Product and Process

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PeaPod Homes

I would like to define prefab simply as materials or groups of materials and processes that facilitate design and construction with the intentions of building a superior product, using superior and more appropriate materials, and controlling costs of both design and construction. There are many, varied models of prefabrication throughout the twentieth century that have attempted to work toward these goals. I would like to touch on some models that examined materials, the sociology of home, building systems, production and salability; models that have informed the attitude my office Lugosch Architect, Inc. brought into our work with prefabrication through PeaPod Homes (PeaPodHomes.com).

In the early twentieth century, Thomas Edison turned his attention to prefabrication as a means to address a housing shortage. For Edison, this was an exploration of concrete as material and process. Devising a single pour system, the concrete house was formed from foundation through roof and poured from the ridge of the structure. (Fig. 1) The windows, doors, and finishes were applied after the concrete set. Not surprisingly, problems developed. The series of pours formed striations in the concrete with resultant cracking. This cracking and perhaps the oddity of these buildings resulted in limited customer adoption. Few were built; however, this investment into the exploration of an alternative material remains significant. Edison’s concrete houses are precursors to precast concrete systems seen in work such as Moshe Safdie’s Habitat 67 in Montreal, Canada.

The explorations of Buckminster Fuller were inspired by a lifelong commitment to the environment and to making a difference. Fuller, a brilliant non-conformist, seemed without particular direction or ambition as a young man. Following the death of his daughter, for which he blamed himself, Fuller dedicated his life to “an experiment, to find what a single individual [could] contribute to changing the world and benefiting all humanity.”

Fuller pursued a completely unique system-based design that thoroughly and holistically integrated a flexible, modern program, with building structure, heating, cooling, ventilation, building sanitation, rain water collection, bringing together resources and materials, fabrication and assembly. The design for the DYnamic MAXimum TensION, or Dymaxion, House merged a central, umbrella-like steel structural system with a convection driven mechanical system. (Fig. 4-6) The enclosure material, aluminum, was selected as a lightweight, high strength, highly durable material — properties thought to offset the initial costs. Although popular response was reflected in some 30,000 requests for Dymaxion Houses, Fuller was never able to raise the funds needed to bring these houses to market.
The Charles and Ray Eames House was based on the integration of a sociological study of family systems and the economic system of materials and production. (Fig. 7) Case Study House No. 8, designed to meet the needs of a family to live, work and entertain, was built of off the shelf parts from steel fabricator catalogues. The house, a highly successful home and office for the Eameses throughout their lives, was filled with life and the artifacts of living and working, a counterpoint to the sterile, white architecture of the time. It was a reflection of the study of family and the real family of the Eameses, defining a live-work program still viable in contemporary residential design. Additionally, the Eames house developed an attitude toward construction based on available, off the shelf materials, an ongoing direction of architectural investigation. (Fig. 8)
Sears and Roebuck mission was to develop technologies and methods that would allow them to offer a large number of homes to the American public. Their interests were not to celebrate systems of fabrication but rather to use technologies of prefabrication to produce safe, sturdy, well designed homes. Through mass production of easily assembled parts, they were able to lower purchase costs and shrink construction time. (Fig. 10, 11)

Attributed to their legacy is the development and popularization of what are now common materials and practices such as drywall sheathing, asphalt shingles, balloon framing, central heating, and indoor plumbing.

Another vein of prefabrication is defined by Sears and Roebuck Catalogue Homes. The
By the end of their 32 year history from 1908 to 1940, Sears and Roebuck produced 447 different house models that varied in expense and were designed to meet local climatic and stylistic conditions. Over 70,000 Catalogue Homes were sold in North America before the company’s downfall, brought about by payment defaults that accumulated throughout the Great Depression.

If we fast forward to our current housing situation, we can easily identify a drift toward house as status symbol: bigger, fatter, more expensive; McMansions. The renewed investigation of prefab is a resounding retort, working to develop an alternative to this aberration of home, to develop a response that will extract ideas from these and other precedent prefabrications that will take into consideration lifestyle, cost, materials, and sustainability.

My efforts in this direction are through the design and production of PeaPod Homes. PeaPod homes have been generated through the work of a partnership that has included Van Krzywicki, Business Manager, Mark Rittle, Sales and Production, and Lugosch Architect Inc., Design Team.

I fear that in the design profession we often eschew the business component of our work. If one is looking at prefabricated homes as a response that embodies the mission of transforming the construction of homes, overtaking trends to energy and land gobbling houses, then market and salability must be considered as a significant part of design. We defined our buying market: the NPR crowd; a thinking crowd, a step to the side of main stream. We researched real estate marketing reports to identify programmatic elements of our house designs. One trend noted was the tendency of families to change homes and neighborhoods as their housing needs shifted over times in response to changing family constellations: a couple, a family with children, empty nesters, in-law or family dependents, caretaker apartment, live/work studio. We determined to bring the potential for expansion, change and division into the base design of PeaPod Homes. We also made a very clear decision to design a house that would fit comfortably within an existing neighborhood, using imagery that is reminiscent of an American farmhouse. (Fig. 12, 13) And from the start, our goals included the reach to Zero Net Energy and LEED Gold.
optimum performance and control of the construction dollar. We also paid close attention to build-ability. For these houses to meet the criteria of market acceptability, they need to be easily built. The package that we have designed will deliver all major structural, passive mechanical and enclosure components to the site for field assembly by a certified SIP contractor, giving the finish work to a local contractor of the client’s choice, thereby assuring the homes will meet the defined performance criteria and also provide local employment.

Fig. 14. Building Systems Computer Model. (Lugosch Architect, Inc.)

Fig. 15. Summer Solar Study. (Lugosch Architect, Inc.)

Fig. 16. Winter Solar Study. (Lugosch Architect, Inc.)
Critical to the success of the endeavor of prefabrication is the integration of design and production, the movement from CAD to parametric software and Building Information Modeling. Hernan Barufaldi, Lugosch Architect Inc., directed the integration of BIM technology into our parametric CAD explorations. BIM is a critical tool that advances our reach as architects from merely designing a building into the specification and value engineering of materials and the sequence of production. This is essential to the development of prefabricated housing. BIM has given us the ability to work closely with our selected manufacturers and to meet our stated design criteria of customizing homes in response to client programmatic and site needs. BIM truly revolutionizes our ability as architects to amplify our reach with the result of a more coherent and streamlined design, production, and construction process. Barufaldi also spearheaded the development of our web presence, developing a critical marketing tool — baseline for the dissemination of product information. (Fig. 20, 21)

There is, however, one aspect to a deeply research based endeavor that must be noted: the upfront efforts require a significant commitment of time and office resources. This has been a tremendous investment for Lugosch Architect, Inc., and for Pea Pod Homes, beyond what we had budgeted at the start of the project. We hope to offset these upfront costs...
through the sales and production of our homes, but I caution that this kind of speculative work, especially in today's market, should only be undertaken by those who are wildly, maybe even blindly, and hopefully not foolishly, optimistic.

Fig. 20. CAD Documentation. (Lugosch Architect, Inc.)

Fig. 21. CAD Documentation. (Lugosch Architect, Inc.)