Low Cost Sustainable Housing for Tijuana, Mexico

Department of Architecture
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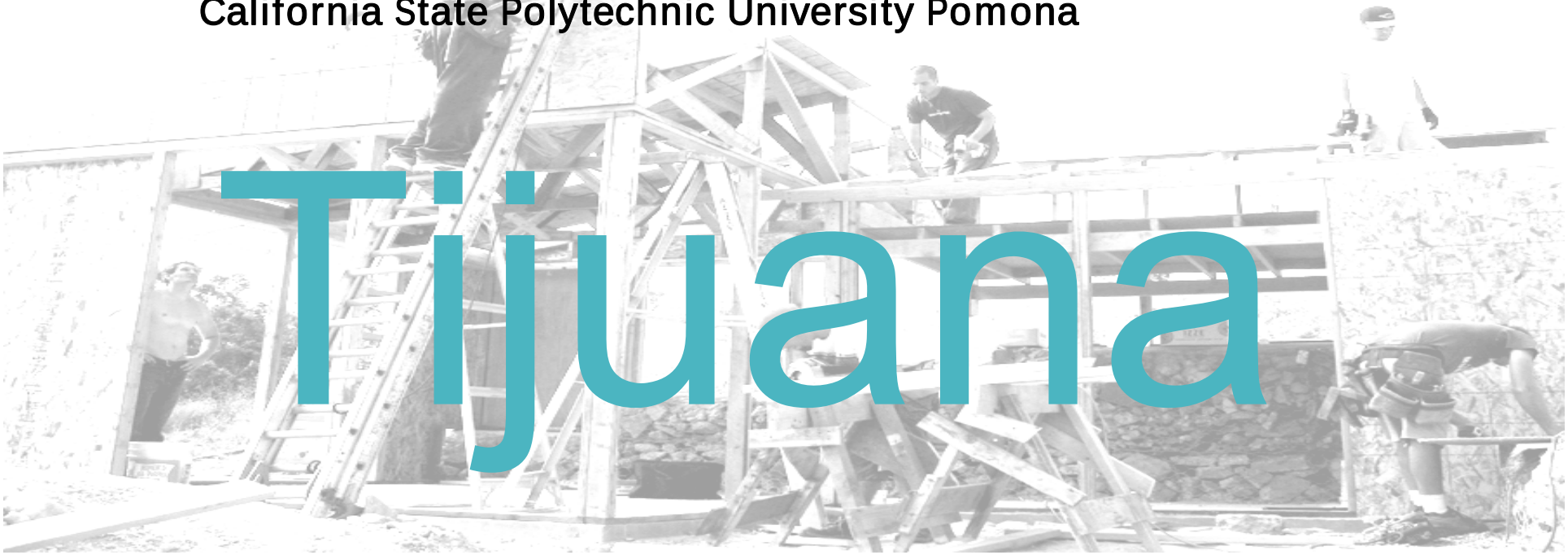
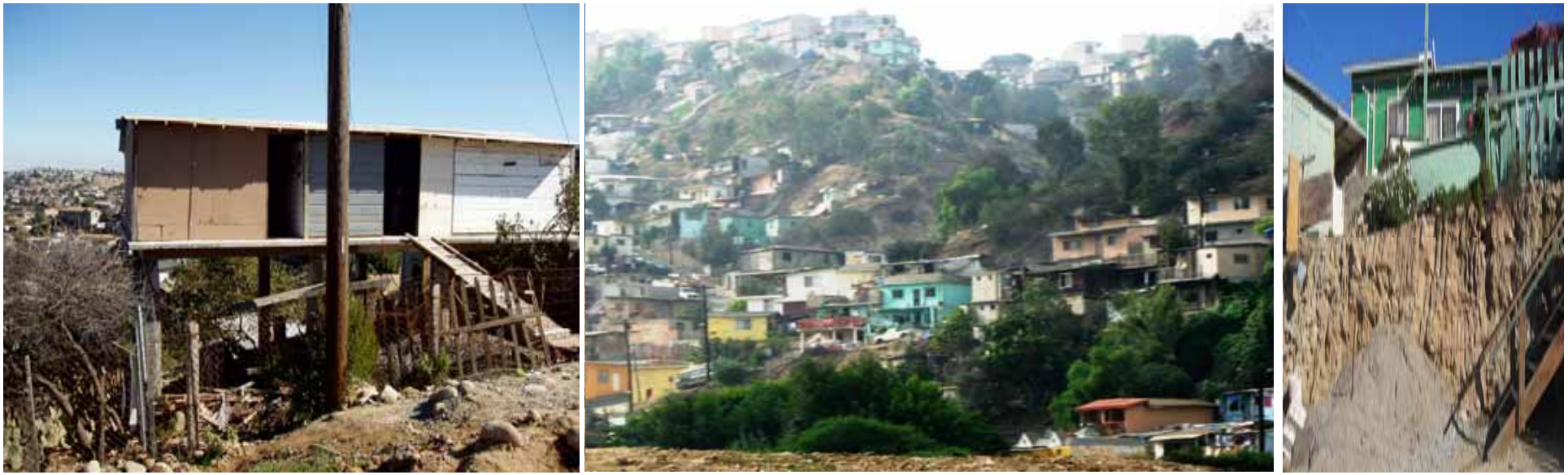


Tijuana



Informal settlements in the foothills of Tijuana, comprised of substandard housing and informal urban services in steep slopes with landslide, earthquake and flood hazards. These homes do not have insulation or furnaces.

Prototype design & construction

This project explores the development and integration of sustainable technologies for low cost housing in Tijuana, integrating, design construction and research in one project.

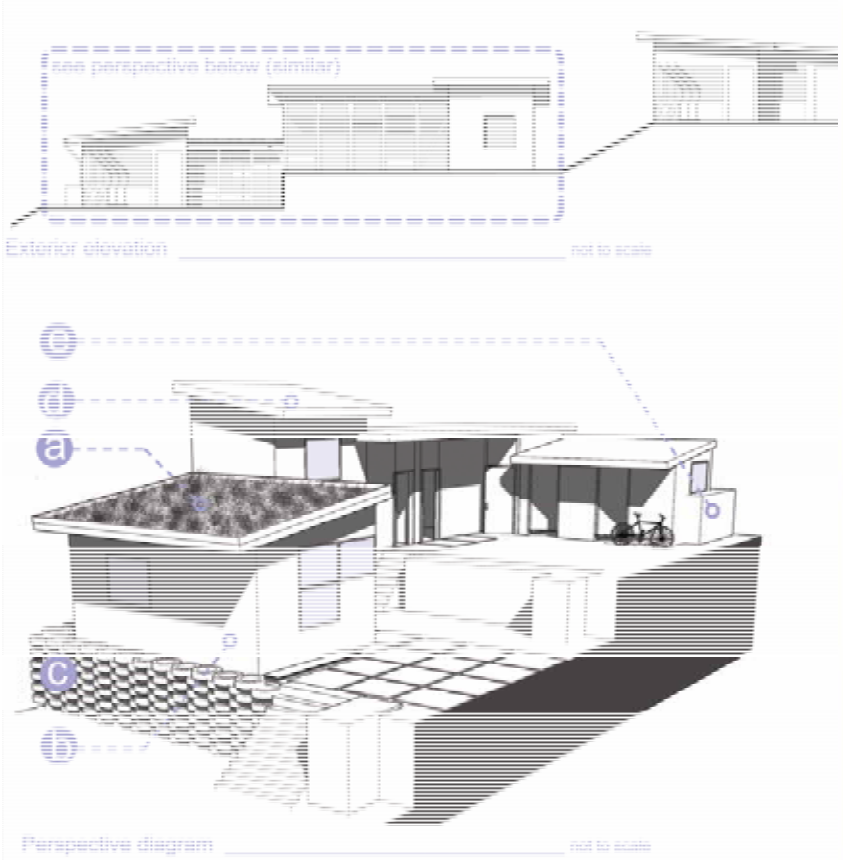
Design and Construction

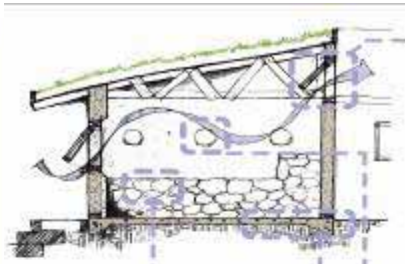
The main design objectives were: use of local materials, low cost sustainable systems, passive heating and cooling, adaptation to local topography, and flexibility to grow.
Information and data can be disseminated to residents, allowing for them to make changes individually and as a community

Window system & wood truss

Pallet wood truss: Constructed from wood pallets and nails. $8 in materials per truss. Low cost window system with exterior shading device and insulated operable interior shade.

Sustainable Systems:





Windows

An operable window placed along the Western façade, as well as clerestory windows on the Eastern façade provide daylight, natural ventilation, and solar gain in the morning. Windows on the Southern wall provide radiation during the afternoon in the winter. Made from reused pieces of lumber and either single-pane sheets of glass or polycarbonate, the operable windows can be made easily and affordably.

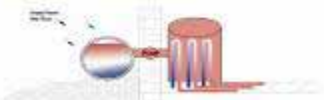
Gabion Walls

The gabion wall units can be constructed by using rocks found during site excavation. They provide terracing of the site and wall structure with thermal mass. The retaining quality of the gabion units are adaptable to site specific considerations.

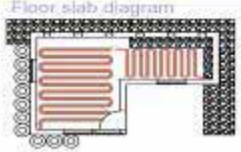
Windows

A system of round operable windows on the north side further improve natural ventilation and daylighting. Using locally reclaimed tubes and affordable glass plates, the round windows can be made for as little as $1.

System: tank & pump



Floor slab diagram

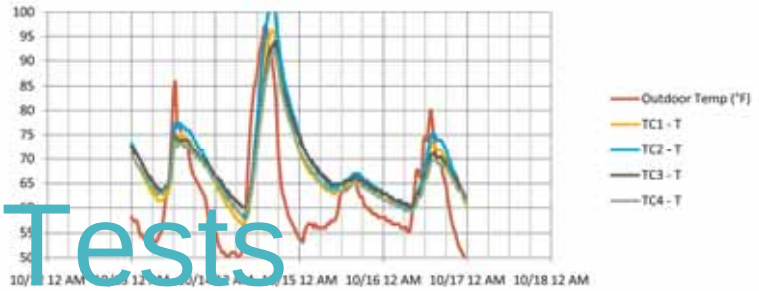


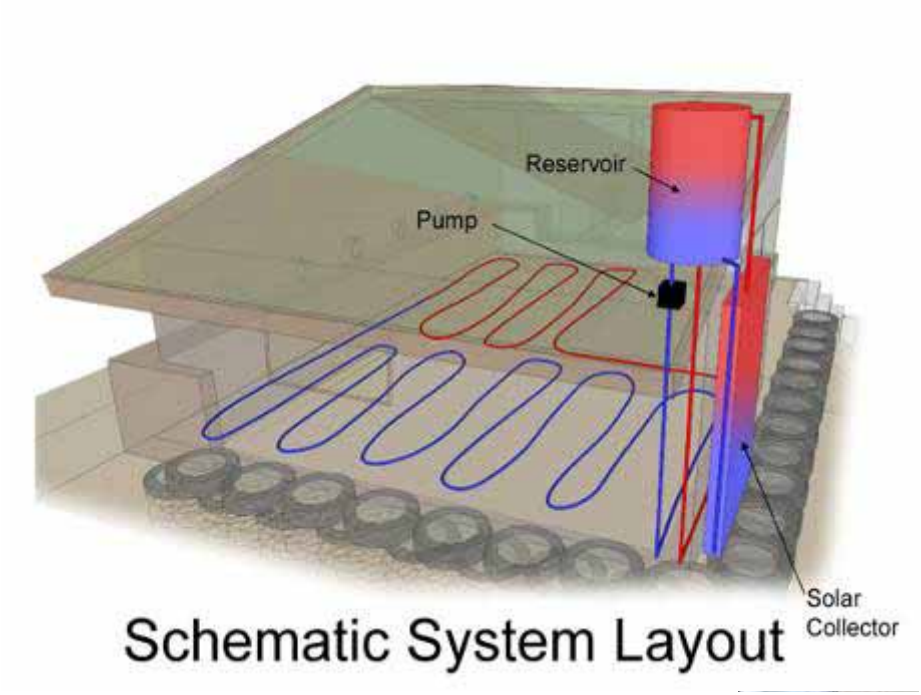
Slab under construction

Radiant Heating System

In our radiant heating system, sun light warms water in black pipes along the south side of the house. The heated water is then pumped into a tank located in the home. ¾ inch garden hose (with 6 ounces of water per foot) runs into the tank, heats the water within the hose, and then continues to run into the concrete floor slab subsequently heating the base of the dwelling.

Research & Field Tests





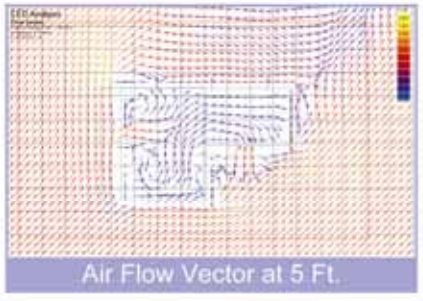
Schematic System Layout

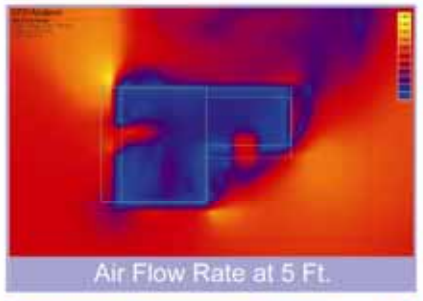
Low cost radiant floor heating for thermal comfort through cold winter months. Plastic irrigation tubing in slab and collector. Ease of construction for people within informal settlements

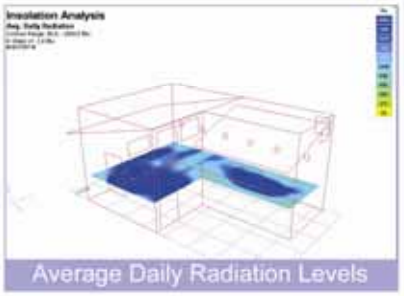
Digital Analysis

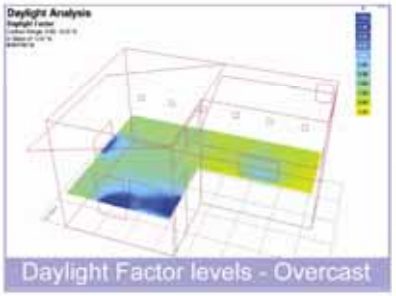

24 Hour Temp. for December 21st

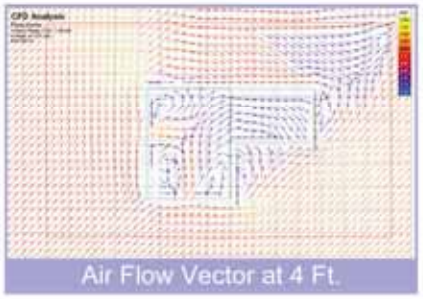

24 Hour Temp. for August 21st

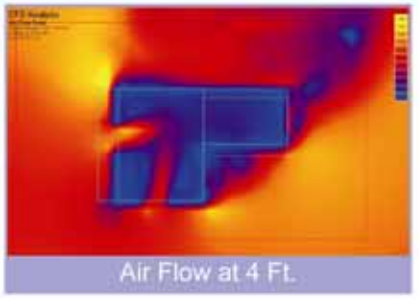

Air Flow Vector at 5 Ft.


Air Flow Rate at 5 Ft.


Average Daily Radiation Levels


Daylight Factor levels - Overcast


Air Flow Vector at 4 Ft.


Air Flow at 4 Ft.

sustainable architecture

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