



CRAFTSMAN BAMBOO and PLASTIC BOTTLE HOUSE

By Owen Geiger

Summary: The high cost of housing is the number one problem that must be addressed in order to solve the world's housing crisis. At a cost of just \$3.50 per square foot for materials, the Craftsman House provides safe, disaster-resistant, comfortable housing that is affordable for those in poverty.

Specifications: 940 square feet, 72 square feet loft space, 3 bedrooms, one bath, footprint 23'x40', plus 118 square feet covered porch

Features: The spacious, modern kitchen includes base cabinets made of rot-proof low-fired brick, a pantry and broom closet and dining area; the living room includes built-in bench with storage below (extra sleeping space if needed), coat closet and wood stove; children's bedrooms include desks and loft space for additional sleeping or storage space; all bedrooms include ample closet space and two windows per room for cross ventilation and emergency egress; the bathroom has a shower, composting toilet and sink; the open-air laundry creates a pleasant work space that keeps excess moisture out of the house and helps clothes smell better and dry faster; garden area includes trellises and raised beds for fresh food production; three water barrels – including one gravity feed water barrel to the kitchen sink – provide potable water for plants and household use; the front porch includes built-in benches for relaxation and social interaction.

The primary building method is bamboo frame with infill panels of plastic bottles stuffed with plastic trash. The main benefit of this design is its low cost and simplicity of construction. We know the concept outlined here is viable because similar projects have already been constructed by numerous groups in Latin America.

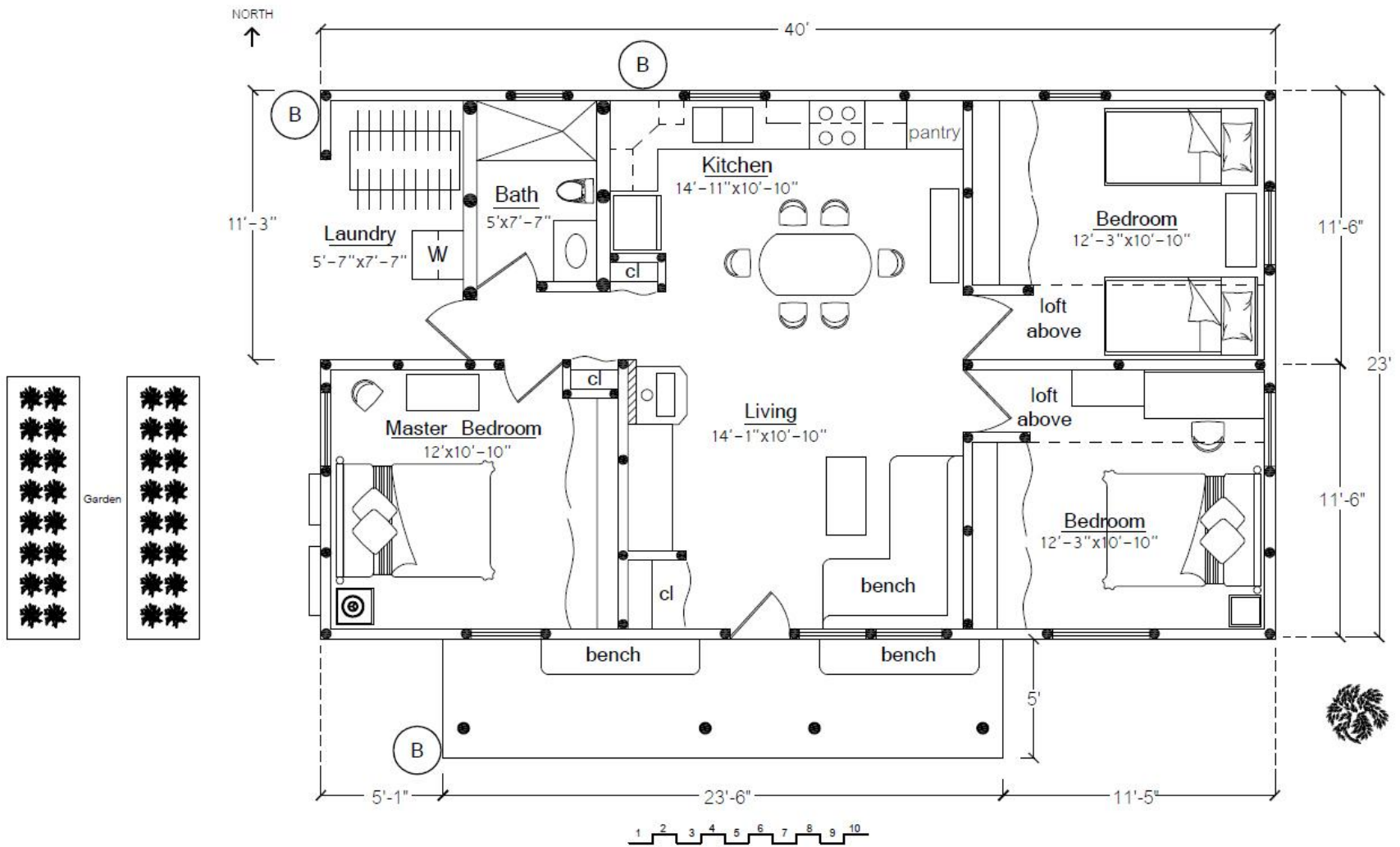
- **Resiliency:** As the main structural element, bamboo will flex in earthquakes and strong winds without breaking. Bamboo has twice the compressive strength of concrete and roughly the same strength-to-weight ratio of steel in tension. Plastered walls of borax-treated bamboo resist fire, rot and insects.
- **Sustainability:** Plastic trash is a free, abundant resource that can be used to build houses and schools, while also reducing the garbage problem at the same time. Bamboo is a rapidly renewable grass that grows about 12"-18" per day. Bamboo helps offset global climate change by sequestering carbon (17 times as much as a typical tree forest).
- **Viability:** Hug it Forward <http://hugitforward.org/> has built 14 schools made with plastic bottle walls. Their video shows how communities are enthusiastically accepting this building method. <http://www.youtube.com/watch?v=k3gl1wWJdTM>
- **Feasibility:** Hug it Forwards' success with building plastic bottle schools has inspired other projects such as Project Somos Children's Village <http://projectsomos.org/>. In all these cases, local communities enthusiastically support the projects. Men and women of all ages, including children, are eager to help. Construction materials are low cost and readily available, and building with bamboo and plaster are widely known.
- **Scalability:** Bamboo is abundant throughout much of the world and its use in construction has a long history. (See bamboo production map.) Encouraging the cultivation of the most suitable species would make bamboo even more widely available. In addition, plastic trash is plentiful worldwide and utilizing it in construction of buildings is a practical way to clean up the planet.

Estimated Construction Time

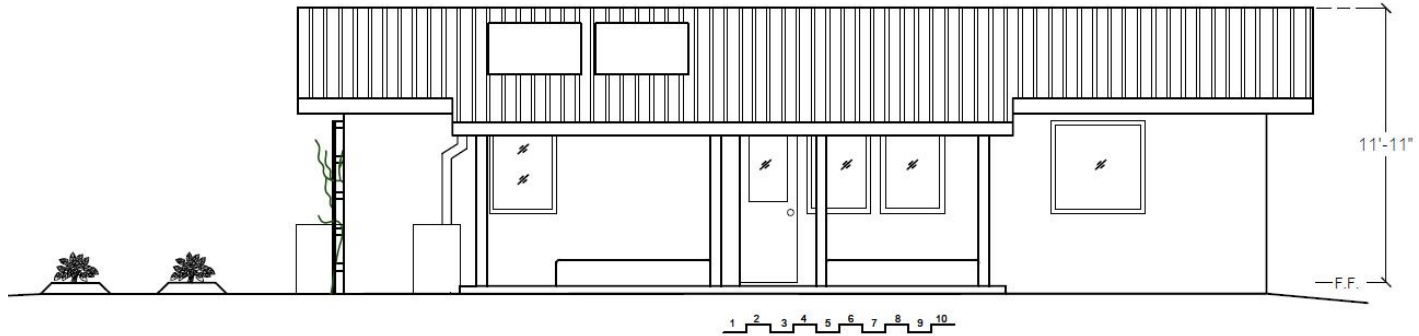
Labor (man hours)	
Walls: 9 days x 8 workers x 8 hours/day = 576 man hours	
Plaster: 9 days x 8 workers x 8 hours/day = 576 man hours	
Roof: 5 days x 8 workers x 8 hours/day = 320 man hours	
Remainder: 5 days x 8 workers x 8 hours/day = 320 man hours	
Total Unskilled Labor: 1,792 man hours	
Total for one skilled foreman: 28 days x 8 hours/day: 224 man hours	
Total Labor: 2,016 man hours	
Unskilled Labor Cost Total: 1,792 man hours x \$1.70/hour	\$3,046
Skilled Labor Cost Total: 224 man hours x \$2.25/hour	\$504
Total Materials and Labor Cost	\$3,550

Cost Estimate

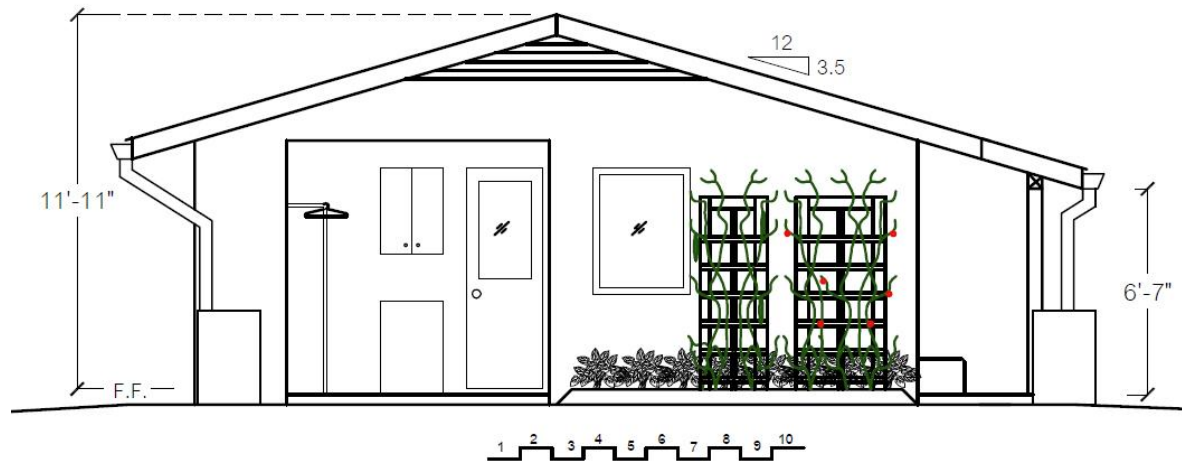
Item	Size	Quantity	Unit cost \$	Total cost \$
Bamboo	5" DIA	1,990 lineal feet	.44	876
Bamboo	2" DIA	288 lineal feet	.07	20
Metal roof/screws	30 gauge	1,330 sq. ft.	.34	452
Cement	94 lb.	13=foot,10=flr,3=join	4.41	115
Gravel	pea gravel	2 truckloads	25	50
Sandy/gravel soil	N/A	10 truckloads	25	250
Clay soil = plaster	clean	2 truckloads local clay	N/A	N/A
Iron oxide color	powder	25 lbs.	2.20	55
Plastic sheeting	6 mil	940 sq. ft.	.02	20
Threaded rod/nuts	1/4"	265 lineal ft.	.75	199
Anchor bolts	1/4"x6"	65	.2	13
Hurricane ties	standard	22	1	22
Wood bond beam	2"x6"	126 lineal ft hardwood	.50	63
Exterior doors recy	36"	2	10	20
Interior doors recy	28"	4	5	20
Window shutters	varies	10	5	50
Window screen	fine mesh	120 sq. ft.	.07	8
Twine	1/16"	4,000 ft. roll	.001	5
Plastic bottles	varies	# on their blog	N/A	N/A
Plastic trash	N/A	plastic bags, foam, etc.	N/A	N/A
Fishing net	1" mesh	2,944 sq. ft.	.01	35
Cabinets	36" base	19 lineal ft.	15	285
Shelves	12" wide	29 + 38=67 lineal ft.	.30	20
Plastic barrels	55 gal	3	3.33	10
Plumbing, sinks	7/8", 2-1/4	2 sinks	varies	100
Composting toilet	N/A	1 bucket, scrap wood	N/A	N/A
Electrical (min.)	N/A	wire, outlets, lights	varies	100
Tile	varies	108 sq. ft.	.55	60
Wax	gallons	2 cans	10	20
Paint	gallons	5 cans	5	25
Misc.	N/A	hardware, clothes rod..	N/A	100
Subtotal				2,993
10% cost overrun				299
Total Materials Cost				\$3,292
Total Labor: 2,016 man hours				
Unskilled Labor Cost Total: 1,792 man hours x \$1.70/hour				\$3,046
Skilled Labor Cost Total: 224 man hours x \$2.25/hour				\$504
Total Materials and Labor Cost				\$6,842



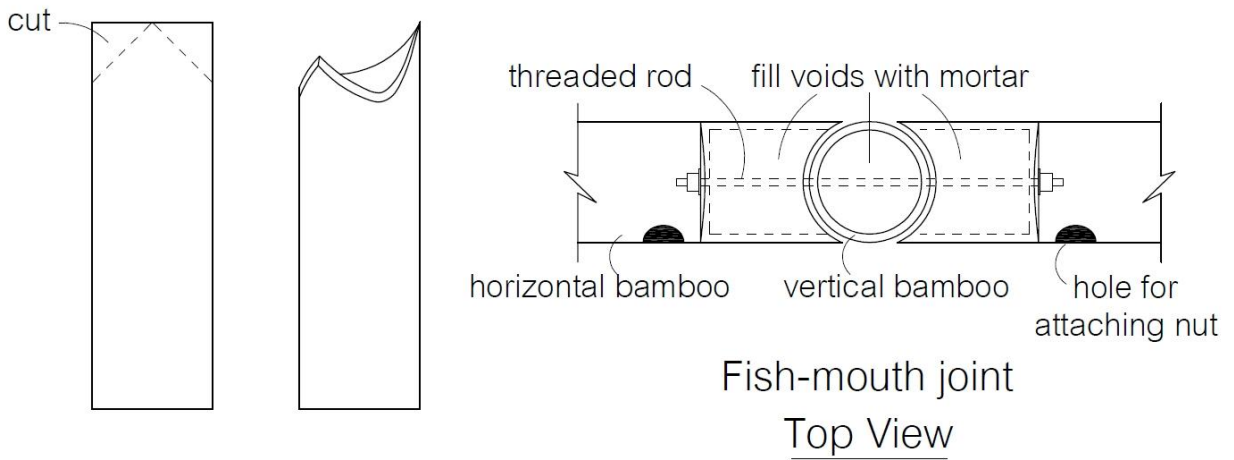
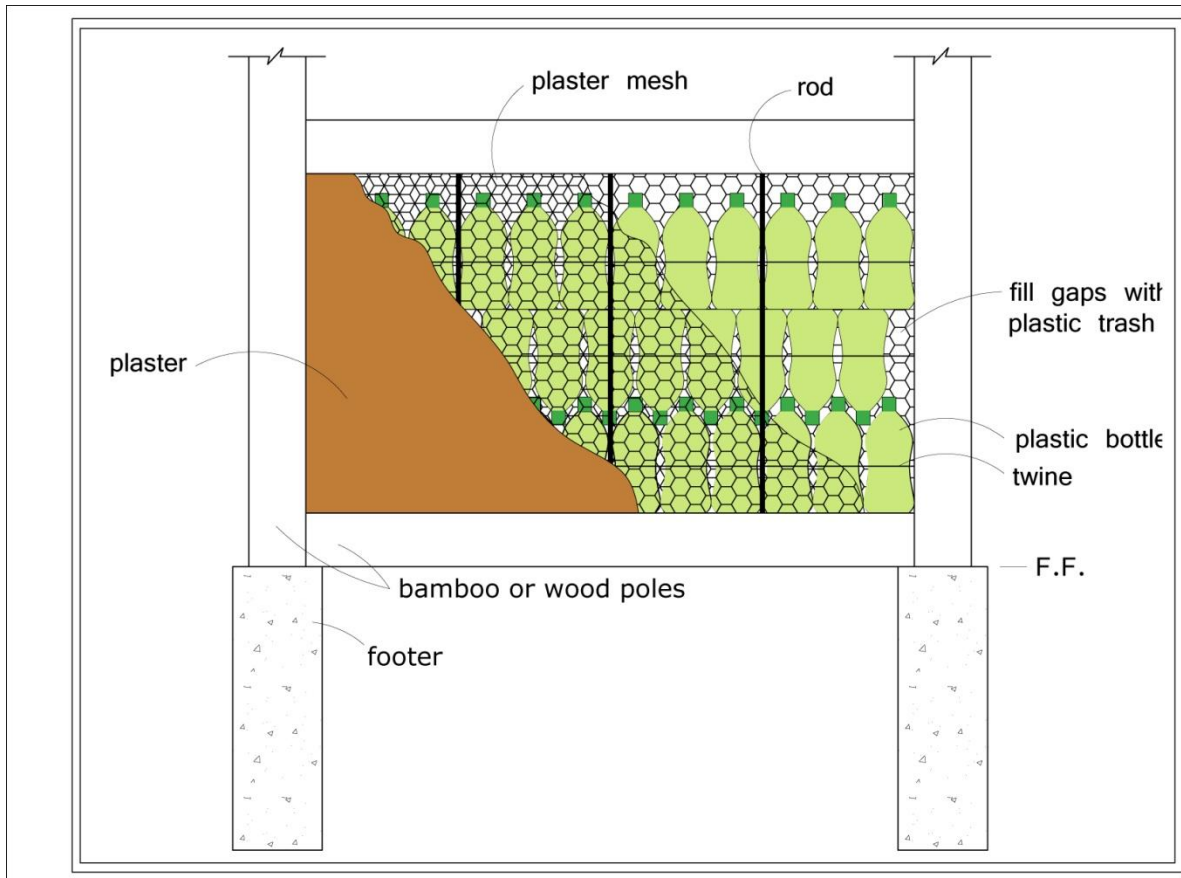
Floor Plan



South Elevation



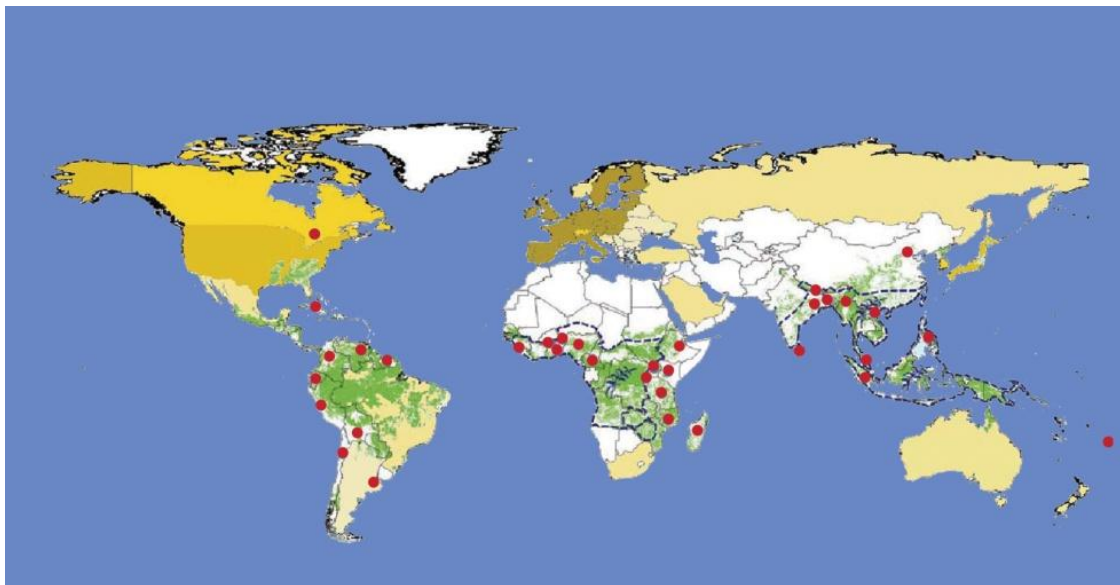
West Elevation



Bamboo Details



Bamboo Wall



Bamboo Production