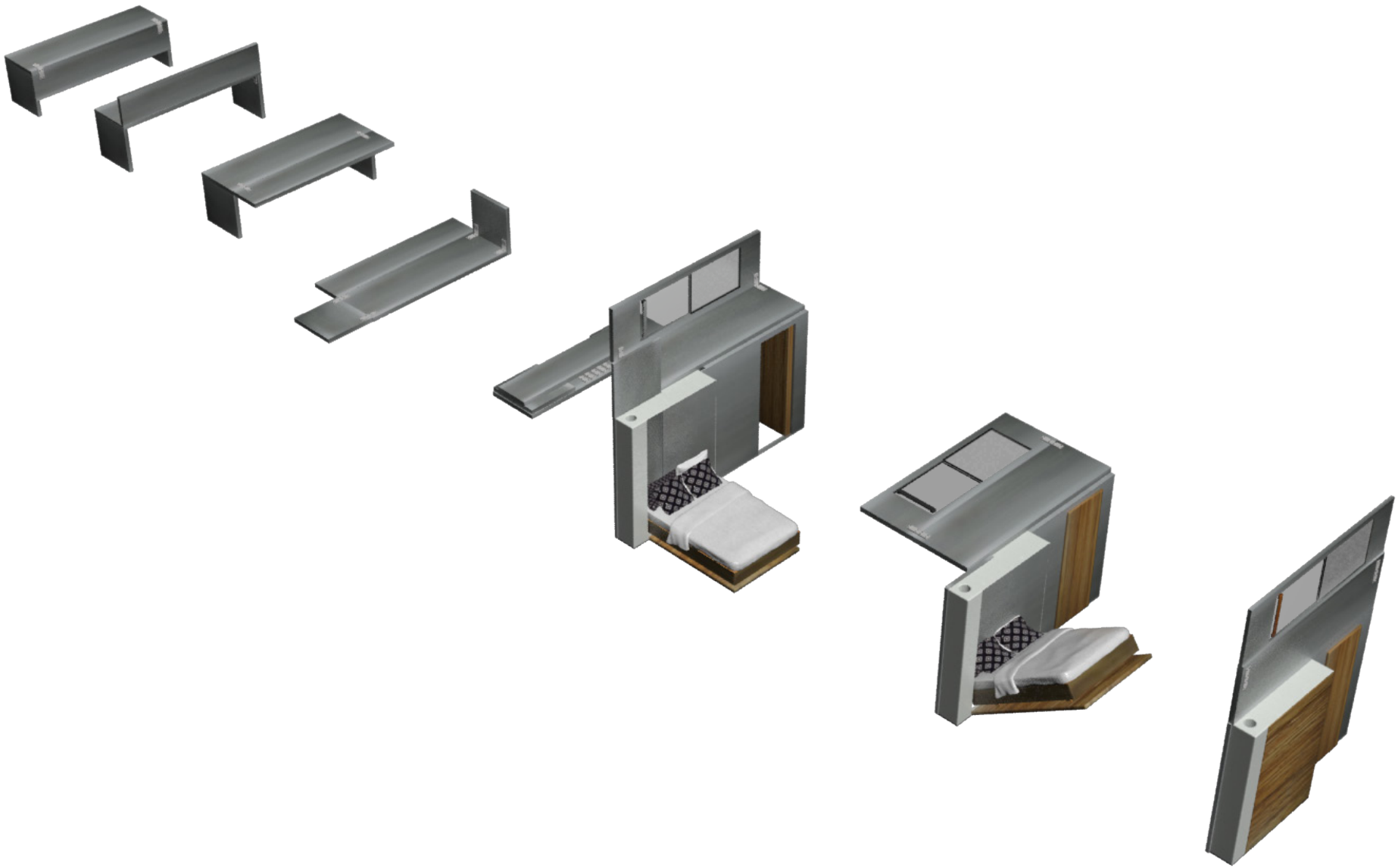


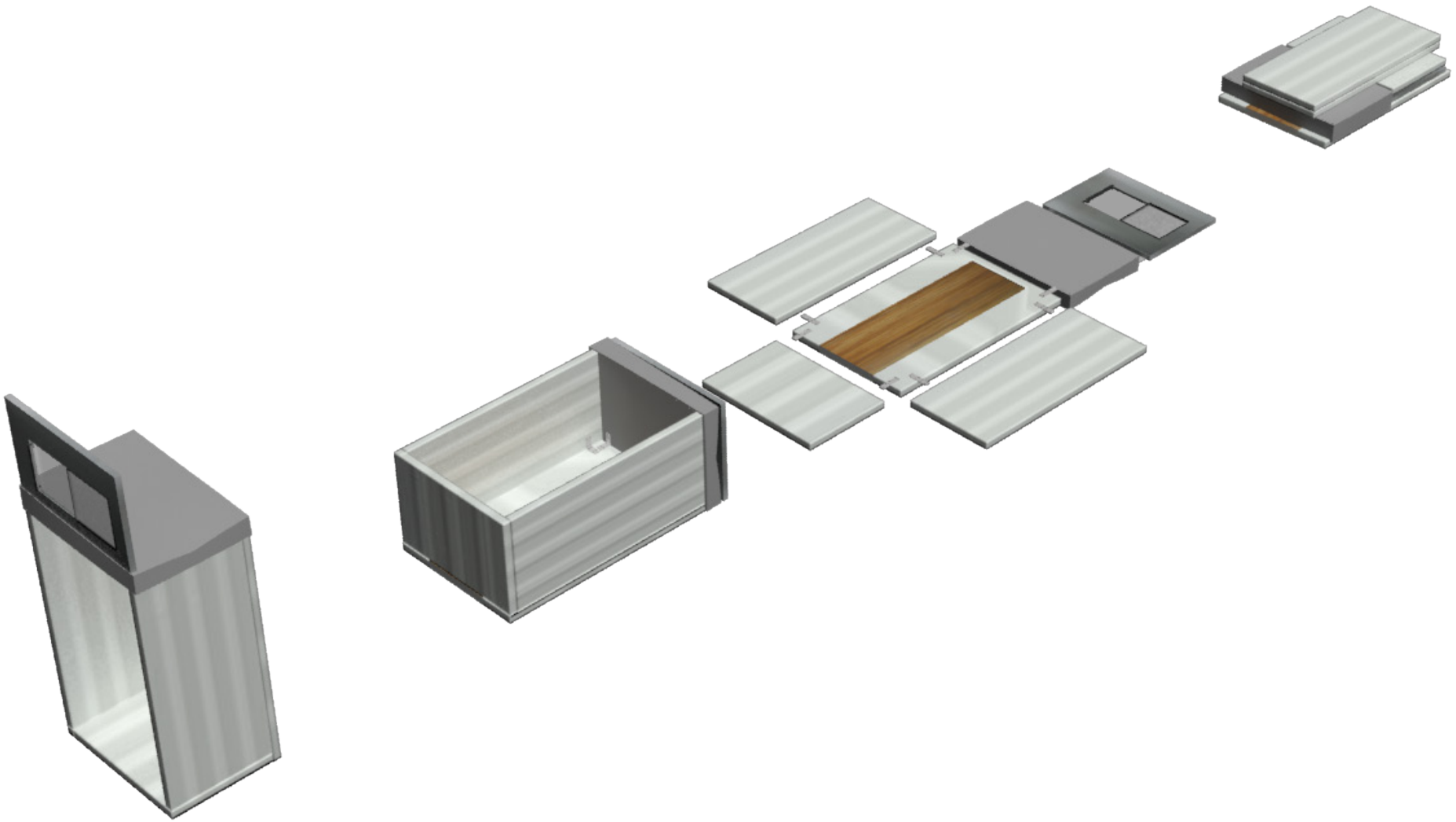


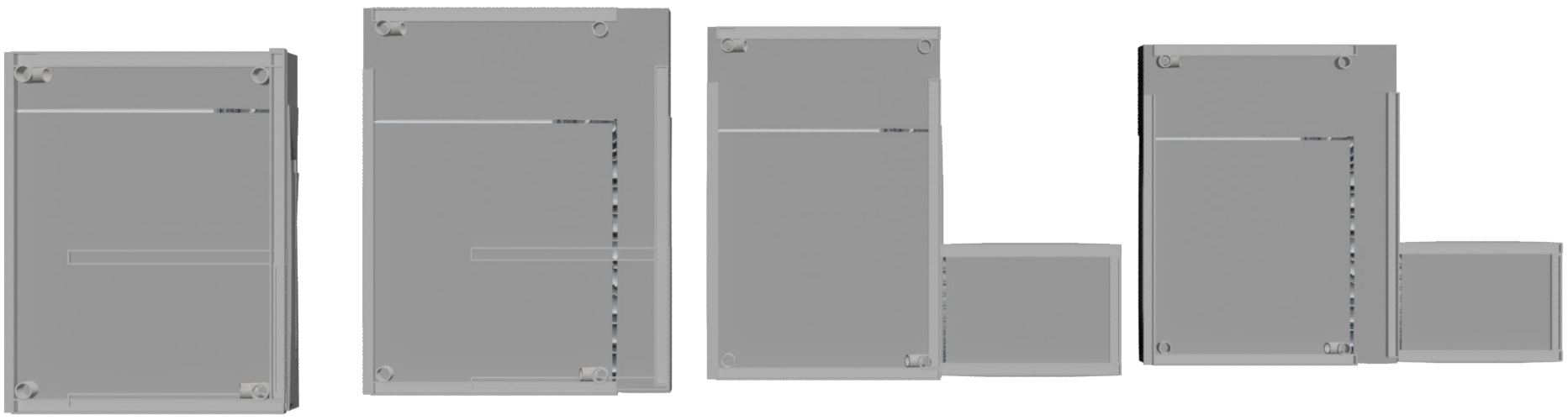




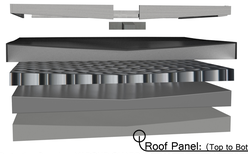




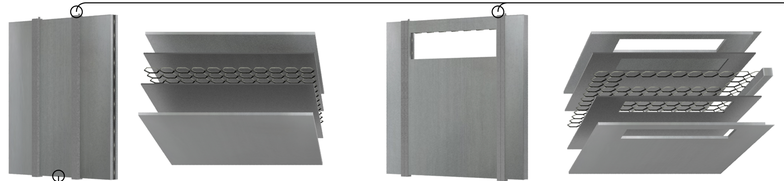




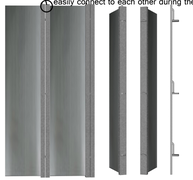
Operation of Aluminum Structure Poles



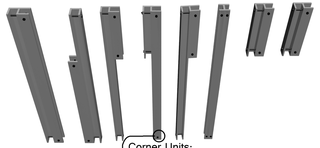
Roof Panel: (Top to Bottom)
Protective Covering, VAPOUR GUARD, Roof Membrane, Sloped Insulation



HoneyComb Paneling:
This lightweight material makes up the wall on each unit for fast and easy construction.

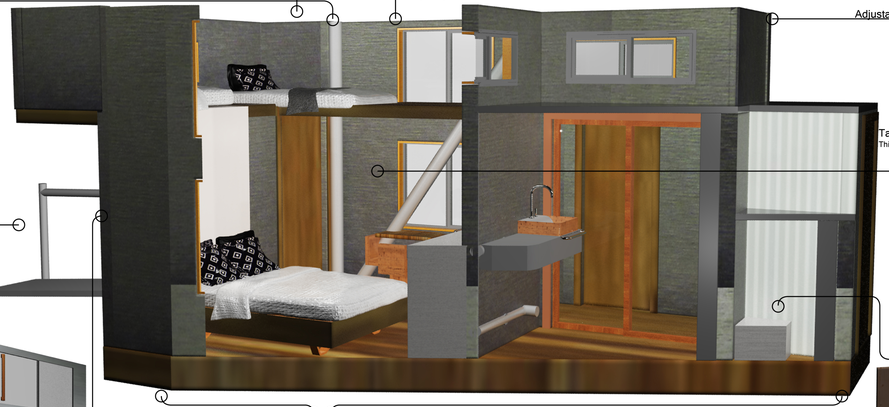


Wall Joint: A clip-in pressure system allows for panels to easily connect to each other during the manufacturing process



Corner Units:
These elements help insulate the unit.

Corner Unit Joints:
These are high strength rubber elements that hook-in and secure the corner units together.



Adjustable Awning

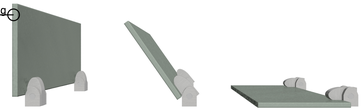
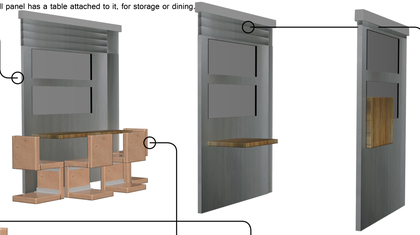
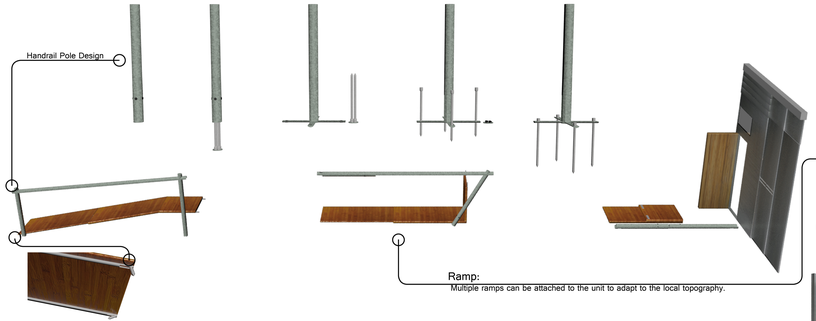


Table Panel:
This wall panel has a table attached to it, for storage or dining

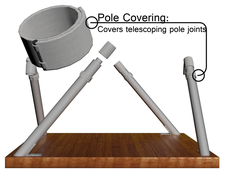


Telescoping Panels:
This part of the wall projects up to accommodate for when the unit is raised from 10 feet to 12 feet.

Handrail Pole Design

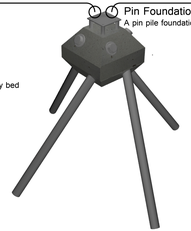


Ramp:
Multiple ramps can be attached to the unit to adapt to the local topography.



Pole Covering:
Covers telescoping pole joints

Murphy Bed Panel:
Each unit is equipped with a Murphy bed to ensure a relaxing place to sleep



Pin Foundation:
A pin pile foundation system, has a precast concrete top. It does not require pouring concrete or digging large holes.

Chair:
Designed to hang on a wall while not in use to preserve floor space in the unit.

Plumbing and Electricity:
The water tank, black water and grey water tanks provide plumbing for two sinks, a shower, and a toilet. The electrolyzer, powered by a silicon solar panel and five hydrogen fuel tanks, gives power to the fan coil unit, lights and outlets placed around the unit in raceway tracks.