designing affordable housing out of shipping containers for cuidad juarez, mexico
maquiladoras + Cuidad Juarez

- over 3000 maquiladoras
- 40% in poverty
- $1 to $2.30 an hour
- lack of housing and facilities
shipping containers

• 17 million empty containers worldwide
• 700,000 empty containers in the U.S.
• $900 to ship back an empty container
• standard: 8’-0” x 8’-6” x 40’-0”
goals + objectives

• improve the standard of living of *maquiladoras* workers in Ciudad Juárez by providing an affordable and desirable housing

• create a safe and pleasant community

• provide dignity and choice to residents of the community

• create a sense of pride and ownership for residents of the community

• provide comfortable living spaces that protect the inhabitants from the harsh environment
methodology

research sub-groups
- site planning
- space planning

structural
- civil
- mechanical/
- electrical/
- plumbing

sociology marketing
- cost analysis

design sub-groups
- east site
- north site
- west site
- south site

final solution
- 200 m x 300 m site study
west + south site studies

- to create courtyard spaces that would allow each unit to have access to more private outdoor space
- Provide a variety of different sized housing options
- Create an aesthetic that disguises the idea of ‘shipping containers’

West site: 4 unit types, 130 Units. 530 people

South site: 2 unit types, 352 units, 1408 people
north + east site studies

- Vehicular corridors restrained to site’s perimeter
- Security gained by visibility
- Maximum of four containers tall
- Incorporation of potential commercial activity within site
- Adaptability to similar situations around the world
- Accommodation of culture in the physical environment

East site: 100m x 100m, 3 unit types, 111 Units, 555 people, 555 people/ hectare

North site: 100m x 100m, 2 unit types, 512 units, 2,560 people, 2,560 people / hectare
Final site: 200m x 300m, 3 unit types,
1,773 units, 8,865 people, 1,478 people / hectare
unit types

Proposed Unit Plan A
shell: 8 ft. x 40 ft. modified shipping container

Proposed Unit Plan B
shell: 8 ft. x 40 ft. modified shipping container
unit types

Proposed double-unit plan

shell: 2 - 8 ft. x 40 ft. modified shipping containers
sections + elevations
### Initial Cost Summary

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAND</td>
<td>$2,384,000.00</td>
</tr>
<tr>
<td><strong>HARD COST CONSTRUCTION</strong></td>
<td></td>
</tr>
<tr>
<td>Single width units</td>
<td>Qty: 1,689</td>
</tr>
<tr>
<td>Double width units</td>
<td>Qty: 75</td>
</tr>
<tr>
<td><strong>SOFT COSTS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL = LAND + HARD COST + SOFT COST</strong></td>
<td>$17,789,575.00</td>
</tr>
</tbody>
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### Affordability

(Based on Hard Cost Only)

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shipping container as structure

- Rigid steel frame, primary load bearing component
- Concrete foundations required
coh as thermal insulation

- Low thermal conductivity (0.6 W/m*K) compared to steel (50 W/m*K)

- High thermal mass

- A natural resource
proposed MEP distribution

MECHANICAL
INDIVIDUALLY CONTROLLED HEAT & A. C.

ELECTRICAL
COMMON RISER SYSTEM WITH BRANCH CIRCUIT SYSTEM

PLUMBING
COMMON SHARED RISER SYSTEM FOR WATER, WASTE AND VENTS
mechanical system

- Heating and Cooling loads:

<table>
<thead>
<tr>
<th>Building Orientation</th>
<th>Cooling Load (Btu/hr)</th>
<th>Heating Load (Btu/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North-South</td>
<td>10,000</td>
<td>15,000</td>
</tr>
<tr>
<td>East-West</td>
<td>15,000</td>
<td>15,000</td>
</tr>
</tbody>
</table>

- PTAC, heats and cools
addressing the cultural needs

• Provide recreational, spiritual and practical areas

• Tailor cost to the average income

• Keep safety and security in mind
questions?