Bruce Coldham FAIA, Architect

To:	Megan McDonnough
From:	Bruce Coldham FAIA
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Subject:	Big Enough House — Some design concepts

Here are some thoughts as to how P.V. Habitat might create a house for a $50,000 construction budget. They are associated with a budget spreadsheet constructed in Excel and pasted below. The thinking is to take a typical, recent PV Habitat construction budget and ask "how can each of these budget line items be modified in pursuit of a $50K outcome"? That is what I have done: (not quite there yet, but close!). And then in the right hand column I have noted the design and/or construction strategies associated with achieving the line item budget/cost projection. Those strategies are coded with a number that links to an expanded narrative below.

But first, there are a three of over-arching strategies:

1. Make the house small — around 650± sq. ft. (maybe not including a storage loft area)

2. Shift work from sub-contract to Habitat volunteers.
   The tabulated budget spreadsheet (below) shows subcontract work in BLUE, and work by Habitat volunteers in ORANGE. Some of the work for which we have typically engaged subs. is shifted to the ORANGE category — specifically the foundation and floor plate. The notes below explain this and more.

3. Encourage the homeowner to accept a more open floor plan with a lower level of finish in some specific locations.
   This involves the incoming homeowner creating and finishing space using furnishings, screens, plantings, curtains, and the like. This will involve some supportive conversations with the homebuyer/owner about just how to achieve this, and why (perhaps) they should be excited by this approach.

KEY to following table:

	Construction Activity SUB-CONTRACTED
	Construction activity by Habitat Volunteers

A schematic design for a "Big Enough House" that guided by the strategies outlined above, and fitting with the line item budget for the various construction components tabulated below, accompanies this narrative.

Pioneer Valley Habitat for Humanity

North Pleasanst St Amherst Duplex
Construction Budget Detail

Big Enough House — Budget Projection

BEH Solution concepts to reduce cost

(explained in accompanying memo)
#2– BEH is 650± s.f. 22' x 30' rectangular plan with 200 s.f. loft at one end (over bathroom, bedroom, and entry)

Division	Description	Amherst Per Unit	BEH Budget	Notes
1	**General Requirements**			
1	Mobilization: material cost for sheds	1,400	1,400	Assume same as past Habitat projects
1	Recurring			
	porta-potty	960	-	
	dumpster - recycling fee	430	200	
	site power (electricity, gas for generato	450	200	
1	Construction services, approvals			
	design and construction oversight	4,500	2,000	
	permits	3,580	1,800	Pro-rated on size
	equipment purchases & rentals	250	100	
	Energy Star certification	620		
	Miscellaneous	400	100	
	Total Div 1 - General Requirements	**12,590**	**5,800**	
2	**Site work, including permits**			
	remove trees and stumps	4,000	500	#1– Assume clear site
	Dig and backfill foundation; dig and install 'SonoTubes' on 'Bigfoots'. For shed support concrete piers	6,000	1,000	#3– Excavated holes to received Sonotubes on 'BigFoot' (21 total)— Assume backhoe with 30" bucket and operator for 1 day supported by Habitat volunteers
	sewer and water connections into street	7,000	7,000	
	fill for inside & outside foundation	2,000	Not Applicable	
	grade property to site plan specs	4,000	500	No disturbance to be ameliorated
	blacktop apron, gravel driveway and parking	3,150	3,000	
	loam, seed and hay mulch disturbed areas	2,200	-	Limited or no site improvement
	tree and shrub planting	300	-	Limited or no site improvement
	Total Div 2 - Site Work	**28,650**	**12,000**	
3	**Concrete**			
3	Foundation & Slab	8,000	700	#3– 21 Concrete piers(10" diam. Sonotubes and 'BigFeet') poured insitu; (2+ CY of concrete)
	Tota Div 3 - Concrete	**8,000**	**700**	
6	**Wood & Plastics**	-		
6	Rough carpentry	11,000	4,000	#3– Includes framed floor deck on piers; #4– No trusses; structural ridge and 2x12 SPF rafters; #10– fewer interior partitions
6	Interior Trim	1,200	750	#10– fewer interior partition walls = less trim
6	Kitchen & Bath - cabinets & counters	3,500	2,000	#5– Open shelves and pantry in lieu of upper cabinets
	Total Div 6 - Wood and Plastics	**15,700**	**6,750**	
7	**Thermal & Moisture**			
7	Roofing and sealing	6,500	2,200	#2– 32' x 16' x 2 + shed = 1080 s.f. roof area
7	Gutters	1,000	-	#14– No gutters
7	Exterior siding and trim	3,500	2,500	#2– 8' exterior walls w/ 10:12 pitch roof = 1,000 s.f. siding
	Insulation — rigid	-	2,000	#6– Insulation donation OR 2,000 s.f. of salvaged 3" thick paper-face insulation @ $... Per s.f; #7– overlay wall sheathing (and maybe roof plane) with rigid insulation

Division	Description	Amherst Per Unit	BEH Budget	Notes
7	Insulation — Blown in	6,000	1,000	#8– Use Habitat labor to blown in cellulose in much simpler envelope
	Total Div 7 - Thermal & Moisture	**17,000**	**7,700**	
8	**Doors & Windows**			
8	Windows	4,500	3,000	#9– Fewer, larger windows — and use casements Budget = 100 sq. ft of window at $30/s.f. of R.O.
8	Exterior doors	2,000	1,200	Assumes that a single exterior door is code compliant for a small house
8	Interior doors	1,600	400	#10– fewer interior partitions (= fewer interior doors)
	Total Div 8 - Doors & Windows	**8,100**	**4,600**	
9	**Finishes**			
9	Drywall			
	materials	1,500	800	#10– fewer interior partitions walls
	GWB hanging		1,000	#10– fewer interior partitions walls
	GWB Taping	4,000	1,500	#10– fewer interior partitions walls
9	Flooring	2,500	1,500	#13– Use painted plywood overlay floor in loft; 600 s.f of CoreMax and contributed ceramic tile in bathroom
9	Interior & Exterior Painting	1,000	400	
	Total Div 9 - Finishes	**9,000**	**5,200**	
15	**Mechanical - Plubming & Heating, including permits**			
	HVAC - mini splits and vent fans	3,100	3,000	#11– single port Fujitsu
	Plumbing supplies (for Smith Voc. Student plumbers)	4,500	2,800	#2– one bathroom only; plumbing clustered; #3– no sub-slab piping
	Total Div 15 - Mechanical	**7,600**	**5,800**	
16	**Electrical**			
	materials	2,500	1,000	#10– fewer interior partitions = fewer lights & switches and
	fixtures	500	350	
	subcontractor	5,500	3,000	#12– 100 Amp service
16	WMECO hookup	750	750	
	Total Div 16 - Electrical	**9,250**	**5,100**	
		-	-	
	Total Direct Construction Costs	**115,890**	**53,650**	

Strategies for achieving a $50"K Habitat construction budget.

1. Assume a clear site:

2. Create a small, rectangular plan 22' wide by 30' long:
   a. Steep pitched roof (10:12) with insulation and air barrier in roof plane — so that a small loft can be added at one end.
   b. A porch/enclosed shed at one gable end — making the volume 38' long.
   c. Optional "bays" to hold/locate key functions in the large volume (I show one for the bedroom below).
   d. One bathroom only — with plumbing fixtures clustered together.
      (no sub-slab plumbing, but there will be a heated – with a light bulb – pipe riser space from the grade level up to the floor level).
   e. One exterior doorway only.

3. Found the building on concrete piers — those piers being 10" diameter Sonotubes with 'BigFoot' splayed bearing pads. Excavation to be by small backhoe with a 30" wide bucket. Such a machine with an operator for a day will cost $1,000 and I am assuming that two or three Habitat volunteers can work with the professional operator to place the pier forms level and true using a laser device provided by the excavator.

   Framed first floor deck (22' long continuous 9 ½" I-Joists) supported on beams (triple 2 x 8) spanning 8' between each line of piers

4. No trusses; use a structural ridge beam (double 1 ¾" x 11 7/8" deep LVL (*to be confirmed*) and 2 x 12 SPF (or I-Joists if we can get a good enough deal) rafters spanning from wall to ridge. There would be a post coming down somewhere in the vicinity of the kitchen counter.

5. Open shelves in a pantry in place of upper cabinets in kitchen.

6. Rigid insulation, 2" (or 3") thick "wrapped" over exterior wall (and maybe the roof planes and under framed floor if we can manage it — depends upon donations). Use salvaged polyiso. roof insulation if the donated material from Dow is not available.

7. Fill rafter cavities with blown in cellulose.
   Create a continuous air barrier by "flash" foam spraying the rafter pockets above the exterior wall to seal the underside of the roof sheathing to the wall top plate.

8. Use Habitat labor to blow in the cellulose insulation in what is a much simpler envelope.
   (Depends on what the "regular" volunteers worker think about this — they/we might hate the idea!!)

9. Use fewer, but larger windows.
   (I have been advised that 4'x4' is the most cost effective glass size).
   Use some fixed glazed windows — say as a high-lite ribbon in the gable end of the living area.

10. Use fewer interior partitions.
    Fewer partitions means fewer doors, less baseboard and casing trim, fewer light fixtures and switches, and a simpler heating/cooling system.
    Position the enclosed bathroom to create semi-enclosed spaces to either side, then use furniture, screens, plants, curtains — (and later partition installations by the Owner if necessary) — to achieve the required level of privacy/enclosure.

11. Use a single port ASHP device as the sole heating/cooling unit — a single , interior, wall-mount cassette linked to a single outdoor compressor/condenser unit. A relative absence of partitions will enable this simpler system to function satisfactorily.

12. 100 AMP electrical service.

13. Use painted overlay plywood for loft level finish flooring.