Arch 384 F04 Competition Elective
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Strategies for Change
Challenges to Industry

The design assignment of the Cradle to Cradle Home Competition has at its focus the application of the ideology described in the book *Cradle to Cradle: Re-making The Way We Make Things*. The theme of the competition is to test various ideologies against real home design for specific sites in Roanoke VA.. The core ideology takes the position that "waste" is a culturally learned phenomena and is unknown in nature. Current models for sustainability do not eliminate the concept of waste; current models focus on the "acceptable" waste management with variations on strategies of efficiency. There is no true recycling, just down-cycling whereby a product is reused by degradation into something else. This degradation of material in current recycling systems, still, in the end, generates "waste". The ultimate goal is to eliminate the concept of waste by a housing system that is modeled on a natural system. This is in contrast to the current housing system that has as its end cycle the local C&D landfill. It is this confinement of limited natural resources to landfills that defines "waste".

The design challenge, then, is to start the process of change for housing with waste as an end cycle to housing that has no waste as the end cycle.

The design must invent strategies of effectiveness that are within the context of existing conditions. The proposed home, if it is to gain acceptance, must house the modern lifestyle. It must be a home that is a machine for modern living that consumes yet does not discard resources.

Current market driven mass housing production methods do not have an end cycle other than a landfill. A possible key reason for this is that post-use material separation and disassembly cannot be done cost effectively. Housing today is not built to be easily modified, repaired, or adapted; most houses are site-built. This allows for custom everything. There is little standardization of assembly and the fastener of choice (the air-driven nail or staple), is not easily removed. To keep housing material out of the landfill (to generate no "waste"), the opposite must be true. All housing material must be able to be cost-effectively, completely separated for re-use. Material separation (and easy disassembly) would allow for repairs, modifications, and material re-molding. In order for re-use to be feasible, a material taken from one location must fit into another location. This concept has implications for standardization. In order to fit the context of the modern lifestyle, the standardization cannot be of a scale to produce cookie cutter houses that have no personalization possibilities. I would suggest that standardization should occur at the "chunk" level allowing for differences by operating within an over arching framework. For this design, I propose a 4 ft. x 4 ft. grid as the over arching framework with a secondary 16 in. o.c. grid overlay. This dimensional scheme would require the least industry re-tooling. Currently excepted panelizing construction methods could easily be modified to this new uniform standard. This standardization should, in turn, make the modern lifestyle home more affordable[1].

Consider a typical 2 ft. x 6 ft. wood exterior wall as an illustration of this process.

The typical 2 ft. x 6 ft. wood frame wall as a building enclosure type fulfills the functions of a building enclosure in the following way:

[1] The housing industry is one of the few industries left that has not been industrialized fully. Production techniques in many ways have not changed from the one off prototyping that has characterized house building through the ages.

1. Support function provided by 2 ft. x 6 ft. wood members nailed together.
2. Thermal control function provided by fiberglass batt insulation fit into cavities of odd sizes.
3. Air intrusion control provided by plywood sheathing nailed 8” o.c. to framing.
4. Water intrusion control provided by an exterior facing that is built up of many small individual pieces (siding), all mailed to the sheathing.
5. Finish function (on interior) provided by gypsum board that has all the fasteners covered and easily breaks with handling.
6. Distribution function provided within wall cavity, totally inaccessible.

All of the components assembled to fulfill the building enclosure function are fastened together. They are fastened in such a way, assembled in such a way, that disassembly is not practical. The end result is no re-use, just “waste”.

The same exterior wall building enclosure functions can be achieved in the following way:

1. Support function provided by hybrid “post and beam” 4 ft. o.c. wood frame with exposed standardized metal connectors.
2. Thermal control function provided by an insulating panel (4 ft. wide) that is placed exterior to the frame with removable fasteners.
3. Air intrusion control function provided by a wood sub-framing of salvaged (re-molded or down cycled) wood framing (a 2 ft. x 2 ft. will span the 4 feet) covered with a 4 ft. wide sheathing.
4. Water intrusion control function provided by 4 ft. wide panelized facings of various materials with gasketed joints.
5. The finish function (on interior) provided by leaving the wall assembly exposed in most cases (wood post and beam framing is an enhancement in our current housing market).

6. Distribution function provided outside and independent of wall assembly. This would facilitate repairs and modifications to the key components of a house that are currently the most repaired and modified components in our current housing market.

The whole assembly could be easily disassembled, the material re-used. Unique conditions such as windows and doors could be pre-installed in 4 ft. wide modules ready to be inserted into the overall framework.

In conformance with the concept of adaptability and re-use, interior partitions would be non-load bearing. They would be located on the 4 ft. x 4 ft. grid or 16 in. o.c. sub-grid and could be pre-assembled panelized "chunks"[2]. They could also be individualized with re-molded, salvaged material as need or want determines to enhance individuality in support of the modern lifestyle. The proposed floor plans of the house verify that a floor plan in support of the modern lifestyle can occur within such a framework.

The over arching structural grid concept does not negate the need for the use of other accepted current sustainability concepts. Orientation, mild climates, overhangs, thermal mass, direct and indirect solar gain, natural ventilation, all have a role to play. It is the stated aim in the competition to "encourage the adoption of technologies that glean energy from the sun in clean and abundant forms"[3]. The proposed house form, as shaped within the 4 ft. x 4 ft. grid, accommodates all of these concepts. The design as presented would be able to heat and cool with natural forces 96% of the time. This performance is based on modeling the house in software for this specific location.[4] They are included in the proposed design to demonstrate that their

[2] The concept of standardized "chunks" produced after an industrialized model was extensively presented at the Fabrications Conference hosted at the University of Waterloo School of Architecture as the next logical progression in building technology.
[3] Although the main ideology of the Cradle to Cradle book centers on materiality, the competition parameters have been broadened to include any and all sustainability concepts
[4] Ecotect ver5.2 was used for the simulation

inclusion would not radicalize the plan to the extent that the home would be unmarketable. The home as proposed would fit the current context, local zoning[5] and the modern lifestyle[6]. The radical part of the design (changes in assembly methods and choices of materiality) would only be realized by a change in the mass housing construction industry to standardize "chunk" production[7]. It is the hope of this designer and the design competition organizers that the challenge can be taken up by a market driven industry to establish standards and produce the components. Standardization would be the lynch pin of the change towards affordable, truly sustainable housing.

[5] the selected site (tax parcel 2021743) is in zone designation RM-2 which results in a 40 ft wide by 67 ft deep maximum buildable footprint

[6] the space requirements as stated in the competition include 2 full baths and 3 bedrooms. To this the design added a half bath on the main floor and a 2 car attached garage accessible from a rear lane

[7] Simpson Strong Tie has just launched a new series of standardized fasteners for post and beam construction