

Manufacturing Affordability: An Evaluation of Factory-Built Housing in the United States



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Sooner or later no one who has anything to do with architecture can escape answering the question: What about the prefabricated house? I have taken part in so many fruitless arguments about the subject that I am ready to call for help as soon as the subject is broached...Somehow, if people believe in prefabrication, they also think it is a cure for everything, from a bad sinus condition to what used to be called the depression. If they don't believe in it, they usually also dislike everything else about modern architecture, including some of the excellent innovations in design that are very, very belatedly being embodied in prefabricated houses.

- Lewis Mumford, *The New Yorker*, 1936

Chapter 1: Introduction to Factory-Built Housing

Introduction

Although the above quote about prefabricated housing appeared in *The New Yorker* nearly 75 years ago, the sentiment behind it still rings true for many. Factory-built housing remains a controversial subject with strong supporters and staunch opponents, and not many opinions in between. Factory building as a method of housing construction has several benefits: homes can be efficiently produced in much less time than it takes to build a conventional site-built home, cutting down on construction waste and increasing overall sustainability of the home; homes can also be inexpensively produced without sacrificing structural integrity. While factory-built housing has real benefits, barriers like lack of union support and fair labor practices for factory workers, financing obstacles for homebuyers, and cultural stigma and stereotypes hold it back from wide public acceptance. Despite these drawbacks, factory-built housing represents a new opportunity for unions to organize the largely non-union sector of labor in home manufacturing plants; with the support of unions and affordable housing developers, factory-built housing can serve as a rallying point for myriad interests, providing a new way to quickly and inexpensively develop quality affordable housing.

To explore these topics, I will begin with a historical overview of factory-built housing in the United States, because to assess the industry's future, it is essential to understand its past successes and failures. From there, I will explain the state of both prefabricated housing and affordable housing today. I will then present my research on both the benefits and drawbacks of prefabricated housing. Additionally, I will provide a range of perspectives on factory-built housing from various stakeholders in the industry in professions such as architecture, affordable housing development, city planning, and

labor organizing. Finally, I will offer a set of recommendations to improve the factory-built housing industry, strengthen its potential for use in the development of affordable housing, and increase public acceptance of factory-built housing.

A Historical Overview of Factory-Built Housing in the United States

Historians agree that the earliest factory-built home was created in the seventeenth century to serve as a house for a fishing fleet – it took the form of a panelized wood house that was shipped from England to Cape Ann, Massachusetts in 1642. As new settlements sprung up in Europe and eventually the United States, the demand for housing increased rapidly and was met with creative solutions like kit houses shipped by rail to settlers during the California gold rush in 1849 and iron buildings shipped to British colonies in the late nineteenth century. In 1908, renowned innovator Thomas Edison developed a poured-concrete house intended to be mass-produced as affordable housing for workers, but his plans were never implemented because the house was too heavy.¹

With the new methods of production introduced by Henry Ford in the early 1900s and popularized by his Model T, the public began to see the merits of mass-production. Ford proved that mass production was an effective way to create affordable, high-quality goods. By the late 1910s, the housing industry began to take cues from Fordism as several companies introduced high-quality, precut, factory-built houses to their repertoires.²

Sears, Roebuck & Co. took the early factory-built house to the next level by offering a wide variety of houses for purchase in catalogs and sales offices, then delivering them by mail. In 1906 Frank W. Kushel, manager of Sears's china department, was tasked with overseeing the dismantling of the company's failing building materials

department. Kushel suggested that instead of selling building materials in random bits and pieces, Sears should market them in one package as a house. Richard Sears recognized the genius of Kushel's plan and thus the House By Mail kit (later known as the Modern House Program) was created.³

The kits were priced from \$650 to \$2,500, making them relatively affordable, and contained lumber, nails, shingles, windows, doors, hardware, house paint, and instructions for assembly.⁴ The company readily acknowledged that these homes were not innovative in design, nor were they attempting to be. But customers could modify the house to meet their needs and suit their tastes, and could even design their own home and submit the blueprint to Sears, which would then ship out the appropriate materials.

Various new methods were created to ease construction, such as the use of drywall, which was much easier to install than the old plaster and lath wall-building technique. Sears homes also used asphalt shingles as an alternative to the tin or wood roofing that was common at the time – tin was unattractive and required a skilled roofer for installation, and wood was flammable, but asphalt shingles were fireproof, inexpensive to produce, and easy to install.⁵ Furthermore, Sears estimated that using their precut, prefitted lumber could save 40 percent on labor costs, although in reality, most homeowners left the building to a local builder.

In 1911, Sears decided to not just sell house-building packages, but to finance them. The rapidly growing, largely immigrant middle and working classes had been mostly shut out by the banking community, and Sears took advantage of this newfound niche. The company required a down payment of 25 percent of the cost of the house and lot, and as little as 6 percent interest for five years – fairly good terms – but perhaps most importantly, the application for the financing package did not require the buyer to list any

information about race or ethnicity, thus opening up the market to thousands of new home buyers. After its early success, the program began to struggle with the advent of the Great Depression, and eventually declined due to a rise in payment defaults; this culminated with the company liquidating millions of dollars in defaulted debt. Over the span of its 32 years in operation, the Sears Modern Home program sold between 70,000 and 75,000 homes.⁶

In contrast to the relatively widespread success of the Sears Modern Home Program, only one of Swiss-French architect Le Corbusier's home designs was built in North America. Nevertheless, his buildings in Europe and the legacy of his concept for the "mass production house," solidify his position as one of the most important figures in the modern prefabricated housing movement. In his book Vers Une Architecture (Towards a New Architecture) published in 1923, he promoted efficiency and utilitarianism, asserting the house as a "machine for living". At the center of his theory of housing was the idea that the calculation of the engineer should be matched by the knowledge of the architect, and the two should combine to create "an art in harmony with the reason and power of the machine."⁷

After visiting the Ford Motor Company plant in Detroit in 1935, his fervor for mass produced homes grew; he wrote that his visit confirmed "a lesson of blinding clarity that I have been defending for ten years: heavy industry must become involved with housing, construct assembly line, mass production housing with entirely new industrial processes. Housing must be made in shops similar to those of the automobile."⁸ He believed that this would first come to fruition in the United States as it was "equipped with technicians and machines as no one else."⁸

In order for such an ambitious plan to be enacted, it would take a massive change in popular ideas about housing. Le Corbusier recognized this and suggested that “financial and social organization, using concerted and forceful methods, will be able to solve the housing question.”⁹ He lamented popular resistance to the idea of the mass-produced home, suggesting “the necessary state of mind [for prefabricated homes] does not exist” and that “the mass-production state of mind is hateful to architects and to the ordinary man.”¹⁰ He believed if only people could progress to his level of thinking and see mass produced homes as logical and efficient, not sterile and impersonal, society as a whole would be able to mobilize and solve the housing problem once and for all. But this was not the case, and due to the extreme and polarizing nature of his ideas, they were never carried out in the United States, though the theory behind them certainly lives on in factory-built housing today.

Arguably America’s answer to Le Corbusier, Richard Buckminster “Bucky” Fuller was perhaps one of the most radical and unique figures in the early factory-built housing movement. An innovative thinker with ideas well ahead of his time (many similar to those of Le Corbusier), he philosophized in the late 1920s that mankind was on the verge of amazing achievements in technology, but such innovations were not even being attempted because people were stuck in traditional ways of thinking. Fuller asserted that it was time to make a “great leap forward” and selected himself as the man to realize this goal using the methods he knew best: building and engineering.¹¹ Perhaps more so than any architect before him, Fuller understood the need for the research into and production of lightweight materials such as aluminum to address the issue of transporting factory-built homes. He also experimented with creating differently shaped houses to promote natural heating and cooling – an idea that was well ahead of his time.¹²

Fuller's earliest factory-built home design was presented to the public in 1929, and was designed in connection with the Marshall Fields department store as an innovative marketing strategy to showcase the store's furniture. The design, called the Dymaxion House (a combination of the words dynamic, maximum, and tension) and had all the amenities of a standard home: a living and dining room, two bedrooms, two bathrooms, a library, and even a sundeck on the roof.¹³ Its cost was the price of a Cadillac at the time, and could fit in a metal tube to be shipped anywhere in the world. The house was heated and cooled by natural means, could withstand earthquakes and storms, required little to no maintenance, and could be disassembled and rearranged as necessary.¹⁴ However, Fuller's ideas were so radical compared to other housing models in the 1920s and 30s, and there was no real lack of housing in the United States at the time, so there was little support for his plans to be realized.¹⁵

In 1936, famed architect Frank Lloyd Wright put his own unique spin on factory-built housing. A potential client asked him to design a "decent five-thousand-dollar house," and he accepted gladly; for years, he had wanted to design an affordable house but there was no client interest in such a project.¹⁶ Wright coined the term "Usonian" in a play on the acronym U.S.A. to describe both his model for the affordable home and his utopian vision of a culturally reformed America, in which the country would consist of decentralized, nature-oriented communities.¹⁷ For the Usonian houses, Wright incorporated factory building by creating a grid system that established regular, modular dimensions while still allowing for design flexibility. The houses, all made of wood, also shared standardized details which helped to reduce costs.¹⁸ Though his vision for a mass-produced, affordable, well-designed home was certainly admirable, the houses ended up

going about \$5,000 over budget, bringing their price up to \$10,000, and only sixty of them were ever built.¹⁹

Many of the aforementioned efforts at factory-built housing failed largely because mass production required an expensive investment in equipment and a strong network of dealers for the homes. Without the ability to produce homes on a large scale, the individual houses were simply too expensive to gain popularity in the housing market. But after World War II as veterans returned home, America experienced an unprecedented housing crisis as the result of slowed building during the Great Depression and the war. The government estimated it needed to quickly provide homes for three million people between 1946 and 1947.²⁰ In hopes of solving the housing problem, President Harry Truman appointed Wilson Wyatt as “Housing Expediter” in 1946 as part of the Veterans’ Emergency Housing Program. Wyatt was a great proponent of factory-built housing and his goal was to produce 250,000 prefab homes in 1946 and an additional 600,000 in 1947.²¹ He had strong backing from the Veterans’ Emergency Housing program, which attempted to convert industrial war plants into prefab firms, allocating them resources and providing them with consistent funding.²²

Unfortunately for factory-built housing, Wyatt’s bold plans were stifled with the congressional defeat of the Democrats in 1946. Another government initiative, introduced in 1944 under the Veterans Administration mortgage program, helped facilitate and finance vast housing projects in the 1950s, one of which turned out to be the suburb of Levittown. In 1945, developer William Levitt took inspiration from Henry Ford and made good use of mass-production construction techniques to rapidly create a housing development for veterans and their families.²³ Levitt brought the assembly line to the construction site, so workers moved from house to house performing their specific task

like pouring foundations, installing plumbing, and painting windowsills. In doing this, Levitt saved money by avoiding hiring craft workers and involving unions, and was able to quickly train new workers because they only needed one specific skill.²⁴ By 1948, Levittown saw the completion of 150 houses each week, which continued until 6,000 were built, creating a massive suburban community of nearly identical homes. Levittown's instant success led it to be the model for many suburban developments today.²⁵

Perhaps less widely known, but no less important than Levittown, were the Lustron houses, another experiment in factory-built, mass-produced homes for postwar America. Introduced to the public in 1948, Lustron homes – the name a play on the phrase “luster on steel” – were developed by engineer Carl G. Strandlund using direct federal loans totaling 15.5 million dollars as part of the Veterans' Emergency Housing Act of 1946.²⁶ As with Levittown, the engineers and inventors at the Lustron company sought to rapidly create housing for GIs returning from the war, though these homes were different in that they acted as an alternative for home buyers who were tired of the monotony of traditional wooden frame structures or brick bungalows.²⁷ Each home cost around \$10,000 not including the lot, and required about 350 man hours to assemble after delivery via flatbed truck. The homes were made of porcelain enamel-finished steel and were ranch-style, usually had two to three bedrooms, and the exterior panels came in four bright colors: maize yellow, dove gray, surf blue, and desert tan.²⁸

Following advertising campaigns in *Life* and other magazines and the production of model homes displayed in 100 eastern and Midwestern cities, the Lustron factory finally began producing homes for purchase in the fall of 1948. But by the end of the year, the company struggled to meet demand and was left with 20,000 unfilled orders. In

1949, more houses were produced, though not nearly the stated annual goal of 17,000 units, and by 1950 the company declared bankruptcy.²⁹ Despite millions of dollars in government loans, Lustron simply couldn't produce enough homes to meet demand: only 2,498 had been manufactured at the time the factory closed.³⁰ Other problems with the houses came in the form of hidden costs: Lustron required dealers of its product to pay for the house before it left the factory and to cover the cost of transportation and construction, so many dealers were forced to find the rare customers who could pay for the house upfront. The on-site assembly of the house posed a whole host of problems, specifically that the houses were often assembled by local laborers who were unaccustomed to the precise assembly required by the factory parts; consequently construction of the houses took around 1,000 hours – far more than the meager 350 hours advertised by Lustron.³¹ Also, the Lustron company was involved in some questionable financial deals with the government including paying for Senator Joseph McCarthy's gambling at the racetrack – no wonder it struggled financially! While the failure of the Lustron homes was a significant setback in the realm of factory-built housing, it was not as catastrophic as Senator Ralph Flanders suggested in 1947 when he stated, “if Lustron doesn't work, let us forever quit talking about the mass-produced house.”³²

Emerging at the same time as Levittown and the Lustron houses, *Arts & Architecture* magazine's Case Study House Program sought to define postwar housing on its own terms. John Entenza, the magazine's editor, launched the program in 1945 with the magazine acting as client for acclaimed architects such as Richard Neutra, Raphael Soriano, Charles Eames, Pierre Koenig, and Craig Ellwood. The architect was given a somewhat low budget as well as information on the house site and its relation to work, schools, neighborhood conditions, and hypothetical family need. Each month, one

completed house would be featured in the magazine along with photographs, comments from the architect, and detailed design plans, with the idea that the houses could be easily and affordably replicated by anyone. Upon completion, the house would also be open to the public for viewing and touring, and would then be sold to an actual family.³³

Case Study House #8, designed by the husband and wife team of Charles and Ray Eames, is especially impressive in its use of affordable, mass-produced materials for construction. The Eameses sought to demonstrate the potential of design that used existing prefabricated parts – all elements of the house were ordered by catalogue or purchased from an industrial manufacturer.³⁴ The Eames House proved the financial viability of using factory-built elements, with the house costing one dollar per square foot to build compared to the average \$11.50 per square foot of other houses during that era. To build the Eames House today would cost only eight dollars per square foot compared with the current U.S. average of \$83.89 per square foot.^{35 36}

Perhaps one of the most forward-thinking aspects of the Case Study House Program was Entenza's goal to question past standards of living and think about how to reformulate the house. In doing this, he sought to create homes that were not designed just by the architect or developer but rather took a multidisciplinary approach to housing. Of Entenza, architectural historians Ethel Buisson and Thomas Billiard write:

Entenza reintegrates the architect, engineer, designer, and user into the thinking and making process of the dwelling object. He places them above 'process' and elevates them to the rank of good designers who synthesize numerous disciplines from research to production...³⁷

So, the Case Study Houses were admirably meant to be affordable, easily replicated, and user-friendly, but the program never really took off. Case Study architects did make good use of cheap, mass-produced materials like plywood, steel, and glass, but

over the twenty years that the houses were produced, inflation grew rapidly and the low-cost model was no longer so inexpensive.³⁸ The program's vision for mass production of each house model had potential, but it was a victim of the economy (specifically inflation) as well as the constantly changing American perception of what a house should be – many people simply weren't comfortable with the modern aesthetic of the Case Study Homes and preferred the uniformity of suburbs like Levittown.³⁹

In 1969, just a few years after the end of the Case Study House Program, the U.S. Department of Housing and Urban Development (HUD) under secretary George Romney introduced a new housing program called “Operation Breakthrough.” Romney, former president of the American Motors company and one-time Presidential candidate, believed strongly that houses, like cars, could be produced at a high quality and low cost using factory technology, with the ultimate goal to “shift from conventional to industrial production and from local to national markets.” In 1970, 22 producers were chosen to test their housing concepts and over 2,000 housing units were scheduled to be built; by 1972 a total of 25,000 units had been completed. However, Operation Breakthrough, like so many other attempts at factory-built housing before it, failed to gain momentum and was phased out when Secretary Romney left HUD in 1973.⁴⁰ A government report on Operation Breakthrough suggests it did not accomplish its objectives for a few reasons: unexpected decreases occurred in the housing market, HUD subsidized mortgage housing programs were suspended, and some housing systems lacked the cost savings they had promised.⁴¹

In the post-Operation Breakthrough era, innovations in the American factory-built housing industry were in short supply. But as the housing boom of the early 2000s began, factory-built housing saw a resurgence, propelled by advocates such as the influential

Dwell magazine and architects like Michelle Kaufmann, Rocio Romero, and Leo Marmol and Ron Radziner. Just as this resurgence was starting to gain momentum, the housing market collapsed and with it, the market for factory-built housing. However, a recent report predicts that shipments of factory-built housing will achieve above-average growth through 2011, with more households beginning to choose the economy of manufactured housing over site-built homes.⁴²

Chapter 2: Trends in Factory-Built and Affordable Housing

Current State of Factory-Built Housing in the United States

The factory-built housing industry is complicated and multifaceted, and as such is difficult to define. For the purposes of this paper, I will use the term “factory-built housing,” referring to any home constructed using any measure of pre-assembled components, from an entirely factory-built home to a home with just a few pre-assembled components. To reflect these differences, there are several categorizations of factory-built homes, such as modular, manufactured, panelized, and pre-cut. This paper focuses primarily on manufactured and modular housing as they are the most common types of factory-built housing with the most information and data available.

A **manufactured home or HUD code home** is factory built to meet the Housing and Urban Development (HUD) code, must have a chassis (underlying steel framework), and rarely moves once placed (Figure 1).⁴³ Manufactured homes are delivered about 80 to 90 percent complete with appliances, paint, lights, and utilities ready to be hooked up on site.⁴⁴ Concerns about the quality, safety, and durability of manufactured homes led to the passage of the Federal Manufactured Housing Construction and Safety Standards Act in 1974, ultimately creating a national manufactured housing code, also known as the HUD code. The key difference between manufactured homes and other types of factory built homes is that manufactured homes are built to a national quality and safety standard, whereas other factory-built homes are constructed according to a variety of state and local codes. But the HUD code does not address local standards, meaning that local zoning, subdivision ordinances, and architectural requirements can limit the number of areas where manufactured housing can be sited and can impose additional onsite installation standards.⁴⁵

Before the 1980s, about 75 percent of manufactured homes were single-section units only 12 to 14 feet wide, but since 1998, more than 60 percent of manufactured homes consist of two or more units joined in a variety of ways, some of which are even two-story units.⁴⁶ Between 1993 and 1999, manufactured housing comprised more than one-sixth of the growth of owner-occupied housing stock. This figure was even higher for certain demographics: among very low-income households, 23 percent of homeownership growth came from manufactured housing. For southern households, 30 percent, and for rural households, 35 percent of homeownership growth came from manufactured housing.⁴⁷

During the period from 2000 to 2005, there were even more pronounced differences in regional manufactured housing activity. The South attracted the largest amount of manufactured housing shipments, though this share has declined since 2000. Similarly, the Midwest saw declining shipments, while the Northeast and West saw steady low levels of shipments.⁴⁸ The recent housing market crash had a major impact on manufactured housing – new manufactured home placements dropped from 280,900 units in 2000 to just 49,000 in 2010.⁴⁹

The **modular home** is also factory built but arrives on site closer to 70-85 percent complete (Figure 2). Unlike manufactured homes' HUD code compliance, modular homes follow building codes adopted by states, then must comply with local building codes for the home installation and any additional site-built elements such as garages or porches.⁵⁰ Because they arrive less complete, there is more room for design flexibility and customization, allowing them to be tailored to the homebuyer's wishes or to fit in aesthetically with the rest of the neighborhood. Modular homes have a much smaller market share than manufactured and site-built homes, but they do have a larger share of

the urban market than manufactured homes.⁵¹ Like manufactured homes, modular home production fell dramatically in the recent housing crisis, with U.S. shipments of modular homes down to 12,719 units in 2009 compared with 43,025 units in 2004.⁵²

For **panelized homes**, wall panel sections are assembled in off-site factories and are supplemented with on-site construction to meet state and local building codes (Figure 3).⁵³ The degree to which the panels, or large wall sections, are completed varies, though they typically include windows, doors, wiring, and outside sheathing.⁵⁴ More specifically, these can be wood panels or structurally insulated panels (SIPs), which are built by sandwiching foam insulation between two outer panels of wood. SIPs mate tightly together, improving energy efficiency by reducing heating and cooling costs and making them an increasingly popular factory-built component for homes.⁵⁵

Pre-cut homes are kit homes, like the popular Sears Kit House of the early 1900s (Figure 4). All materials are assembled at a factory and cut according to specific dimensions, then compiled into a kit and shipped to the home site for assembly. Like modular and panelized homes, they are regulated by state and local building regulations.⁵⁶

The term **mobile home** technically refers to manufactured housing units built before 1976, which are similar to a trailer; though it is occasionally incorrectly used to describe units built after 1976 (Figure 5).⁵⁷ Even today when people think of manufactured homes, the image of a mobile home or a trailer park often comes to mind, despite the many improvements made to manufactured home technology since its early days.

A **trailer home**, also known as a camper and sometimes mistakenly referred to as a mobile home, is a unit not built to federal code that can be hitched to an automobile and moved (Figure 6).⁵⁸

Once a home or home components have been produced in a factory, there are a few different ways to place it on its site. A foundation must first be installed to fit exactly with the home it will support in order to avoid damage to structural elements and plumbing or utility-hook up problems. When the foundation is properly set up, the home installation can be performed, usually by an experienced installation company with specialized equipment. One method of installation is the **drive-on method**, normally used for smaller projects, where sections of the house are literally driven onto the foundation by trucks, then lowered onto the foundation using hydraulic jacks. The **roll-on method** is used when the foundation prevents sections from being driven into place; instead, sections of the house are rolled into place using special equipment. Finally, with the **crane method**, an industrial crane picks up each unit of the home and lowers it into place. This method is more expensive but much faster than the drive-on or roll-on methods, making it best suited for larger projects.⁵⁹

Current State of Affordable Housing in the United States

Over 16 percent of Americans spend half or more of their income on housing expenses. The common standard of **housing affordability** is spending under 30 percent of one's income on housing; those who spend more than 30 percent have an **excessive cost burden**, and those who spend more than 50 percent have a **severe cost burden**.⁶⁰ As of 2007, about 30 percent of all homeowners and 45 percent of all renters were classified as having an excessive cost burden.⁶¹ This cost burden falls disproportionately on low-

income renters: in 2008, almost one in four renter households had severe cost burdens, compared to one in eight owner households.⁶²

The lack of affordability for low-income renters is caused by a few concurrent problems: due to a growing national income inequality, renters are becoming poorer while the available supply of affordable housing is shrinking, reflecting the private housing market's inability to create low-cost housing without public subsidies.⁶³ The loss of affordable rental housing has been dramatic: between 1997 and 2007, the number of units with rents under \$400 including utilities fell by about 15 percent, mainly due to demolition, disaster, and conversion to nonresidential uses.⁶⁴ Further compounding the problem, rents collected from low-cost housing are often too low to cover maintenance costs and taxes for the housing units, making affordable housing an undesirable and unprofitable venture for private investors.⁶⁵

Indeed, in 2010 there was a sharp decline in investor demand for federal low income housing tax credits, indicating a drop in affordable housing development. **Low income housing tax credits (LIHTC)** provide the private market with an incentive to invest in affordable rental housing: these tax credits are awarded to developers of qualified projects, who can then sell the credits to raise capital for their projects, reducing the debt that the developer would otherwise have to borrow. As long as the property complies with LIHTC guidelines, investors receive a dollar-for-dollar credit against their federal tax liability every year for ten years.⁶⁶ Major financial institutions had dominated the tax credit market during the housing boom earlier in the 2000s, but in 2007 when the housing market dropped, they no longer had much taxable income to offset.⁶⁷

One major factor sure to shape the future of affordable rental housing is immigration. From 2000 to 2009, the share of foreign-born renter households increased

from 17.4 percent to 19.6 percent. The number of Hispanic renters more than tripled from 1.9 million in 1980 to 7 million currently. With minority renters rising in number, demand for larger and more child-friendly units will likely increase: minority renter households typically include 2.8 people while white renter households typically include 2.1 people. For all renters under age 55, minority households have an average of 1.1 children, with only 0.6 children per white households.⁶⁸ Clearly, the lack of affordable housing stock in the United States is a major problem and seems likely to increase as the population grows and with it, demand for low-cost housing.

Chapter 3: Benefits of Factory-Built Housing

Factory building has several benefits as a method of housing construction, the most prominent of which are reduction of waste, cost efficiency, quality control, and perhaps most importantly, great potential for affordable housing construction.

Reduction of Waste and Quality Control

More than 135 million tons of debris from construction sites are dumped in U.S. landfills each year, making construction the largest single contributor to the waste stream.⁶⁹ Similarly, new construction projects in the United States each year account for 30 percent of all raw materials and 25 percent of water used, as well as 30 percent of the materials placed in landfills. Most green building efforts seek to reuse and recycle this waste post-construction, but factory-built housing is inherently resource-efficient, allowing for waste reduction on the front end.⁷⁰

Because factory-built homes are constructed in a controlled environment, they are not subject to the fluctuating conditions of site construction, which can often cause construction inefficiencies. For example, inclement weather conditions, damage or vandalism to materials stored on site, and subcontractor delays can all slow the process of constructing a site-built home.⁷¹ Additionally, when multiple homes or modules are being constructed in the same factory, extra building components that would normally be thrown away can easily be allocated for use on another project.⁷²

As previously mentioned, homes or home components built in a factory are not affected by weather conditions, which contribute to material degradation and slow the construction process. Furthermore, home-building machinery used in factories tends to be quite advanced, making construction simultaneously quicker and more efficient. Also, employees can focus on one construction task or one project at a time rather than

switching from job to job, making them more skilled at their job and reducing construction errors and delays.⁷³

Cost Efficiency

Factories can generally purchase construction materials in bulk at a discounted price, often up to 30 percent, reducing the cost of producing the house and then passing the reduced cost on to the buyer. In a study analyzing the effectiveness of using factory-built components, the Wood Truss Council of America and the Systems Building Council of the National Association of Homebuilders built two identical homes next to each other – one conventionally built and the other built with wood trusses and wall panels (factory-built components). They found that the conventionally built house took 401 man hours to erect, whereas the house with factory-built components only took 148 hours. The total man hour cost at 20 dollars an hour for framing crew labor was \$8,020 for the conventionally built house, compared with \$3,460 for the component-built house. Also, the amount of panel scrap generated for the conventional home was 17 yards, compared to four for the component built house, demonstrating the reduction of waste typical of factory-built homes. Overall, the cost to build the 2,600 square foot house was \$21,373 for the stick-built house and \$18,017 for the component-built house, with a total savings of \$3,356 or about 16 percent.⁷⁴

Potential for Affordable Housing Development

Historically, manufactured homes have served as the predominant unsubsidized type of affordable housing in the United States.⁷⁵ Residents of factory-built homes perceive their homes to be higher quality than similar rental units and lower cost than traditional owned units, creating what Casey J. Dawkins and C. Theodore Koebel call a “quality-cost advantage,” creating potentially significant market demand for factory-built

units. Moreover, the quality-cost advantage is important in terms of developing affordable housing. In most urban communities, affordable housing units are older and more run-down, causing maintenance costs to burden low-income households. Factory-built housing is less expensive to build, and if built well can be quite durable, making it a viable technique to improve the quality and quantity of affordable housing units.⁷⁶

Chapter 4: Drawbacks of Factory-Built Housing

Despite its significant advantages, certain aspects of factory-built housing have held it back from gaining mainstream acceptance. The most prominent barriers are a lack of union support, complicated financing processes, and cultural stigma and stereotyping.

Lack of Union Labor for Factory-Built Housing and the Construction Industry as a Whole

Construction is a trillion-dollar industry employing more than six million workers. While construction firms were historically smaller (less than twenty workers per firm), the rise of national and multinational building corporations has fundamentally changed the way the industry works.⁷⁷ For a number of years beginning around 1945, labor unions held varied national and local legislative, electoral, and economic power.⁷⁸ Thanks to unions, tradesmen were paid high hourly wages and enjoyed a wide range of benefits, and contractors saw unions as a form of stability in a typically unstable business.⁷⁹ Politically, labor leaders had easy access to elected officials and were known for their ability to deliver critical votes at federal, state, and local levels; this power allowed unions to influence urban housing policy and promote affordable housing. After the American Federation of Labor and the Congress of Industrial Organizations merged in 1955 to form the AFL-CIO, the organization represented labor's position on housing issues, advocating for expanded homeownership for moderate-income families through federal subsidies and lower interest rates as well as an increased stock of public housing for the poor.⁸⁰ But in the 1960s and 70s, and continuing through today, unions began to turn away from smaller residential projects as large industrial construction projects offered well-paying contracts to construction firms and steady income for union members.⁸¹

Double Breasting in the Construction Industry

One common problem in the construction industry that greatly weakened the power of unions is double-breasting, when “a person or business entity operates two or more business enterprises that are commonly owned and controlled, and used selectively depending on the circumstances.” For example, owners of a construction business may use union labor in areas that are well organized by unions but use non-union labor in areas that are less organized.⁸² Due to rising land and material costs, employers double-breast to save money on labor costs, which benefits them but hinders unions’ strength.⁸³ In 1977, the National Labor Relations Board (NLRB) issued the Kiewit decision, which loosened the restrictions on double-breasting, making it easier for unionized contractors to establish non-union subsidiaries and thus avoid contractual agreements with building trades unions. Just ten years after this decision, eight out of the ten top American building contractors were double-breasted.⁸⁴

Who Are Today’s Construction Workers?

It has become increasingly difficult to recruit new construction workers; wages are unstable and firms are increasingly relying on immigrant labor. Interestingly, labor compensation varies significantly by geographical area: in the northeast, Midwest, and West Coast, craft workers often enter into collective bargaining agreements, and even nonunion contractors pay rates similar to union wages for fear of losing their workers to unionized companies. Conversely, in the south, Gulf Coast, and Rocky Mountain areas, non-union construction workers are paid lower wages and as such, labor supply is consistently less than the demand.

With wages too low to attract many workers, many contractors are turning to immigrant labor, both documented and not. According to government estimates, the

number of undocumented workers in the United States is about nine million, but private researchers believe that number is closer to 20 million.⁸⁵ The two most common construction trade jobs, carpenters and construction laborers, make up nearly 30 percent of all construction employment. About 22 percent of carpenters and 32 percent of construction laborers are immigrant workers, and almost a third of painters, masons, and roofers are immigrants.⁸⁶

Due to the transient nature of construction work it can be hard to track union membership, but the Building and Construction Trades Department of the AFL-CIO estimates that from 1973 to 2002, union membership declined from 1.6 to 1.2 million. At the same time, the unorganized construction workforce more than doubled, growing from 2.5 million to 5.5 million. Average hourly wages for construction workers have dramatically dropped 17.5 percent between 1973 and 2002.⁸⁷

Labor in the Factory-Built Housing Industry

In terms of labor in the factory-built housing industry, there is little official data as government data does not separate factory-built home construction workers from conventional residential construction workers. However, according to anecdotal information from Dan O'Donnell of the Carpenters Industrial Council, most factory-built housing workers are non-union, with very poor wages, benefits, and overall working conditions.⁸⁸ A study by the Bureau of Labor Statistics ranked mobile/manufactured home production among the top ten high-risk industries, with the 1987 incidence rate of workplace injuries and illnesses double that of other construction industries. Typically, hazardous work activities associated with home manufacturing include manual handling and lifting of heavy floor, wall, and ceiling partitions, assembling and working around unstable building structures, and handling operating tools or equipment.⁸⁹

In December 2000, President Bill Clinton signed the Manufactured Housing Improvement Act, which aimed to reform and modernize the outdated federal regulatory program governing construction standards for manufactured homes. The act establishes a consensus committee composed of members from the industry, users, general interest groups, and public officials, which reports to the Department of Housing and Urban Development every two years on ways to keep the HUD code for manufactured homes up to date. The act also addresses installation standards, affordable homeowner finance and protection issues, and encourages innovative and cost-effective construction techniques.⁹⁰

While the passage of this legislation was certainly a step in the right direction, it may not have a strong enough impact on the industry. In a study by the Center to Protect Workers' Rights in Maryland, observation found that when performing tasks like using a chain saw, air nailer, step ladder, and drill, basic safety procedures were not followed due to a lack of formal safety training of many employees. In addition to hazards in the factories themselves, workers installing factory-built homes on site failed to take necessary precautions. In one instance, a crane carrying part of a home module was overloaded and a worker had to enter the house while it was suspended in the air in order to remove materials and bring the module's weight down. In this same installation, the crew consisted of only two workers, both of whom had to periodically pass under the house while it was suspended in the air.⁹¹ Clearly, more stringent worker protection regulations are necessary.

Purchasing and Maintaining a Factory-Built Home

Loan terms for factory-built homes appear similar to conventional mortgages, and Federal Housing Administration (FHA) loans and Veterans' Affairs (VA) loans are available to those who qualify. However, there is one major difference between

conventional and factory-built home financing: higher interest rates. Interest rates tend to be two to three percentage points higher than those for site-built homes, largely because banks are wary of lending on factory-built homes. The logic behind these higher rates is, according to lenders, borrowers who buy manufactured homes are more likely to default than those with traditional home mortgages. Indeed, around 12 percent of manufactured home loans end up in default because manufactured homes are more likely to lose value over time than conventional homes.⁹² Once a home is purchased, it is often sited on land rented from a factory-built home park, meaning that residents can lack long-term security and are less likely to build assets through home price appreciation.⁹³

Factory-built home financing practices are left over from the era of mobile homes and trailers. In the past, factory-built homes were financed as personal property, but are increasingly being financed together with land as real property. Personal property includes everything that is subject to ownership (i.e., the manufactured home) but not real property (i.e., land and anything permanently affixed to the land). Additionally, security interests in personal property are regulated under the Uniform Commercial Code and are enforced through repossession, while real property is secured by a mortgage or deed of trust enforced through foreclosure.⁹⁴

Personal Property Financing

Many manufactured homes are still financed through personal property or “chattel” loans, from private sources as well as public programs that originate loans which are secured through the asset-backed security sector. These types of loans are usually smaller in amount than real property mortgage loans, but are easier to originate. Loan amounts are calculated from wholesale invoice prices and are readily available to

borrowers who may have sub-par credit histories and therefore do not qualify for a typical mortgage loan.⁹⁵

Government sponsored personal property loans are another form of financing. FHA and VA sponsored loans were first initiated for manufactured housing in the early 1970's. FHA loans are generally available while VA loans are limited to eligible veterans, but both loans are securitized through bonds issued by the Government National Mortgage Association (Ginnie Mae). However, both of these types of loans represent a small share of manufactured home financing, due to administrative burdens, delays in loan approvals, and difficulty of obtaining payment in the instance of default.⁹⁶

Overall, personal property loans tend to have shorter terms and higher interest rates than conventional mortgage financing, and are therefore less beneficial to the consumer. Moreover, manufactured homes are often sold at retail sales centers by dealers who receive commissions and may not always have the customer's best interests in mind.⁹⁷

Real Property Financing

If a manufactured home is attached to the land by a permanent foundation and the home and land are treated as a single real estate package, then the home is eligible for a conventional 30-year mortgage through government programs as well as through government sponsored enterprises like the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac).⁹⁸ Also, there is a private-sector market for loans on manufactured homes that do not conform to Fannie Mae or Freddie Mac criteria, led by institutions that originate mortgage loans for these types of homes. The loans are compiled into asset-backed securities, rated for quality, then sold to investors. Loans in this market tend to be more risky, involving

borrowers with high debt-to-income ratios or low credit scores.⁹⁹ However, it is inconclusive how many manufactured homebuyers actually fit the subprime borrower profile versus how many pay unnecessarily high rates.¹⁰⁰

The Landlord-Tenant Relationship

Another finance-related problem with factory-built housing is that approximately 35 percent of all factory-built home residents live in factory-built home parks, meaning they own their home but not the land it sits on.¹⁰¹ Site rental rates, utility charges, and cable TV fees can all have hidden components and unforeseen charges, and in many states, a land or park owner can easily intimidate residents by imposing arbitrary rules, and complaints about the owner can lead to eviction.¹⁰² Also, few states have protections against rapid rent increases or land fees, park closures that might lead to displacement, or non-renewed leases without just cause.¹⁰³

At an average price of \$64,900 or \$41.34 per square foot, factory-built homes can be nearly half the price of conventional homes, which cost an average of \$217,744 or \$88.55 per square foot.¹⁰⁴ But certain aspects of factory-built homes including high interest rates, high rates of default, and the inability to own land can turn prospective buyers away.

Cultural Perception and Stigma of Factory-Built Homes

The stigma attached to factory-built housing is inescapable – even deciding what to call this type of housing is a challenge, as separate designations like manufactured and modular are not comprehensive enough, but an all-encompassing term like factory-built housing brings to mind the negative stereotypes associated with mass-production of homes. In her book Mobile Homes: The Unrecognized Revolution in American Housing,

Margaret Drury argues that in American culture, value is placed on the stereotypical, traditional single-family home:

Many of today's housing problems are related to the refusal of American society to change or to redefine its concepts of housing. Perhaps, the most peculiar American idiosyncrasy is the concept of the 'symbolic traditional single-family home.' Society's unwillingness to change this traditional concept of home in spite of changes in family needs, type of use, or new technology reflects our strong cultural desire and its resulting institutional backup for this symbolic home. Before innovation or a major revolution in housing can be effected, the culture will have to redefine its ideal of this symbolic home, not just in a structural sense, but from a deep conviction that cultural reevaluation of the use and users of 'home' is needed.¹⁰⁵

Drury's argument echoes Le Corbusier's assertion that there must be a cultural, ideological shift in the way we think about housing in order for factory-built housing to succeed on a large scale. Though Drury's book was published in 1955, her argument still resonates today, suggesting little has changed in terms of public perception of factory-built housing.

Indeed, in a recent survey by the U.S. Department of Housing and Urban Development to analyze consumers' attitudes to different types of housing, respondents rated site-built homes more favorably than manufactured, modular, and panelized homes. Interestingly, respondents who were knowledgeable about each housing type were more likely to consider purchasing modular and panelized homes, indicating that for many, it is simply a lack of knowledge about different types of factory-built housing that causes negative perceptions about the product.¹⁰⁶

This ignorance about factory-built homes leads to stereotypes about factory-built homeowners, such as the perception that most factory-built housing owners are low-income and tend to live in the middle of nowhere. Certain stereotypes do have some validity; for example, more than half of all manufactured households are located in rural areas, and the median annual income of households residing in manufactured housing is

nearly 40 percent less than that of households residing in conventional homes. One unfounded stereotype going back to the era of the mobile home is the idea that most manufactured homes are located in park settings (previously mobile home parks). In fact, only about 34 percent of manufactured homes are located in such communities.¹⁰⁷ The issue of class bias in relation to factory-built housing was actually taken to court in the landmark *Mount Laurel II* decision, where the New Jersey Supreme Court declared it unconstitutional to use zoning to purposefully exclude mobile homes from certain areas of a community, ruling such exclusion a form of class discrimination.¹⁰⁸

Other public concerns with factory-built housing are design-related; focus group research based in Seattle, Washington revealed concerns related to the visual compatibility of factory-built housing to the surrounding neighborhood. Residents of many neighborhoods disapproved of the flat-sided trailers with low-pitched roofs typical of more conventional factory-built housing, despite the fact that great improvements in design make many factory-built homes look more modern. Moreover, fears that factory-built housing could negatively impact nearby property values remain a major obstacle, even though there is no conclusive evidence to prove or disprove such perceptions.¹⁰⁹

Reconciling High-Design Prefab and Manufactured Housing

Manufactured, modular, panelized, pre-cut, mobile home, trailer home – the various types of factory-built housing and their respective differences are a source of confusion for many. Regarding the idea of “prefab,” Barry Bergdoll and Peter Christensen posit “prefabricated houses are no longer anonymous but brands, offering one safe choice.”¹¹⁰ Indeed, many architecture firms and other forces in the architecture industry such as Dwell Magazine have created a concept of prefab as not just manufactured housing but modern and stylish housing that just happens to be produced in a factory. Jennifer Siegal,

architect and principal at the Venice Beach-based Office of Mobile Design, said her typical client is affluent, educated, and appreciates design – a very different customer base than what many think of when considering the inhabitants of a run-down manufactured home park.¹¹¹ There is a difference between people who seek out factory-built housing as a low-cost housing solution and are relatively unconcerned about design versus those who are drawn in by the more expensive, stylish prefabricated homes, seeking a well designed home that can be built quickly. Neither consumer type is necessarily good or bad, they just have different intentions when it comes to purchasing a home. But there should be more of a middle ground between the two types – a factory-built home that is well designed and solidly constructed but still affordable to those with a lower income.

Chapter 5: Perspectives on Factory-Built Housing

To present a comprehensive view of the factory-built housing industry, I contacted several individuals who deal with factory-built housing in a variety of ways, many of whom are leaders and important figures in their field. The following is a compilation of information about each person and their work, as well as their thoughts on factory-built housing. Due to the nature of this report I had to somewhat limit the number of interviewees, and I focused on firms and organizations located in California to better facilitate interviews. While valuable, these interviews are by no means comprehensive, and each interviewee's opinions do not necessarily reflect those of his or her field as a whole.

Shilpa Sankaran, Cofounder of ZETA Communities Architecture

ZETA produces net zero energy multifamily housing and mixed-use structures for sustainable communities, meaning that the buildings generate as much power as they consume. The firm focuses on urban infill, transit-oriented development, public land development, and educational campuses (Figures 7 and 8). All components of ZETA's modular buildings are produced in their 91,000 square foot manufacturing facility in Sacramento, California. The firm estimates that their off-site construction enables them to complete projects 50 percent faster with 80 percent less waste. In addition to producing both residential and non-residential structures, ZETA provides construction management and project development consultation assistance to its clients.

As far as construction services, ZETA has an approved list of companies to transport the factory-assembled buildings to their final location, as well as companies to manage craning and module-setting for the placement of the home. Before the home is placed though, ZETA manages and evaluates the quality control and quality assurance of

the site, working with the general contractor selected by the client or recommending a general contractor to handle the foundation, installation, and finishing work.

In terms of project development services, ZETA conducts a feasibility analysis for each client, including a conceptual architectural proposal, an initial cost estimate, and a proposed project schedule; they can also provide a market assessment of the project, looking at market acceptance, absorption, pricing, and profitability. Also, the firm has a team of modular engineers as well as building scientists who work on project design and development and plan for features like net zero energy mechanical systems, solar and other renewable energy features, and high indoor air quality. Finally, ZETA's urban planners and real estate economists assist with land use and site planning.¹¹²

By providing not only architectural design and modular components but a comprehensive range of services to assist with the entire building process, ZETA sets itself apart from other modular design firms. Moreover, the firm's commitment to creating net zero energy homes is quite ambitious. In an interview with Shilpa Sankaran, co-founder of ZETA, she told me she and her business partner Naomi Porat sought to find a better way to build that would also be a solution to climate change that could eventually be adopted by the mass market. Sankaran and Porat realized that in order for any type of building to be widely accepted, it must hit a certain price, making it affordable for the average buyer. However, Sankaran said there is no average price of a ZETA building, as price varies widely depending on several factors such as building size, design, and added features.

Sankaran sought to dispel the notion that factory-built homes have a higher carbon footprint because they must be transported via truck to the installation site; rather, she noted that with conventional building, each component (e.g. lumber, insulation,

roofing) must be transported from separate factories to each building site, rather than simply delivering all materials to a single factory. In the future, ZETA plans to expand nationally, allowing them to truly impact the mass market and help reduce the energy consumed by both building homes and living in them, while simultaneously keeping their operations as local and regional as possible to reduce transportation emissions.¹¹³

Ray Kappe, Renowned Architect and Designer for LivingHomes

LivingHomes, a firm based in Southern California, also uses modular construction to build their homes. On their website, they pledge that their homes are “not your weird cousin’s mobile home,” but instead are built in a factory, enabling LivingHomes to produce higher quality homes faster and for less money than traditional site-built methods. From a design perspective, LivingHomes are quite upscale and sophisticated, inspired by the style of modernism practiced by architects like Walter Gropius and Richard Neutra (a Case Study home architect). LivingHomes has been particularly adept at branding themselves as eco-friendly builders, separating their product from stereotypical factory-built homes. Their tagline, “Nature Made, Factory Built” suggests a natural, environmentally friendly building process. Additionally, the firm created a “Sustainability Scorecard,” which “like a nutritional label, provides an easy reference for the ecological footprint” of their homes, focusing on the home’s score on the U.S. Green Building Council’s (USGBC) Leadership in Energy and Environmental Design (LEED) rating as well as the reduced impact of the operation and construction of the home.

The firm partners with well-regarded architects to design their home prototypes, one of whom is renowned residential architect Ray Kappe. In his past work, Kappe has explored modular building systems, prefabrication, and solar energy and is also an urban designer and planner active in the arena of community and social advocacy.¹¹⁴ I was

fortunate enough to interview Kappe about his perspective on factory-built housing. When I asked for his thoughts about the criticism that factory-built homes are inherently impersonal due to their mass production, he told me he believes his designs for LivingHomes have proven that factory-built homes can in fact be built to reflect a client's wishes. The Ray Kappe line of LivingHomes has five different standard models, but each can include customized floorplans, layouts, and finishes based on the client's needs. Standard designs take approximately 46 weeks and custom designs up to 54 weeks from start to finish, including feasibility analysis, permitting, and the actual fabrication of the building. The least expensive Ray Kappe-designed LivingHome, the "RK 5.1," costs \$230 per square foot, starting at a total of \$317,400 for the entire home, not including land (Figure 9). The most expensive model, the "RK 1" is \$320 per square foot, totaling \$589,030 or more – hardly an affordable solution for low-income buyers (Figure 10). Interestingly, Kappe said most of LivingHomes' clients seem to be categorized as custom-built clients who are interested in building more quickly without sacrificing design.

On the topic of the future and longevity of the industry, Kappe believes that it is possible for factory-built housing to gain more widespread acceptance. The obstacle to achieving this thus far is that there is not enough demand for the type of prefabricated homes characteristic of LivingHomes and other more high-design firms. Until these types of factory-built homes can reach wider acceptance, they will not be competitive with conventional site-built housing. Kappe said he has been convinced for forty years that widespread prefabrication of homes is possible, but the present housing market has once again made it impossible once again.¹¹⁵

Fleetwood Homes

Fleetwood Homes, one of the largest American manufactured housing producers, was founded in 1950 and started out a producer of recreational vehicles (RVs) but soon began manufacturing residential homes as demand for affordable housing for young families grew after World War II. Though I was unable to contact anyone at Fleetwood for an interview, they are an important player in the manufactured housing world and must be mentioned. Fleetwood is a more traditional manufactured housing producer than the previously discussed architecture firms; the company provides a range of home designs that are regionally designed to meet local market preferences and constructed regional manufacturing plants. These designs can be purchased in different sizes, with different bedroom and bathroom configurations depending on the number of people living in the home. In the Southern California region, design choices include the “Chestnut Manor” and “Vogue II,” each of which can be purchased at a local manufactured housing dealership (Figures 11 and 12).

Recently, Fleetwood came under fire regarding its RVs. The company was asked by the Federal Emergency Management Agency (FEMA) to be one of many suppliers of “Emergency Living Unit” trailers for displaced Hurricane Katrina survivors. In 2007, these trailers came under review by the Centers for Disease Control and Prevention which was concerned about toxic fumes in the units. Officials from FEMA and the Centers for Disease Control and Prevention did a study on the trailers and found formaldehyde levels were an average of five times higher than what residents of conventional homes are exposed to, and in some cases, 40 times higher.¹¹⁶ Formaldehyde, a chemical commonly found in plastics, insulation, and furniture, is a known carcinogen and is thought to have caused chronic sinus infections, nosebleeds, skin rashes,

headaches, aggravated asthma symptoms, and cancer in residents of the contaminated trailers.¹¹⁷ Fleetwood's attorney claimed that the levels of formaldehyde in Fleetwood units is below the level of irritation by even hypersensitive people, and in a National Public Radio reporter's visit to a Fleetwood manufacturing plant in Ohio, interviewed workers said they had never gotten sick from working in the factory around materials containing formaldehyde.¹¹⁸ When tested by the Centers for Disease Control, Fleetwood's trailers showed statistically significantly lower levels of formaldehyde compared with other brands of trailers for Hurricane Katrina victims tested.¹¹⁹ Regardless, FEMA ordered residents to vacate all trailers, although it failed to provide any adequate housing alternative for the evacuees, so many of them stayed in the trailers long past the ordered evacuation.¹²⁰

Later investigation found that when developing the list of specifications for these emergency trailers, FEMA paid little attention to the health and safety of those to be housed. FEMA faults the trailer manufacturers for using substandard products in the rush to meet production targets, while manufacturers fault their suppliers for using cheap, high-formaldehyde-emitting plywood imported from China.¹²¹ Blame can be placed at many points in the process, but overall it is clear that while FEMA's effort to quickly provide shelter for Katrina victims was admirable, it was not carried out in such a way that considered the long-term health impacts of the project. Moreover, this incident highlights the importance of using quality materials and supply sources in the construction of factory-built homes as well as increased federal regulation of chemicals used in home construction, both factory-built and otherwise.

***Bill Roschen, President of the City of Los Angeles Planning Commission
and Founding Principal at Roschen Van Cleve Architects***

Since 1987, Bill Roschen's firm Roschen Van Cleve has strived to build architecture in the service of the community by taking on projects in the areas of mixed use, adaptive reuse, transit oriented design, housing, campus design, affordable green design, and historic restoration. Major projects have included the Sunset and Vine historic restoration and mixed-use area and the Hollywood and Vine transit-oriented market rate and affordable housing.¹²² On the planning commission, Roschen works to represent public opinion while creating public policy around land use such as affordable housing, environmental justice, and public health.¹²³

About one-third of Roschen Van Cleve's projects are affordable housing, which Roschen said is actually more expensive to build than market-rate housing. What makes the housing affordable is the fact that it is subsidized, often from over six different sources such as tax credits and federal, local, and community redevelopment funds. Roschen believes that because of the subsidy structure, not enough affordable housing units are being produced, both in Los Angeles and the country as a whole. He believes this lack of affordable housing is "a housing crisis that's also a sustainability crisis, due to the lack of communities where residents can both live and work."

Another major obstacle to creating affordable housing, particularly in Los Angeles, is the issue of parking. Roschen explained that to build a parking garage is extremely expensive; when the costs are broken down, a single parking stall can cost \$40,000 or more. According to city codes, when building affordable housing, at least one stall per housing unit must be included in the development, greatly increasing the cost of the project. Building transit-oriented development can be much less expensive as it

requires less parking, not to mention the fact that it encourages residents to walk or use public transit, thereby reducing the development's carbon footprint.

On the topic of factory-built housing, Roschen acknowledged the link between factory-built housing and modernism, but believes that architecture has been somewhat hijacked. He says, "Architects themselves have built an industry around individualism, so when they try to create mass-produced housing, they seek to individualize it, which is fine, but I don't believe it's necessary." Roschen believes the affordability and efficiency of building prefabricated housing could help produce at least 50 percent more affordable housing units. If it were feasible to build a transit-oriented affordable housing project using factory-built components, there would be a substantial reduction in the real cost of housing. Unfortunately Roschen does not think there is a structure to support this kind of development, at least not presently. Because both factory-built housing and affordable housing development rely on the support of a complicated set of relationships, from labor to developers to the city government, integrating the two would require support from a wide and diverse range of stakeholders.¹²⁴

Paul Zimmerman, Executive Director of the

Southern California Association of Nonprofit Housing

The Southern California Association of Nonprofit Housing (SCANPH) creates affordable housing opportunities for low-income people by expanding the knowledge, capacity, and influence of the nonprofit development sector. The organization seeks to build a long-term commitment to community development by serving low-income households, delivering permanent affordability, building to the highest and most environmentally sustainable standards, contributing to the social and physical fabric of the surrounding community, incorporating broader community development strategies,

demonstrating good stewardship of public resources, providing supportive services, and contributing to strategies for ending poverty.¹²⁵ According to Paul Zimmerman, Executive Director of SCANPH, about half of what the organization does is policy work such as advocating for affordable housing at the federal, state, regional, and local level; the other half of their work is technical assistance such as conducting workshops and forums on topics like green building and construction, property management strategies, and legal and insurance issues.

In an interview with Zimmerman, I asked if he thought factory building techniques could be an effective way to develop affordable housing. In response, he brought up an interesting point about the political dimension of affordable housing development as it relates to factory-built housing. The major power players in the Los Angeles political arena include the Chamber of Commerce, the Central City Association, and organized labor. SCANPH gets a good deal of support from organized labor, particularly the buildings trades, because housing development means jobs for them. Regarding factory-built housing, Zimmerman said “Prefab drives [labor unions] crazy because it is viewed as an anti-labor innovation. So as an affordable housing developer I am stuck navigating a landscape between the need to build affordable housing as cost effectively and as efficiently as possible while still keeping the support of our allies.”

Zimmerman suggested one of the reasons factory building is not more prevalent is the construction industry tends to be conservative and reluctant to change building processes. Hence, there are not many construction firms that have experience with factory building, which is problematic for housing developers. As Zimmerman said, “As a developer, you want as big of a bidding pool as possible [for new projects]. You want as many companies as possible bidding on your job to increase competition. If there are

only three companies out there who are experienced with the construction methods, then you aren't getting any competition.”

Another issue around factory-built affordable housing is design: for SCANPH and other related organizations, good design is crucial because these organizations depend on public support for their projects, and if a building is poorly designed or doesn't visually fit in with the surrounding neighborhood, it will lose support among funders. Moreover, affordable housing has to be constructed well; as Zimmerman said, “buildings have to be built well or else you're killed on the maintenance side.” These types of buildings are truly investments as they are expected to last 70 to 80 years, and the rents collected are purposefully low, which means there is not a lot of money left to pay for the upkeep of the building.

In short, Zimmerman believes that there is an inevitability to a certain amount of “prefabness” in the world of housing development – in this case, affordable housing development. But the challenge will be balancing elements of factory building with creating and retaining construction jobs.¹²⁶

Jan Breidenbach, Labor Activist and Community Organizer

Jan Breidenbach, a labor activist and community organizer, was involved with the building trades and construction unions and worked to get affordable housing funding programs to require that affordable housing projects pay prevailing wages. Breidenbach worked on a very successful campaign to create a housing trust fund for Los Angeles. The Housing LA coalition was conceived in 1998 when Breidenbach was the Executive Director of the Southern California Association of Non-Profit Housing (SCANPH), and its goal was to create a substantial trust fund dedicated to the production of affordable housing in Los Angeles. The coalition was built around Community Development

Corporations (CDCs) but also brought together a variety of different constituencies including labor, the religious community, and tenants. Labor unions supported Housing LA because creating more housing would create jobs for them, religious leaders believed in the morality of the cause, and tenants wanted better living conditions for themselves and their families. Other supporters included affordable housing developers, environmentalists, disability rights advocates, social service agencies, and social justice organizations. After a hard three-year campaign, the city council unanimously endorsed the Housing LA proposal for \$100 million in affordable housing development funds, provided by increased redevelopment funds, revenue from some city advertising, and dedicated portions of tobacco settlement funds, city business tax, and hotel occupancy tax.¹²⁷

The Housing LA campaign's ability to galvanize such a wide range of stakeholders undoubtedly played a huge role in its success. A similar campaign would be needed to create strong support for factory-built affordable housing development.

***Dan O'Donnell, Membership Mobilization Director
of the Carpenters Industrial Council***

The Carpenters Industrial Council (CIC), an affiliate of the United Brotherhood of Carpenters (UBC), represents industrial factory workers across the United States. The CIC's main activity is developing and maintaining a unified membership program to improve compensation, benefits, safety, and work-related issues. The CIC also maintains an active organizing program to help non-union workers gain representation in their workplace.

I contacted Dan O'Donnell, the CIC's membership mobilization director, to see if the CIC had any experience dealing with issues of labor in the factory-built housing

industry. According to O'Donnell, many workers in the factory-built housing industry, like all housing construction workers, were put out of work by the recent economic and housing crisis. As a whole, the factory-built housing industry is mostly non-union, and wages, benefits, and working conditions are very poor. On a related note, there is a good deal of labor turnover, as is common in jobs involving hard physical work, low wages, and few benefits.

O'Donnell believes the biggest obstacle to unionizing the factory-built housing industry is the intense opposition from employers. He claims that employers knowingly violate federal laws such as making illegal threats to workers during union organizing campaigns because the National Labor Relations Board and current labor laws fail to provide adequate financial penalties for employer violations of workers' rights to organize. When unions are able to successfully organize, workers make about 28 percent better wages than non-union workers in the same industry.¹²⁸ Clearly, unionizing the factory-built housing industry is essential to ensure satisfactory wages, working conditions, and benefits for workers.

Chapter 6: Findings

Recommendations

Based on interviews and research, I have developed a set of policy recommendations to not only increase the development of factory-built housing (particularly as affordable housing) but to ensure such development benefits as many stakeholders as possible.

1. Eliminate zoning policies that impede the development of factory-built homes and increase factory building as a means of infill development in urban areas.

Zoning ordinances define factory-built housing units in a variety of ways and usually treat them differently from other single-family homes. Many areas adopted restrictive or exclusionary regulations because factory-built housing units were seen as temporary structures that could be moved from site to site, and were suitable for rural areas but not city areas. According to a study on barriers to the placement of manufactured housing in urban areas, “by right” or “as of right” zoning can have a positive impact on unit placement.¹²⁹ Instead of requiring applicants to go through a discretionary review process such as getting a conditional use permit or a zoning variance, a jurisdiction can encourage more affordable housing types by allowing them “by right,” approving them administratively instead of requiring a public hearing.¹³⁰ Under by right zoning, developers still need to secure a building permit and fulfill regulatory requirements, but the approvals process tends to be less contentious and time-consuming than the process for proposals that require an exception from current zoning regulations.¹³¹ Moreover, factory-built homes are an effective way to promote affordable development in urban areas and should be encouraged as a means of infill development.

2. Improve regulation of factories producing homes or housing components.

Many workers in the factory-built housing industry lack sufficient wages, benefits, and safety training. Factory-built housing manufacturers should implement stronger safety standards and training programs for workers in home manufacturing plants as well as those installing homes. Also, factory-built housing manufacturers must provide fair wages and benefits to their workers and installers, even if doing so means their cost of production increases. Finally, the government should impose stronger regulations on any harmful chemicals like formaldehyde that are emitted during and after the home production process to benefit the health of workers as well as residents of factory-built homes. Workers and residents should also be better informed about any chemicals present in their homes and the risks associated with such chemicals.

3. Increase access to legal advice for factory built home buyers and encourage development of resident-owned communities (ROCs).

The process of acquiring a loan for a factory-built home can be confusing and overwhelming. Also, homebuyers often must purchase a factory-built home through a dealer, who seeks to make a profit and may not always have the customer's best interests in mind. Potential factory-built homeowners should have access to legal consultation before taking out a loan and purchasing a home to ensure their best interests are kept in mind. Furthermore, to ensure residents of factory-built home parks are not being abused by their landowner, more factory-built home communities should be turned into ROCs, where homeowners form a non-profit cooperative or corporation to own and operate their own community. The cooperative can borrow money from a home loan fund or bank to

purchase the property, helping preserve the long-term affordability of the park and helping residents build wealth.¹³²

4. Enhance public education to help rebrand factory-built housing.

Public opinion is never easy to change, particularly about something like factory-built housing that has been around for over a century. Tactics like public information campaigns and design charettes are effective ways to show people that factory-built housing can be innovative in design and is no longer the ugly mobile homes of the past. Magazines like *Dwell* and *Sunset* effectively promote “prefab” housing to their readers, emphasizing the innovative design and environmentally-friendly features of factory-built housing. Also, public installations of factory-built homes allow the public to explore the homes firsthand: in 2007, prefab architect Michelle Kaufmann installed her “mkLotus” model in front of San Francisco City Hall as part of a “West Coast Green” event.¹³³ And in 2008, the New York Museum of Modern Art organized an exhibit called “Home Delivery: Fabricating the Modern Dwelling,” which surveyed the history of factory-built home and included the installation of five contemporary factory-built homes.¹³⁴ Strategies like these help bring factory-built housing to a broader audience and dispel negative stereotypes and preconceptions.

Conclusion

There are lessons to be learned from this study for policymakers, architects, affordable housing developers, city planners, and union organizers. Most literature on the subject of factory-built housing focuses on just one or two of these stakeholder groups, but in order to address all of the issues around factory-built housing, all of the stakeholders need to be considered in relation to each other. Factory-built housing has the potential to make valuable contributions to the development of affordable housing by

making it more affordable and increasing construction efficiency. But in order for this to happen, various policy changes must be made and coalitions including tenants, affordable housing developers, environmental groups, and building trades unions, must be built.

Notes

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- ¹ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 8.
- ² Arieff, 14.
- ³³ Maxwell, Shirley and James C. Massey. "The Story on Sears: Houses by Rail and Mail." Old-House Journal. July/August 2002.
- ⁴ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 14.
- ⁵⁵ Sears Archives. "What Is A Sears Modern Home?" Sears Archives Online. Accessed 20 November 2010. <<http://www.searsarchives.com>>.
- ⁶ Maxwell, Shirley and James C. Massey. "The Story on Sears: Houses by Rail and Mail." Old-House Journal. July/August 2002.
- ⁷ Fishman, Robert. Urban Utopias in the Twentieth Century: Ebenezer Howard, Frank Lloyd Wright, and Le Corbusier. Cambridge: MIT Press. 1982. Pg. 180.
- ⁸ Bacon, Mardges. Le Corbusier in America: Travels in the Land of the Timid. Cambridge: MIT Press. 2003. Pg. 104.
- ⁹ Le Corbusier. Towards a New Architecture. Mineola: Dover Publications. 1985. Pg. 236.
- ¹⁰ Ibid. Pg. 232.
- ¹¹ "Design: The Dymaxion American." Time. 10 January 1964.
- ¹² Oshima, Ken Tadashi and Rasmus Waern. Home Delivery: Fabricating the Modern Dwelling. New York: The Museum of Modern Art. 2008. Pg. 20.
- ¹³ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 18.
- ¹⁴ Baldwin, J. Bucky Works: Buckminster Fuller's Ideas for Today. Hoboken: Wiley Publishing. 1997.
- ¹⁵ Oshima, Ken Tadashi and Rasmus Waern. Home Delivery: Fabricating the Modern Dwelling. New York: The Museum of Modern Art. 2008. Pg. 20.
- ¹⁶ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 19.
- ¹⁷ Lind, Carla. Frank Lloyd Wright's Usonian Houses. Petaluma: Pomegranate Communications. 1994.
- ¹⁸ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 19.
- ¹⁹ "Usonian House." PBS: Frank Lloyd Wright. Pbs.org. Accessed 25 November 2010. <<http://www.pbs.com>>.
- ²⁰ Wolfe, Tom and Leonard Garfield. "A New Standard For Living: The Lustron House, 1946-1950." Perspectives in Vernacular Architecture. Vol. 3, 1989. Pg. 52.
- ²¹ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 23.
- ²² Wolfe, Tom and Leonard Garfield. "A New Standard For Living: The Lustron House, 1946-1950." Perspectives in Vernacular Architecture. Vol. 3, 1989. Pg. 53.
- ²³ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 27.
- ²⁴ Hales, Peter Bacon. "Building Levittown: A Rudimentary Primer." Chicago: University of Illinois. Accessed 7 December 2010.
- ²⁵ Arieff, Allison. Prefab. Layton: Gibbs Smith. 2002. Pg. 27.
- ²⁶ Wolfe, Tom and Leonard Garfield. "A New Standard For Living: The Lustron House, 1946-1950." Perspectives in Vernacular Architecture. Vol. 3, 1989. Pg. 53.
- ²⁷ Feters, Thomas T and Vincent Kohler. The Lustron Home: The History of a Postwar Prefabricated Housing Experiment. Jefferson: McFarland & Company, Inc. Publishers. 2006.
- ²⁸ "Lustron Connection." Lustronconnection.org. Accessed 14 November 2010. <<http://www.lustronconnection.org>>.
- ²⁹ Wolfe, Tom and Leonard Garfield. "A New Standard For Living: The Lustron House, 1946-1950." Perspectives in Vernacular Architecture. Vol. 3, 1989. Pg. 55.
- ³⁰ "Lustron: The House America's Been Waiting For." WOSU Public Media. Accessed 7 December 2010. <<http://www.wosu.org>>.
- ³¹ Wolfe, Tom and Leonard Garfield. "A New Standard For Living: The Lustron House, 1946-1950." Perspectives in Vernacular Architecture. Vol. 3, 1989. Pg. 59.
- ³² Lustron: The House America's Been Waiting For." WOSU Public Media. Accessed 7 December 2010. <<http://www.wosu.org>>.
- ³³ Entenza, John. "Announcement: The Case Study House Program." Arts & Architecture Magazine. January 1945.

-
- ³⁴ “Home Delivery: Fabricating the Modern Dwelling.” 2 February 2011. <<http://www.momahomedelivery.org>> .
- ³⁵ Rawsthorn, Alice. “A Prefab House That Dazzles Still.” *The New York Times*. 14 June 2009.
- ³⁶ “Median and Average Price Per Square Foot of Floor Area in New Single-Family Houses Sold by Location.” *United States Census, 2009*. <www.census.gov>
- ³⁷ Buisson, Ethel and Thomas Billard. *The Presence of the Case Study Houses*. Berlin: Birkhauser – Publishers for Architecture. 27 October 2000. Pg. 25.
- ³⁸ McCoy, Esther. *Case Study Houses, 1945-1962*. Los Angeles: Hennessey & Ingalls, 1977. Pg. 4.
- ³⁹ Arieff, Allison. *Prefab*. Layton: Gibbs Smith. 2002. Pg. 28.
- ⁴⁰ Nenno, Mary K. *Ending the Stalemate: Moving Housing and Urban Development into the Mainstream of America’s Future*. Lanham: University Press of America. 1995. Pg. 13.
- ⁴¹ Staats, Elmer B. “Operation Breakthrough: Lessons Learned About Demonstrating New Technology.” *Report to the Congress*. 2 November 1976.
- ⁴² “Prefabricated Housing to 2011 – Demand and Sales Forecasts, Market Share, Market Size, Market Leaders.” Freedomia Group. January 2008.
- ⁴³ Apgar, William et al. “An Examination of Manufactured Housing as a Community- and Asset-Building Strategy.” *Report to the Ford Foundation by the Neighborhood Reinvestment Corporation in collaboration with the Joint Center for Housing Studies of Harvard University*. September 2002. P. 2.
- ⁴⁴ “A Community Guide to Factory-Built Housing.” *Partnership for Advancing Technology in Homebuilding*, prepared for the US Department of Housing and Urban Development. January 2001. P. 14.
- ⁴⁵ Dawkins, Casey J. et al. “Regulatory Barriers to Manufactured Housing Placement in Urban Communities.” *Center for Housing Research at Virginia Tech*, prepared for the US Department of Housing and Urban Development. January 2011. P. xi.
- ⁴⁶ *Ibid.* P. 24.
- ⁴⁷ Apgar, William et al. “Manufactured Housing as a Community- and Asset- Building Strategy. *Neighborhood Reinvestment Corporation and Joint Center for Housing Studies of Harvard University, prepared for the Ford Foundation*. September 2002. P. 2.
- ⁴⁸ Dawkins, Casey J. et al. “Regulatory Barriers to Manufactured Housing Placement in Urban Communities.” *Center for Housing Research at Virginia Tech*, prepared for the US Department of Housing and Urban Development. January 2011. P. 9.
- ⁴⁹ “Placements of New Manufactured Homes by Region and Size of Home.” United States Census 2010. <www.census.gov>
- ⁵⁰ “A Community Guide to Factory-Built Housing.” *Partnership for Advancing Technology in Homebuilding*, prepared for the US Department of Housing and Urban Development. January 2001. P. 24.
- ⁵¹ *Ibid.* P. 25.
- ⁵² Quarterly Modular Housing Report. *National Modular Housing Council*. November 2010.
- ⁵³ Apgar, William et al. “Manufactured Housing as a Community- and Asset- Building Strategy. *Neighborhood Reinvestment Corporation and Joint Center for Housing Studies of Harvard University, prepared for the Ford Foundation*. September 2002. P. 2.
- ⁵⁴ Bandy, Dewey. “Affordable Manufactured Housing Best Practices: Opportunities for California Affordable Housing Developers.” *California Coalition for Rural Housing*. 26 February 2010. P. 14.
- ⁵⁵ Koonen, Sheri. *Prefabulous and Sustainable*. New York: Abrams, 2010.
- ⁵⁶ Bandy, Dewey. “Affordable Manufactured Housing Best Practices: Opportunities for California Affordable Housing Developers.” *California Coalition for Rural Housing*. 26 February 2010. P. 14.
- ⁵⁷ Apgar, William et al. “Manufactured Housing as a Community- and Asset- Building Strategy. *Neighborhood Reinvestment Corporation and Joint Center for Housing Studies of Harvard University, prepared for the Ford Foundation*. September 2002. P. 2.
- ⁵⁸ *Ibid.*
- ⁵⁹ Bandy, Dewey. “Affordable Manufactured Housing Best Practices: Opportunities for California Affordable Housing Developers.” *California Coalition for Rural Housing*. 26 February 2010. P. 23.
- ⁶⁰ Schwartz, Alex F. *Housing Policy in the United States*. New York: Routledge, 2010. P. 26.
- ⁶¹ *Ibid.* P. 29.
- ⁶² “The State of the Nation’s Housing 2010.” *Joint Center for Housing Studies of Harvard University*. 2010. P. 23.
- ⁶³ Schwartz, Alex F. *Housing Policy in the United States*. New York: Routledge, 2010. P. 36-38.

-
- ⁶⁴ “The State of the Nation’s Housing 2010.” Joint Center for Housing Studies of Harvard University. 2010. P 24.
- ⁶⁵ Schwartz, Alex F. Housing Policy in the United States. New York: Routledge, 2010. P. 36-38.
- ⁶⁶ “LIHTC Basics.” United States Department of Housing and Urban Development. 12 November 2010. <www.hud.gov>
- ⁶⁷ “The State of the Nation’s Housing 2010.” Joint Center for Housing Studies of Harvard University. 2010. P 25.
- ⁶⁸ *Ibid.* P. 27.
- ⁶⁹ Freymann, Vance, Tessicini, John, and Martine Dion. “Planning for Construction Waste Reduction.” The United States Green Building Council.
- ⁷⁰ Hardiman, Tom. “Designing Out Waste: ‘Pre-cycling’ to Eliminate Waste in Design Phase.” Green Building Pro. 26 October 2010. <www.greenbuildingpro.com>
- ⁷¹ “A Community Guide to Factory-Built Housing.” Partnership for Advancing Technology in Homebuilding, prepared for the US Department of Housing and Urban Development. January 2001. P. 16.
- ⁷² Hardiman, Tom. “Designing Out Waste: ‘Pre-cycling’ to Eliminate Waste in Design Phase.” Green Building Pro. 26 October 2010. <www.greenbuildingpro.com>
- ⁷³ “A Community Guide to Factory-Built Housing.” Partnership for Advancing Technology in Homebuilding, prepared for the US Department of Housing and Urban Development. January 2001. P. 18.
- ⁷⁴ “What We Learned by Framing the American Dream.” Structural Building Components Association. 1996.
- ⁷⁵ Wallis, Allan D. Wheel Estate: The Rise and Decline of the Mobile Home. Baltimore: Johns Hopkins University Press. 1997. P. 21.
- ⁷⁶ Dawkins, Casey J. and C. Theodore Koebel. “Overcoming Barriers to Placing Manufactured Housing in Metropolitan Communities.” Journal of the American Planning Association 76 (1). December 2009. P. 75.
- ⁷⁷ Erlich, Mark and Jeff Grabelsky. “Standing at a Crossroads: The Building Trades in the Twenty-First Century.” Labor History 46 (4). November 2005. P. 422.
- ⁷⁸ Botein, Hilary. “Labor Unions and Affordable Housing: An Uneasy Relationship.” Urban Affairs Review 42 (6). July 2007. P. 800.
- ⁷⁹ Erlich, Mark and Jeff Grabelsky. “Standing at a Crossroads: The Building Trades in the Twenty-First Century.” Labor History 46 (4). November 2005. P. 422.
- ⁸⁰ Botein, Hilary. “Labor Unions and Affordable Housing: An Uneasy Relationship.” Urban Affairs Review 42 (6). July 2007. P. 800-801.
- ⁸¹ Erlich, Mark and Jeff Grabelsky. “Standing at a Crossroads: The Building Trades in the Twenty-First Century.” Labor History 46 (4). November 2005. P. 425 and 430.
- ⁸² Craig, Clyde E. Basic Labor and Employment Law for Paralegals. New York: Aspen Publishers. 2008. P. 29.
- ⁸³ Grabelsky, Jeff. “Serving the Public Interest: Preventing Double-Breasting in the Construction Industry.” Testimony to the Standing Committee on Law Amendments, New Brunswick, Canada. 17 October 2007.
- ⁸⁴ Erlich, Mark and Jeff Grabelsky. “Standing at a Crossroads: The Building Trades in the Twenty-First Century.” Labor History 46 (4). November 2005. P. 423.
- ⁸⁵ *Ibid.* P. 426.
- ⁸⁶ Siniavskaia, Natalia. “Immigrant Workers in Construction.” National Association of Home Builders. 2 December 2005.
- ⁸⁷ Erlich, Mark and Jeff Grabelsky. “Standing at a Crossroads: The Building Trades in the Twenty-First Century.” Labor History 46 (4). November 2005. P. 425.
- ⁸⁸ O’Donnell, Dan. Personal Correspondence. 26 March 2011.
- ⁸⁹ Personick, Martin E. and Judy R. Daley. “Profiles in Safety and Health: Work Hazards of Mobile Homes.” Monthly Labor Review 112 (7). July 1989.
- ⁹⁰ “Policy Guide on Factory Built Housing.” American Planning Association. 12 March 2001.
- ⁹¹ Becker, Paul E., Fullen, Mark D., and Brandon Takacs. “Safety Hazards to Workers in Modular Home Construction.” The Center to Protect Workers’ Rights. July 2003.
- ⁹² “Dream Home...or Nightmare?” ConsumersUnion.org. July 1999.
- ⁹³ “Policy: Use Shared Equity Mechanisms to Preserve Homeownership Subsidies.” HousingPolicy.org. 4 April 2011. <www.housingpolicy.org>

-
- ⁹⁴ “Home Builders’ Guide to Manufactured Housing.” National Association of Home Builders, prepared for the US Department of Housing and Urban Development. May 2000. P 45.
- ⁹⁵ Ibid. P. 46.
- ⁹⁶ Ibid. P. 48.
- ⁹⁷ George, Lance and Jann Yankausas. “Preserving Affordable Manufactured Home Communities in Rural America: A Case Study.” Housing Assistance Council. March 2011.
- ⁹⁸ “Home Builders’ Guide to Manufactured Housing.” National Association of Home Builders, prepared for the US Department of Housing and Urban Development. May 2000. P 44.
- ⁹⁹ Ibid. P. 45.
- ¹⁰⁰ Genz, Richard. “Why Advocates Need to Rethink Manufactured Housing.” Housing Policy Debate 12 (2). 2001. P. 401.
- ¹⁰¹ “Policy: Use Shared Equity Mechanisms to Preserve Homeownership Subsidies.” HousingPolicy.org. 4 April 2011. <www.housingpolicy.org>
- ¹⁰² Genz, Richard. “Why Advocates Need to Rethink Manufactured Housing.” Housing Policy Debate 12 (2). 2001. P. 405.
- ¹⁰³ “Policy: Use Shared Equity Mechanisms to Preserve Homeownership Subsidies.” HousingPolicy.org. 4 April 2011. <www.housingpolicy.org>
- ¹⁰⁴ “Policy: Ensure Zoning Policies Allow Housing Diversity.” HousingPolicy.org. 4 February 2011. <www.housingpolicy.org>
- ¹⁰⁵ Drury, Margaret J. Mobile Homes: The Unrecognized Revolution in American Housing. New York: Cornell University. 1967.
- ¹⁰⁶ “Factory-Built Construction and the American Homebuyer: Perceptions and Opportunities.” Optimal Solutions Group LLC, prepared for the US Department of Housing and Urban Development. June 2007. P. 9.
- ¹⁰⁷ George, Lance and Jann Yankausas. “Preserving Affordable Manufactured Home Communities in Rural America: A Case Study.” Housing Assistance Council. March 2011.
- ¹⁰⁸ Wallis, Allan D. Wheel Estate: The Rise and Decline of the Mobile Home. Baltimore: Johns Hopkins University Press. 1997.
- ¹⁰⁹ Dawkins, Casey J. and C. Theodore Koebel. “Overcoming Barriers to Placing Manufactured Housing in Metropolitan Communities.” Journal of the American Planning Association 76 (1). December 2009. P. 86.
- ¹¹⁰ Bergdoll, Barry and Peter Christensen. Home Delivery: Fabricating the Modern Dwelling. New York: Museum of Modern Art. 2008. P. 32.
- ¹¹¹ Siegal, Jennifer. Personal Correspondence. 11 February 2011.
- ¹¹² Zeta Communities. Accessed 15 March 2011. <www.zetacommunities.com>
- ¹¹³ Sankaran, Shilpa. Personal Correspondence. 11 February 2011.
- ¹¹⁴ LivingHomes. Accessed 20 March 2011. <www.livinghomes.net>
- ¹¹⁵ Kappe, Ray. Personal Correspondence. 11 February 2011.
- ¹¹⁶ Lohr, Kathy. “Fumes Chase Family Out of FEMA Trailers.” National Public Radio. 29 May 2008.
- ¹¹⁷ Lohr, Kathy. “FEMA Trailers May Be Making Residents Sick.” National Public Radio. 31 October 2007.
- ¹¹⁸ Adams, Noah. “FEMA Trailer Supplier Reacts to Health Threat.” National Public Radio. 29 May 2008.
- ¹¹⁹ “Interim Findings on Formaldehyde Levels in FEMA-Supplied Travel Trailers, Park Models, and Mobile Homes.” The Centers for Disease Control and Prevention. 29 February 2008.
- ¹²⁰ Hsu, Spencer. “Safety Lapses Raised Risks In Trailers for Katrina Victims.” The Washington Post. 25 May 2008.
- ¹²¹ Ibid.
- ¹²² Roschen Van Cleve Architects. Accessed 23 March 2011. <www.rvca.org>
- ¹²³ Roschen, Bill. Personal Correspondence. 4 February 2011.
- ¹²⁴ Ibid.
- ¹²⁵ Southern California Association of Nonprofit Housing. Accessed 13 March 2011. <www.scanph.org>
- ¹²⁶ Zimmerman, Paul. Personal Correspondence. 3 February 2011.
- ¹²⁷ Breidenbach, Jan. “LA Story: The Coalition that Made a \$100 Million Trust Fund Happen.” Shelterforce. March/April 2002.
- ¹²⁸ O’Donnell, Dan. Personal Correspondence. 26 March 2011.

¹²⁹ Dawkins, Casey J. and C. Theodore Koebel. "Overcoming Barriers to Placing Manufactured Housing in Metropolitan Communities." Journal of the American Planning Association 76 (1). December 2009.

¹³⁰ "Building Workforce Housing in Orange County: A Resource Guide." Urban Land Institute Orange County. June 2009.

¹³¹ "Policy: Ensure Zoning Policies Allow Housing Diversity." HousingPolicy.org. 4 February 2011.
<www.housingpolicy.org>

¹³² "Policy: Use Shared Equity Mechanisms to Preserve Homeownership Subsidies." HousingPolicy.org. 4 April 2011. <www.housingpolicy.org>

¹³³ Fehrenbacher, Jill. "Zero-Energy mkLotus Debuts!" Inhabitat. 21 September 2007.
<www.inhabitat.com>

¹³⁴ "Home Delivery: Fabricating the Modern Dwelling." 2 February 2011.
<http://www.momahomedelivery.org> .

Appendix



Figure 1: A typical HUD code home
www.fleetwoodhomes.com



Figure 2: A typical modular home
www.newworldhome.com



Figure 3: A panelized home being constructed
www.multifacetedhomes.com



Figure 4: A pre-cut home being constructed
www.caprefab.com



Figure 5: A mobile home
www.arcs.com



Figure 4: A trailer home
www.alabama-motorhome-dealers.us



Figure 7: A home under construction in the ZETA factory
www.zetacommunities.com



Figure 8: A ZETA live/work townhome
www.zetacommunities.com



Figure 9: The LivingHomes RK 5.1
www.livinghomes.net



Figure 10: Rendering of the LivingHomes RK 1
www.livinghomes.net



Figure 11: Fleetwood Homes' "Chestnut Manor"
www.fleetwoodhomes.com



Figure 12: Fleetwood Homes' "Vogue II"
www.fleetwoodhomes.com