

CREATING AFFORDABLE HOUSING USING SHIPPING CONTAINERS IPRO 339A CHICAGO, ILLINOIS

THE PROBLEM

The Southside of Chicago is undergoing a real estate renaissance. Neighborhoods all around IIT are being redeveloped. New housing is being built and older housing is being renovated. Many of the residents who have lived in these neighborhoods their entire lives are being forced out by the increasing costs for renting or purchasing housing.

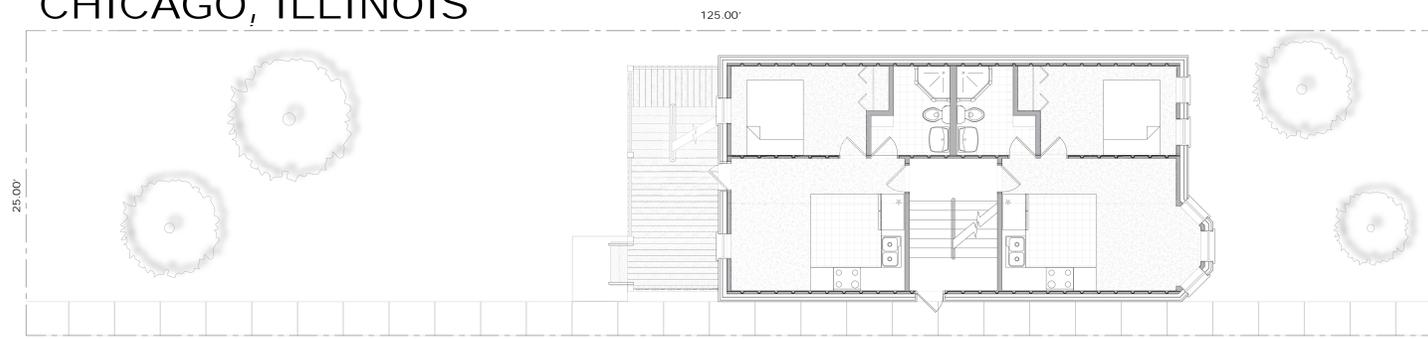
GOALS AND OBJECTIVES

- To produce affordable, vernacular housing for these residents. Containers provide good, cheap structure for a building, but are generally not attractive and are difficult to heat and cool. The appearance problems have "stigmatized" container structures as post-modern warehouses for the poor, or as "artsy" housing for non-conformists.
- Utilize the structure inherent in the containers, while mimicking the layout and appearance of "traditional" Chicago buildings.
- Provide low-cost, off site, interior finishing, including utilizing the resources of the RV/Mobile Home industry in Indiana, as a way to speed up the construction of the buildings, and reduce on site construction costs.
- To construct housing so that containers are visible for as short a time as possible before they become Chicago buildings, therefore minimizing the stigma of being container housing and avoiding controversy about them.

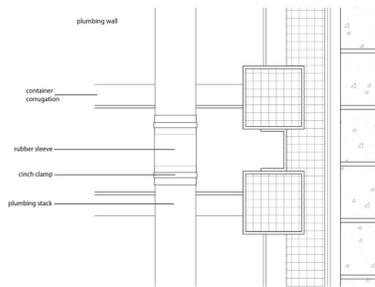
Incorporate environmentally friendly technologies

METHODOLOGY

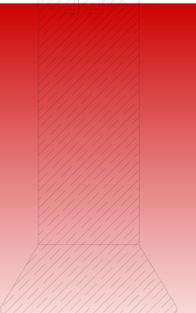
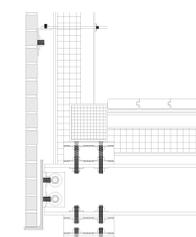
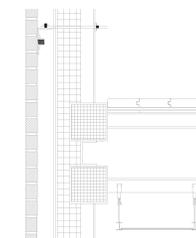
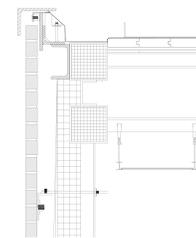
- Members of IPRO 339 were first divided into research sub-groups: energy, exterior envelope, design, and infrastructure. These groups were responsible for researching and recommending solutions for the housing design.
- In addition to these research groups, the whole IPRO was then divided between team A(Chicago) and team B (Juarez). To achieve our design objectives, each Chicago group member gathered information pertaining to their sub-group. Each team then worked with their counterparts in IPRO Juarez, to solve a list of specific challenges.
- Design**
 - Our design group was given the task of visualizing the shipping containers as homes. They were to come up with floor plans laid out with families and individuals in mind.
- Exterior Envelope**
 - Our exterior group was given the task of addressing the aesthetics of our home. It was their priority to solve problems connected with making our home "distinctively Chicago," i. e., brick exteriors and narrowed to fit on a common Chicago lot which is 25 by 125 feet.
- Energy**
 - Our energy group was given the task of designing efficient energy systems. They were to focus on keeping our home warm in winter and cool in the summer, solar energy options, and methods of saving and reusing energy.
- Infrastructure**
 - Our infrastructure group was given the task of figuring out our home's electrical and plumbing systems.



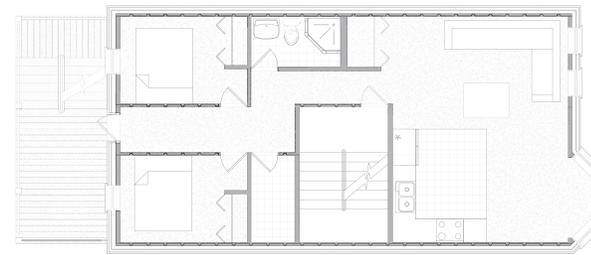
Site Plan & Typical 1st Floor



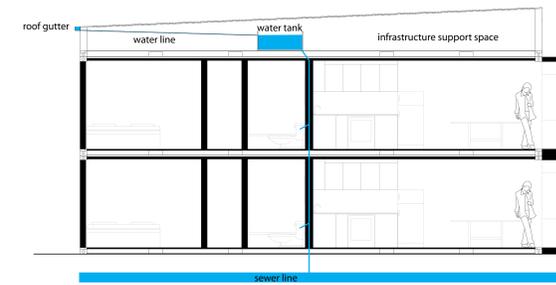
Plumbing Wall Detail



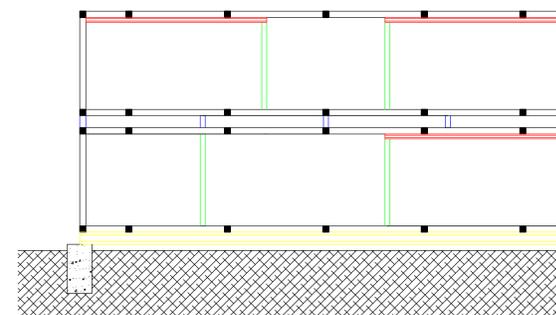
Wall Detail



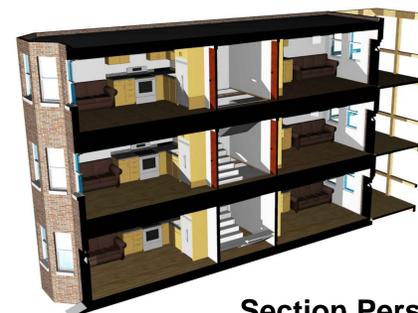
Typical 2nd Floor



Building Section



Structural Section



Section Perspective



Exterior View



Interior View 1



Interior View 2

PROBLEMS FACED

- The enormity of our task was a concern. Because over the last 10 years, developers have had the upper hand in forming the modern day Chicago cityscape, it seems as if designing affordable housing is a feudal endeavor.
- Making our homes distinctly Chicago and addressing acoustical problems with working with stacked metal structure.
- Summer term is always too short. We overcame this by investing twice the time to hammer out the details necessary for IPRO Chicago to move forward.
- IPRO Chicago is an exciting project and sometimes there are numerous solutions to a single problem. Choosing the right one was sometimes difficult.

SOLUTIONS

- Design**
 - Typical floor plans
 - 53 foot: This typical 53' container incorporates 3 bedrooms with accessible bathroom, kitchen a larger living room space, a utility room and a small dining space.
 - Kitchen
 - Every single container will be provided with a typical kitchen that has a stove, a sink, wall cabinets, a refrigerator and counter space. The idea is to have the kitchen open to the living space or dining space in the unit.
 - Bedroom
 - Every single bedroom will have a window that provides enough sunlight to offset energy costs.
 - Living room
 - The living room has a typical Chicago bay window with the purpose of bringing in enough sunlight to illuminate the corridor.
- Exterior Envelope**
 - Use of pier foundation system rather than continuous footing system to save on cost of concrete.
 - Use of blown cellulose insulation. Blown in cellulose insulation is made mostly from recycled shredded newspaper and mixed with a variety of chemicals (up to 25% by weight) to reduce its flammability.
 - Use of traditional brick wall system because it can be constructed fairly cheaply, with local materials, and union labor. It also blends in with the surrounding Chicago homes.
- Energy**
 - A regular gas generator could be used to provide electricity for the entire building
 - For a unit by unit basis a hybrid engine (similar to a car engine) could be used.
 - Alternative energy from the gas generator or hybrid engine was most suitable
 - The heating load value for Chicago reflected the necessity of effective insulation which would retain heat and energy
 - A passive water heating system could be feasibly implemented only by accounting for infrastructure effects to roof
 - LEED certification would require very detailed building planning, but is a realistic goal

- Structure**
 - Any connections or attachments to the container should be made on the frame of the container only. Nothing should be attached to the corrugation itself, as it does not have enough strength to sustain lateral loading.
 - Any cuts being made for doors (as well as windows, preferably) should be made away from the center of span lengths (half the length of the container where no reinforcements have been made, or halfway between supports where they have been added) because this is where the largest moment forces will develop in the structure.
 - All cuts being made in the corrugation should be reinforced with a frame. This should be made from a minimum of wooden 2"x4"s.
 - The lowest container should rest on a footer beam that spans the entire length. This will help to provided greater stability to the structure, and eliminate sag between the footings. Recommended section: W12x40
 - In areas where large sections of corrugation (15'+) must be removed, the roof frame section should be reinforced with a header beam. Recommended Section: W5x19

CONCLUSION

The goal of IPRO Chicago is to design affordable housing for Chicago using shipping containers. Shipping containers are abundant, can be purchased cheaply, and can provide a solid core for a home. As our groups thought through the solutions to the problems facing our project, we discovered that collectively we were able to come up with solid design ideas, that can in time be used to build homes for Chicago residents. With safe housing stock our neighborhoods flourish. And, when our neighborhoods are healthy, so is the cultural and economic life of our home, Chicago.

IPRO 339A TEAM MEMBERS

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