

IPRO 339 PROJECT PLAN

Designing Affordable Housing out of Shipping Containers for Ciudad Juarez, Mexico

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1.0 Objectives

IPRO 339 is focused on providing an affordable housing option for the working poor in Juarez, Mexico. This semester we will research the technologies involved in reusing shipping containers for this housing. We will design a prototype housing unit which will relate to other units in an overall community, with services such as commerce, open spaces for activity, and community centers to support them. We wish to design a housing community that embodies the ideals of humanity, affordability, functionality, opportunity, sustainability, durability, safety, culture, and neighborhood. In order to do this, our team for the Spring Semester has set forth the following objectives:

- Research and understand the users of our product by looking at the social, economic, and physical factors in Juarez, Mexico and in the Maquiladoras where they work.
- Research the most cost efficient and sustainable ways of incorporating plumbing, HVAC, and electricity into the homes.
- Research the structural aspects of building this community.
- Develop a potential site plan and floor plans and sections for the housing units.
- Using our research and designs, develop a proposal for our sponsor, considering the client at hand.

2.0 Background

The sponsor for IPRO 339 is Mr. Brian McCarthy, President of PFNC Global Communities in Corrales, New Mexico. His company strives to create affordable housing for those areas in the world where there is none or not an adequate amount for the working population. Workers of Maquiladoras factories in Juarez, Mexico face daily struggles with wages of less than two dollars an hour. Owning even a very basic home with no electricity or plumbing is out of reach for most people. If they do wish to purchase one, they must go in with several other families for one home. Workers therefore have little choice but to create squatter settlements. They construct the homes themselves out of wooden palettes, and boxes. Sometimes there is a makeshift foundation or metal roof. The majority of these settlements do not have running water, sewage systems, or electricity for heating and air conditioning. Because the job turnover at the factories is sometimes over one hundred percent a year, the communities are often transient as well. By providing homes that are affordable for their income and which they can own themselves, we hope that people will be able to stay longer and feel a better sense of entitlement to the land and community there. The slums of Juarez face many social problems as well. There is a huge problem with gangs and violence, and there have been hundreds of murders and rapes of young women in the last couple of years. There is little justice within the court system or with the police there. With the majority of factory workers being single mothers with children, it can be a very scary place to live. We will address these problems with our project as well. The situation calls to mind previous

attempts at public housing, which have often led to social problems in regards to crime, isolation from the rest of the community, and dependency on the government for income.

Our project aims to provide homes for sale, however. Affordable housing should not cost more than thirty percent of a household's gross income. Reusing shipping containers for another occupiable use has been done many times before. Portakabin is one example, in which the units can be moved as well. They have been successfully converted into youth centers, classrooms, office space, artists' studios, live / work space, nurseries and retail space. Often these are more trendy projects, however, rather than basic housing like our project. We are therefore working on ways to make these containers still inviting and a place to call home. Habitech is another company which manufactures affordable housing technologies. Homes can be assembled in anywhere from one day or one week and cost about thirty to fifty percent less. But overall, there is not enough affordable housing for many areas of the world.

In investigating the problem at hand, the team must be careful of any assumptions they make with the way people live and what resources they need or want. Just because they are from a poorer area than us, we must not forget that they have similar goals and desires for the way they live. We need to therefore provide them with appropriate resources. We also should not be blinded by the fact that there is violence and social problems; our solutions need to be appropriate and not stifling or worse than what is there now.

Our team plans to have a large base on information on the user we are aiming our houses at and take their specific social, economical, and physical needs into account with our design. We will look at the climate and geography of the area and use this to influence the design of our HVAC and structural systems. By the end of the semester, we will integrate all these spatial, cultural and physical investigations to create a suitable housing unit. We will come up with a marketing plan focused on the companies in Juarez, who will then be able to sell them to their workers at very affordable prices.

3.0. Methodology

- A. Our design problem is to design a community out of recycled shipping containers for the maquiladoras of Ciudad Juarez, in Mexico. The problem restraints include a cost per unit of about 8,000 USD, which restricts the number of shipping containers we can use per dwelling. In addition, we must design for dramatic temperature and weather changes. The city of Juarez also has a high crime rate, so our design must be conducive to increasing the safety of the residents of our developments.
- B. In order to solve the design problem at hand, we will first start by doing initial research. There are many precedents for this type of residence that ideally we can utilize in our design. In addition, it will help to know about the type of culture not just of Ciudad Juarez, but also of the maquiladoras. After our initial research, we met with our sponsor Brian McCarthy to discuss our preliminary designs with him, and to learn what he has developed with the project so far. At this point, we will break into three sub-groups. The first will be in charge of researching the cultural and monetary wants and needs of the people in the

maquiladoras. They will also be in charge of assembling the cost analysis for the project at the end. This group's research and conclusions will help guide the second sub-group, the design team, in creating individual units and an overall comprehensive site plan for our project. At this point, the engineering subgroup will conduct an analysis of the structure of our units, and the mechanical, electrical, and plumbing aspects of our building. After these groups have completed their portions of the project, we will regroup to create a final design.

- C. Potential design solutions can be tested for structural stability and mechanical and design efficiency using models and computer software to create simulations of actual conditions.
- D. Each group will carefully document the work that they do, and post the group's work on iGroups. In addition, at each scheduled IPRO class, the teams will give reports on the work they are doing, and time will be allotted for groups to ask questions and exchange information for use in other sub-groups.
- E. Analysis of our designs can be generated by utilizing models and modeling software. Our sociology/ marketing sub-group can also conduct general surveys and come to conclusions about how our project will work in Ciudad Juarez. In addition, we will maintain contact with our sponsor in order to get constructive feedback about our design solution.
- F. Each of the three sub-groups will be directly responsible for the deliverables on IPRO day. The design group will be in charge of generating the drawings and renderings to accompany a model. The engineering group will produce structural and MEP drawings to supplement the design drawings. The sociology and marketing group will be in charge of preparing the cost analysis and an abstract for the IPRO presentation describing the design problem and sociological and cultural conditions of the maquiladoras.

4.0. Expected Results

- A. The expected activities involved with our project are as follows:
 - Research and understand the users of our product by looking at the social, economic, and physical factors in Juarez, Mexico and in the Maquiladoras where they work.
 - Research the most cost efficient and sustainable ways of incorporating plumbing, HVAC, and electricity into the homes.
 - Research the structural aspects of building this community.
 - Develop a potential site plan and floor plans and sections for the housing units.
 - Using our research and designs, develop a proposal for our sponsor, considering the client at hand.
- B. Though research we hope to gain an understanding of the needs of the Maquiladora workers in Juarez, Mexico as well as the gain an understanding in the steps involved in building not just homes, but communities.

- C. Through the development of different prototypes and site plans, we hope to develop a housing unit and community that will take into consideration the socioeconomic needs of those working in the Maquiladoras as well as those to whom we hope to sell the communities.
- D. Potential outputs produced through the execution of tasks will be knowledge in the architectural, structural, mechanical, electrical, and sociological aspects that go into building sound and cost efficient structures. Also, we hope to gain an understanding of Juarez, Mexico as a location and culture. Through our sharing of our different background knowledge and research, we hope to learn from each other.
- E. In terms of deliverables, we hope to have a site model, site plan, floor plan, a detailed understanding and application of electrical, mechanical, plumbing, structural, and architectural designs for each subunit, as well as the entire site. We would also like to have a proposal ready for our sponsor by the end of the semester. Steadily the group will also work to become strong public speakers, so as to convey our thoughts efficiently.
- F. The needs of our sponsor are for our group to create a cost efficient floor plan and site model intended for the Maquiladoras of Juarez, Mexico. Furthermore, we will deal with the cultural aspects, which the sponsor did not originally expect us to consider. The needs of the final customer are being met by our group looking into the floor plan as intended for a large family, the cultural needs of the people of Juarez, as well the affordability of the new homes.
- G. We continually come with new plans on how to manipulate the containers, how to build communities, how to incorporate all the needs of the residents and still keep it affordable; we can pass these ideas onto our sponsor. The sponsor will continue to adapt his ideas with that of our group, until a reasonable finished project can be achieved. Also, the sponsor hopes to have multiple site ideas, allowing us to continue to experiment and better our plans.

5.0. Project Budget

Item	Price	QTY	Price	Purpose
Site Plan Models (1st Plans)	\$25.00	2	\$50.00	100m x 100m representation of site and models of building units
Printing	\$5.00	10	\$50.00	Printing of renderings, floor plans, site plans for in class presentations
IPRO day	\$250.00	1	\$250.00	Poster and Presentation materials (Including models)
TOTAL:			\$300.00	

6.0. Schedule of Tasks and Milestone Events

ID	Task Name	Duration	Start	Finish	December	January	February
1	Project Organization	11.5 days	Tue 1/22/08	Mon 1/28/08			
2	Preliminary Research	1 wk	Tue 1/22/08	Mon 1/28/08			
3	Formation of Subgroups	1 day	Tue 1/22/08	Tue 1/22/08			
4	Define the Problem	50 days	Tue 1/29/08	Tue 2/26/08			
5	Subgroup Research	1 wk	Tue 1/29/08	Mon 2/4/08			
6	Meet with Sponsor	2.5 days	Tue 2/5/08	Tue 2/19/08			
7	Prepare possible solutions, including models	4 days	Tue 2/5/08	Fri 2/8/08			
8	Ask questions, gather information to define sc	1 day	Tue 2/19/08	Tue 2/19/08			
9	Prepare Project Plan	11.5 days	Wed 2/20/08	Tue 2/26/08			
10	Prepare IPRO group budget	1 day	Wed 2/20/08	Wed 2/20/08			
11	Assign individuals and sub-groups specific ta	5 days	Wed 2/20/08	Tue 2/26/08			
12	Prepare Code of Ethics	5 days	Tue 2/19/08	Mon 2/25/08			
13	Development	4.5 days	Wed 2/27/08	Tue 4/1/08			
14	Marketing	11.5 days	Wed 2/27/08	Tue 3/4/08			
15	Define target group, along with needs, experie	5 days	Wed 2/27/08	Tue 3/4/08			
16	Define amenities needed	3 days	Wed 2/27/08	Fri 2/29/08			
17	Prepare cost analysis for project	2 days	Wed 2/27/08	Thu 2/28/08			
18	Prepare one comprehensive scheme	19.25 days	Wed 3/5/08	Tue 3/18/08			
19	Design units, primarily single-width units utiliz	2 wks	Wed 3/5/08	Mon 3/17/08			
20	Prepare comprehensive layout of site	1 wk	Wed 3/5/08	Mon 3/17/08			
21	Prepare engineering plans	2.75 days	Wed 3/19/08	Tue 3/26/08			
22	Structural plans	1 wk	Wed 3/19/08	Tue 3/26/08			
23	MEP Plans	1 wk	Wed 3/19/08	Tue 3/26/08			
24	Finalize design scheme	1 wk	Wed 3/26/08	Tue 4/1/08			
25	Modern Oral Presentation	22 days	Wed 4/2/08	Mon 4/14/08			
26	Modern Progress Report	9.75 days	Wed 4/2/08	Mon 4/7/08			
27	Revised Objectives	1 day	Wed 4/2/08	Wed 4/2/08			
28	Revised task/event schedule	1 day	Thu 4/3/08	Thu 4/3/08			
29	Changes in task assignment/ member roles	1 day	Fri 4/4/08	Fri 4/4/08			
30	Rehears to date	1 day	Thu 4/3/08	Thu 4/3/08			
31	Barriers and Obstacles	1 day	Mon 4/7/08	Mon 4/7/08			
32	Slides - maximum of 12 slides	5 days	Tue 4/8/08	Mon 4/14/08			
33	IPRO Day Deliverables	28 days	Mon 4/14/08	Wed 4/30/08			
34	One-page abstract	1 day	Tue 4/15/08	Tue 4/15/08			
35	Boards	17.5 days	Mon 4/14/08	Thu 4/24/08			
36	Drawings	4 days	Mon 4/14/08	Wed 4/16/08			
37	Site plan	2 days	Mon 4/14/08	Tue 4/15/08			
38	Plans of different units	2 days	Mon 4/14/08	Tue 4/15/08			
39	Elevations	2 days	Tue 4/15/08	Wed 4/16/08			
40	Sections of units and blocks (including sit	2 days	Tue 4/15/08	Wed 4/16/08			
41	Diagrams	2 days	Mon 4/14/08	Tue 4/15/08			
42	Renderings	7 days	Wed 4/16/08	Thu 4/24/08			
43	MEP Drawings	5 days	Wed 4/16/08	Tue 4/22/08			
44	Cost analysis	3 days	Tue 4/15/08	Thu 4/17/08			
45	Model	1 wk	Tue 4/15/08	Mon 4/21/08			
46	Presentation	9.75 days	Fri 4/25/08	Wed 4/30/08			
47	Summary of project including target group, bu	4 days	Fri 4/25/08	Wed 4/30/08			
48	Explanation of design	2 days	Fri 4/25/08	Mon 4/28/08			
49	CD with all IPRO research, deliverables, etc on it)	1 day	Mon 4/28/08	Mon 4/28/08			
50	IPRO DAY	1 day	Fri 5/2/08	Fri 5/2/08			
51	Final Report Due	1 wk	Mon 4/28/08	Fri 5/2/08			



7.0. Individual Team Member Assignments

A. Individual Members and Responsibilities

1. Name: Vitali Basiourski
Year: 3rd year
Major: Mechanical Engineering
Experience, Skills, Strengths:
Roles: preliminary shipping container research, worked in initial MEP, Site planning, and Structural engineering sub-groups, worked on Design study – East, and is a member of the development engineering sub-group.
2. Name: Amy Bourquard
Year: 4th year
Major: Materials Science and Engineering
Experience, Skills, Strengths:
Roles: Code of Ethics, preliminary research, participated in the Ethics workshop, worked in initial cost analysis, MEP, and Structural engineering sub-groups, worked on Design study – East, and is a member of the development engineering sub-group.
3. Name: Carl Hart
Year: 3rd year
Major: Architectural Engineering
Experience, Skills, Strengths: Architectural Intern, AutoCAD, HVAC Analysis/Design Software, Highly Analytical and Detailed
Roles: iGroups manager, preliminary research, worked in initial MEP, Space planning, and sociology/marketing subgroups, worked on Design study – East, and is a member of the development engineering sub-group.
4. Name: Chandani Joshi
Year: 3rd year
Major: Molecular Biochemistry and Biophysics/ Pre-medicine
Experience, Skills, Strengths: Organization, Management, Research
Roles: Project management plan, minute taker, preliminary research on Juarez, worked in initial cost analysis, space planning, and sociology/ marketing sub-groups, worked on Design study – East, and is a member of the development sociology sub-group.
5. Name: Joshua Lebak
Year: 4th year
Major: Architecture
Experience, Skills, Strengths: Urban planning, design, space planning
Roles: preliminary research, worked in initial civil engineering, space planning, and site planning sub-groups, worked on Design study – West, and is a member of the development Design sub-group.

6. Name: Man Leung
Year: 5th year
Major: Civil Engineering
Experience, Skills, Strengths: Structural design/analysis to AISC/ASCE Steel Bridge Building Competition 2007, 2008; Non-linearized structural analysis using SAP2000
Roles: preliminary research on pre-existing conditions in Juarez, worked in initial civil engineering, structural engineering, and cost analysis sub-groups, worked on Design study – West, and is a member of the development engineering sub-group.

7. Name: Michael Lynn
Year: 5th year
Major: Architecture
Experience, Skills, Strengths: AutoCAD, adobe illustrator/Photoshop, 3d modeling, model making. Experience in construction and working at architectural firms. I have also worked at CNU, Congress for New Urbanism, doing site planning related research.
Roles: preliminary research on Juarez, worked in initial site planning, sociology, and structural engineering sub-groups, worked on Design study – East, and is a member of the development Design sub-group.

8. Name: Luke McGuire
Year: 3rd year
Major: Architectural Engineering
Experience, Skills, Strengths: IT manager for group of 7 medical clinics (Minnesota Oncology), Software developer for Parametric Technology Corporation, General manager campus radio station, Peer Leadership program developer and facilitator, AutoCAD, MathCAD, Pro/Engineer
Roles: Code of Ethics, preliminary research, worked in initial Site planning, Space planning, and structural engineering subgroups, worked on Design study – West, and is a member of the development engineering sub-group.

9. Name: Gustavo Mendoza
Year: 5th year
Major: Architecture
Experience, Skills, Strengths: AutoCAD, Adobe suite
Roles: preliminary research, worked in initial structural engineering, site planning, and sociology sub-groups, worked on Design study – East, and is a member of the development Design sub-group.

10. Name: Brett Monroe
Year: 4th year
Major: Architecture
Experience, Skills, Strengths: Problem solving, design, planning

- Roles: preliminary research, worked in initial site planning, space planning, and MEP sub-groups, worked on Design study – West, and is a member of the development Design sub-group.
11. Name: Patrick Park
Year: 4th year
Major: Electrical Engineer
Experience, Skills, Strengths: AutoCAD, Adobe suite
Roles: preliminary research, worked in initial sociology, MEP, and cost analysis sub-groups, worked on Design study – West, and is a member of the development Design sub-group.
12. Name: Jacqueline Schaefer
Year: 3rd year
Major: Architecture
Experience, Skills, Strengths: have worked in 2 architecture offices, cad and some 3dmax skills
Roles: project management plan, code of ethics, preliminary research, worked in initial site planning, space planning, and MEP sub-groups, worked on Design study – West, and is a member of the development Design sub-group.
13. Name: Yihan Su
Year: 3rd year
Major: Applied Mathematics, physics minor
Experience, Skills, Strengths: Matlab, a little C++ computer language, 2 languages (Chinese and English), has worked as an accountant in a shipping company.
Roles: preliminary research, worked in initial Civil engineering, cost analysis, and structural engineering sub-groups, worked on Design study – West, and is a member of the sociology/marketing sub-group.
14. Name: Jaquelin Tijerina
Year: 5th year
Major: Architecture, specialization in landscape architecture
Experience, Skills, Strengths: AutoCAD, adobe illustrator/Photoshop, 3d modeling, model making, graphic design, bilingual in Spanish/ English, visited Mexico, and have worked as an architectural intern, where I have handled projects and dealt with consultants.
Roles: preliminary research on Juarez, worked in initial space planning, site planning, and sociology/marketing sub-groups, worked on Design study – East, and is a member of the development Design sub-group.
15. Name: Maciej Tusz
Year: 5th year
Major: Aerospace Engineering and Materials Science, Math minor

Experience, Skills, Strengths: Worked at NASA for the summer, studied abroad, speak 3 languages, traveled to some poor neighborhoods in my life. Lived in communist Poland so understand the mentality of some of these projects, open mind

Roles: time sheet collector/ summarizer, preliminary research on materials, worked in initial MEP, Structural, and cost analysis sub-groups, worked on Design study – East, and is a member of the development engineering sub-group.

16. Name: Theresa Zappala

Year: 3rd

Major: Architecture

Experience, Skills, Strengths: Project leader, group leader, computer skills (Adobe suite, Microsoft Office suite, CAD, VIZ), on time, dedicated, able to see the whole picture and focus on many different parts of a project at once, worked as an intern for two different firms

Roles: project management plan, preliminary research, worked in initial site planning, space planning, and sociology sub-groups, worked on Design study – West, and is a member of the development sociology/ marketing sub-group.

B. Sub-groups

1. **Sociology/Marketing:** Defining the economic scope of our project and our clients (both the corporation buying the project and the families buying the units). Defining the cultural needs of the clients, in order to work their habits into the design. Researching social patterns that affect design. Researching the best way to present the idea to a client. Preparation of building/construction cost analysis.

Sub-group leader: Chandani Joshi

2. **Design Team:** Using the sponsor's initial requirements as a starting point, preparing individual unit floor plans and a site arrangement conducive to fostering a community atmosphere without drastically changing the cultural needs of the client.

Sub-group leader: Jacquelin Tijerina

3. **Engineering Team:** Preparing an analysis of the best and most cost effective passive heating and cooling systems, any supplementary mechanical systems, plumbing systems, and any auxiliary structural systems needed to support the Design Team's plans.

Sub-group leader: Luke McGuire

Sub-group Name	Sociology/Marketing	Design Team	Engineering Team
Sub-group Leader	Chandani Joshi	Jacquelin Tijerina	Luke McGuire
Group Members	Theresa Zappala	Jacqueline Schaefer	Carl Hart
	Yihan Su	Michael Lynn	Man Leung
	Patrick Park	Joshua Lebak	Maciej Tusz
	Michael Glynn (Prof)	Gustavo Mendoza	Amy Bourquard
	Blake Davis (Prof)	Brett Monroe	Vitali Basiourski
		Michael Glynn (Prof)	Michael Glynn (Prof)
		Blake Davis (Prof)	Blake Davis (Prof)

8.0. Designation of Roles

C. Meeting Roles

1. Minute Taker: Chandani Joshi
2. Agenda Maker: The professor is the agenda maker for this IPRO.
3. Time Keeper: The professor is time keeper for this IPRO.

D. Status Roles

1. Weekly Timesheet Collector/ Summarizer: Maciej Tusz
2. Master Schedule Maker: Chandani Joshi
3. iGROUPS: Carl Hart