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**Executive Summary**

Open Source Ecology (OSE) is committed to removing the barriers to replicating civilization. In pursuit of this mission, OSE is creating open source hardware. Tangential, but necessary to the current mission and future collaborative barrier scaling, is the construction of a microhouse. The current need is derived from OSE’s goal to stabilize by establishing permanent houses. The future need is related to civilization replication. Microhousing is a reoccurring if not constant demand; see hurricane Katrina, Tōhoku earthquake and tsunami or the growing populations of India and China.

The proposed microhouse is intended to minimize budget and resource demands by maximizing design simplicity and use of current available resources. Structural strength for climate and topography are priority in design. Second to structural strength is function and comfort. Minimizing the budget is a constant objective, requiring quantitative, qualitative and subjective reasoning throughout the build.

**The Problem**

The barriers to home ownership are great. Access to building machines, tools, materials and knowledge is specialized and expensive. Using the current OSE prototypes, the labor of 12 people over 2 day increments and collaboration caveated with frugality, produce a microhouse. These parameters develop OSE’s open collaboration processes, while benefiting the current goal to stabilize and the future mission to replicate civilizations.

**Scope**

1. Build a microhouse – single person studio size house complete with a modular bathroom and kitchen components. First priority is structural integrity. A close second is function and comfort.
2. Use the following resources
   1. OSE prototypes
   2. Open source collaboration and genius
   3. Naturally present or pre-existing resources located on or near Factor e Farm – withstand from using uncommon or costly resources, as this build aims to be globally replicable
   4. Reused and recycled building and construction materials
   5. Wooden framing (for insulation and possibly roof)
   6. Modular bathroom and kitchen
   7. WikiHouse Roof
   8. 12 people in 48 hour time blocks
   9. Miscellaneous (relatively accessible) building materials and supplies: nails, hay, rodent repellent, gravel, concrete, screws, moister barriers, level, plumb lines, foundation insulation, drywall, stucco.

1. Fiscal responsibility (budget) – Labor and convenience are the most significant sources of increasing costs. As previously noted, use of volunteer and stakeholder labor offsets cost increase due to labor. The cost of convenience is mitigated through research and education, particularly regarding local and shippable resource pricing trends.

**Project Management**

**Tasks and Resource Allocation**

With the objective outlined, the construction manager must define all necessary tasks to accomplishment. It is necessary that tasks are separated into dependent timelines. This allows for independent tasks to be worked in parallel, possibly condensing the timeline. Once the 1st tier tasking is divided, sub-tier tasking is created as needed. The entire project timeline is dependent on the longest tasking sequence.

Recognizing which tasks can be conducted in parallel is only the first step. The construction manager must then identify the resources needed to complete each task. This includes labor.

With resources assigned, the construction manager is able to assign start dates to each sequence in a manner to optimally allocate resources. Resource allocation is the primary driver of timelines. It is essential that the construction manager maintain foresight and oversight.

1st Tier Tasking recommendation:

1. Source WikiHouse roof materials
2. Source bathroom and kitchen modules
3. Source windows/doors
4. Dig foundation trenches
5. Dig well connection trench and lay pipes
6. Frame foundation trenches
7. Pour footing and flooring concrete
8. Build CEB walls
9. Build WikiHouse roof modules
10. Attach WikiHouse roof modules
11. Build bathroom modules remotely
12. Connect to well water source
13. Trouble shoot water
14. Build kitchen modules remotely
15. Install bathroom modules
16. Install kitchen modules
17. Stucco exterior
18. Frame interior (2 x 4)
19. Install water pipes and electrical
20. Install interior
21. Drywall interior

Using a Gantt chart, the construction manager is able to track scope, resources and timeline. Microsoft excel provides access Gantt chart templates for building and maintaining project control.

**Timeline**

The timeline is subject to some externalities. However with early identification of issues, mitigation is likely. Acquiring budget conscious resources, particularly windows and doors, is dependent on local reused and recycling distribution centers. If the required materials are not sourced locally, then remote warehouses may be able to provide the materials at a lessor cost (shipping included) than newly purchased items. However, if shipping negatively impacts the entire timeline, then new, low-cost windows or doors may be the best solution.

The second timeline factor is access to building inspectors. It is important to verify quality of construction to ensure building code and safety is met.

While externalities are often negatively impacting to the timeline, the construction manager can re-work the initial Gantt chart to mitigate setbacks.

**Budget**

Building-Cost.net provided an estimated building budget using inputted parameters specific to the design. See Appendix A. Refer to Katie Log for inputs used.

It is imperative that this budget be used as a theoretical estimate. Quick computing subtracts $10,000 associated with labor costs, reducing the estimated budget to $13,000. This is a mundane approach, but significantly useful in preliminary planning and estimation.

While execution of the build is the only approach to nailing down the exact budget, the ability to accurately estimate the budget is a capability necessary to OSE’s current and future operations. Various budget estimation methods must be tried prior to commencing. Without preforming budget estimates, the project’s success cannot be measured.

**Communication and Coordination**

While communication of progress and problems is critical, communication of tempo and culture are particularly significant to this project. Tempo is controlled by the construction manager’s capacity to ensure timeline accountability. Culture influences the processes by which an organization achieves objectives. Because OSE is stabilizing, this project’s culture will have lasting influence on OSE processes.

Due to the large number of remote and onsite contributors, communication on multiple platforms is needed. AM and PM Factor e Farm meetings should be held daily during project build days. Minutes transmitted directly onto an online discussion platform will provide documentation, monitoring and collaborative solutions. The documentation lead is responsible for this function.

Key stakeholders responsible to connect on all communication platforms:

1. Founder and Director
2. Operations Officer
3. Remote collaborators
4. Construction manager
5. Weekend teams
6. Documentation Lead

**Conclusion**

The electrical source is a major issue left unresolved. A detailed cost benefit analysis is essential to determine whether off-grid sources are a feasible option. Initially, connecting to the grid is probably the cheapest option to support current needs. On the other hand, development of open source off-grid energy solutions aligns with OSE’s overarching mission.

Katie Log provides detailed concerns and considerations regarding the design methods and materials used; foundation, drainage, septic, floor plan, sourcing and orientation are more robustly defined. Both Katie Log and the proposed project plan summary are intended to provide scope, building parameters/means and project management overview.

To move ahead, I recommend finalization/approval of tasks and the construction of a detailed Gantt chart for the purpose of providing a strong timeline and resource allocation assessment. **References**

*Free Residential Building Cost Calculator. Building-Cost.net.* Craftsman Book Company, 2004. Web. 18 Mar. 2013.

Whitman, Katie B. "Katie Log." Web log post. *Open Source Ecology*. MediaWiki, n.d. Web. 19 Mar. 2013.

**Appendix A:**

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| --- | --- |
| Estimated building costs for this microhouse using Building-Cost.net | |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Item Name** | **Material** | **Labor** | **Equipment** | **Total** | | Excavation | -- | 211 | 69 | 280 | | Foundation, Piers, Flatwork | 549 | 714 | 140 | 1,403.00 | | Rough Hardware | 84 | 109 | 22 | 215 | | Masonry Frame | 2,860.00 | 3,261.00 | 231 | 6,352.00 | | Insulation | 519 | 294 | -- | 813 | | Exterior Finish | 1,021.00 | 493 | 72 | 1,586.00 | | Exterior Trim | 64 | 83 | 16 | 163 | | Doors | 162 | 113 | -- | 275 | | Windows | 279 | 157 | -- | 436 | | Finish Hardware | 27 | 19 | -- | 46 | | Garage Door | -- | -- | -- | -- | | Roofing, Flashing, Fascia | 940 | 653 | -- | 1,593.00 | | Finish Carpentry | 98 | 411 | -- | 509 | | Interior Wall Finish | 473 | 604 | -- | 1,077.00 | | Painting | 282 | 546 | -- | 828 | | Wiring | 287 | 448 | -- | 735 | | Lighting Fixtures | 215 | 56 | -- | 271 | | Flooring | 268 | 314 | -- | 582 | | Carpeting | 532 | 157 | -- | 689 | | Bath Accessories | 132 | 67 | -- | 199 | | Shower & Tub Enclosure | 84 | 58 | -- | 142 | | Countertops | 201 | 139 | -- | 340 | | Cabinets | 661 | 172 | -- | 833 | | Built In Appliances | 322 | 37 | -- | 359 | | Plumbing Rough-in and Connection | 302 | 606 | 45 | 953 | | Plumbing Fixtures | 613 | 161 | -- | 774 | | Heating and Cooling Systems | -- | -- | -- | -- | | Unit Heating and Cooling | 566 | 849 | -- | 1,415.00 | | Fireplace and Chimney | -- | -- | -- | -- | | **Subtotal Direct Job Costs** | **$11,541.00** | **$10,732.00** | **$595.00** | **$22,868.00** | | Final Cleanup | -- | 110 | -- | 110 | | Insurance | 768 | -- | -- | 768 | | Permits & Utilities | 466 | -- | -- | 466 | | Plans & Specs | 110 | -- | -- | 110 | | **Subtotal Indirect Job Costs** | **$1,344.00** | **$110.00** | **--** | **$1,454.00** | | Contractor Markup | 3,428.00 | -- | -- | 3,428.00 | | **Total Cost** | **$16,313.00** | **$10,842.00** | **$595.00** | **$27,750.00** | |