

Senp kay (the Simple House) Sustainable Model Home

Port-au-Prince Haiti-February 2012



Overview

Senp kay introduced by Andy Mueller of GreenSpace Collaborative is the first prototype structure in Haiti constructed utilizing prefabricated, tilt-up, plastic bottle filled panels and light straw-clay walls. It was designed and constructed as an innovative solution for low-tech sustainable housing for low income communities in emergent nations.

Low-cost housing is an issue of huge social relevance in Haiti, and indeed globally. Two years have passed since the earthquake in 2010 and thousands of Haitians continue to be without permanent

living structures. There are over 800 camp settlements with an estimated .5 million people still homeless. Inadequate standards of construction and poor materials were the root causes of many of the collapsed buildings and loss of life. It is extremely important that reconstruction addressed these issues, and ensured that any new buildings are earthquake resistant and provided greater protection in the face of future seismic events. The need for permanent, low cost, safe housing is pressing.



There is an abundance of precedents and inspiration of using plastic bottles, tilt-up panels and light straw-clay infill separately as wall systems; The World Earthship Biotope movement utilizes plastic bottles as a low-tech, non-structural filler in walls, the Tilt-up method of wall construction (typically concrete) has been around since the early 1900's and the light straw-clay walls of European and North America natural building communities has been utilized for over 700 years. All three methods have successfully evolved independently in their respective applications.



The **Senp kay** is a modular wall design which incorporates the structural integrity of the Tilt-up panel, the creative recycling/repurposing of the bottle wall system and the simplicity of light straw-clay infill. It is simple to mass produce on site, assemble and customize to one's particular needs. The use of repurposed materials is a positive response to one of many environmental problems in Port-Au-Prince. The Island of Haiti currently has no successfully



operational recycling facilities. The cost to transport it to the US is prohibitive even for developed



countries. There are many refuse dumps where piles of waste lie as a potential source of innovative material. Rice straw is plentiful in both the Artibonite and Les Cayes valleys. Straw is a rapidly renewable resource and 80% of the rice straw in Haiti goes to waste, usually burned after harvest adding to the already saturated air pollution.

The **Senp kay** explores the use of alternative, local and repurposed materials as a substitute to the widely accepted concrete block method of construction. It suggest an unprecedented and viable option for appropriate building solutions to existing problems that are not merely handed to the local population, but owned and built by them. This of course will take more than just a single demonstration project, but the idea is to captivate the imagination of the Haitians that have contributed to the project and those which will follow.



Project Details

REPURPOSED LOCAL MATERIALS: The prototype utilizes many in-country materials; ubiquitous plastic bottles, plastic bags, discarded tarps, crushed rubble, clay soil, bamboo, sand and rice straw.

FLEXIBLE DESIGN: Prefabricated panels allow for expansion in either two or four foot increments. Buildings can utilize both a pier or stem wall foundation system.

SIEZMIC AND HURRICANE RESISTANT: The construction of this prototype demonstrates these wall systems have excellent resistance to earthquake and hurricane forces, both in-plane and out-of-plane. They can be part of a well-engineered structure capable of withstanding forces of a 7.0 or greater earthquake and 140 mph hurricane winds.

COMFORT: Solutions include building orientation, window/door location, shading, wall and ceiling insulation, and generous attic ventilation.

COST: The Senp kay is more sustainable and less carbon consumptive than the typical concrete block building in Haiti. Cost per square foot-\$35USD. In this project, the main considerations were to reducing time and cost of the building process, and to allow community involvement.

FAST CONSTRUCTION: low-tech, easy to assemble structure, requiring only two skilled trades. The structural system is produced locally, is suited for mass production and provides job opportunities and skills development for the community.

SIMPLE, HONEST, AND ECONOMICAL

Materials:

- #179, 20 oz. plastic bottles per 4'x8' prefabricated panel
- 22 gauge 1" sq. mesh
- 2x4 and 1x4 lumber
- Clay and Cement plaster
- Corrugated steel roofing
- Straw/clay wall infill
- ½" round internal Bamboo pinning in the light straw-clay infill walls
- Repurposed gutter rain catchment system
- Concrete footing and stem wall
- Roof and foundation tie-downs

Contributors**Technical**

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We seek to employ sustainable building techniques that are community based, geographically and culturally appropriate