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The 194x House: Economy, Efficiency, and Prefabrication

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Abstract

The Second World War transformed Florida residential architecture in the 1940s through the development of new technologies: prefabrication, material innovations, increased industrial production, innovations in lighting, and improvement in thermal comfort design. These technological advancements combined with budget constraints and cultural shifts from the Second World War called for a national dialogue to define what was the ideal postwar home. Architects faced tension between the mass-production and individualization of houses in the efforts of planning a house within limited budgets. Thus, the planning of the 1940s Economy House was introduced to address the competing requirements of standardization and customization. Through examining the September 1942 issue of the trade journal the Architectural Forum dedicated to the ideal postwar house or 194x house, this paper looks at how prefabrication and the individualization of homes were able to work together to create the ideal "economy home". The editors of Architectural Forum, posed a key question for architects and construction professionals: "How can the House of 194x be made the most-wanted commodity in the competitive postwar marketplace" (The Editors, 1942)? The war's rapid technological advancements led the editors of Architectural Forum to conclude that the tension between the mass-production and customization for individual needs would be a key determinant of residential architecture after the war. The technological developments, coupled with the emerging financial constraints in home ownership resulted in a national dialogue on the 194x house. Thirty-three designers presented proposals for the ideal House of 194x in the Architectural Forum September 1942. This paper examines how these designers resolved the conflict between prefabrication and individualization of homes to create the ideal "economy home."

Keywords: Economy house, prefabrication, mass-production, customization, postwar house

Introduction

The September 1942 issue of the trade journal the *Architectural Forum* was dedicated as a special issue to the ideal postwar house, called the 194x house. The editors of *Architectural Forum*, posed a key question for architects and construction professionals: "How can the House of 194x be made the most-wanted commodity in the competitive postwar marketplace" (The Editors, 1942)? During the war the rapid advances—in the areas of prefabrication, new materials,

industrialized construction processes, lighting, and thermal-comfort design—led the editors of *Architectural Forum* to conclude that the tension between the mass-production and customization for individual needs would be a key determinant of residential architecture after the war (The Editors, 1942). The technological developments, coupled with the emerging financial constraints in home ownership resulted in a national dialogue on the 194x house. Thirty-three designers presented proposals for the ideal House of 194x in the *Architectural Forum* September 1942. This paper examines how these designers resolved the conflict between prefabrication and individualization of homes to create the ideal "economy home".

In a memo to the designers, who submitted proposals for the 194x house, the *Architectural Forum* asked the participants to propose new ideas in areas of five categories: 1) planning of the prefabricated house 2) kitchen efficiency 3) bathroom design 4) maximizing storage 5) reconceptualization of the living room (The Forum's Editors, 1942). These categories were selected because the *Architectural Forum* editors predicted that: one, the 194x kitchen would not only achieve higher levels of efficiency through mechanization of labor with gadgets, but also be standardized and mass-produced as one single unit; two, the bathroom would become one unified unit and be prefabricated with the availability of non-ferrous metals (aluminum, monel metal and others), vitreous enameled iron and steel, and ceramics fixtures; three, efficient storage would be the hallmark of the 194x house; four, with cultural shifts after the war and increased leisure time, the living room would serve multiple functions that ranged from informal family living to formal hosting of guests, which were often difficult to reconcile; and five the use of new materials, advanced acoustics and lighting, and better articulation of space would make it possible to design multipurpose living rooms (The Forum's Editors, 1942).

In response to solutions that allowed for negotiation between prefabrication and individualization, designers submitted proposals for homes; mass-produced building components; mechanical systems; interior partitions; gadgets; specific room plans such as the bedroom, kitchen, bathroom, and the living room; and strategies for cost-cutting. The proposals for complete houses included:

No.	Designer and Product	Technologies	Intent
1.	Victorine and Samuel Homsey (Homsey and Homsey, 1942)	Movable Interior Partitions	Flexible space and overall economy
		Soil Stabilization technologies	Foundation Cost Saving
	Prefabricated house	Prefabricated Panels	Modular Construction
2.	Joseph Amisano (Amisano, 1942)	Mass-Produced Concrete Components	To create a system of components that would be used for a completely prefabricated house
	Prefabricated Row-Type Apartments	Mechanical Equipment	Mechanization of thermal comfort
3.	Walter Bogner (Bogner, 1942)	Groundwork	Streamlined workflows of prefabricated construction
		Shell assembly	
	Systemization of Prefabrication	Installation Units	
		Accessories	
4.	Paul Thiry (Thiry, 1942)	Prefabricated Piers	To diminish foundations, reduce ground coverage and eliminate below-grade rooms. Raising the living floor increased the apparent size of the house while providing views and privacy. Sheltered areas for play and car parking are created without additional construction.
	New type of house elevated on piers	Prefabricated Mechanical Units	Used as interior Partitions
		Prefabricated Construction Components	Overall economy
5.	Charles H. Warner Jr. (Warner Jr., 1942)	Construction components designed for assembly, disassembly, and reassembly	Mobility. Reuse.
	Prefabricated and Demountable House		
6.	Ralph Rapson and David B. Runnells (Rapson and Runnells, 1942)	Insulated “Roll Fab”	Akin to a camping tent; Used for Mobility, experimenting with new materials, and thinking of a new type of house
7.	Peter Blach and George Daub (Blach and Daub, 1942)	Steel Columns and Beams	Completely standardized housed in a two- story steel box, allowed for truly industrial methods

		Mechanical components	Separation of mechanical components and living spaces
8.	Morris Ketchum, Jr. and Jedd S. Reisner (Ketchum Jr. and Jedd S. Reisner, 1942)	Open Compact Plan	Idea for an open plan house without partitions into a single integrated unit
	Prefabricated House		
9.	Alfred Kastner (Kastner, 1942)	Structural Glass for frameless doors and windows	Economy of materials
	Prefabricated House	New Plastics for floor and wall surfaces and structural components	To find solutions to material shortages
		Packaged bathroom as a separate sanitary unit	Prefabrication to save costs
		Plywood and Glued Construction to build inexpensive shells	Material economy and flexibility
10.	Louis Skidmore, Nathaniel Owings, and John Merrill [SOM] (Skidmore, Owings, and Merrill, 1942)	Outer shell with an open plan house	Highest possible customization to suit individual needs
	Prefabricated House	Modular interior walls	
11.	Alfred Shaw and Ray Stuermer (Shaw and Stuermer 1942)	Concentration of mechanical services along outside walls	Flexibility of interior spaces
		Outer Shell	Prefabrication and open plan
		Movable Partition Walls	
	Prefabricated Apartments	Non-load bearing Partitions	Flexibility of space
12.	Zareh Sourian (Sourian, 1942)	Prefabricated structural unit	Freedom to exercise one's expression in design
	Prefabricated Structural Unit	Modular Structure	Possibility to expand
13.	Richard J Neutra (Neutra, 1942)	New Material: diatomaceous earth	An idea for a house that would be completely prefabricated and made of diatomaceous earth
	Diatom		
14.	Edward D. Stone, J. Stanley Sharp, and Cope B. Walbridge (Stone, Sharp, and Walbridge, 1942)	Mass-Produced Utility Components	Intent that the plumbing and heating equipment are planned in a package separate from the main body of the house

	Combination of *in situ* construction and prefabricated components	Carpentry Roof Construction	For the roof to be dictated by climate, materials available, and desires of the owner
15.	Victor Civkin (Civkin, 1942)	Compact Plan	Economy of Space Provide more storage
	Prefabricated House	Mechanical Equipment and Appliances	Efficiency of kitchen chores
	Mass-produced kitchen Window Construction	Division of Window into two parts: vision and ventilation	Window design for better control of natural light, heat intake, and ventilation
16.	John Porter Clark and Albert Frey (Clark and Frey, 1942)	Prefabricated Floor Slabs Prefabricated Wall Units Prefabricated Glass Units Prefabricated Roof Units	Proposal for improving housing construction, shorten the time of building, will be more economical to build and maintain
17.	Samuel Marx (Marx, 1942)	Extruded Aluminum Construction	Proposal for the 194x mass-produced house for the average family Prefabricated column and beam construction
	Prefabricated House	Rolled Steel	Advancements in column and beam construction
		Plastics	Advancements in wall surfaces
18.	Gardner A. Dailey and Joseph Esherick Jr. (Dailey and Esherick, Jr., 1942) Movable Prefabricated House	Lightweight Construction	House designed for the moving population suited for any condition, can be shipped, and constructed anywhere
19.	Burnham Hoyt (Hoyt, 1942)	Heavy Curtains	Proposal for prefabricated house with new ideas for movable interiors partitions
20.	Douglas P. Maier and Emrich Nicholson (Maier and Nicholson, 1942)	Mass-produced shell Interior Components	Uses prefabrication as a tool for a practical and easily maintainable suburban house

21.	Raphael S. Soriano's proposal for a prefabricated mobile house on wheels. (Soriano, 1942)	Wheels	Ability for a mobile house on wheels for the ease of transportation and moving to a new location when necessary
	Mobile Prefabricated House	Cantilevered Roof	Folded back over central structure
		House Frame	Self-balancing and stable
22.	Paul. Laszlo (Laszlo, 1942)	Pressure-Molded Plastic	Design for a small house with large space for a Western climate built entirely of pressure-molded plastic
23.	Mario Corbett (Corbett, 1942)	Light-Weight Metal	To create a prefabricated light-weight metal house due to its durability and its ability for mass production

All the solutions presented for the 194x house addressed the question: how to create prefabricated components, or completely mass-produced houses that allowed for customization of interior spaces with economy and efficiency. The three recurrent themes in the above solutions were: flexible space, separation of the mechanical core and living spaces, and new materials.

Flexible Space: The Balance Between Prefabrication and Individualization

In order to allow for customization of the indoor spaces in the house, architects advanced the idea of flexible space with interior walls that were easily maneuverable. The three problems for creating flexible space for designers of the 194x house were—one, spatial; two, structural; and three, utilities. The spatial challenges in the creation of maneuverable interior walls were twofold—one, how to have partitions to accommodate homeowners' needs in terms of individual family sizes at the time that they moved into the house; and two, how to give homeowners flexibility over time to subdivide, or consolidate rooms to account for increase or decrease in the family size. The second problem in creating freely moveable partitions was that the interior walls in houses often contained structural elements such as columns and load bearing walls, which could not be easily demolished or relocated without compromising the structure of the house.

The final complication for designers of the 194x house with flexible space was that interior walls were often not just dividers between rooms, but also contained mechanical systems and utility components such as electrical outlets and wiring; heating, ventilation, and air conditioning (HVAC) system components; and plumbing fixtures and pipes. Thus, architects of the of the 194x house had to suggest solutions that allowed for interior walls that could be moved easily, without having to relocate mechanical and structural components.

movable space dividers.

In response to these challenges, architects Victorine and Samuel Homsey proposed a house as an outer shell with only one fixed interior partition, which concealed plumbing, while all other dividers were detachable (Homsey and Homsey, 1942). They proposed movable wheeled modular partitions of plywood panels on metal frames in heights of one, two, three, four, and seven feet (See Figures 1 and 2) (Homsey and Homsey, 1942). In order to address problems of utilities, the Homsey's proposed creative solutions—one, the heating system would be nested in the outer shell only; two, the electrical outlets were embedded in the partitions; three, the partitions could be left open or closed all the way up to the ceiling; and four, the space on top the partitions was designed to hold fluorescent light fittings, spot lights, and ventilation ducts (See Figures 1 and 2) (Homsey and Homsey, 1942). Thus, the Homsey's addressed all three problems of flexible partitions.

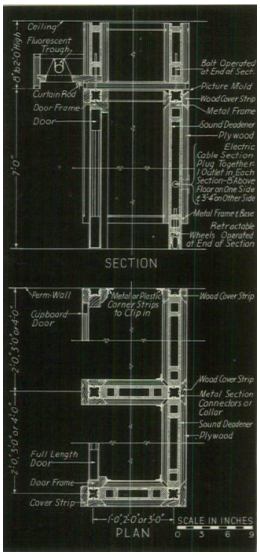


Figure 1: Plan and Section of movable wheeled modular partitions showing construction details by Victorine and Samuel Homsey
Source: Homsey, Victorine, and Samuel Homsey. 1942. "1: Foundation Saver, Prefabricated Parts." *The Architectural Forum* 77(3): 72.

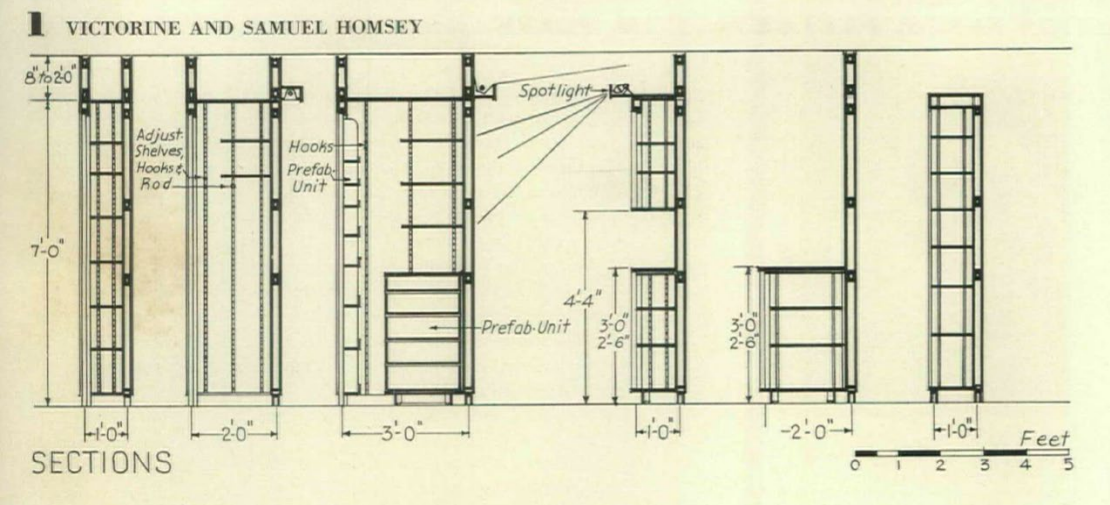


Figure 2: Section through modular partitions by Victorine and Samuel Homsey
Source: Homsey, Victorine, and Samuel Homsey. 1942. "1: Foundation Saver, Prefabricated Parts." *The Architectural Forum* 77(3): 72.

Like the Homsey's Fred J. Mac Kie, Jr. and Karl F. Kamrath, proposed movable space dividers, which would have a base with an electric outlet, indirect florescent lights on the top of the divider, provision for internal wiring for thermostats, standardized doors with interchangeable panels that could be removed to place doors, and sound insulation (Mac Kie, Jr. and Kamrath, 1942) (See Figure 3).

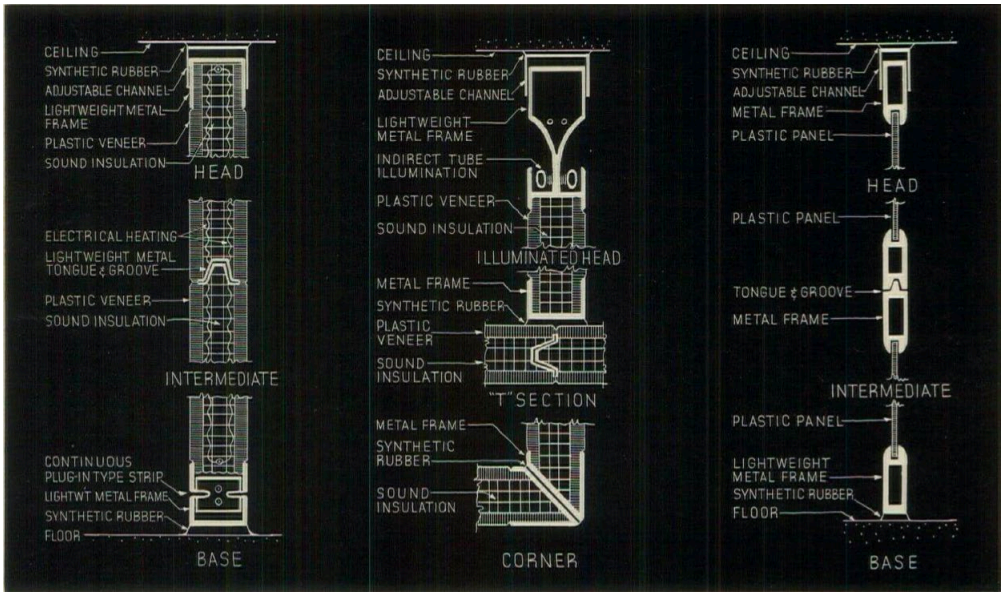


Figure 3: Movable Space Dividers by Fred J. Mac Kie, Jr. and Karl F. Kamrath
Source: Mac Kie, Jr., Fred J., and Karl F. Kamrath. 1942. "20: Movable Space Dividers." *The Architectural Forum* 77(3): 120.

To break away from the inflexible interior spaces of homes in the 1930s, architects Louis Skidmore, Nathaniel Owings, and John Merrill known as SOM, completely departed from obduracy of divided interior spaces (Skidmore, Owings, and Merrill, 1942). They proposed an open plan house akin to the open plan office, which would be roofed over with trusses to create a column free space. The open plan house is what they called a "rectangular space," which would be an outer prefabricated shell and mass-produced utilities, leaving the modular interiors to the individual owners (Skidmore, Owings, and Merrill, 1942) (See Figure 4).

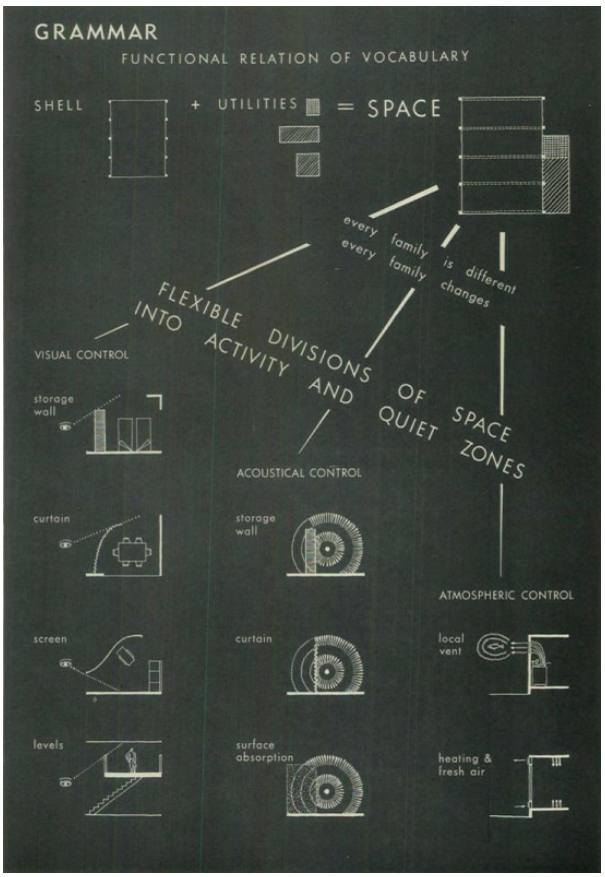


Figure 4: Grammar: Functional Relation of Vocabulary by Louis Skidmore, Nathaniel Owings, and John Merrill Source: Skidmore, Louis, Nathaniel Owings, and John Merrill. 1942. "12: Flexible Space." *The Architectural Forum* 77(3): 100–103.

separation of living spaces and the mechanical core.

These segregation of living spaces from mechanical components constituted the central premise in the design entry by Edward D. Stone, J. Stanley Sharp, and Cope B. Walbridge. However,

unlike Victorine and Samuel Homsey, they argued against prefabricated wall units. Their design was based on the premise that prefabricated components for utilities, appliances, and mechanical systems would be delivered to the site in the form of what they called a "mechanical core," which would have modular capacities based on the family size (Stone, Sharp, and Walbridge, 1942). The mechanical core would contain mass-produced kitchen and laundry appliances; and HVAC components such as the heating unit, water-heater, fans, and bathroom fixtures. In addition to the mechanical core, other prefabricated construction components included closets, doors, windows, and screens (See Figure 5). According to Stone, Sharp, and Walbridge, "The result of this concentration of a separate mechanical package is that the living unit, freed from plumbing and heating problems, is erected with comparative ease by local builders" (Stone, Sharp, and Walbridge, 1942). Their focus was on a system of building that could be modified based on individual tastes, technical know-how of the local construction labor, and available materials (Stone, Sharp, and Walbridge, 1942). Thus, the architects thought of the 194x house as a combination of prefabricated and *in situ* construction. They proposed that the economies of scale in the mass-production of utilities and mechanical services would result in cost-savings and the freedom to individualize living spaces would give homeowners the flexibility to express individual taste, account for specific site conditions, material availability and choice, and local building practices.

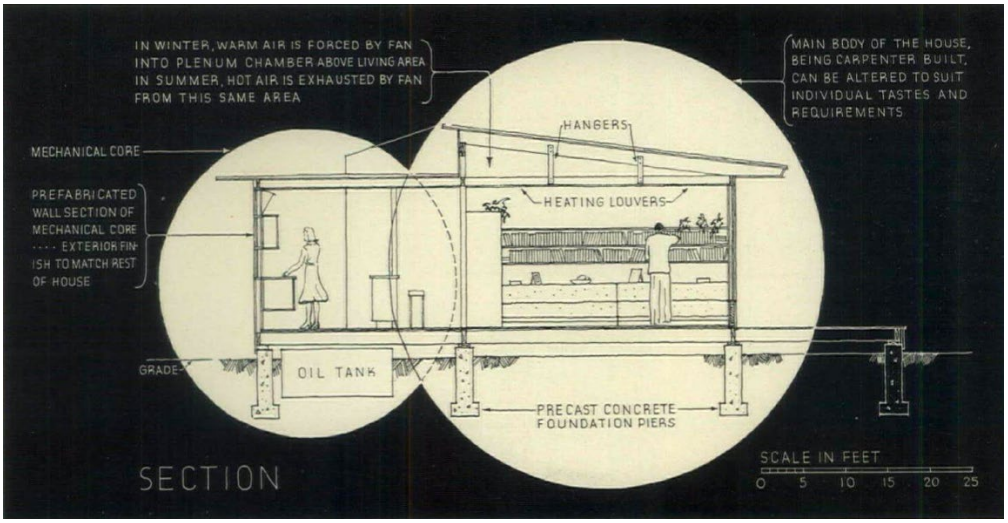


Figure 5: Section of the Mechanical Core in the Proposal by Edward D. Stone, J. Stanley Sharp, and Cope B. Walbridge

Source: Stone, Edward D., J. Stanley Sharp, and Cope B. Walbridge. 1942. "19: Planning for Economy and Flexibility." *The Architectural Forum* 77(3): 117.

Analogous to the proposal by Edward D. Stone, J. Stanley Sharp, and Cope B. Walbridge; the architects Peter Blach and George Daub also proposed the separation of the mechanical components and living spaces. However, they proposed a specific two-level house that comprised upper-level living areas for maximum views (See figure 6). The living areas in the house included multifunctional spaces for day and night use, for example the master bedroom functioned as a study during the day and the recreation room for children also served as children's or guest bedroom at night (Blach and Daub, 1942). The mechanical core, in Blach and Daub's proposal would be a two-tier steel box with the HVAC system on the upper floor (Blach and Daub, 1942). The lower level this box would contain prefabricated baths and a kitchen with a dumbwaiter to serve the living areas on the upper floor (Blach and Daub, 1942).

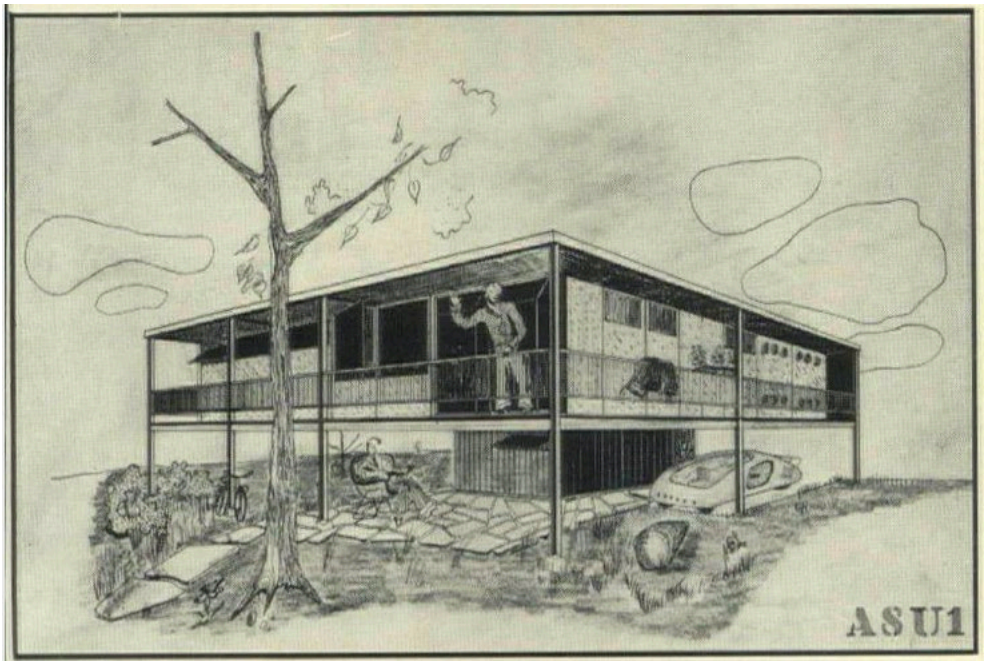
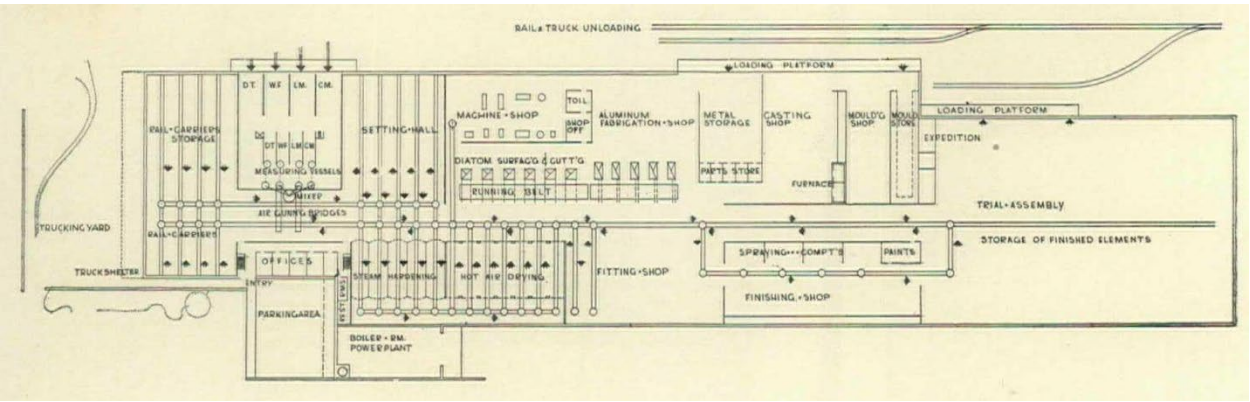


Figure 6: Illustration of the House by Peter Blach and George Daub
Source: Blach, Peter, and George Daub. 1942. "8: Service and Circulation Core." *The Architectural Forum* 77(3): 90–92.

New Materials

Richard J Neutra's proposal for the 194x, called "The Diatalum Dwelling" that would be made of diatomaceous earth, which is a pulverized siliceous sedimentary rock that is rich in Diatom fossil—a sea-algae. A monocellular algae with silica shells, the Diatoms belong to the algal class *Bacillariophyceae*, whose fossils constitute the key ingredient of diatomaceous earth (The Editors of Encyclopedia Britannica, 2019). Diatomaceous earth—due to its properties of rendering concrete mixes more impervious to water intrusion and higher in tensile strength—became a highly used concrete additive for building concrete ships for the Emergency Fleet Corporation during the Second World War (Calvert, 1930). Its mineralized content made it a construction material for bricks and concrete. According to Neutra, diatomaceous earth's light



weight (40 pounds per cubic foot), high insulation value, and great fire-resistance—combined with its ease of weatherproofing and structural reinforcement—made it an ideal material for a "plant-based" dwelling. (Neutra 1942)

Figure 7: Plan for the Diatalum Dwelling Plant for the 194x House.
Source: Neutra, Richard J. 1942. "15: Diatalum Dwellings." *The Architectural Forum* 77(3): 110.

Neutra not only proposed a modular floor plan for the 194x house, but also a manufacturing plant for the Diatalum Dwellings (See Figure 7). In this plant, the raw materials comprised diatomaceous earth, wood fiber, lime, and cement, which would be cast into panels and structural elements of the house that would be subsequently hardened with steam; and finally dehydrated (Neutra, 1942). These diatomaceous panels would then be finished with aluminum components to be completed as prefabricated parts of the modular Diatalum Dwelling (See Figure 8).

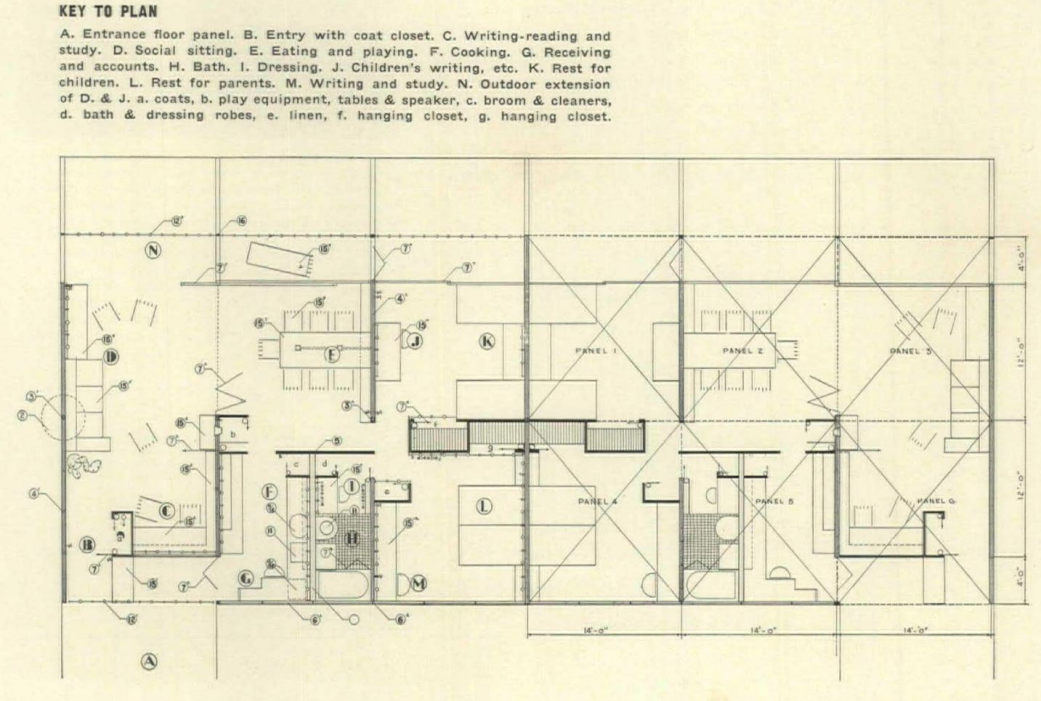


Figure 7: Plan of the Diatalum Dwelling as the 194x House.
Source: Neutra, Richard J. 1942. "15: Diatalum Dwellings." *The Architectural Forum* 77(3): 109.

Architects anticipated widespread use of plastics after the war. In Morris Ketchum, Jr. and Jedd S. Reisner's 194X house, the ceiling was proposed to be made of plastics and the bathing unit was constructed out of plastic sheets (Ketchum Jr. and Jedd S. Reisner, 1942). Alfred Kastner predicted that plastics would increasingly constitute floor finishes, wall panels, and even structural elements (Kastner 1942). Likewise, Rohde, Gilbert speculated that plastic structural walls—with a high-density outer surface and a low-density non-plastic core for acoustic and thermal insulation—would be crucial prefabricated elements in cost-saving and mass-production (Rohde, 1942). Fred J. Mac Kie, Jr. and Karl F. Kamrath proposed movable plastic dividers (Mac Kie, Jr. and Kamrath, 1942). Likewise, Peter Blach, and George Daub also proposed plastic interior panels (Blach and Daub, 1942).

Conclusion

The 1940s proposals for the Economy House comprised two main strategies in their designs: reduction of the cost through mass-production and an increase in flexibility of homes for future expansion. Postwar high building costs compounded the struggle to create livability at a

lower cost, thus forcing the architectural agenda to prioritize more economical homes. Florida architects prioritized this idea of the economy house both for design and civic responsibility. The economy house achieved greater affordability through efficient use of space, better use of materials, and a newfound reliance on prefabrication. The Second World War led to a new degree of mass production and standardization, which reflected in the mass production of economy housing. The postwar house was to be mass-produced and had the most success with plans of construction that were easily modifiable. By having a plan of construction that is designed to incur alterations, these homes were able to adjust to new future requirements and become more personalized overtime to the respective homeowners. To the extreme of this, many economy houses were built with only one permanent partition allowing for multiple schemes based on use of movable partitions. For ease of life and convenience new devices, mechanics, and construction resulted after the war that improved living in the 194x house. Lighting and acoustics advanced with the progress of the economy house as structural glass encouraged frameless doors and windows. Developments in plywood and other glued construction lent to building inexpensive housing shells with considerable freedom. With less set interior forms due to movable partition walls, space reached a new level of flexibility. Privacy and comfort stayed paramount, yet the economy house permitted more freedom than ever before due to moving away from the complete compartmentalization of enclosed spaces. While mass-produced, the economy house was not designed to encourage complete standardization, but rather used prefabrication to be expressed through individual design. Numerous technologies and ideas proposed in the 194x house are now fairly mainstream. Some were never realized. The historic analysis of the 194x house shows how architects had utopian visions of the mass-produced house. These idyllic visions of the postwar house can be argued to have resulted in mainstream suburban dystopias, however without the postwar push for technological advancements in affordable construction, Florida residential would not have progressed to the standard that it has.

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