

Industrialized Housing: Vernacular and Utopian

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INTRODUCTION

From the beginning of modernism architects have dreamed of the factory-built house as the solution to housing needs in contemporary society. Le Corbusier, Konrad Wachsmann, Buckminster Fuller, and other brilliant designers labored unsuccessfully to make the factory-built house a reality. Ironically, American industry created in the same period a type of inexpensive housing that achieved wide public acceptance and was produced in large numbers: the mobile home. Far from fulfilling the utopian dreams of the heroic modernists, however, certain legal, social, and design-related factors have caused the mobile home to become and remain the "lowest common denominator" of housing in this country.

During the past year, we have conducted at Virginia Tech a two-part investigation of the mobile home as a housing type. We began with an analysis of the modifications made to mobile homes by their owners. The goal of our research was to establish a set of design criteria that we could use to produce a better design for an inexpensive factory-built house. We wanted to know what specific features help give mobile homes the economy that is their chief advantage, and which features detract from the desirability of mobile homes and contribute to their stigmatization as substandard housing. Rather than starting over from the beginning with the design of an industrialized housing prototype, as so many of the utopian designers did, we began with the reality of the mobile home as it is actually lived in, and attempted to use our observations to modify the existing design and construction of this housing type towards the idealistic goals first imagined at the beginning of this century.

CONSTRUCTION METHODS IN THE MOBILE HOME INDUSTRY

Together with the students in our fourth-year architecture studio, we began to study the redesign of the mobile home in the spring semester of 1994.¹ Our initial goal for the semester was the development of a series of prototypical models that significantly improved on the current industry standard. One

of our first tasks was to familiarize ourselves and our students with the materials and processes by which mobile homes are built. A local manufacturer, Fleetwood Homes in Rocky Mount, Virginia, allowed us to tour their factory and observe their procedures at first hand. Throughout the project, we attempted to design within the construction and material standards current in the industry. For example, at mid-point in the semester, students presented a series of axonometric drawings documenting the construction process of their designs.

Most contemporary mobile homes are essentially frame houses built on a steel chassis. Their assembly begins with the welding up of an undercarriage on wheels, necessary for their transportation. This "foundation" supports a substructure of wood sills and particle board sub-flooring. Most of the necessary wiring, insulation, plumbing and HVAC equipment is installed next, before the interior partitions and exterior walls are set in place. Walls and partitions are assembled separately as complete units using jigs and specially adapted power tools. All interior finishes and cabinetry are installed before the exterior walls are put in place. In this respect, the procedure for constructing a mobile home differs most radically from a typical site-built frame house, in that it is built literally from the inside out. Exterior walls are made of standard 2x4 stud construction with sheet rock finish inside. Finally, the roof assembly is lowered onto the completed frame, and the exterior finishes are installed. From start to finish, the entire process requires less than twelve hours. Compared with typical low-end site-built housing, contemporary mobile homes are arguably better-made and better-inspected. The factory we toured had an inspector at each work station, and a computerized record of the builders and supervisors responsible for certifying the quality of the work at each stage.

COMMON MODIFICATIONS TO MOBILE HOMES

The conventionality of mobile home construction makes possible their continuing adaptation and alteration by their owners. A typical Sunday carpenter has all the tools neces-

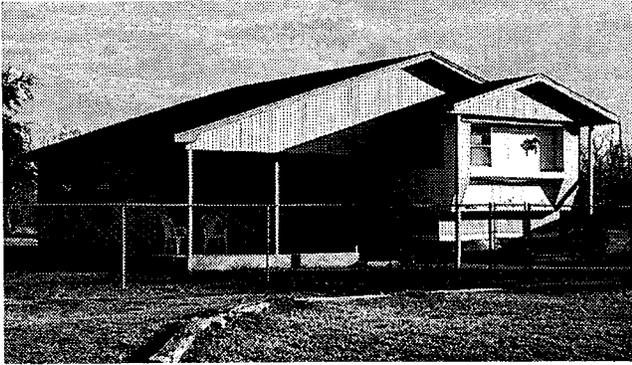


Figure 1: Modified Mobile Home near Beaumont, Texas

sary to add a new room, take out a partition, attach a deck, screened porch, or carport, or to alter the house in any way that a conventional wood-frame house can be altered. It is not unusual to come across houses that are unrecognizable as adapted mobile homes, having been added onto and covered over to such an extent that they are only distinguishable by the presence of a chance relic of their original configuration, such as a surviving trailer hitch or tail reflector.

The fact that mobile homes are so often modified by their owners, (and modified in almost the same ways), suggests that they have serious shortcomings when compared to traditional houses. Among the more common alterations are the additions of a higher-pitched roof, projecting rooms, decks, and porches. Although these modifications reflect the owners' programmatic needs, they are also, and most importantly, indications of their dissatisfaction with the image and spatial "feel" of the mobile home.

Among the more vexing characteristics of standard mobile home designs is the constricted spatial sense we term "tube-ness." Without exception, mobile home interiors are obviously and uncomfortably constrained by their legal height and width restrictions. From the perspective of our typical image of "house," the mobile home is an obviously manufactured and somewhat "alien" artifact; an isolated and self-contained object in its spatial field, its compact volume defined absolutely by six planes. The plan of the mobile home is restrained by necessity to a single linear sequence of rooms, accessed by way of a single hall extending along one side. The pronounced thinness of the exterior walls and sheathing contributes to this sense of living in an extended tube. There is no spatial mediation between interior and exterior spaces; entry into a mobile home is an unmediated and instant transition from outside to inside, through the thinnest of barriers. Several responses to these conditions appear in the modifications made to their homes by owners. Added rooms and decks usually extend the space of the house at right angles to its length. Such additions add a perceived complexity to the volume of the house that expands the visual sense of its size and permanence. The interior "tubeness" of the house is also relieved by spatial expansion in other directions than along its long dimension. Superimposed roofs are made to extend over decks and entries, adding a

perception of transition between the interior and exterior that is wholly lacking in the unmodified mobile home. These new roofs increase the height of the mobile home and help it conform to social expectations of the image of the house.

The explorations of our students suggested other ways in which these spatial restrictions can be overcome or modified. One possibility is the use of the roof as a protected exterior deck, extending the private space of the house vertically. In the typically constrained mobile home park, private exterior space is a rare luxury, and expanding the usable area of the mobile home to include its upper surface is a relatively inexpensive option. Within the volume defined by the height and width restrictions, recessed spaces can be created that mediate between interior and exterior, and create the perception of thickness in exterior walls. The usually uncoordinated placement of windows and doors in standard mobile homes also contributes to their spatial confinement and monotony. The alignment of openings with one another across spaces opens up lines of sight through the width of the house, expanding the sense of space without actually increasing the floor area.

MAKING THE MOBILE HOME MORE SITE SPECIFIC

Another set of issues concerns the relation of the mobile home to its surroundings. The actual situations in which mobile homes are located vary widely, from the stereotypical "trailer park," with each unit lined up side by side and the trailer hitch facing a common access road, to isolated rural sites. Unfortunately, the typical mobile home makes no provision for any situation other than the dense side-to-side park. The typical mobile home is designed for a generic, "worst-case scenario" in which the house must have minimal openings to protect the privacy of its occupants. In fact, it is important for the mobile home to adapt to differing situations and to take advantage of any positive site characteristics that exist. In our area of rural Virginia, for example, mobile homes are commonly used as starter homes for new families. Often, an elderly family with land will set aside a section to locate a mobile home for the family of an older child. As the parents' land and original house will eventually be inherited, there is no need for anything other than temporary housing. Just as common is the use of a mobile home as a "grandparent's house" allowing an aging parent to live close to but separate from one of their children. In our investigations, we attempted to respond to these variable situations by increasing the adaptability of the mobile home to variable sites.

As mentioned, owner-occupied mobile homes are usually expanded or remodeled in various ways. The single-wide, although well adapted for transport, is an awkward configuration in its relationship to the street and private exterior space, having no true front, back, or sides. A degree of adaptability to the site, together with an appropriate relation of interior spaces to the varying public or private character of the surroundings, will greatly increase the quality of the

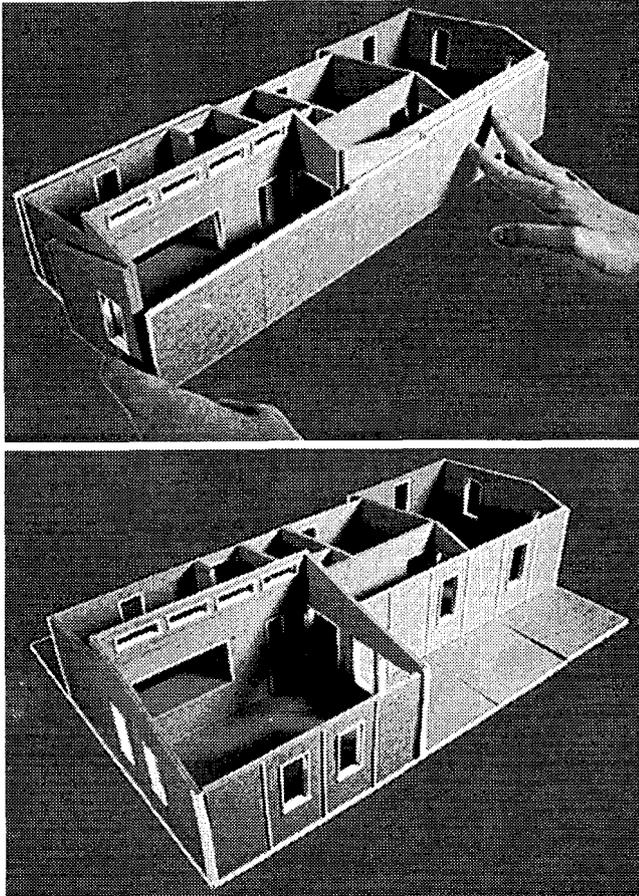


Figure 2: Fold-out Expansion of Manufactured House Prototype (Rob Buckanavage)

mobile home as housing. The key to maintaining the low cost of the mobile home, however, is the minimization of transportation and set-up expenses. To this end, we developed several practical alternative approaches that increase the adaptability of the house to differing sites and programmatic needs, without affecting the basic economies of manufacture, transport, and set-up. In contemporary modular house design, elements of the house are folded up during transport in order to comply with height and width restrictions. Simplified versions of these techniques can be used to increase the width and height of the mobile home during set-up, without greatly increasing labor costs.

Another response to site and program specificity is to adopt a simplified version of joining two separate modules, as presently done in the modular housing industry. One student developed two typical units that, when combined, create a single home in multiple configurations. One unit, containing the kitchen, dining, and living areas, is combined in a variety of ways with a second unit containing bedrooms and bathrooms. Both units are compact enough to be transported to the site in a one trip, as both are pulled by a single tractor in a double-trailer configuration. Joined at site, the additional set-up costs, although greater than with a simple single-wide, can be significantly less than those involved with the set-up of double-wide or modular units.

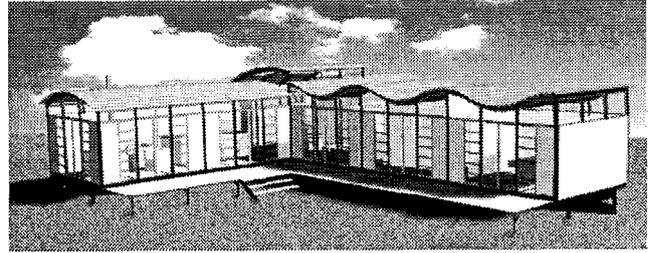


Figure 3: Manufactured House Prototype with Added Extension (Christine Iglauer)

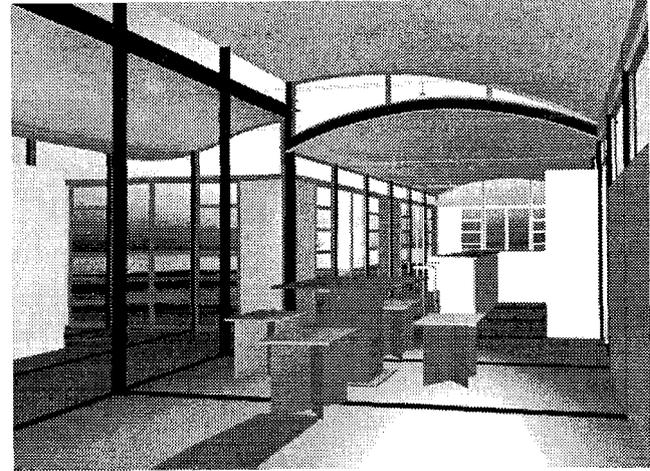


Figure 4: Interior of Manufactured House Prototype (Christine Iglauer)

The variable configurations of this two-unit house greatly increase its ability to adapt to differing sites. Another approach assumes that the initial single-wide unit, containing a single bedroom, bath, kitchen, and living/dining area, is sufficient as a starter house for a couple. At a future date, a second unit would be transported to the site and attached in an L or T configuration, expanding the living area of the house with additional bedrooms and baths. All these approaches break away from the stereotypical tube-like space and external appearance of the mobile home, and permit a more open flow of space and activity between inside and outside. In addition, the variability of configuration allows these houses to more specifically establish its relationship to the street and private yard.

TRAILERS BECOME MOBILE HOMES

The reality of transience made possible by the light-weight and mobile trailer seemed, earlier in this century, to fit the general character of American life. The modern American mobile home originated with the development of the industrially produced travel trailer in the 1920's.² The growing popularity of the trailer led economist Roger W. Babson to predict in the first issue of *Automobile and Trailer Travel* (1936), that "Within twenty years, more than half the population of the United States will be living in travel trailers."³ The reaction to this boom in trailer living was mixed, with

many municipalities expressing the fear that trailer owners were separating themselves from their communities and destroying the essential political and financial structure of local government. From an early stage in their development, trailers were excluded from legal classification as housing and confined to "parks" outside the towns. Despite this resistance, the travel trailer, and the mobile home that developed from it, has come increasingly to fill the gap in the availability of traditional site-built housing. On our visit to the Rocky Mount Fleetwood plant, we were astonished to learn that their most pressing problem was simply keeping up with the backlog of orders. Even with a production rate of twelve units per day, they were unable to build them fast enough to prevent some of their customers from canceling their order out of impatience with a waiting period lasting as long as six months. This situation could only have developed in the absence of any inexpensive site-built alternative. It is, unfortunately, common knowledge that the small "starter house" of the post-war period is a thing of the past. Few builders are willing to invest in a type of dwelling with such a minimal margin of profit, and yet the demand for such housing is patently obvious.

In their early development, mobile homes were streamlined and painted to give the impression of rapid forward motion, expressing a desire for association with such representative modern artifacts as airplanes and sports cars. The sense of freedom made possible by the trailer was also essentially modern, and their designers sought to minimize their visual identification as "housing." As the mobile home developed into low-cost stationary housing, the image of mobility and modernity was gradually abandoned. It became apparent that the culture of radical mobility foreseen by Babson and others was not to become a permanent feature of American life. The desire for a true mobile house was transitional, and did not survive past the 1950s. An inevitable reaction against the perceived instability of the mobile home developed. The "trailer house" was stereotyped as unfit for all but the poorest members of society. As designers tried to make the trailer more "house-like", the "trailer house" became the "mobile home" and, eventually, a unit of "manufactured housing." In the process, materials and forms shed their machine-likeness and became, in appearance, more traditional. Instead of shiny aluminum and automobile paint, contemporary mobile homes are sheathed in printed wood-grain sheet aluminum or vinyl cladding. Most units have a single long gabled roof line, or a smaller transverse gable above the entry door. Interiors are designed to be as traditional in appearance as the manufacturing process will allow.

Inevitably, however, this attempt to appear house-like is contradicted by the requirement for transportability. In addition to the legal height and width restrictions, each mobile home retains its metal chassis and rubber-tired wheels. This requirement for permanent mobility is not a market-driven feature; instead, it is the result of the mobile home's classification as personal property for purposes of

taxation. The retention of the apparatus for initial transportation is legally necessary to qualify the mobile home as a vehicle. From this perspective, living in a mobile home is the legal equivalent of living in your car.

The truth seems to be that modern Americans don't need or want permanently mobile houses. The existence of the mobile home as a type is an anomaly resulting from its evolution from the travel trailer. As a type, the mobile home is an atavistic form, surviving and thriving in a narrow legal niche resulting from its artificial classification as a vehicle. The true factor in the success of the type is not its mobility, but its industrialized production. The way seems open, therefore, for the development of an inexpensive, fixed-site, industrially produced house that unites the mobile-home's economy of production with the social and legal advantages of site-built housing. We believe that the future of low-cost housing in America will be initiated by the adaptation of the mobile home industry to the manufacture of an easily transportable house, set up on a permanent foundation, with the capacity for close adaptation to the selected site.

A NEW FACTORY-BUILT HOUSE PROTOTYPE

Our current project at Virginia Tech is the design and construction of a working prototype house incorporating the results of these investigations. The "single-wide" unit, as currently designed, measures 16 feet in width and is 65 feet in length. It is designed to be constructed using standard materials and assembly methods, including wood framed walls, pre-finished sheet rock interiors, and vinyl siding. Our prototype differs from current industry types in its method of transportation, as it is to be moved on a low-boy trailer, or by means of wheels attached to the side of the unit. Both methods allow the unit to be transported without requiring a chassis and permanent wheel assembly. The result is that the height of the unit can be greatly increased, while remaining within the legal height restraint (13 feet and 6 inches) imposed by the requirement for transportability from factory to site. In designing our prototype, we took full advantage of this possibility, and increased the height of interior spaces to a maximum of ten feet. This height is also made possible by our use of a flat, one-piece (and seamless) aluminum roof assembly. A second important consequence of changing the mode of transportation is that the unit can be set up lower to

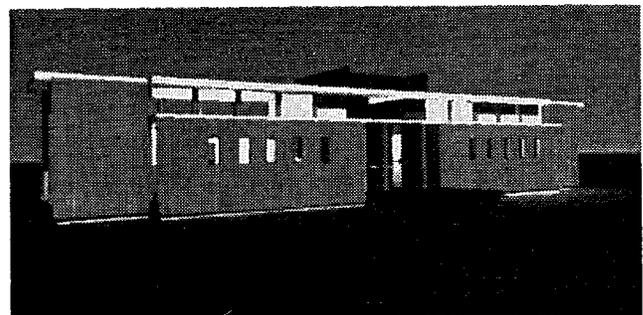


Figure 5: Exterior of Prototype (Scott Gartner and Bill Green)

the ground. Mobile homes sit at least three feet above the ground, the height required by their wheel assembly. Without such a wheel assembly, the prototype can conform to a lower and more conventional floor height above grade.

A central spine of tall space containing the primary rooms of the house is flanked by two lower sections, used for an entry and primary corridor. These ancillary spaces are 6 feet, 8 inches in height, and contrast dramatically with the taller space in the main areas. This difference in height allows us to make a band of clerestory lighting and circulation on either side of the main spaces down the entire length of the house, and to insure adequate natural light and ventilation to every room. The main areas of the house are composed and proportioned rooms. A wainscoting divides the walls into upper and lower segments and is coordinated with the height of the window sills. The height and width of these rooms are proportionally related, and doors and windows aligned in ways that increase the sense of spatial order throughout the house.

A central litchen module contains a fireplace, heating and ventilation ductwork, and, on a platform above the roof level, a solar water heater and propane-powered heat pump. The kitchen module, with its vertically extended elements (chimney and mechanical platform surround) is clad with ceramic panels, giving a sense of mass to the center of the house. Entry is by way of a recessed, covered porch, placed at the center of one side and coordinated with the mass of the central kitchen module. Opposite the entry is a fold-down rear deck directly accessible from the litchen and living areas.

The prototype is designed as a house for a family (one- or two-parents) with one or two small children. It is to be set up on a permanent foundation and to qualify for classification as real property. The short-term advantage of the personal property status of most mobile homes will be offset by the longer-term advantages that can accrue to real property ownership. The house is intended as an affordable option for younger buyers, fulfilling the function of a "starter house." The prototype overcomes the numbing "tubeness" of the typical mobile home by creating spatial contrast and

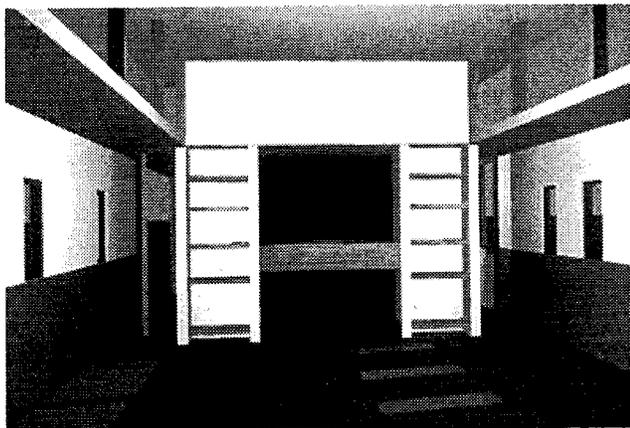


Figure 6: Interior of Prototype (Scott Gartner and Bill Green)

order inside, and volumetric complexity outside. The clearly defined central mass and entry give the house a distinct front and back, and help orient the house to the common pattern of public and private space found in most communities.

We envision our new prototype making extensive use of

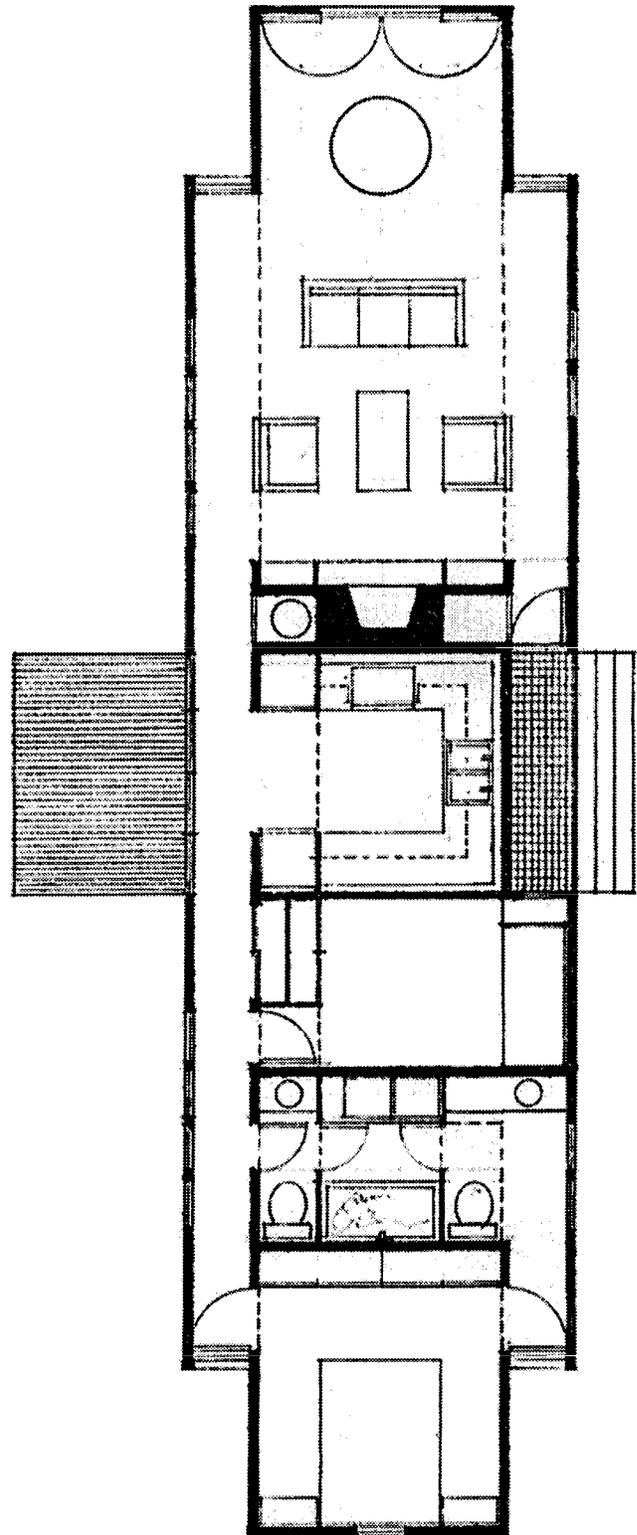


Figure 7: Plan of Prototype (Scott Gartner and Bill Green)

advanced technologies—not in construction, but in marketing and design. A house buyer will arrive at a dealership and examine its available range of models and configurations. Survey information on potential sites will be accessible from a computer data bank, (perhaps making use of Landsat aerial photography). The models and configurations available to the buyer will be projected onto the potential sites, and the various options and configurations examined using advanced visualization techniques. With slight modifications to the basic module, a wide variety of programmatic and site adjustments will be possible. It will be possible to read off the varying cost of the completed unit as the options are being discussed. When the buyer determines the specific design of the unit and makes the order, and agrees on a schedule of delivery, the order is sent immediately to the factory where, after examination and approval by the factory architect, the unit is constructed. As each unit is built, a computer at each work station keeps track of all the specifications and modifications decided by the buyer. As with contemporary mobile home factories, the construction of the house will take approximately twelve hours. At completion, the unit modules will be loaded onto the flatbed of a special installation vehicle and transported to the site along with its pre-constructed foundation. As with the units themselves, the foundation will have been designed specifically for the site and produced in the factory. At the site, the foundation is put into place, utilities are laid ready for installation, the house modules are lowered into position and attached to the foundation, and, after the utilities are connected, the house is ready for occupancy. The entire installation period will take less than three hours. It will be possible for a buyer to walk in the showroom door, order a new house

for a specific site, and move into a custom-built house within twenty-four hours.

Presently, the high cost of so-called "low-cost" site-built housing prevents lower-income Americans from attaining the central goal of the "American Dream"—home ownership and the civic responsibilities that ownership carries with it. The result will be the ever-increasing segregation of lower-income citizens from the rest of American society. If we want to avoid these consequences there is no feasible substitute for the low-cost single-family house. The key to making such a house available, as we have argued, is the adaptation of the three basic economies currently used by the mobile home industry: assembly-line construction using conventional materials, transportability from factory to site as a single unit, and minimal labor costs involved in setting up the house on its site. The key to making this type of housing better and more acceptable is an intelligent redesign of the mobile home in response to the vernacular critique of its form. Our investigations indicate that this goal is within our reach.

NOTES

- ¹ Students participating in this project include: Dimitri Borri, Rob Buckanavage, Jon Covington, Rich Crunkilton, Rob Deal, Jason Lockhart, Melissa Manuel, Staci May, Rob Nocella, Melissa Yankho, and a visiting Fulbright scholar from Germany, Christine Iglauer.
- ² This account of the development of the mobile home is abstracted from: Allan D. Wallis, *Wheel Estate: The Rise and Decline of Mobile Homes* (New York: Oxford University Press, 1991).
- ³ Wallis, 58.