Lincoln Houses Corporation aluminum composite houses

Peter Lobner, 15 June 2020

During World War II, Lincoln Industries developed manufacturing processes for making high-strength, light-weight, low-cost composite structural materials for radar housings. This evolved into Lincoln's capability to manufacture large aluminum composite panels that could be used as the primary structural elements of a prefabricated house. The manufacturing process is described in A.L. Carr's 1947 book, "A Practical Guide to Prefabricated Homes."

> "Lincoln plastic panels are made by alternating sheets of heavy paper, cloth, or glass cloth with glue strips. When the desired thickness is obtained, the sheets are expanded on an automatic machine to form a honeycomb pattern. This honeycomb core is thoroughly impregnated with high-strength phenolic resin and then bonded between facing sheets of aluminum alloy, and the entire panel sealed with a vapor barrier."

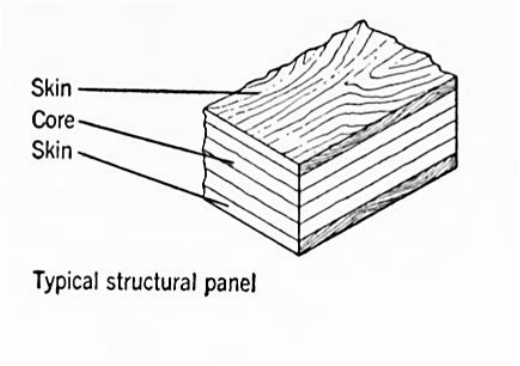
The resulting 4 x 8 foot (1.2 x 2.4 meter) aluminum composite structural panels were manufactured in 2 and 3 inch (5 and 7.6 cm) thicknesses for use in prefabricated houses offered by Lincoln Houses Corp.

A.L. Carr further described the attributes of Lincoln's aluminum composite structural panels:

> "Tests conducted by independent laboratories show that this material provides both great strength and high insulating properties. The roof panels have a tested bearing capacity sufficient to withstand an 8 foot snow load. The bearing capacity of the wall panels compares favorably with the load carrying capacity of a brick wall one foot thick. "
>
> "Insulating values were obtained by a special test made by governmental agencies in June 1946 for the National Housing Administration. A 3 inch Lincoln panel was found to permit only one fifth the thermal transmittance of a 12 inch concrete wall, one third that of an 8 inch brick or cinder block wall, and

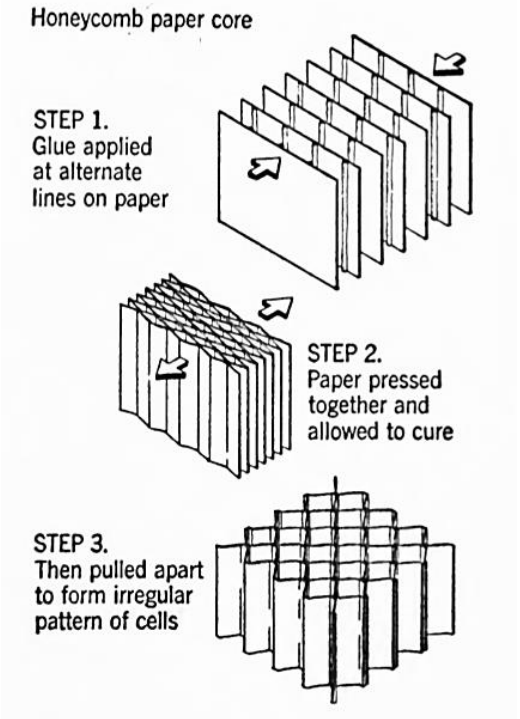
substantially less than a 7 inch frame wall, and was adjudged adequate, without the use of separate insulating material, in all climates where a low winter temperature of 20 degrees below zero obtains. The material has remarkable insulating properties with respect to sound as well as heat and cold, and is impervious to dry rot, internal condensation, termites and other destructive forces. “

In his 1951 book “The Prefabrication of Houses,” author Burnham Kelly reported that development work on aluminum clad, plastic-impregnated, honeycomb paper-core materials was carried out primarily by Lincoln Houses Corporation, Chrysler, Douglas Aircraft, and Consolidated Vultee. The basic structure of this type of building material is shown in the adjacent figure.



Typical structural panel

The National Housing Administration (NHA) approved Lincoln’s aluminum honeycomb panels. In October 1946, *Aviation News* magagine reported, “The Lincoln house design seems destined for wide use in the pre-fab program by aircraft and non-aircraft companies.”



Generic sandwich panel material. The skin can be aluminum or some other material. Source: Burnham Kelly, Fig. 20

A Lincoln aluminum home.
Source: Aviation News magazine, 2 Sep 1946

A.L. Carr provided the following description of design and construction details for Lincoln prefabricated houses:

> "Large single pane windows, which give an uninterrupted view, are built into the panels at the factory. The large windows at the front are fixed, and screened louvers inserted in the wall panels supply controlled ventilation. The windows in the rear are of the casement type opening outward on metal slides. Doors are of panel construction employing the new material with a thin wood veneer, which gives them a natural, solid-wood appearance. The doors weigh only 7 pounds, as contrasted with an average 20 pounds of a solid-wood door. The foundation of the house is cinder block, concrete, or any other standard masonry construction. The floor consists of a (two-inch thick) concrete slab poured over a metal grill, with tile, linoleum or wood finished flooring laid over it."
>
> "Heat is supplied by a special unit installed beneath the floor. The house is heated both by radiation from the heated concrete floor and by convection through conveniently placed registers. This method of heating is inexpensive, and does not encroach upon the living space in the house."
>
> "Roof panels are 3 inches in thickness, employing a protective cap mold over the sealed joints. A 4 inch slope for every 4 feet allows the roof to become automatically self-cleaning."

> “Paint of any desired color can be baked on the panels at the factory, and these surfaces can be washed and waxed in the same manner that a car is cleaned. Interior walls may be painted, papered or covered with veneer.”

Under the Veteran's Emergency Housing Program, Lincoln offered 2- and 3-bedroom houses that included a living room, kitchen, dining room, bathroom and general utility room. These designs included provisions for the convenient addition of another bedroom, and other optional features, including a garage, porch, sleeping porch, and fireplace.

Lincoln’s offered the Veteran's Emergency Housing Program houses and a larger 3-bedroom house at the following prices.

- 2-bedroom model priced from $3,500 to $4,000
- 3-bedroom model priced at about $4,500
- 4-bedroom model priced at about $6,000

These prices included the heating unit, installation of electrical and plumbing fixtures, as well as erection on the home site. The price did not include the site itself, the kitchen range or refrigerator, or hot water heater. All needed subassemblies and components of the house would be packaged and shipped to the site, where a crew would assemble the house, primarily with screws and adhesives.

A 2 September 1946 article in *Aviation News* magazine reported that the plans submitted by Lincoln Houses Corp. under the Veteran's Emergency Housing Program were strongly favored by the FHA. One authority said 25,000 of the Lincoln type home would sell at once in the Los Angeles area.

In 1947, A.L. Carr reported on the status of manufacturing:

> “Several five-room Lincoln aluminum panel homes were built in Virginia in 1946.”
>
> At least one larger house was built: “This attractive nine room home provides many features not generally obtained in houses costing under $10,000. It provides two bathrooms, three

bedrooms, an office or den, a 26 foot living room, a large separate dining room, and a full-size kitchen. The unique dining terrace with its plastic tube trellis and corrugated glass shield gives the house added distinction."

"At present Lincoln Houses, Inc. is turning out only a limited number of these homes at its pilot plant at Marion, Virginia, but within the next few months several of the larger airplane factories will begin production under the Lincoln process. Since the new material is lightweight and easily transported, distribution will probably be nationwide! Erection is extremely simple, and can be accomplished in about two days by the local Lincoln representative."

"Ultimately a wide variety of homes will be produced."

In spite of this promising outlook in 1947, I've been unable to find any other documentation on specific completed Lincoln aluminum panel houses or the fate of Lincoln's manufacturing plant. If you have any information you're willing to share, please contact me by e-mail at: PL31416@cox.net.

It's safe to say that Lincoln never made the transition to large-scale production of aluminum panel prefab houses.

For more information, see the following resources:

- Ante Lee Carr (A. L.) Carr, "A Practical Guide to Prefabricated Houses", pp. 74-77, Harper & Brothers, 1947, available online in text via the Internet Archive at the following link: https://archive.org/stream/ALCarrApracticalguidetoprefabricatedhouses0001/ALCarrApracticalguidetoprefabricatedhouses0001_djvu.txt
- Blaine Stubblefield, "Aircraft Industry Will Make Aluminum Houses for Veterans," Aviation News, Vol. 6, No. 10, 2 September 1946 (available in the Aviation Week & Space Technology magazine online archive)

- Burnham Kelly, “The Prefabrication of Houses - A Study by the Albert Farwell Bemis Foundation of the Prefabrication Industry in the United States,” pp. 233 – 235, Technology Press of MIT and John Wiley & Sons, 1951: http://www.survivorlibrary.com/library/the_prefabrication_of_houses_1951.pdf