



**IPRO 339B - SHIPPING  
CONTAINER HOUSING  
JUAREZ, MEXICO**

**Students: Shreyas Dole  
Haim Eliyahu  
Jeremy Moore  
Benjamin O'Neil  
Heather Olson  
Joe Peroni**

**Faculty Advisors: Blake Davis  
Michael Glynn**





# **IPRO 339B - SHIPPING CONTAINER HOUSING JUAREZ, MEXICO**

## **Why Containerization?**

### **1. Abundant**

U.S. trade imbalances are causing a vast surplus in empty shipping containers.

### **2. Affordable**

They can be purchased for as low as \$1,500.00.

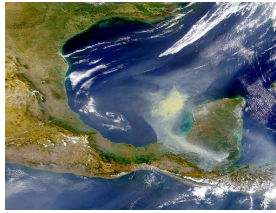
### **3. Practical**

Ideal for use as a structural skeleton given their durability, malleability, and extreme strength.

### **4. Adaptable**

Housing units can be custom designed for many uses relatively quickly.





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## **Why Juarez?**

### **1. Maquiladoras**

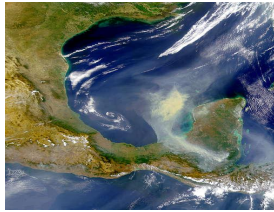
**Corporations producing American goods using Mexican soil and labor.**

### **2. Housing Conditions**

**Shanty towns of pallets and found scrap prop homes and are typically ridden with crime, corruption and unsanitary conditions.**

### **3. Feasibility**

**Conveniently located across the U.S. border to make research and implementation easier. Mexico is also very welcoming to international aid.**



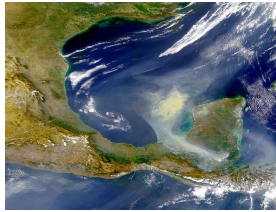
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Hard Cost	Qty. / Units	Material Costs	Unit Costs
Container	1	\$1,400.00	\$1,400.00
Window Unit Type A	1	\$48.00	\$48.00
Window Unit Type B	1	\$52.00	\$52.00
Entry Door & Window	1	\$125.00	\$125.00
Interior Door	2	\$45.00	\$90.00
Prefabricated Shower Unit	1	\$200.00	\$200.00
Shower Valve	1	\$75.00	\$75.00
Water Closet	1	\$80.00	\$80.00
Bath Sink & Faucet	1	\$75.00	\$75.00
Kitchen Sink	1	\$25.00	\$25.00
Kitchen Sink Faucet	1	\$25.00	\$25.00
Laminated Countertop - Bath ( by linear foot )	3	\$15.00	\$45.00
Laminated Countertop - Kitchen ( by linear foot )	10	\$15.00	\$150.00
Wire Shelving - Bedroom ( by linear foot )	8	\$1.20	\$9.60
Wire Shelving - Storage ( by linear foot )	22	\$1.20	\$26.40
Light Fixtures ( per unit cost )	3	\$32.00	\$96.00
Refrigerator ( Half Size )	1	\$100.00	\$100.00
Electric Cooktop & Range	1	\$250.00	\$250.00
Kitchen / Bath Exhaust Fans	2	\$30.00	\$60.00
HVAC Unit	1	\$300.00	\$300.00
Electrical Outlets / Switches ( per unit cost )	10	\$30.00	\$300.00
Electrical Conduit ( by linear foot )	70	\$1.90	\$133.00
Interior Walls ( by linear foot )	30	\$5.50	\$165.00
Bathroom Subfloor	1	\$65.00	\$65.00
Plumbing - Rough In	1	\$100.00	\$100.00
Vinyl Flooring - Bathroom	1	\$80.00	\$80.00
Refinish Wood Flooring ( by square foot )	280	\$0.50	\$140.00
Furniture	1	\$250.00	\$250.00
Insulation / Soundproofing	1	\$594.00	\$594.00
Strawbale / Stucco Exterior Wall Finish	1	\$918.00	\$918.00
<b>Logistics and Labor</b>			
Container - Shipping Cost	1	\$250.00	\$250.00
Crane Operation - Container Installation	1	\$35.00	\$35.00
Factory Labor	1	\$450.00	\$450.00
Onsite Labor	1	\$210.00	\$210.00
<b>Shared Infrastructure &amp; Land Costs</b>			
Concrete Footings / Foundations	0.0417	\$1,750.00	\$72.98
Domestic Water Heating Plant	0.0417	\$4,250.00	\$177.23
Electrical Distribution System	0.0417	\$2,100.00	\$87.57
Land Cost ( \$16,000 / acre )( 60 d.u./ acre )	0.017	\$16,000.00	\$272.00
Stairs, Landings & Railings	0.0417	\$9,500.00	\$396.15
Green Roofing / Single Ply Roofing	0.0417	\$2,800.00	\$116.76
<b>Total Cost Estimate</b>			<b>\$8,044.68</b>
<b>Sales Price</b>	( Includes Total Cost + 10% Contingency )		<b>\$8,849.15</b>

## IPRO 339: Past Semesters

1. Initial Research
2. Housing Layouts
3. Site Layouts
4. Plumbing and Electrical Schematics
5. Initial Cost Estimate





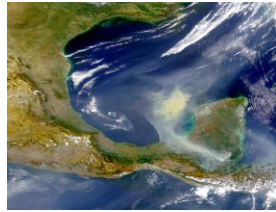
# **I PRO 339B - SHIPPING CONTAINER HOUSING JUAREZ, MEXICO**

## **I PRO 339: This Semester**

### **Goals**

- **Provide a healthy community for Juarez, Mexico.**
- **Provide an affordable housing solution to under served workers.**
- **Decrease energy consumption and environmental impact.**
- **Update design of last semester's I PRO while maintaining minimal costs.**



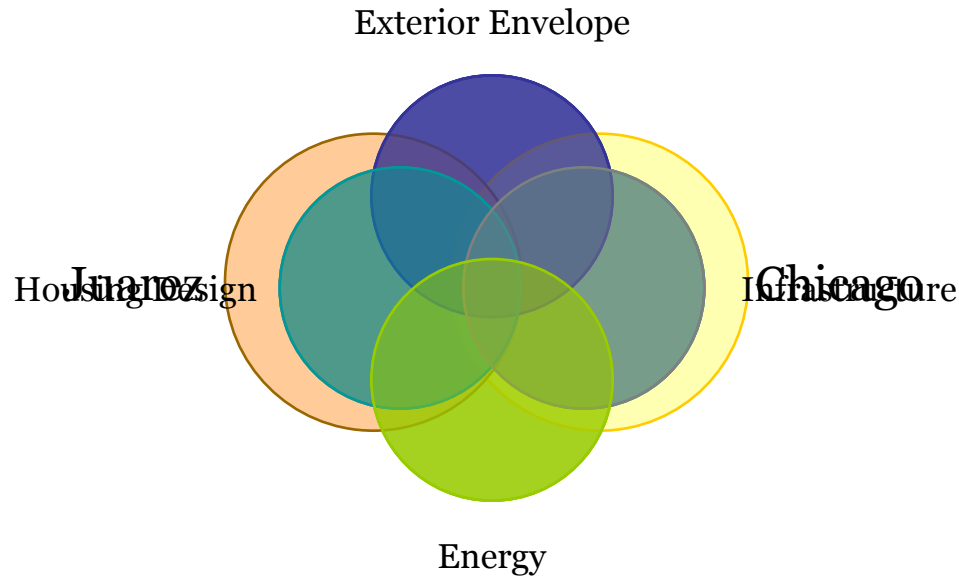


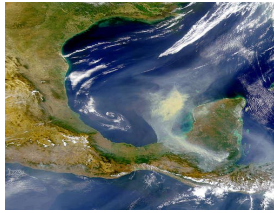
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## **IPRO 339**

- 1. Two Teams:**
  - 1. Juarez (6)**
  - 2. Chicago (12)**

- 2. Four Research Groups:**
  - 1. Housing Design**
  - 2. Infrastructure**
  - 3. Exterior Envelope**
  - 4. Energy**





# **IPRO 339B - SHIPPING CONTAINER HOUSING JUAREZ, MEXICO**

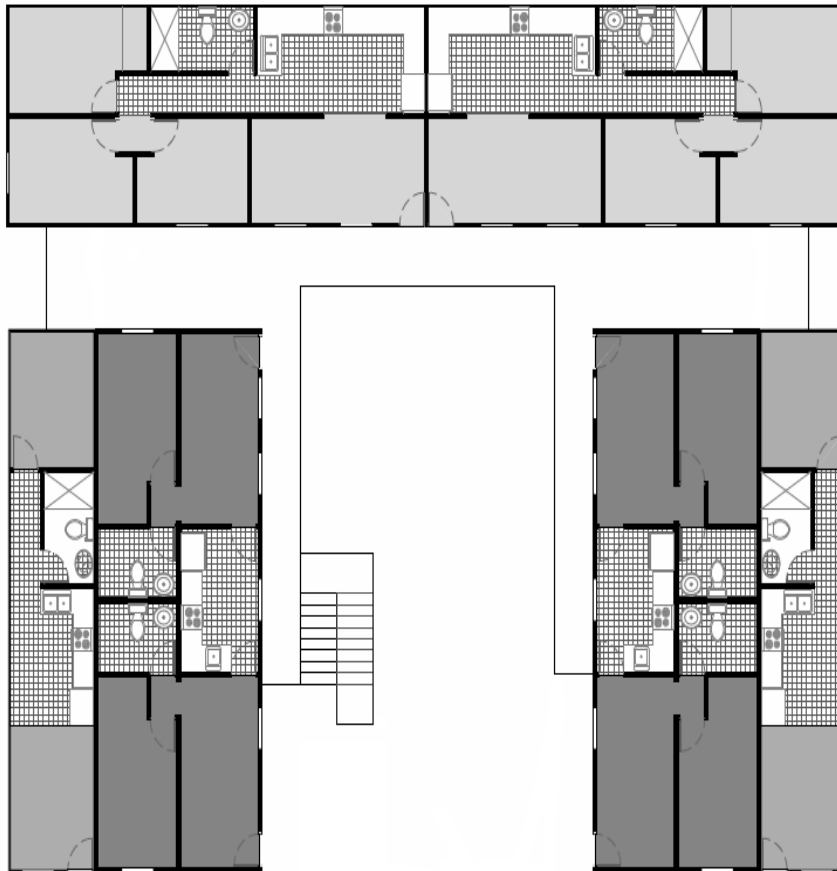
## **Housing Design Group**

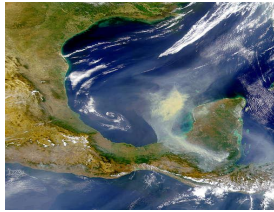
### **Goals**

- 1. Decrease Solar Gain**
- 2. Increase Natural Ventilation**
- 3. Adjust Floor Plans**
- 4. Aesthetic Appeal**
- 5. Decrease Cost**

### **Accomplishments**

- 1. Shade design specific to Juarez.**
- 2. Window design used to embrace natural ventilation.**
- 3. Void spaces researched.**
- 4. Costs analyzed and floor plans adjusted.**





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## **Exterior Envelope**

### **Goals**

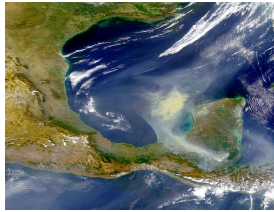
- 1. Building codes analysis**
- 2. Fire safety issues**
- 3. Exterior insulation**
- 4. Cost reduction**

### **Accomplishments**

- 1. Juarez building code incorporation.**
- 2. Increased fire safety.**
- 3. Selection of spray insulation.**
- 4. Research of cheaper materials to be found in Juarez.**







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## **Infrastructure**

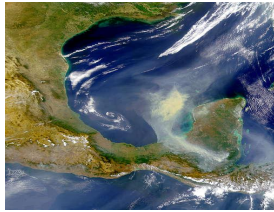
### **Goals**

- 1. Establish Connection with RV manufacturer.**
- 2. Look into alternatives for securing of containers.**

### **Accomplishments**

- 1. Prospective RV manufacture interest found.**
- 2. Use of Tandem Loc for securing the containers**
- 3. Rainwater collection system supplied.**





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## Energy

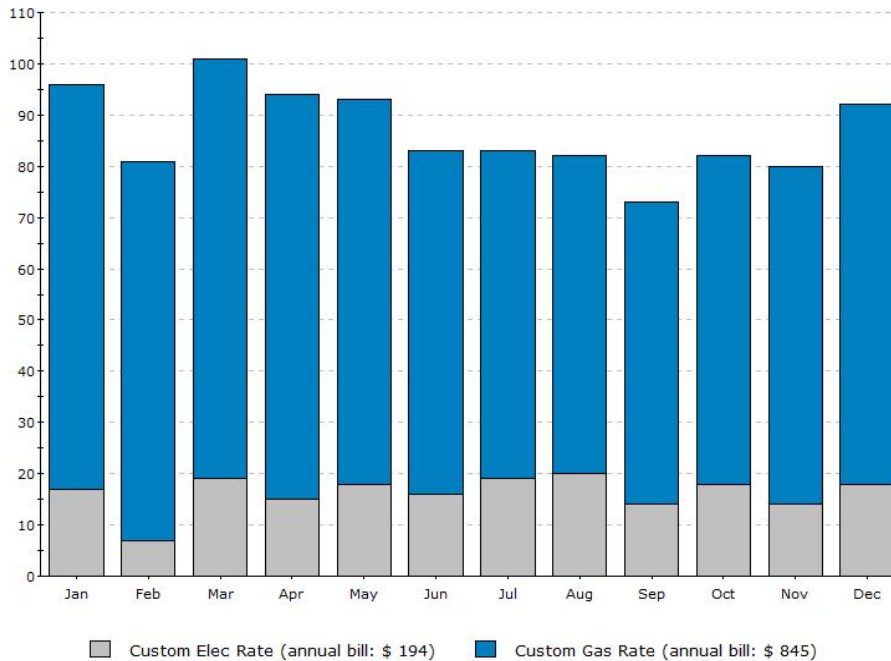
### Goals

1. Research fuel sources and energy systems.
2. Research energy modeling software.
3. Assemble an appropriate energy model of the building.

### Accomplishments

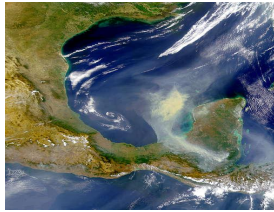
1. Achieved understanding of energy systems.
2. Extensively learned two energy modeling software packages.
3. Developed reasonable cost estimates for energy usage.

Monthly Utility Bills (\$)



Total Annual Bill Across All Rates: \$ 1,039

Total 8.28 7.77 8.67 8.30 7.88 7.01 6.76 6.55 6.19 6.78 6.98 7.78 88.96



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<b>IPRO 339 - Cost Analysis</b>				<b>5-Dec-08</b>
		<b>Qty. / Unit</b>	<b>Material Cost</b>	<b>Unit Cost</b>
<b>Hard Cost</b>				
Container		1	\$1,500.00	\$1,500.00
Window Unit A		1	\$48.00	\$48.00
Window Unit B		1	\$52.00	\$52.00
Entry Door & Window		1	\$125.00	\$125.00
Interior Door		1	\$27.50	\$27.50
Shower Unit		1	\$200.00	\$200.00
Shower Valve		1	\$75.00	\$75.00
Water Closet		1	\$80.00	\$80.00
Bath Sink & Faucet		1	\$75.00	\$15
Kitchen Sink		1	\$25.00	\$4.84
Kitchen Sink Faucett		1	\$25.00	\$25.00
Laminated Countertop - Bath ( by linear foot )		3	\$9.55	29.55
Laminated Countertop - Kitchen ( by linear foot )		10	\$5.50	55
Wire Shelving - Bedroom ( by linear foot )		8	\$1.20	\$9.60
Wire shelving - Storage ( by linear foot )		24	\$1.20	\$28.80
Light Fixtures ( per unit cost )		3	\$14.00	\$42
Refrigerator		1	\$375.00	\$264
Range		1	\$250.00	\$250.00
Kitchen / Bath Exhaust Fams		2	\$30.00	\$60.00
HVAC Unit		1	\$200.00	\$200.00
Electrical Conduit ( by linear foot )		70	\$1.95	\$136.50
Interior Walls ( by linear foot )		30	\$4.25	\$127.50
Bathroom Subfloor		1	\$65.00	\$65.00
Plumbing - Rough In		1	\$100.00	\$100.00
Vinyl Flooring - Bathroom		1	\$80.00	\$80.00
Refinish Wood Flooring ( by square foot )		320	\$0.50	\$160.00
Furniture		1	\$500.00	\$500.00
Insulation / Soundproofing		1	\$250.00	\$250.00
<b>Logistics and Labor</b>				
Container - Shipping Cost		1	\$500.00	\$410
Crane Operation - Container Installation		1	\$55.00	\$55.00
Factory Labor		1	\$550.00	\$550.00
Onsite Labor		1	\$40.00	\$40.00
<b>Infrastructure &amp; Land Costs</b>				
Shared Water Heating Plant		0.0357	\$4,500.00	\$160.65
Electrical Distribution System		0.0357	\$2,200.00	\$78.54
Land Cost ( \$16,000 / acre )		0.0357	\$16,000.00	\$571.20
Stairs, Landings & Railings		0.023812	\$5,500.00	\$130.97
Roofing		0.0357	\$3,000.00	\$80
<b>Total Cost</b>				<b>\$6,886.65</b>
<b>Sales Price</b>				<b>\$7,575.32</b>

## Updated Costs

Approximate cost per structure:

**\$65,357.76**

Approximate cost per unit:

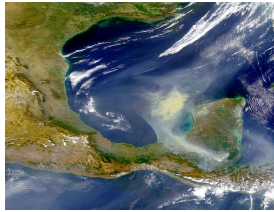
**\$7,575.32**

Utility costs per household per year:

**\$230 Double Unit**

**\$150 Single Unit**



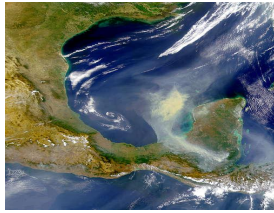


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## **Ethical Considerations**

- 1. Proper cultural understanding of low-wage workers in Mexico.**
- 2. Creating a distinction between cheap and affordable, making the containers livable.**
- 3. Using materials or labor from Mexico or USA.**
- 4. Is a housing solution going to effectively increase the standard of living?**



# **IPRO 339B - SHIPPING CONTAINER HOUSING JUAREZ, MEXICO**

Dear Mr. Glynn and Mr. Davis:

I teach at a small rural school on the Gulf Coast in southwest Louisiana. The school is the center of the community, with only about 130 kids-prek-12. Our community has been hit again with a devastating hurricane, Ike. Rita hit three years ago and demolished the school and community. We have rebuilt and just got back into our school when Ike hit us a few days ago, with the same results.

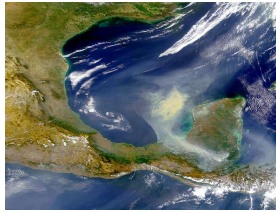
We have to think of a better way to live and go to school in this wonderful place. I began thinking of shipping containers a few weeks ago as we evacuated for Gustav. The containers are watertight...strong...portable.....affordable? Our new school...if one is rebuilt....will be elevated several feet..on pilings. How could storage containers be used on our school campus? How about homes for our residents and oil workers who travel here. I believe mobile homes and campers might be prohibited. Also, do you think they could be buried in the ground and used as tornado shelters?

I am trying to help preserve this incredible community of caring, hard-working people. You won't see them on the national news waiting for a handout. Instead, many will quietly move away from here, to raise their children in a more "predicable" place.

Thanks for your time.  
Sincerely,  
Debbie Hoffpauir, M.Ed.  
Johnson Bayou High School

## **Expanding Our IPRO**

- 1. Natural disaster housing solutions at home and abroad.**
- 2. School facilities are needed in developing nations worldwide.**
- 3. Partnership with NGOs to combat other worldwide housing epidemics.**



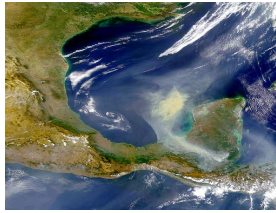
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## **Problems Faced**

- 1. Reducing solar gains while maintaining original floor plans.**
- 2. Learning software while developing a model.**
- 3. Language barriers while researching laws and codes.**
- 4. Creating relationships with professionals as students.**
- 5. Communication between teams and groups.**





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