Prefab the Gap

Off-Site Construction for Affordable Housing on Urban Infill Sites

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A fourplex built from volumetric modules on a site owned by the Minneapolis Public Housing Authority (MPHA).

Executive Summary

It is no secret that the United States today faces a persistent and pervasive housing crisis. The need for affordable housing has grown more serious and widespread as the number of cost-burdened households—defined as those spending more than 30 percent of their income on housing—has reached record levels among both renters and homeowners.[1] With the cost of materials and labor remaining stubbornly high, an increasing number of community-based organizations (CBOs) and nonprofit developers are turning to off-site construction methods to deliver affordable units more efficiently. Their experiments span both modular and manufactured housing techniques—distinctions that are explained in the "Key Terms" section of this paper—and range in typology from single-family homes to multifamily buildings with dozens of units. In almost all cases, the primary objectives are to compress construction timelines and reduce development costs—goals that several CBOs have achieved through strategic coordination and execution.

The paper assesses which strategies maximize the feasibility, design quality, and cost-saving potential of off-site construction techniques for below-market infill housing. The research process began with a general examination of historical and contemporary applications of off-site construction in the United States. Discussions with NeighborWorks staff helped identify modular and manufactured housing recently developed—or in the process of being developed—by member CBOs on infill sites. From that list, as well as the work of two organizations from outside the NeighborWorks network, six projects were identified for site visits and further study. The projects are spread across three states (California, Minnesota, and Rhode Island) and range in type from single-room occupancy units for formerly unhoused residents to single-family for-sale homes on community land trust plots. Drawing on more than thirty conversations with developers, researchers, government officials, architects, manufacturers, and residents, this paper focuses both on key outcomes—total development costs, construction timelines, and design quality—as well as on the processes that precipitated them—team coordination, relationships with key officials, and how certain design decisions were made.

For most but not all of the selected developments, the application of off-site construction techniques over conventional methods minimized construction timelines, lowered overall costs, or both. Contrary to common perceptions that factory-built housing is inherently uniform in its design and detailing, and that such inflexibility limits the contexts for which it is architecturally suitable, the projects featured here exhibit a surprisingly broad array of stylistic and formal attributes. In several cases, this adaptability has enabled architects and developers to tailor their buildings to the particular neighborhoods in which they are sited.

The potential financial and time savings associated with off-site construction are not guaranteed. Stakeholders of the selected projects underscored the importance of key strategies to make the method work, including early team formation, support from local government, selection of effective and relatively proximate manufacturers, and a focus on designs that are contextually sensitive yet economical.

Factory-built housing is not a panacea for the high construction costs that currently inhibit affordable housing production in the US, but the case studies presented here make clear that under certain conditions it can help reduce the cost of high-quality, well-designed housing.

1 Peyton Whitney et al., "Housing Cost Burdens Climb to Record Levels (Again) in 2023," JCHS, December 3, 2024, https://www.jchs.harvard.edu/blog/housing-cost-burdens-climb-record-levels-again-2023.

Key Terms

Discussions of housing design, development, and off-site construction rely on a number of terms that are complex, sometimes interchangeable, frequently misused, and/or constantly in flux. For the purposes of this paper, I define key terms as follows:

Conventional Construction (*also known as "stick-built," traditional, or "on-site" construction*) refers to commonplace construction processes in which building components are assembled sequentially on-site, as is the case with most multifamily housing in the United States. Conventional construction allows for substantial flexibility in design, material, and building height. Conventional construction is also typically more familiar to contractors, lending institutions, architects, and local government leaders than off-site methods.

Off-Site Construction (*also referred to as prefabrication or industrialized construction*) is an umbrella term referring to construction approaches in which building components are manufactured and assembled at a factory (off-site) before being transported to a building site for installation. Under ideal conditions, off-site construction promises a controlled assembly environment, faster construction timelines, and overall development cost savings.

The Bowdoin Street Rowhouse in Providence, Rhode Island features pitched roofs and front porches.

Broadly speaking, there are two distinct approaches to off-site construction for residential development: manufactured housing and modular housing.

Manufactured Housing (MH) (*also known as "mobile homes" or "trailer homes"*) refers to housing that abides by the 1976 federal HUD code, including its requirement of a chassis for potential movability. Through its reliance on a streamlined federal building code, MH offers substantial cost savings (estimates range between 35 and 50 percent) over conventional housing and moderate savings over modular construction techniques.[2]

Modular Housing is factory-built housing set on a permanent foundation, not designed in accordance with the HUD code. While the lack of a federal modular building code requires manufacturers to adjust to varying state and local regulations for each project, it also allows for more design customization, including through stackable units, than manufactured housing.

Modular housing can be separated into two main categories: 2-D or panelized modular and 3-D or volumetric modular.

2 Donald H. Layton, "Manufactured Housing Is a Good Source of Unsubsidized Affordable Housing – Except When It's Not: Q&A on Eight Key Policy Topics (Part 2)," NYU Furman Center, April 3, 2023, https://furmancenter.org/thestoop/entry/manufactured-housing-is-a-good-source-of-unsubsidized-affordable-housing-except-when-its-not-qa-on-eight-key-policy-topics-part-2; Christopher Herbert et al., Comparison of the Costs of Manufactured and Site-Built Housing (JCHS, 2023), https://www.jchs.harvard.edu/research-areas/working-papers/comparison-costs-manufactured-and-site-built-housing.

Crews prepare to hoist a volumetric module onto the site of the Bowdoin Street Rowhouse. (Courtesy Truth Box Architects)

2-D/Panelized Modular is modular housing in which flat components (walls, floors, etc.) are built in a factory and assembled on-site. Panelized systems facilitate more design customization over volumetric modular buildings and are easier to transport to site due to flat packing.

3-D/Volumetric Modular refers to modular housing in which wall, floor, and ceiling components are assembled into boxes in a factory and stacked on site. Volumetric modular buildings typically involve less on-site work, potentially generating more significant time and cost savings over panelized modular construction.

Infill Development typically refers to housing built on vacant, underutilized, or underdeveloped land in an established, usually urban area. Infill housing typically results in the substantial densification of a site, providing a more sustainable and less resource- or land-intensive alternative to sprawl. Infill development can also improve neighborhood conditions through the removal of excessive surface parking, vacant lots, or abandoned buildings.

Affordable Housing (also known as below-market housing), according to the Department of Housing and Urban Development, is housing in which residents are not expected to spend more than 30 percent of household income on housing costs—a condition often achieved through some form of public subsidy.[3] This paper features a variety of affordable housing models, ranging from permanent supportive housing with on-site services in a multifamily format to single-family affordable ownership housing on community land trust plots.

3 HUD, "Glossary of Terms to Affordable Housing," August 18, 2011, https://archives.hud.gov/local/nv/goodstories/2006-04-06glos.cfm.

Context

The Housing Affordability Crisis

In the wake of the COVID-19 pandemic, more households than ever are cost-burdened. As of 2023, the US Census Bureau identified half of all renters nationwide as cost-burdened, an unprecedented figure driven by rent increases that far outpace growth in median income.[4] Among homeowners, the number of cost-burdened households ballooned by 3.6 million between 2019 and 2023 alone—an increase of over 20 percent driven by lower incomes in aging households and an 18 percent surge in housing costs according to the Joint Center for Housing Studies (JCHS).[5]

The geography of the affordability crisis is expansive. While Americans have long associated coastal cities like New York, Boston, and Los Angeles with housing unaffordability, smaller inland urban centers are also witnessing record numbers of cost-burdened households. In the Duluth metro region in Minnesota and Wisconsin, for instance, the percentage of renter households spending more than 30 percent of household income on housing rose to 50.5 percent in 2022.[6] The figure stood at 38 percent just seven years earlier.[7]

Soaring housing costs are driven by increases in land costs, hard costs, and soft costs. Land costs include the purchase price of the land, as well as costs associated with preparing it for construction. Hard costs include all costs related to physical construction, most notably materials and labor. Soft costs encompass all other expenses, including design fees, permitting, and other administrative procedures.

Construction costs in US cities, already ballooning before 2020, have risen substantially since the COVID-19 pandemic. While the rate of increase slowed somewhat in 2024, cooling off from the astronomical highs of 2022, forecasts predict that the pace of growth will increase in 2025.[8] Research from the National Association of Home Builders (NAHB) has shown that the cost of almost all major construction materials—including gypsum, ready-mix concrete, and steel mill products—remains significantly higher than pre-pandemic levels. Only the cost of lumber, which rose by more than 300 percent in 2020 and 2021, has normalized.[9] With the new Trump administration in place, though, the potential negative effects of expansive US tariffs on imported construction materials, including Canadian lumber, have raised concerns that hard costs for housing will again grow substantially.[10]

Development costs are usually even higher for affordable housing developers than for market-rate developers. Accepting public subsidy typically obligates CBOs and other nonprofit developers to meet more stringent regulatory standards that require substantial up-front investment. In many jurisdictions, they are required to adhere to stricter sustainability codes, pay prevailing wages to on-site workers, and navigate the complex assembly of multi-source capital stacks. In California, where two of this paper's cases are located, the cost of building a single subsidized housing unit rose by 10 percent (adjusting for inflation) to $708,000 between 2019 and 2023.[11]

State and local governments have advanced longstanding strategies and introduced new measures to reduce the upfront costs of development. Cities, for instance, often provide developers with free or heavily discounted land in exchange for the production of affordable housing units. There is also a growing movement to enable affordable housing developers to expedite or entirely circumvent local permitting and design review processes, such as through affordable housing overlays.[12]

Still, the US is confronting a significant nationwide shortage of rental and ownership housing units. Experts estimate that there are between 1.5 and 7 million fewer homes nationwide than needed, based primarily

4 US Census Bureau, "Nearly Half of Renter Households Are Cost-Burdened, Proportions Differ by Race," September 12, 2024, https://www.census.gov/newsroom/press-releases/2024/renter-households-cost-burdened-race.html.

5 Whitney et al., "Housing Cost Burdens Climb to Record Levels (Again) in 2023."

6 JCHS, "Cost Burdens High Across the Country," 2024, https://www.jchs.harvard.edu/son-2024-cost-burdens-map.

7 JCHS, "Millions of Americans Burdened by Housing Costs," 2017, https://harvard-cga.maps.arcgis.com/apps/MapSeries/index.

8 JLL, "2025 U.S. Construction Outlook: Shifting Foundations," November 2024, https://www.jll.com/en-us/insights/market-outlook/us-construction; JCHS, The State of the Nation's Housing 2024, 2024, https://www.jchs.harvard.edu/state-nations-housing-2024.

9 NAHB, "How Soaring Prices for Building Materials Impact Housing," July 26, 2024, https://www.nahb.org/blog/2024/07/how-soaring-prices-building-materials-impact-housing.

10 National Multifamily Housing Council, "National Multifamily Housing Council (NMHC) Statement on Tariffs Impacting Housing Affordability," February 4, 2025, https://www.nmhc.org/news/press-release/2025/national-multifamily-housing-council-nmhc-statement-on-tariffs-impacting-housing-affordability/.

11 Terner Center for Housing Innovation, "Low-Income Housing Tax Credit Construction Costs: An Analysis of Prevailing Wages," August 2, 2024, https://ternercenter.berkeley.edu/research-and-policy/lihtc-construction-costs-prevailing-wages/.

12 Cambridge Community Development Department, "100 Percent Affordable Housing Overlay," accessed January 17, 2025, https://www.cambridgema.gov/CDD/housing/housingdevelopment/aho.

on low vacancy rates.[13] Both rental and owner-occupied housing did, however, see a slight uptick in vacancy rates in the last two quarters of 2024.[14]

The shortage is especially pronounced for low-income renters who rely mostly on subsidized units. According to the National Low Income Housing Coalition, there are only 56 affordable and available units for every 100 renter households making 50 percent of Area Median Income (AMI) or less.[15] No major metro area is even remotely meeting demand from the lowest ends of the income spectrum, though deficits differ considerably. The Providence metro region in Rhode Island has about 49 available and affordable units for every 100 households with incomes at 30 percent of AMI or less, while the Riverside-San Bernardino-Ontario metro region in California has just 21.[16]

Off-Site Construction Today

Manufactured housing continues to grow as a key unsubsidized affordable housing model. Because manufactured housing tends to be around 40 percent cheaper to build than conventional housing, it is often highlighted as a critical source of affordable, unsubsidized housing in the US.[17] According to *MHInsider*, an industry publication, 20.9 million Americans lived in manufactured homes as of 2023, most of them within one of over 43,000 manufactured housing communities across the nation. Manufactured homes constitute 8.6 percent of new housing starts.[18] The largest markets for manufactured housing sales are located in the American South, with four Texas metro areas among the top five.[19] In Mississippi, almost 60 percent of all new single-family homes completed in 2021 were HUD-code houses.[20]

Some regulatory barriers still inhibit wider use of manufactured housing and leave residents more vulnerable to predatory lending. Researchers note that broader applications of manufactured housing as an affordable housing solution—and particularly for attainable entry-level ownership homes—are often inhibited by high land costs, limited distribution networks, and a lack of access to affordable financing for homeowners.[21] Despite the reality that the vast majority of manufactured homes are never relocated, and that average ownership periods for manufactured housing are longer than for site-built housing, financial institutions classify HUD-code homes as personal property, or "chattel," rather than as real property. This distinction forces residents to take out loans with shorter terms, weaker consumer protections, and higher

13 David Wessel, "Where Do the Estimates of a 'Housing Shortage' Come From?," Brookings Institution, October 21, 2024, https://www.brookings.edu/articles/where-do-the-estimates-of-a-housing-shortage-come-from/.

14 US Census Bureau, "Quarterly Residential Vacancies and Homeownership, Fourth Quarter 2024" February 5, 2025, https://www.census.gov/housing/hvs/files/currenthvspress.pdf.

15 National Low Income Housing Coalition, "The GAP: A Shortage of Affordable Homes," March 2024, https://nlihc.org/gap.

16 Ibid., 20.

17 Layton, "Manufactured Housing Is a Good Source of Unsubsidized Affordable Housing."

18 Patrick Revere, "Manufactured Housing Industry Trends & Statistics," *MHInsider* (blog), May 30, 2024, https://mhinsider.com/manufactured-housing-industry-trends-statistics/.

19 Ibid.

20 Ben Nelms, "Top 10 States with Largest Manufactured Home Share of All New Single-Family Homes," ManufacturedHomes.com, September 26, 2022, https://www.manufacturedhomes.com/blog/top-10-states-largest-manufactured-home-share-new-single-family-homes/.

21 Christopher Herbert et al., "A Review of Barriers to Greater Use of Manufactured Housing for Entry-Level Homeownership," JCHS, January 2024, https://www.jchs.harvard.edu/sites/default/files/research/files/harvard_jchs_barriers_manufactured_housing_2024.pdf

Manufactured homes on infill sites in San Bernardino, California.

interest rates than standard mortgages.[22] Many homebuyers still opt for manufactured homes because they offer the only feasible path towards homeownership, even if the model is flawed.

Perhaps the most cited impediments to manufactured housing, though, are local zoning and land-use regulations. Numerous cities in the US prohibit the placement of HUD-code homes in certain neighborhoods or anywhere outside of designated manufactured housing communities or "parks," and some go so far as to require that such communities erect fences that obscure them from public view. Parks themselves are often relegated to parts of a city zoned for industrial or other non-residential uses, reinforcing what the scholar Esther Sullivan calls "socio-spatial stigmatization."[23] Many such laws are rooted in longstanding cultural perceptions of manufactured homes as shelters for an undesirable class of people—biases that exacerbate and perpetuate acute affordability crises not just for the owners and prospective owners of manufactured homes themselves, but for all residents in a given jurisdiction.

22 Esther Sullivan, *Manufactured Insecurity: Mobile Home Parks and Americans' Tenuous Right to Place, Democracy and Urban Landscapes* (University of California Press, 2018), 50-51.

23 Ibid., 49-53.

CrossMods™ under construction at a California facility used by NPHS. (Courtesy NPHS)

CrossMod™ homes have broadened the appeal of manufactured housing. Introduced in 2020, this particular variety of manufactured housing applies the aesthetics of site-built dwellings—including steeper roof pitches and architectural features like dormers, porches, garages, and detailed trim—to a prefabricated product.[24] In addition to overcoming aesthetic biases against manufactured homes among community members and local governments, the permanent foundations on which CrossMods™ are set enable residents to access more affordable mortgage financing products and more advantageous appraisal rules than those available to other HUD-code homes.[25] CrossMods™ are more expensive to build than their more standard prefab counterparts, but the product has proven popular. Numerous manufacturers across the nation have introduced CrossMod™ products, many of which have been delivered to infill sites where the physical attractiveness of homes and their visual harmony with surrounding neighborhoods are often under heavy scrutiny.

24 Patrick Revere, "An Introduction to CrossMod Homes," *MHInsider* (blog), January 17, 2020, https://mhinsider.com/introduction-crossmod-homes/.

25 Christopher Herbert and Chadwick Reed, "Overcoming Barriers to Manufactured Housing: Promising Approaches from Five Case Studies," JCHS, April 2024, 4.

Updates to the HUD code have made manufactured housing more flexible. The latest change, introduced in September 2024, included accessibility improvements, higher-quality material standards, and a provision for multifamily manufactured homes of up to four units.[26] The multifamily modification is particularly relevant for infill development projects, as newly designed prefab duplexes or triplexes are unsuitable for most manufactured housing communities where individual plots are typically serviced by only a single utility hookup.[27] Several CBOs, including one featured in this paper, have already initiated projects using new HUD-code duplexes.

More private, public, and nonprofit entities are turning to manufactured housing to address affordability challenges. Working on both scattered sites and in subdivisions in Virginia and Maryland, for instance, MH Advisors and EquityPlus LLC are using CrossModTM homes to provide dozens of middle-income residents with attainable for-sale homes.[28] Public actors like the City of Jackson, Mississippi and CBOs like Neighborhood Partnership Housing Services (NPHS) in California, featured in this paper, have employed similar strategies to maximize access to homeownership opportunities.[29]

The modular construction industry is expanding as well. Data from the Modular Building Institute (MBI) notes that across both residential and commercial projects, permanent modular construction accounted for 6.64 percent of total North American construction starts in 2023, up from just 2.14 percent in 2015.[30] The use of modular methods for single-family homes has fallen steadily since the early 2000s, but the percentage of multifamily buildings that used modular techniques increased from 2 percent in 2022 to about 7 percent in 2023.[31] Among multifamily housing projects, modular construction is most commonly used in low- and mid-rise apartment buildings.

Financial hurdles for modular housing can be difficult to navigate. Modular construction typically requires large up-front capital investments in materials and labor, a payment schedule that is at odds with the traditionally incremental lending practices of multifamily housing development. Some financial institutions have made adjustments specifically for off-site construction, but many are still unwilling to take on the risk of funding modular projects until modules reach the site. Many also require modular manufacturers to offer subcontractor default insurance and guarantee project completion through performance bonds.[32]

26 HUD, "HUD Updates Regulations to Lower Housing Costs and Build Safe and Affordable Manufactured Homes," September 11, 2024, https://www.hud.gov/press/press_releases_media_advisories/hud_no_24_233.

27 Conversation with Clayton Homes representative, July 17, 2024.

28 Herbert and Reed, "Overcoming Barriers," 8-9.

29 Ibid., 6.

30 Modular Building Institute, "2024 Permanent Modular Construction Report," 2024, https://mbimodularbuildinginstitute.growthzoneapp.com/ap/CloudFile/Download/pGnDJN6r.

31 Danushka Nanayakkara-Skillington, "Market Share for Modular and Other Non-Site Built Housing in 2023," National Association of Home Builders: Eye on Housing, September 12, 2024, https://eyeonhousing.org/2024/09/market-share-for-modular-and-other-non-site-built-housing-in-2023/.

32 Michela Zonta, "Increasing Affordable Housing Stock Through Modular Building," Center for American Progress (blog), February 6, 2024, https://www.americanprogress.org/article/increasing-affordable-housing-stock-through-modular-building/.

Geography, as well as differing state and local regulations, also impedes growth. Unlike manufactured housing, modular housing does not adhere to a streamlined federal building code. Thus, manufacturers shipping modular components across state boundaries must abide by a complex web of state and local building regulations, as well as state rules governing the transportation of those components.[33] It is usually simplest and most cost-effective for development teams to select manufacturers that are within the same state or metro region as the building site, though options are often limited. The initial investment required to establish a factory—as well as the need for an immediate and consistent project pipeline to cover up-front costs and sustain operations—increases the financial risk associated with establishing a modular manufacturing facility in some regions. Using out-of-state manufacturers can further complicate the building inspection process, as most states require inspections during both the manufacturing and installation stages of construction. Some states, such as Wisconsin and Minnesota, have implemented reciprocity agreements that allow inspectors from one state to inspect modules fabricated in the other.[34]

Some government actors have worked to boost the industry and offset risks. In line with policy recommendations from entities like the Center for American Progress (CAP), some state, regional, and local agencies have offered to build capacity for modular manufacturing through direct investment in facilities or by directing funding to modular projects. In July 2024, the Massachusetts Metropolitan Area Planning Council (MAPC) secured a $3 million HUD grant to "explore innovative ways to build and install modular housing in the Greater Boston region."[35] That same year, Colorado's Office of Economic Development and International Trade (OEDIT) announced that it would prioritize housing projects using off-site construction techniques in its distribution of $24 million in state funding.[36]

Several CBOs have turned to modular methods to build affordable housing in both single-family and multifamily formats. Organizations like Come Dream Come Build (CDCB) and Habitat for Humanity have deployed modular single-family homes on infill sites in Texas and Wisconsin, respectively, broadening access to homeownership for middle-income residents.[37] CDCB's DreamBuild program (formerly MiCASiTA) uses locally built modular homes that are designed to physically adapt—through the addition of a bedroom, for instance—to the changing needs of residents. Working in the city of La Crosse, Wisconsin, where local zoning prohibits the placement of HUD-code

33 Ibid.

34 Wisconsin Department of Safety and Professional Services, Division of Industry Services, "Chapter SPS 320: Administration and Enforcement," 2016, https://dsps.wi.gov/Documents/Programs/UDC/CodeArchives/SPS320Commentary.pdf.

35 Tim Viall, "MAPC Awarded $3M to Bring a Modular Housing Construction Facility to Greater Boston," Metropolitan Area Planning Council, July 25, 2024, https://www.mapc.org/news/3m-to-bring-modular-housing-construction-facility-greater-boston/.

36 Modular Building Institute, "Colorado OEDIT Announces $24 Million in Proposition 123 Funding for Modular and Innovative Housing Projects," September 13, 2024, https://www.modular.org/2024/09/13/oedit-announces-24-million-in-proposition-123-funding-for-modular-and-innovative-housing-projects/.

37 Come Dream Come Build, "DreamBuild: About Us," accessed March 7, 2025, https://dreambuild.org/about-us; Sharon Welch, "Participatory Models of Housing: Promising Design Practices for Affordable Housing on Tribal Lands," JCHS, 2023, https://www.jchs.harvard.edu/research-areas/working-papers/participatory-models-housing-promising-design-practices-affordable; Caroline Lauer, "Bounce Forward, Not Back: Leveraging Resiliency to Promote Equity," JCHS, 2018, https://www.jchs.harvard.edu/research-areas/working-papers/bounce-forward-not-back-leveraging-resiliency-promote-equity.

A panelized home manufactured by Lagom Modular, designed by Ben Olsen and Ryan Hughes, and placed on a community land trust site in Duluth, Minnesota by One Roof Community Housing.

homes outside of manufactured housing communities, Habitat for Humanity has turned instead to volumetric and panelized homes.[38] Numerous affordable housing developers around the country have also applied modular methods to multifamily buildings, including the Skid Row Housing Trust's 102-unit Star Apartments in Los Angeles and Preservation of Affordable Housing's (POAH) 168-unit Clarendon Hill Apartments in Somerville, Massachusetts.[39]

38 Herbert and Reed, "Overcoming Barriers," 22.

39 Michael Maltzan Architecture, "Star Apartments," accessed July 30, 2025, https://www.mmaltzan.com/projects/star-apartments/; Preservation of Affordable Housing, "Clarendon Hill Apartments," 2025, https://www.poah.org/property/massachusetts/clarendon-hill.

Research Methodology

At the outset of this research in summer 2024, it was presumed that the CBOs with the most demonstrable interest and experience in off-site construction would be those working in rural and exurban communities. Manufactured housing, for one, is most strongly associated with such contexts, where corporations and individual landowners have for decades operated large-scale manufactured housing communities (also known as mobile home parks) with hundreds of individual dwellings. By contrast, in denser urban districts where some multifamily housing developers have turned to modular building methods, the complexities and steep learning curve associated with off-site construction might seem ill-suited to CBOs and the smaller sites often at their disposal.

Early conversations with housing researchers and experts, however, largely dispelled this presumption. In recent years, a growing number of CBOs across the nation, including several within the NeighborWorks network, have used both modular and manufactured housing for affordable housing projects in both urban and suburban contexts. Working with the limited availability of affordable or discounted land in US cities, more organizations than initially expected have placed these modular and manufactured buildings on infill sites—overcoming the perceived logistical challenges of transporting volumetric modules to smaller sites, such as the need for staging areas or ample street space. These entities' successes, as well as the challenges they faced during the development process, offer critical insights into how CBOs can best take advantage of factory-based approaches to housing production.

Throughout the research process, one question remained central: **Which strategies are likely to maximize the feasibility, design quality, and cost-saving potential of off-site construction techniques for below-market infill housing?**

Literature Review

The existing literature on off-site construction that informed the initial stages of this report falls into three main categories:

1. **Literature that focuses on the history of off-site construction in the United States highlighted that, while these methods are often touted as "innovative" today, they are connected to decades-old efforts to promote factory-built housing across the US.** In the case of manufactured housing, historical and ethnographic texts were particularly helpful in distilling the social stigmas and consequent municipal regulations that often impede broader adoption, especially on infill sites.
2. **Numerous think tanks, research institutes, consultancies, or advocacy groups have published reports that lay out the advantages and disadvantages of contemporary off-site construction.** While some express certain skepticisms about the broad applicability of off-site construction, many such reports are designed to educate businesses and policymakers on the promise of the method while pushing for policy changes that may foster industry growth or greater cost savings. Few of these reports offer in-depth analyses of built projects in particular geographic contexts.
3. **Much of the literature on modular housing comes directly from modular advocacy groups or industry publications.** Some papers offer a comparative analysis between case studies, but seldom cross between both manufactured and modular types. There are also relatively few in-depth studies that explore factory-built housing through a design lens.

This report builds on existing literature by thoroughly examining the outcomes and lessons learned from a select set of cases. In highlighting projects that include multiple units (whether distributed or in a

Isla Intersections under construction in Los Angeles, California. (Paul Vu, courtesy LOHA)

single building), that were built between 2021 and 2024, and that are exclusively affordable, this report's central objective is to offer CBOs relevant insights on the opportunities and hurdles they might encounter while using off-site construction techniques.

Project Selection

For CBOs working primarily in urban and suburban areas, the built examples included here offer a window into how other organizations have navigated common spatial, financial, and regulatory constraints to create dignified, affordable homes. Case studies were selected through extensive consultations with housing experts, NeighborWorks datasets on CBOs using off-site methods, and presentations from the 2024 HUD Housing Innovation Showcase in Washington, DC.

The six selected projects represent all three types of off-site construction highlighted in this report—manufactured housing, volumetric modular, and panelized modular—and are sited in municipalities across three different regions of the US—the West, Midwest, and Northeast. The projects also represent a diverse array of affordability types (permanent supportive housing for the formerly unhoused, subsidized rental housing, deed-restricted ownership housing) and architectural forms (single-family homes on scattered sites, townhomes, multifamily buildings, and single-room occupancy buildings). The differences in these projects' approaches to affordable housing provision, as well as the differences in their physical and regulatory contexts, ensure that this report is relevant to as many CBOs as possible.

Given the geographic and typological diversity of the projects featured here, it was important to outline certain common threads between them. In the case study selection process, projects had to meet the following criteria in addition to using off-site construction methods:

1. All projects had to be fully composed of below-market housing, no matter the subsidy model or method used.
2. All projects had to be sited on infill sites as defined in the "Key Terms" section of this report. All sites sit within an existing urban or suburban fabric rather than on large-scale tract or subdivision developments, and most involve some level of densification.
3. All projects had to consist of five or more total built units, whether on a single lot or on several scattered lots.
4. All projects had to be completed between 2021 and 2024, since supply chain disruptions and other shifts in the US construction industry brought on by the COVID-19 pandemic have rendered lessons from earlier projects less pertinent. Projects for which completion is expected in 2025 or later were also not included.
5. All projects had to offer permanent housing, meaning no case study could feature modular or manufactured housing built to temporarily shelter unhoused or displaced people.

There are a number of compelling projects that were considered but ultimately left out of this study due to the constraints of the research timeline or their failure to meet all of the above criteria. They include Come Dream, Come Build's (CDCB) aforementioned work installing factory-built homes on infill sites in Texas's Rio Grande Valley, Avenue's four modular homes recently assembled in Houston, and MH Advisors' work with manufactured homes in Maryland and Virginia. All are worthy of further study.

Stakeholder Interviews

The bulk of information gathered for this project came from interviews—in person, over Zoom, or by phone—in which the author discussed a particular project with a member of the development team. While the interviews remained largely conversational and varied depending on the role of the interviewee, the questions focused on three broad categories:

1. **Motivations**
   Sample Questions:
- Who were the main actors or entities pushing for the use of off-site construction on this site, and what were their motivations?
- Did anyone on the development team have prior experience with modular/manufactured housing?
- What was your ultimate objective with this project/what was your ideal outcome when it was first planned?
  Sample Questions:

2. **Experiences**
   Sample Questions:
- Did the local regulatory environment support or inhibit your pursuit of factory-built housing, and in what ways?
- How did the steps you took to complete this project (permitting, inspections, design consultation, etc.) differ from those taken in projects in which you've used conventional construction techniques?
- What were the most challenging and the most surprising aspects of working with off-site construction methods?
- Did the construction timeline match your expectations? Was it more efficient than conventional construction?
- Did off-site construction reduce construction costs? By how much?

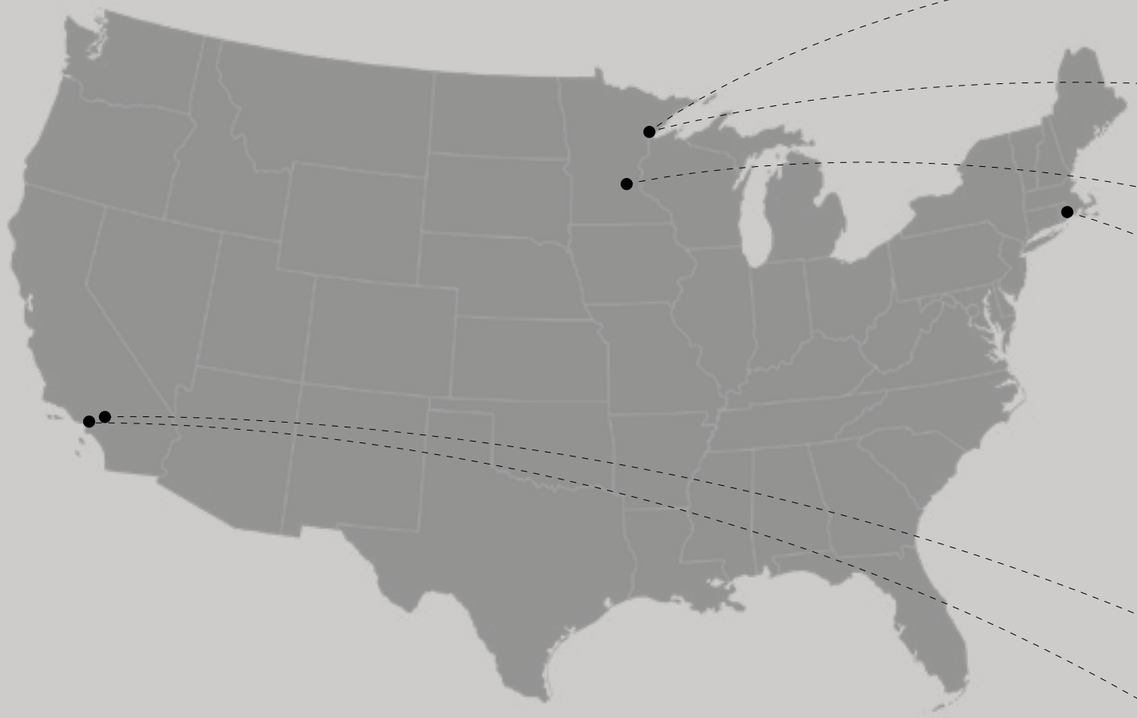
3. **Future Outlooks**
   Sample Questions:
- What advice would you give to other entities (designers, developers, manufacturers) exploring off-site construction for urban infill development?
- From your perspective, what changes—in terms of policy, financing, design, and/or cultural perception—would make off-site construction methods easier to deploy on urban infill sites?
- Do you intend to use off-site construction techniques for future projects? Why or why not?

A six-unit apartment building constructed from nine volumetric modules in Minneapolis, Minnesota.

Site Visits

As with any research undertaking that focuses partly on design, site visits proved critical in honing an understanding of each project's architectural qualities and contextual environment. Site visits to all six case study projects were conducted over the course of two and a half weeks in July 2024. In most cases, visits were guided by a member of the development team. Access was granted to the interiors of two projects—Plover Place and the Community Land Trust Homes, both developed by One Roof Community Housing in Duluth, Minnesota.

Projects



The projects in this study make clear that, while time savings and cost savings associated with off-site construction are achievable and relatively common, they are not necessarily guaranteed. For four out of six projects, hard construction costs were lower than they would have been if development teams had used conventional methods. For five out of six projects, construction timelines were shorter than they would have been with conventional methods. Specifics on each project are detailed in this section.

Interviewees, particularly those who drew on their own previous experiences using off-site construction techniques, noted several strategies that increase the likelihood of realizing financial and scheduling efficiencies—several of which are detailed below in the “Key Insights” section of this paper.

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Two-Level Infill Houses

Duluth, Minnesota

Year Completed:	2022 - ongoing
Developer:	One Roof Community Housing
Manufacturer:	Lagom Modular
Architect:	Ben Olsen and Ryan Hughes (OHO)
Construction Type:	Panelized Modular
Number of Units:	11
Number of Sites:	11
Number of Boxes:	N/A
Box Dimensions:	N/A
Construction Timeline:	2.5 days for install
Prior Site Conditions:	Mostly vacant lots
Affordable Housing Type:	Ownership, community land trust (60-80 percent AMI)
Unit Mix:	2-bedroom single-family homes

The panelized homes designed for Duluth's narrow lots mirror some existing residential architecture.

One Roof Community Housing's Community Land Trust Homes are situated on scattered lots across Duluth, Minnesota, where a mounting affordability crisis has driven record numbers of residents to spend 30 percent or more of their income on housing costs. Housing development in the city has historically been inhibited by lot size—about 15 percent of the city's parcels are only twenty-five feet wide. Modern setback rules leave only seventeen feet of buildable width on narrow sites—a constraint that has deterred most for-profit developers.[40] Having stood vacant for years or decades, many of these sites came into the City of Duluth's possession through tax forfeiture.

In 2019, the Duluth Economic Development Authority and the Duluth Housing and Development Authority launched "Rebuild Duluth," a competition that aimed to tackle the challenge of developing housing on the city's narrow lots. Applicants were asked to submit design schemes alongside construction timelines and budgets that could be replicated on parcels across Duluth. Winners would be granted one of thirteen sites,

40 Justin R. Wolf, "A New Prototype for Building Affordable Houses on Narrow Lots in Duluth," *ENTER*, April 7, 2022, https://www.entermn.com/articles/a-new-prototype-for-building-affordable-houses-on-narrow-lots-in-duluth.

Interior spaces are light-filled and airy, with the ground floor entirely occupied by a kitchen, living room, and dining area.

Panels being manufactured at Lagom Modular's facility in Minnesota. (Courtesy Lagom Modular)

free of cost, on which to test their idea. The goal, one senior housing developer in Duluth was quoted as saying, was to "prove that infill development is possible and help lower the barriers to do that."[41]

Through the competition, one of the sites was granted to Office Hughes Olsen, a small St. Paul-based design practice run by Ben Olsen and Ryan Hughes. The firm had designed a two-story template house that—at less than thirteen feet wide and forty feet deep—could fit on almost any lot in Duluth.[42] Partnering with local CBO One Roof Community Housing, Office Hughes Olsen built the first house using conventional construction methods. Later versions of the house were modified to 15 feet wide and used panels manufactured by Duluth-based Lagom Modular. Eight of these homes have been built on One Roof's twenty-five-foot lots, while an additional pair of single-story homes designed by Olsen and Hughes were built on larger sites. In the wake of One Roof's receiving over $50 million in funding from the Minnesota Housing Finance Agency in 2023, several more homes designed by Olsen and manufactured by Lagom are under contract or under construction across northern Minnesota.[43] The standard two-bedroom homes are all part of One Roof's expansive Community Land Trust (CLT) and are offered to local residents making 80 percent of AMI. Resale profits for residents are restricted so that homes remain affordable for potential future buyers.

Outcomes

One Roof's Two-Level Infill Houses cost roughly $300,000 each to develop, with on-site installation typically taking 2-5 days. While total construction time, including the manufacturing of the panels, site preparation, placement, and on-site finishing, has varied from site to site, One Roof has realized hard cost savings through shortened overall construction timelines and continues to place more panelized homes throughout northern Minnesota.

The Two-Level Infill House's roof is designed with a pitch angle that matches the standard 45-degree gables that characterize Duluth's residential architecture. Adapting the form with low-maintenance steel cladding and a flexible layout that enables the home to fit on both corner and single-frontage sites, the Two-Level Infill house won multiple design awards, including a 2022 Affordable Housing Design Award from the American Institute of Architects' (AIA) Minnesota chapter.[44]

41 Jared Brey, "Free Land in Duluth If You've Got a Good Plan for Affordable Housing," *Next City*, November 26, 2019, https://nextcity.org/urbanist-news/free-land-in-duluth-if-youve-got-a-good-plan-for-affordable-housing.

42 Wolf, "A New Prototype."

43 Paige Hansen, "One Roof Community Housing To Receive $50 Million in Funding," *Fox21*, December 16, 2023, https://www.fox21online.com/2023/12/15/one-roof-community-housing-to-receive-50-million-in-funding/.

44 AIA Minnesota, "2022 Affordable Housing Design Award Given to Two Projects," October 13, 2022, https://www.aia-mn.org/ahda-22/.

The thinness of the homes becomes apparent when viewed from an angle.

In some of the two-level infill homes, the main entry is centered on the longer edge of the building.

Generous windows connect the homes to the streets and green spaces around them.

Plover Place

Duluth, Minnesota

Year Completed:	2024
Developer:	One Roof Community Housing
Manufacturer:	Dynamic Homes
Architect:	Greg Strom
Construction Type:	Volumetric Modular
Number of Units:	24
Number of Sites:	1
Number of Boxes:	16
Box Dimensions:	12’ x 40’ and 15’9” x 40’
Construction Timeline:	3 months fabrication, 2 days for install, 1 year for finishing
Prior Site Conditions:	Undeveloped site
Affordable Housing Type:	Permanent Supportive Housing
Unit Mix:	Single-Room Occupancy Units (SROs)

The space between Plover Place’s two modular structures during construction.

Plover Place is a permanent supportive housing development located on a formerly unoccupied residential site northwest of downtown Duluth, Minnesota. Developed by One Roof Community Housing in response to the county’s mounting homelessness crisis, which saw the number of unhoused individuals increase by 41 percent from 2013 to 2023 and the chronic homelessness rate increase by 157 percent over the same period, the project offers twenty-four apartment units to people experiencing long-term homelessness with qualifying mental or physical disabilities.[45] One Roof used American Rescue Plan Act (ARPA) funding allocated by the City of Duluth and St. Louis County to fund the project.

One Roof’s central objective with Plover Place, informed by conversations with stakeholders across local government, the nonprofit sector, and the design and construction fields, was to create a permanent supportive housing model that could be easily replicated across the state.[46] To that end, they turned to Dynamic Homes, a modular housing manufacturer in Detroit Lakes, Minnesota, to develop a simple yet

45 St. Louis County, “St. Louis County Homelessness & Outreach Response,” November 16, 2024, https://duluthmn.gov/media/fkddr5ds/2024-11-26-slc-homelessness-response.pdf.

46 Deborah Freedman, email message to author, August 1, 2025.

Plover Place's micro-units include a private bathroom, kitchenette, furniture, and ample storage. (Courtesy One Roof)

Plover Place consists of two identical buildings built from eight volumetric modules each.

dignified design. One Roof has since built a strong working relationship with Dynamic Homes, collaborating with the manufacturer on multiple projects across northern Minnesota.

Outcomes

Plover Place's total development cost (TDC) was about $3.85 million, which translates to just over $160,000 per unit or $430 per square foot. Interviewees noted that One Roof's lack of conventionally constructed projects with comparable unit compositions makes it difficult to estimate cost savings over traditional building methods The project's modules took about three months to manufacture. The first building was assembled on February 7, 2024, and the second was assembled on February 12, 2024. Finishing work was slated to take three months, but municipal building inspectors, despite having approved the design at permitting review, determined that the state-approved modules did not meet their standards. The issue led to a series of changes that, when combined with other construction delays, pushed the completion date back by months. Plover Place received its certificate of occupancy on October 22, 2024.[47]

Plover Place was designed with twenty-four identical micro-units, each of which is equipped with furniture, a refrigerator, a microwave, storage cabinets, and a private bathroom.[48] Larger kitchens and laundry facilities are shared communally on the ground floor of each building, encouraging some level of interaction between residents and on-site support staff. Plover Place is operated by the Salvation Army.

The design for Plover Place is understated—two rectangular rows of contiguous housing units that face inward towards a central walkway. Because the project addresses the urgent need for permanent supportive housing for Minnesota's growing unhoused population, One Roof focused more on replicability than design expression or contextual specificity, opting for a massing composed of identical units arranged along a double-loaded corridor. Such architectural simplicity also tends to ease the task of managing and maintaining the structure.

47 Ibid.

48 Stepping On Up, "Salvation Army Plover Place," accessed July 6, 2025, https://steppingonupduluth.org/plover-place.

Hallways are capped by generous windows, allowing for views of surrounding greenery.

Each building contains shared spaces for residents, including a large kitchen, lounge, and dining area. (Courtesy One Roof)

Plover Place's modules being craned into place. (Courtesy One Roof)

Scattered Site Family Housing

Minneapolis, Minnesota

Year Completed:	2024
Developer:	Minneapolis Public Housing Authority
Manufacturer:	Rise Modular
Architect:	DJR Architects
Construction Type:	Volumetric Modular
Number of Units:	84
Number of Sites:	16
Number of Boxes:	126
Box Dimensions:	15’ x 72’ and 15’8” x 72’
Construction Timeline:	1-2 days of assembly per site
Prior Site Conditions:	Some vacant lots, some unoccupied homes, some occupied duplexes and single-family homes owned by the MPHA
Affordable Housing Type:	Section 8 Project-Based Voucher Housing
Unit Mix:	2-bedroom and 3-bedroom units

A six-unit apartment building constructed from nine volumetric modules in Minneapolis, Minnesota.

In 2019, the City of Minneapolis, Minnesota adopted an expansive new comprehensive plan, titled Minneapolis 2040. As part of the plan, city leaders made Minneapolis the first US municipality to eliminate exclusive single-family zoning citywide, effectively upzoning all single-family residential neighborhoods at once.[49] The zoning change was especially pertinent for the Minneapolis Public Housing Authority (MPHA), which in addition to several apartment blocks and towers, owns over seven hundred single-family homes that it rents to low-income residents.[50] Minneapolis 2040 opened the door to densification on several MPHA sites—an opportunity that the housing authority was quick to pursue.

The MPHA did not consider off-site construction for their development projects until RISE Modular, a local manufacturer, collaborated with Minneapolis-based DJR Architects to design and build Mod42, a thirty-unit market-rate modular building in the city’s Standish-Ericsson neighborhood. Through a Request for Quotation (RFQ) procurement process that noted a preference for off-site construction methods,

49 City of Minneapolis Department of Community Planning and Economic Development, “Minneapolis 2040 - The City’s Comprehensive Plan,” October 25, 2019, https://minneapolis2040.com/media/2018/pdf_minneapolis2040_updated-june-2024.pdf.

50 Brian Schaffer (Assistant Director, Planning & Development, MPHA), in discussion with the author, July 2024.

An accessible entryway at one of the MPHA's modular sixplexes.

the MPHA selected a team that included RISE, DJR, and Frerichs Construction to evaluate twenty-two City-owned sites for potential densification, including eighteen owned by the housing authority itself. The team singled out sixteen sites across twelve neighborhoods with a total of twenty-one existing units in single-family homes or duplexes, thirteen of which were occupied.[51]

Through an extensive stakeholder engagement process, DJR developed plans for a four-unit, two-story building and a six-unit, three-story building, both of which shared almost identical layouts and entry configurations. With a footprint of over fifteen feet by seventy-two feet, each volumetric module was the maximum allowable size for transport to site. After delays in site preparation pushed the project back from fall 2022, RISE began manufacturing the modules in February 2023. Transport to site and installation began in May 2023, with installers and contractor teams moving from site to site each week in a highly coordinated operation that had all 126 modules fully set by September

51 Ibid.

Workers set a single volumetric module on the foundation of one of MPHA's scattered site buildings. (Courtesy DJR)

2023. With ten sites hosting sixplexes and six sites hosting fourplexes, the project produced eighty-four total units of deeply affordable housing for a net gain of sixty-three units.[52]

Outcomes

Total development costs for the MPHA's scattered-site project were about $600,000 per unit, or over $50 million in total, reflecting the high cost of constructing housing in the Twin Cities. While the inflated cost of materials eroded direct hard cost savings, the project's total construction duration of thirteen months shaved five months off conventional timelines for MPHA projects, saving the housing authority roughly $500,000 in interest payments alone.[53] Of the eighty-four total units, sixty-four were made available to families earning 30 percent of area median income (AMI) or less and twenty were offered to families earning up to 60 percent of AMI, all through Section 8 project-based vouchers.[54]

52 Amanda Pederson (Associate and Project Manager, DJR Architects), in discussion with the author, July 2024.

53 Schaffer, in discussion with the author, July 2024.

54 Local Housing Solutions, "Affordable Manufactured and Modular Housing Strategies from Norwood, CO; Minneapolis, MN; and Halifax, MA," May 10, 2023, https://www.localhousingsolutions.org/housing-policy-case-studies/affordable-manufactured-and-modular-housing-strategies-from-norwood-co-minneapolis-mn-and-halifax-ma/.

A module being craned onto its site in Minneapolis. (Courtesy DJR)

A modular fourplex with a distinct color scheme to reflect the surrounding neighborhood.

DJR designed the two template buildings for “maximum efficiency of the modules,” ensuring that modules for the fourplexes and sixplexes were roughly identical.[55] Each floor is composed of three modules, with the central module housing the circulation core, mechanical spaces, and private areas like bathrooms. Living spaces and bedrooms are concentrated in the outer modules for maximum daylight exposure. Each of the sixteen buildings is effectively identical in structure and massing, but differences in site conditions and proximity to neighboring buildings required changes in window size and placement to comply with zoning. Each building is clad in one of four distinct colors, intended as references to the neighborhoods in which each is located.[56]

55 DJR Architects, “MPHA Family Housing Expansion,” accessed June 7, 2025, https://www.djrarch.com/modular/mpha-family-housing-expansion.

56 Ibid.

Bowdoin Street Rowhouse

Providence, Rhode Island

Year Completed:	2022
Developer:	One Neighborhood Builders
Manufacturer:	Champion Homes
Architect:	Truth Box, Inc.
Construction Type:	Volumetric Modular
Number of Units:	8
Number of Sites:	1
Number of Boxes:	14
Box Dimensions:	13’ 9” x 40’
Construction Timeline:	12 months total
Prior Site Conditions:	3 triple-deckers destroyed by fire
Affordable Housing Type:	Rental (50-80 percent AMI)
Unit Mix:	1- and 2-bedroom townhouses

The Bowdoin Street Rowhouse consists of six duplex units and two single-story accessible units.

In January 2018, a fire broke out in a triple-decker home in Olneyville, a predominantly Hispanic neighborhood of Providence, Rhode Island. Originating in a building facing multiple code violations and official condemnation by the city, the inferno spread to two adjacent triple-deckers, killing one person and leaving twenty others homeless.[57] Emerging in the days and weeks after the fire, details on the physical dilapidation of the property and the overcrowding of its tenants underscored the lack of affordable housing options in Providence, where the average rent for a two-bedroom apartment had risen to $1,200 despite a state minimum wage of $9.60 per hour at the time.[58] Even as the state minimum wage increased in subsequent years, Rhode Island produced fewer units of housing per capita than any other state, exacerbating Providence’s housing shortage and pushing rents further out of reach for most working people.[59] As of January 2025, rents in Providence had grown by over 33 percent since the start of the pandemic, the fifth-largest increase among metro areas with over one million residents.[60]

57 Josh Faiola, “Site of Deadly 2018 Fire in Providence Transformed into Affordable Housing,” One Neighborhood Builders (reposted from WPRI), March 4, 2022, https://oneneighborhoodbuilders.org/wpri-site-of-deadly-2018-fire-in-providence-transformed-into-affordable-housing/.

58 Katie Davis, “NBC 10 I-Team: Deadly Providence Fire Highlights City’s Housing Crisis,” WJAR, January 10, 2018, https://turnto10.com/i-team/nbc-10-i-team-deadly-providence-fire-highlights-citys-housing-crisis.

59 Cristina Miguelez, “Homebuilding Across the States with Totals Vs. Per Capita Rates,” *Fixr*, April 12, 2019, https://www.fixr.com/articles/looking-at-homebuilding-across-the-states-with-totals-vs-per-capita-rates.

60 Claudie Bellanger, “The Median Asking Rent in Providence Shot up 12.6 percent in a Year,” *Boston.com*, January 29, 2025, https://www.boston.com/real-estate/renting/2025/01/29/providence-median-rent-skyrockets/.

The building's units boast large kitchens and living spaces. (Jason Wessel Photography)

In the wake of the fire, local CBO One Neighborhood Builders (OneNB) worked with the City of Providence to acquire the site, committing to develop safer and more dignified affordable housing in its place. OneNB soon brought on Providence-based Truth Box Architects to devise a scheme for affordable two-bedroom row homes on the site. The development team sent shop drawings and site designs to multiple manufacturers as part of a request for bids. Champion Homes, one of the largest manufactured housing producers in the US, won the bidding process and began its collaboration with OneNB and Truth Box through its modular homebuilding brand, Excel Homes.[61]

Despite beginning construction in the wake of the pandemic as supply chain disruptions continued to plague the construction industry, Excel Homes was able to move relatively quickly to manufacture the project's fourteen modules and ship them from Pennsylvania, delivering them within six months of receiving the order. Placement on site took four days in February 2022, after which four months of finishing work commenced.

61 Peter Gill Case (Principal, Truth Box Architects), in discussion with the author, December 2024.

Flat-packed roofs were folded upward into place after on-site module assembly. (Courtesy Truth Box Architects)

Each unit has a private entry facing directly onto the street. (Jason Wessel Photography)

Renters making 50-80 percent of AMI moved in by the end of summer that year, shaving months off of a development timeline that would have taken 15-18 months with traditional construction.

Outcomes

Each unit in the Bowdoin Street Rowhouse costs about $285,000 to develop, reflecting a per-unit cost reduction of about $15,000 to $55,000 over conventional construction methods according to OneNB's estimates.[62] The project's effectiveness in realizing cost and time savings has since spurred OneNB to pursue modular construction in other projects. For Sheridan Village, a twenty-unit condominium development in Providence, OneNB is again working with Truth Box Architects to create a simple yet context-sensitive modular development.

Truth Box Architects worked with Excel Homes to craft a building that

62 Michelle Bleau (Director of Housing Development, OneNB), Steve Kearns (Project Manager, OneNB), Ali Steinberg (Policy & Research Manager, OneNB), in discussion with the author, July 2024.

Single-story units on either end continue the same roof pitch as the duplexes. (Jason Wessel Photography)

mirrored the neighborhood despite its unique construction method. The Bowdoin Street Rowhouse arranges its units linearly under a repetitive gable roof, employing techniques for pitched roof construction that are commonplace in manufactured housing. The roof of each unit was shipped to site as flat components, then folded up during the assembly process to form each gable.[63] The architects selected two-tone siding for the building's exterior, referencing materials, color palettes, and an overall scale that are ubiquitous in Olneyville.

63 Peter Gill Case (Principal, Truth Box Architects), in discussion with the author, December 2024.

Homes by NPHS

San Bernardino, California

Year Completed:	2024
Developer:	Neighborhood Partnership Housing Services (NPHS)
Manufacturer:	Clayton Homes, Silvercrest (Champion Homes), Skyline Homes (Champion Homes)
Architect:	N/A
Construction Type:	Manufactured housing
Number of Units:	10 (22 under way)
Number of Sites:	9
Number of Boxes:	10
Box Dimensions:	27’ x 56’, 20' x 56', 24' x 44'
Construction Timeline:	3 months in total
Prior Site Conditions:	Varied
Affordable Housing Type:	Affordable ownership and rental
Unit Mix:	3-bedroom single-family homes, 2-bedroom ADUs

A manufactured CrossMod™ home placed on a suburban lot in San Bernardino, California by NPHS.

Long a bastion of relatively affordable housing in a state where astronomical costs have become the norm, Southern California’s Inland Empire has begun to feel the pressure of an influx of residents priced out of coastal cities. According to Redfin, the median home price in San Bernardino County rose from well under $400,000 to over $550,000 between summer 2020 and summer 2025.[64] An individual or household would need to earn over $150,000 per year to afford such prices, far more than the county’s median household income of approximately $85,000.[65] It is within this context that Neighborhood Partnership Housing Services (NPHS), a CBO based in Rancho Cucamonga, began deploying manufactured housing as a key part of its strategy to address the region’s mounting affordability crisis.

As noted in a 2024 report by the Joint Center for Housing Studies, after working with modular construction for a small project in Chino, California, NPHS turned to manufactured housing to realize even greater cost benefits. The organization set up Homes by NPHS, a social

64 Redfin, “San Bernardino County, CA Housing Market: House Prices & Trends,” accessed July 11, 2025, https://www.redfin.com/county/338/CA/San-Bernardino-County/housing-market.

65 Ariana Bindman, “Investors Gobbling up Homes in One of California’s Last ‘affordable’ Regions,” *SFGate*, March 4, 2024, https://www.sfgate.com/bayarea/article/california-inland-empire-housing-costs-18696495.php; San Bernardino County, “Median Household Income and Cost of Living,” *San Bernardino County Community Indicators Report*, n.d., accessed July 28, 2025, https://indicators.sbcounty.gov/income/median-household-income-and-cost-of-living/.

CrossMods™ being assembled for NPHS in Southern California. (Courtesy NPHS)

CrossMods™ placed by NPHS boast garages and porches that enable them to blend in with conventional homes.

enterprise focused on deploying manufactured housing toward three main ends: developing single-family housing, providing homeowners with manufactured ADUs, and operating as a manufactured home dealer for community land trusts and other nonprofit developers.[66]

NPHS works primarily with three local manufacturers, including Silvercrest and Skyline Homes, both now brands under Champion Homes, and Clayton Homes' factory in Perris, California.[67] Permanent block foundations typically take two to three weeks to prepare, while manufacturing a full home can take between nine to thirty days. Homes can be placed on lots without the use of a crane, after which bolting often takes one week. If work progresses smoothly, the entire process takes three months, well short of the typical construction timeline for a conventional home. NPHS aims to expand its portfolio of HUD code homes, including HUD's newly approved manufactured duplexes.[68]

Outcomes

NPHS has placed eight manufactured homes on lots in San Bernardino, California. Three more are in progress in San Bernardino, in addition to six in Palm Springs. NPHS staff lauded the financial predictability of manufactured housing, noting that the lack of change orders in a controlled manufacturing environment is "game-changing" for lower-income buyers. The average total development cost for NPHS's manufactured homes is $300,000, about 30 percent less than the $425,000 it costs the organization to develop a conventional home.[69]

The manufactured homes that NPHS has placed range from 1,470 to over 2,000 square feet, while the ADUs come in 600- and 800-square-foot options. The homes usually accommodate three bedrooms and two bathrooms, while the ADUs fit two bedrooms and two bathrooms. NPHS works closely with its manufacturers and installers to ensure that its manufactured homes blend in with the site-built homes that surround them, an effort aided by the organization's transition to CrossMods™ products with more customizable features than typical manufactured homes. Block walls enclose the permanent foundation of each home, effectively mimicking conventional slab-on-grade houses in the area. While manufacturers can customize their products only to a limited extent before they are delivered to site, NPHS is able to make neighborhood-specific changes once homes are delivered.[70] On-site customization usually involves installing roofing and cladding in alignment with neighborhood character.

66 Herbert and Reed, "Overcoming Barriers."

67 Jesse Ibarra (Chief Business Officer, NPHS) and Andy Lopez (Assistant Project Manager, NPHS), in discussion with the author, July 2024.

68 Ibid.

69 Neighborhood Partnership Housing Services, "Factory-Built Housing: Solution to Affordable Homeownership," n.d., accessed August 1, 2025, https://nphsinc.org/factory-built-housing/.

70 Jesse Ibarra (Chief Business Officer, NPHS) and Andy Lopez (Assistant Project Manager, NPHS) in discussion with the author, July 2024.

Surrounded by landscaping and neighboring ranch homes, the NPHS's CrossMods™ become almost indistinguishable.

The courtyard between a manufactured home and a manufactured ADU, both placed on a single site by NPHS.

Manufactured ADUs can range in area from 500 square feet to 1,200 square feet.

Isla Intersections

Los Angeles, California

Year Completed:	2024
Developer:	Holos Communities
Manufacturer:	Giant Containers
Architect:	Lorcan O'Herlihy Architects (LOHA)
Construction Type:	Volumetric (Container) Modular
Number of Units:	54
Number of Sites:	1
Number of Boxes:	250[71]
Box Dimensions:	8' x 20'
Construction Timeline:	4 years, due to significant pandemic delays
Prior Site Conditions:	Undeveloped traffic median
Affordable Housing Type:	Rental (30 percent AMI)
Unit Mix:	1-bedroom apartments

71 This number includes several half-height boxes designed to extend ceiling heights on the ground floor.

Holos Communities' Isla Intersections project viewed from a newly redesigned street.

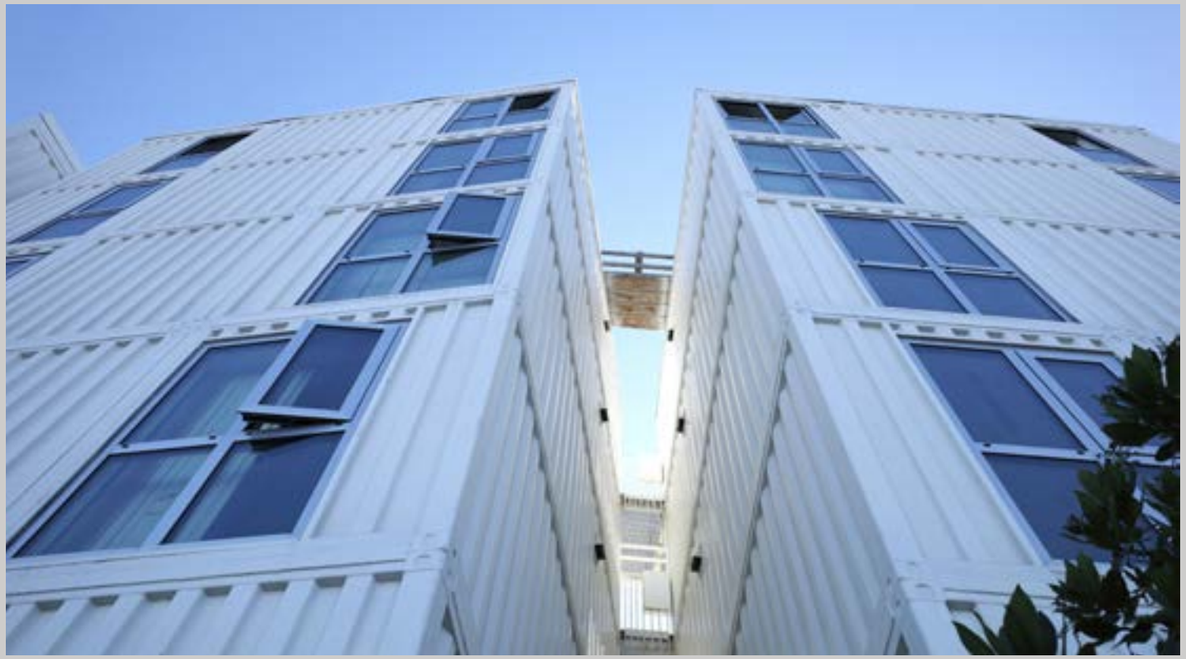
In 2017, the City of Los Angeles's point-in-time count estimated that there were 33,138 unhoused individuals in the city, including over 24,000 unsheltered individuals, representing a 16 percent increase over 2016.[72] After increasing for several consecutive years through the COVID-19 pandemic, the unsheltered population in Los Angeles has decreased for two consecutive years, including by 17.5 percent from 2024 to 2025 alone. Local officials have credited the recent downward trend to Los Angeles County's $2.5 billion investment in housing programs and affordable housing development over the last several years, of which Isla Intersections is one example.[73]

Isla Intersections was initiated as a response to a Request for Qualifications/Proposals (RFP) issued by the City of Los Angeles Housing and Community Investment Department (HCID) in 2017. The RFP called for affordable housing development on eight city-owned parcels, from vacant and underutilized lots to large traffic medians. In identifying the sites, HCID emphasized the need for multiple types

72 Los Angeles Homeless Services Authority, "2017 Greater Los Angeles Homeless Count - Data Summary," May 17, 2018, https://www.lahsa.org/documents?id=1354-2017-homeless-count-total-point-in-time-homeless-population-by-geographic-areas.pdf.

73 Shawn Hubler, "Homeless Population Declines in Los Angeles for a Second Straight Year," *New York Times*, July 14, 2025, https://www.nytimes.com/2025/07/14/us/los-angeles-homeless.html.

Modules are arranged to shield units and the interior circulation spaces from the nearby freeway. (Paul Vu, courtesy LOHA)



Each one-bedroom unit at Isla Intersections is composed of three container modules.

of housing targeting individuals and families making anywhere from 30 percent to 120 percent of AMI, including single-family homes for affordable ownership opportunities, large multifamily affordable rental buildings, and permanent supportive housing for unhoused individuals.[74]

For many of the sites included in the RFP, HCID indicated that preference would be given to development teams with some experience "utilizing modular or container construction," referring to a subset of 3-D modular construction in which shipping containers—or purpose-built boxes designed to resemble shipping containers—are used as stackable and habitable volumes.[75] In 2018, through the RFP's competitive solicitation process, Los Angeles-based affordable housing developer Holos Communities won the right to develop a 20,000-square-foot triangular traffic median facing the elevated interchange of Interstates 110 and 105.[76] The City offered Holos a ninety-nine-year ground lease for $1. Holos partnered with Los Angeles-based Lorcan O'Herlihy Architects (LOHA) and Giant Containers, a Chinese container module manufacturer, to deliver fifty-four units of deeply affordable permanent supportive housing in Isla Intersections.[77]

Outcomes

The numerous logistical challenges that the Isla Intersections team encountered underscore the potential risks that CBOs face in working with module manufacturers abroad. Having cleaned up the site in 2019, Holos was slated to begin construction on the property just as the COVID-19 pandemic shuttered businesses across the United States. Coupled with other international operational complexities, including a 400 percent markup on shipping costs during the holiday season and the inability of Los Angeles's housing accessibility inspectors to visit a manufacturing facility in China, supply chain disruptions delayed the project by years. The development team partnered with California-based manufacturers to receive and apply finishing touches to the modules from Giant Containers, but the first floor's modules were not placed until March 2024. Remaining modules were placed in May of that year, with total development costs reaching over $38 million, or more than $700,000 per unit. Apartments were offered to unhoused residents making 30 percent of AMI or less. While Holos representatives expressed trepidation about working again with container modules manufactured across the Pacific, the CBO is still interested in modular construction in general.[78]

74 City of Los Angeles Housing + Community Investment Department, "Request for Qualifications/Proposals," March 20, 2017.

75 Ibid.

76 Ben Ikenson, "An Old Median near a Los Angeles Freeway Sat Empty for Years. Now It's Affordable Housing," *Fast Company*, November 27, 2023, https://www.fastcompany.com/90988021/an-old-median-near-a-los-angeles-freeway-sat-empty-for-years-now-its-affordable-housing.

77 Audrey Peterson (Director of Real Estate Development, Holos Communities), in discussion with the author, September 2024.

78 Ibid.

Window placement on Isla Intersections' modules staggers from floor to floor.

Each unit in Isla Intersections is a 480-square-foot one-bedroom apartment composed of three container modules. Units are arranged into sixteen vertical stacks that form a teardrop in plan, shielding an interior courtyard, several pocket parks, and unit entries from the noise of the elevated freeways across the street. Open-air walkways on the inner edge of the building provide circulation space between units, stairs, and elevator cores. Having transformed Athens Way, an adjacent street, into a slow-moving paseo for pedestrians and cyclists, LOHA provided Isla with ground-level commercial spaces and offices for support services.[79] The project was recognized with several design awards, including as an affordable housing finalist and jury winner in prefab and modular construction in Architizer's A+ Awards.[80] The AIA's Los Angeles Chapter also granted Isla an Honor award (its highest distinction) in residential architecture in 2025.[81]

79 Lorcan O'Herlihy (Principal, Lorcan O'Herlihy Architects), in discussion with the author, August 2024.

80 Architizer, "2025 Plus Winners - Architizer A+Awards," accessed July 29, 2025, https://winners.architizer.com/2025/Plus/concepts-15/architecture-prefab-and-modular-1/.

81 AIA Los Angeles, "Residential Architecture Award Winners 2025," June 13, 2025, https://www.aialosangeles.org/home/awards/residential-architecture-awards/residential-architecture-award-winners-2025/.

Isla Intersections is centered on a ground-floor courtyard and open-air walkways on each upper floor.

Key Insights

Initial research, conversations with housing experts, and interviews with project stakeholders—developers, architects, residents, and manufacturers—highlighted several insights that can help CBOs and their teams achieve the financial and scheduling efficiencies that off-site construction promises.

Early Decisions & Coordination

Early team coordination is essential to reducing inefficiencies in the planning and construction process. Multiple stakeholders interviewed for this research emphasized that development teams considering off-site construction, and particularly modular construction, should bring both architects and manufacturers onto their teams early in the planning process. Coordination of designs and construction documents is essential from the outset, and teams that hire architects long before hiring a manufacturer—or vice versa—often end up completely reworking earlier schemes.

Choosing the right manufacturer matters. Among the case studies featured here, the CBOs that maintained strong working relationships with a particular manufacturer or set of manufacturers were far more likely to continue their use of off-site construction methods in future projects. Finding the "best-fit" partnership can take time. One developer identified their collaborations with a previous manufacturer as "a nightmare," but praised their current partner as "wonderful to work with." In selecting a partner to work with, CBOs should consider a manufacturer's prior experience with the housing type they are pursuing. Architecture firms, as well as other CBOs or housing developers in the region, may be able to recommend certain companies.

Geography matters, too. While some CBOs have worked with manufacturers based in distant locales, selecting a proximate factory minimizes code complexity and transportation risks. Modules that have to cross state lines between their point of fabrication and the building site are still subject to regular inspection by officials from the destination state. While some states (such as Wisconsin and Minnesota) have formed consortiums or reciprocity agreements to inspect one another's modules, selecting an in-state manufacturer is still preferable in many jurisdictions. Having to work with only one state's highway regulations and reducing the distance over which components have to travel also minimizes the complexity, cost, and risk associated with module transportation. In the Northeast, where the "best-fit" manufacturer is more likely to be located out-of-state due to smaller state sizes and lower numbers of manufacturers, CBOs may have to balance multiple considerations in selecting a partner.

A number of US developers have turned to Chinese modular manufacturers to build housing at even lower costs than those realized through domestic partnerships, but such moves carry substantial risks and complexities.[82] In the case of Isla Intersections, for instance, supply chain volatility resulting from the COVID-19 pandemic delayed the transpacific shipment of modules for years. As volatility in the trade relationship between the United States and China persists, complexities are likely to remain or deepen.

Local governments can help or hinder the deployment of factory-built housing on infill sites, requiring different forms of engagement from CBOs. In the case of Isla Intersections in Los Angeles, local officials explicitly called for the use of off-site construction techniques on the designated project site. In allocating development funds and publicly owned land over the last decade, other cities and states have indicated a preference for teams using off-site construction methods. On the opposite end of the spectrum, many municipalities ban manufactured

82 CIMC, "Chinese Modular Construction Gaining Recognition around the World," PR Newswire, November 18, 2022, https://www.prnewswire.com/news-releases/chinese-modular-construction-gaining-recognition-around-the-world-301682620.html.

homes on infill sites, forcing CBOs to turn to other construction methods for affordable housing development. While local governments did not actively push for off-site construction methods in several of the cases discussed in this report, many were receptive to CBOs' interest in factory-built housing. Interviewees noted that CBOs may have to educate local leaders on the potential benefits of factory-built housing and should work to align objectives with those leaders early, even before permitting begins.

CBOs can leverage design improvements and limited neighborhood disruption to garner support from communities. Several CBOs interviewed for this report noted that, in cases where community opposition to a development was strong, it was usually in response to the development of affordable and/or multifamily housing in general, and not to the use of off-site construction methods in particular. Affordable housing developers were also quick to point out that CBOs can leverage the relative design quality and substantially shorter on-site construction timelines that accompany most factory-built projects to gain buy-in—or at least temper objections—from neighbors. In most cases, primary on-site assembly can be finished in a matter of days, after which much of the work is concentrated on the interior of the building—a marked improvement over the months- or years-long timelines associated with conventional construction.

Regulations

There is a need for greater advocacy, including from CBOs, in support of fairer zoning regulations regarding manufactured housing. Some cities have continued the longstanding push to ban manufactured homes from individual plots in the interest of curb appeal and neighboring home values—restrictions that fail to reflect substantial improvements and changes in the design and material quality of manufactured homes today, as well as their critical role in reducing housing costs for residents.[83] In response, a few states, including California, Nevada, Ohio, and Washington, have long prohibited municipalities from banning manufactured homes on lots where they allow conventional single-family homes.[84] In 2024, the governors of Maine and Maryland signed similar bills into law.[85] CBOs interested in using manufactured housing may advocate for looser restrictions on manufactured housing on infill sites at both the local and state level, highlighting HUD-code houses as a critical source of affordable housing in increasingly expensive cities.

83 Jess Huff, "An East Texas Town Has Put Strict Limits on Mobile Homes — Again," *Texas Tribune*, February 28, 2024, https://www.texastribune.org/2024/02/28/huntington-texas-mobile-home-law/.

84 Matthew Yglesias, "Trailer Park Blues," Slate, October 2, 2012, https://slate.com/news-and-politics/2012/10/mobile-homes-the-absurd-economy-killing-rules-towns-have-passed-against-manufactured-houses.html.

85 Council of State Governments, "States Loosen Manufactured Housing Restrictions," May 30, 2024, https://csgerc.wpengine.com/states-loosen-manufactured-housing-restrictions/.

A volumetric module being lifted into place on one of the MPHA's sites in Minneapolis, Minnesota. (Courtesy DJR)

Isla Intersections' massing consists of several towers of modules stacked to varying heights. (Paul Vu, courtesy LOHA)

Off-site construction can help CBOs meet various state- and local-level sustainability requirements for affordable housing. In the case of Minnesota, for instance, off-site construction can help CBOs meet the requirements of the Buildings, Benchmarks and Beyond (B3) program, which stipulates that development teams must divert 75 percent of construction waste away from landfills.[86] An interviewee from One Roof Community Housing noted that using modular construction is a particularly pragmatic alternative to material recycling through conventional construction in the northeastern regions of Minnesota where they operate, given their distance from viable construction material recycling centers.[87]

Some cost-saving potential associated with industrialized construction can be traced to manufacturers' use of non-union labor in the factories that build units. In contrast to affordable housing projects that use conventional construction methods, development teams in many jurisdictions are not obligated under the Davis-Bacon Act (DBA) to

86 Buildings, Benchmarks and Beyond, "Materials and Waste Guidelines," accessed July 6, 2025, https://www.b3mn.org/guidelines2-2/m_3.html.

87 Interview with One Roof Community Housing staff, July 2024.

Plover Place's 3-D modules were fitted with siding, windows, and millwork before shipment to site. (Courtesy One Roof)

provide local prevailing wages for most factory-based labor. Revisions to DBA issued by the Department of Labor in late 2023 included a pared-down expansion of the prevailing wage requirement to "secondary sites" of construction, but only in cases "where entire portions or modules of a building or work, such as a completed room or structure, are constructed off-site with minimal construction work remaining at the primary site of construction."[88] The Department of Labor noted that it did not expect the change to have a substantial impact on the cost of adopting modular construction methods in affordable housing development, and the Modular Building Institute highlighted the pared-down changes as a win.[89]

Interviewees noted that, in some regional contexts within the United States, non-union subcontractors pay wages that are at least roughly equivalent to union wages. In such cases, the differences in labor costs between off-site construction and conventional construction may be negligible.

88 US Department of Labor, "Frequently Asked Questions: Updating the Davis-Bacon and Related Acts Regulations Final Rule," 2023, https://www.dol.gov/agencies/whd/government-contracts/construction/rulemaking-davis-bacon/faqs.

89 Modular Building Institute, "MBI Defeats Davis-Bacon Expansion," August 8, 2023, https://www.modular.org/2023/08/08/mbi-defeats-davis-bacon-expansion/.

HUD-code duplexes like the one pictured here may be particularly useful for urban infill sites.

CBOs deciding between a factory-built and a site-built structure will often have to grapple directly with the tension between labor interests and the potential to provide more units to low- and middle-income residents. As one nonprofit developer interviewed for this report noted, high labor costs can render some small infill sites entirely undevelopable. The decision that many CDCs confront, then, is not necessarily one between a conventionally built development using union labor and a factory-built development using non-union labor, but rather one between a factory-built building and no building at all. Interviewees also noted, however, that in some regions, there is little to no discrepancy between union wages for on-site work and non-union wages for factory work, shifting the calculus on cost savings through prefabrication.

Some housing experts want a HUD code for modular housing. Interviewees noted that a national HUD code for modular construction would ease barriers to wider use. Currently, manufacturers have to abide by individual local and state building codes and regulations, making it difficult to coordinate projects across state lines. Such a proposition, however, is likely to inspire considerable pushback from the manufactured housing industry, which would view a more streamlined modular industry as a greater competitive threat.

Design & Sustainability Outcomes

Factory-built housing is often essentially indistinguishable from site-build housing in terms of interior quality and appearance. Manufacturers and architects have shown that volumetric modules can be combined to create units that are just as spacious and pragmatic as their site-built counterparts. When a community member passed by Isla Intersections in Los Angeles and exclaimed that she “wouldn’t want to live in a box like that,” it is unclear whether she recognized that a single one-bedroom unit in the building is composed of three—not one—container modules. Despite the building’s exterior expressing its modularity more clearly than any other case study featured here, its unit interiors are largely indistinguishable from conventional affordable housing. Most developers interviewed noted that residents living in their projects are less concerned with the particulars of its construction method than with securing a comfortable, dignified, and affordable home—an objective that off-site construction can help realize in less time or at lower cost.

It appears that durability and construction quality in factory-built homes are now typically on par with site-built homes. Questions of build quality frequently arise in discussions about off-site construction, reflecting an understandable lack of familiarity with a building method that has yet to be widely adopted in all regions of the United States. The benefits of a controlled fabrication environment, though, are clear. Modular buildings often demonstrate better construction quality than their conventional counterparts.[90] While assembly issues occasionally arise, such as misalignments or gaps between modules, they are relatively uncommon, particularly when working with experienced manufacturers and assembly teams. At minimum, modular buildings abide by the same code standards as site-built structures and are inspected regularly during fabrication and after installation.[91]

After a series of changes to the HUD code between the early 2000s and today, including updates to its fire safety and material standards, contemporary manufactured homes are also similar in build quality to site-built homes.[92] Higher-quality materials across all prefabricated structures are likely to improve overall durability and building lifespans.

90 H+M EPC, “On-Site vs. Off-Site Construction: The Pros and Cons,” December 9, 2021, https://www.hm-ec.com/blog-posts/on-site-vs-off-site-construction-the-pros-and-cons-hm.

91 NAHB, “Modular Building Systems: Overview and Benefits,” accessed May 5, 2025, https://www.nahb.org/other/consumer-resources/types-of-home-construction/modular-building-systems.

92 Karan Kaul and Daniel Pang, “The Role of Manufactured Housing in Increasing the Supply of Affordable Housing,” Urban Institute – Housing Finance Policy Center, 2022, https://www.urban.org/sites/default/files/2022-07/The%20Role%20of%20Manufactured%20Housing%20in%20Increasing%20the%20Supply%20of%20Affordable%20Housing.pdf.

The Bowdoin Street Rowhouse resembles the surrounding residential buildings despite its unique construction technique.

A conventional home in San Bernardino, California is similar in profile, layout, and roof pitch to a CrossMod™ home.

Blending in with surrounding site-built housing is a common design goal among many infill projects using off-site construction. In established urban and suburban communities where the presence of affordable housing in any form can spur scrutiny or pushback from residents and elected leaders, it is important for housing projects—and especially multifamily housing projects—to respond to their architectural context with some sensitivity. To that end, CrossMod™ homes and most modular projects are often designed to obscure the fact that they are factory-built products. Except for Isla Intersections, whose façade treatment does little to obscure the fact that the building is composed of container modules, the six projects presented here render their factory roots largely imperceptible, especially to untrained eyes.

Physical context often informs the selection of a particular off-site construction method. NPHS, for example, has been successful in placing CrossMod™ homes in the Inland Empire without significant pushback largely because manufactured homes do not represent a major architectural departure from the existing vernacular. Most homes in San Bernardino are single-story, single-family structures with low roof pitches—a reality that enables manufactured homes to blend in more easily. CrossMods™ fit so closely with the local vernacular architecture, in fact, that even for-profit developers are turning to manufactured housing to bolster their bottom lines.[93] CrossMods™ would be a harder sell in Providence, Rhode Island, where much of the traditional housing stock is composed of 2- and 3-story Victorian homes or triple-deckers. In addition to local regulations on HUD-code housing, development teams should consider architectural context in selecting which method is most appropriate for a given site or neighborhood.

CBOs and designers working with modular and HUD-code manufacturers can now achieve a much higher level of customization. Off-site construction and contextual design expression are often perceived as mutually exclusive, but the case studies in this report demonstrate that prefabrication is not necessarily a one-size-fits-all approach to housing development. In meetings with manufacturers from Champion Homes, for instance, the Providence-based architects at Truth Box were surprised by the level of customization that could be achieved in the pitched roof design of the Bowdoin Street Row Houses. Representatives from Champion's brand Excel Homes not only accommodated but encouraged the architects to pursue an extended roof pitch over the single-story accessible units that bookend the building on either side, assuring the designers that the pitch angle could be matched to that of the gable roofs over the two-story townhomes.[94]

93 Interview with NPHS staff members, July 2024.

94 Peter Gill Case (Principal, Truth Box Architects), in discussion with the author, December 2024.

An entrance to one of One Roof's panelized single-family homes in Duluth, Minnesota.

Customization in prefabricated housing is most often realized through cladding, which in the case of modular buildings is completed after on-site assembly. Interviewees from NPHS noted that, even in the more established manufactured housing industry, installers have made a variety of cladding options available to homeowners and developers, including stucco, an exterior plaster finish that is common on conventional homes in Southern California.[95]

Off-site construction can help CBOs meet their own sustainable construction goals. One of the most widely discussed upsides of off-site construction over conventional construction is the reduction in material waste, through both reduced exposure to the elements and the possibility of recycling unused materials for future projects.[96] For CBOs with long-term sustainability goals, such environmental benefits offer another rationale for turning to factory-based construction rather than traditional construction.

95 Interview with NPHS staff members, July 2024.

96 Sara M. Bour, "Environmentally Sustainable Benefits of Offsite and Modular Construction," AIA Contract Documents, January 13, 2022, https://learn.aiacontracts.com/articles/6468800-environmentally-sustainable-benefits-of-offsite-and-modular-construction/.

The MPHA's buildings were assembled one by one, with crews moving from site to site over several weeks. (Courtesy DJR)

Conclusion

As the number of cost-burdened households swells and the price per unit of constructing new housing balloons across the United States, off-site construction offers CBOs a compelling way to build high-quality, often well-designed affordable housing in less time and at a reduced cost. While prefabrication is not a panacea for the nation's housing crisis, the case studies presented here offer a variety of road maps towards wider and more effective adoption of the construction technique by affordable housing developers working on infill sites and in urban and suburban contexts.

The research conducted for this report surfaced several key strategies for completing prefabricated housing projects effectively and contributing to broader adoption of the method nationwide, but a few stand out as particularly important:

Understand how off-site construction might help a CBO advance its mission. Off-site construction presents many advantages over conventional building methods for organizations that aim to meet urgent affordable housing needs, minimize broader environmental impacts, and maintain strong relationships with their communities. Reflecting on how the potential benefits of modular or manufactured housing align with CBO goals is a vital first step in developing an effective implementation strategy.

Be deliberate about where and how to implement different forms of off-site construction. For CBOs interested in off-site construction, examining a project's architectural context, the available manufacturers in the region, the logistical complexity of transporting and assembling components on-site, and the local regulatory environment for both modular and manufactured housing are critical steps in realizing cost and time savings. No single approach to off-site construction is the right approach for all infill sites.

Coordinate development teams from the outset. Early collaboration among developers, architects, manufacturers, and general contractors reduces costly revisions and mistakes in later parts of the construction and assembly process. Almost all CBOs included in this report stressed the importance of bringing on architects and manufacturers simultaneously, emphasizing that off-site construction is a precision game. Even with the transport expertise of manufacturers and installers, logistics are especially complex for scattered-site infill projects, prompting some interviewees to suggest developing fewer sites simultaneously and dedicating a separate lot for material staging.

Do not shy away from customization and design expression. Many of the designers and developers interviewed for this report noted some initial surprise with the level of design expression now possible in off-site construction, encouraging other CBOs and architects to learn from the expertise of manufacturers and installers. From wider varieties of exterior cladding to creative roof pitches, many architectural features often associated with conventional buildings can now be applied to their prefabricated counterparts.

Engage, educate, and share. While some of the CBOs highlighted here dealt with local government officials who actively pushed for the adoption of off-site construction methods, others had to educate leaders on the potential benefits of prefabrication. Advocacy for a fairer regulatory environment for manufactured housing and more responsive lending practices for modular housing, as well as information sharing among development teams, can help cultivate a more mature and diverse off-site construction industry nationwide. As the industry scales and institutional familiarity with and regulatory acceptance of off-site construction methods grow, the technique is more likely to have a substantial and sustained impact on housing affordability across the US.

Appendix

One of One Roof's two-level infill houses nestled on a narrow lot overlooking Lake Superior.

Interviews & Correspondence

Interviews and conversations with the following stakeholders and researchers took place over twelve months between 2024 and 2025.

Amanda Pederson	DJR Architects
Chris Herbert	Harvard Joint Center for Housing Studies
Audrey Peterson	Holos Communities
Matthew Schauer	Holos Communities
Chadwick Reed	Ivory Innovations
Benjamin Olsen	Lagom Modular; Office Hughes Olsen
Jim Gray	Lincoln Institute of Land Policy
Lorcan O'Herlihy	Lorcan O'Herlihy Architects
Tom Heinemann	MH Advisors, LLC
Brian Schaffer	Minneapolis Public Housing Authority
Gerzon Cesena	Neighborhood Partnership Housing Services
Clemente Mojica	Neighborhood Partnership Housing Services
Rashawna Fahie	Neighborhood Partnership Housing Services
Jesse Ibarra	Neighborhood Partnership Housing Services
Andy Lopez	Neighborhood Partnership Housing Services
Sarah Kackar	NeighborWorks America
Elena Kaye-Schiess	NeighborWorks America
Chad Klawetter	NeighborWorks America
Tamar Greenspan	NeighborWorks America
Michael Molina	NeighborWorks America
Grant Beck	Next Step Network
Michelle Bleau	One Neighborhood Builders
Steve Kearns	One Neighborhood Builders
Ali Steinberg	One Neighborhood Builders
Jeff Corey	One Roof Community Housing
Peter Krieger	One Roof Community Housing
Chad Dipman	One Roof Community Housing
Deborah Freedman	One Roof Community Housing
Dave Walock	RISE Modular
Mary Tingerthal	Tingerthal Group; Minnesota Housing Finance Agency
Peter Gill Case	Truth Box Architects

Sources

Abate, Tom. “INSTANT INFILL / Today’s More Affordable, Better-Built Manufactured Homes Find Their Niche in Urban Neighborhoods.” *SFGate*, September 25, 2005. https://www.sfgate.com/bayarea/article/INSTANT-INFILL-Today-s-more-affordable-2606801.php.

AIA Los Angeles. “Residential Architecture Award Winners 2025.” June 13, 2025. https://www.aialosangeles.org/home/awards/residential-architecture-awards/residential-architecture-award-winners-2025/.

AIA Minnesota. “2022 Affordable Housing Design Award Given to Two Projects.” October 13, 2022. https://www.aia-mn.org/ahda-22/.

Architizer. “2025 Plus Winners - Architizer A+Awards.” Accessed July 29, 2025. https://winners.architizer.com/2025/Plus/concepts-15/architecture-prefab-and-modular-1/.

Avenue. “Avenue Builds Four New Affordable Rental Homes in Houston’s Near Northside.” Community. February 28, 2024. https://www.avenuecdc.org/2024/avenue-builds-four-new-affordable-rental-homes-in-houstons-near-northside/.

Bagli, Charles V. “Developer That ‘Cracked the Code’ on Modular Building Exits the Business.” *New York Times*, October 5, 2016. https://www.nytimes.com/2016/10/06/nyregion/developer-that-cracked-the-code-on-modular-building-exits-the-business.html.

Bellanger, Claudie. “The Median Asking Rent in Providence Shot up 12.6 percent in a Year.” *Boston.Com*, January 29, 2025. https://www.boston.com/real-estate/renting/2025/01/29/providence-median-rent-skyrockets/.

Bindman, Ariana. “Investors Gobbling up Homes in One of California’s Last ‘affordable’ Regions.” *SFGate*, March 4, 2024. https://www.sfgate.com/bayarea/article/california-inland-empire-housing-costs-18696495.php.

Bour, Sara M. “Environmentally Sustainable Benefits of Offsite and Modular Construction.” AIA Contract Documents, January 13, 2022. https://learn.aiacontracts.com/articles/6468800-environmentally-sustainable-benefits-of-offsite-and-modular-construction/.

Brey, Jared. “Free Land in Duluth If You’ve Got a Good Plan for Affordable Housing.” *Next City*, November 26, 2019. https://nextcity.org/urbanist-news/free-land-in-duluth-if-youve-got-a-good-plan-for-affordable-housing.

Buildings, Benchmarks & Beyond. “Materials and Waste Guidelines.” Accessed July 6, 2025. https://www.b3mn.org/guidelines2-2/m_3.html.

Caledonian Record. “Better Homes AHEAD To Showcase Energy-Efficient Homes.” *Caledonian Record*, February 14, 2015. https://www.caledonianrecord.com/features/better-homes-ahead-to-showcase-energy-efficient-homes/article_1583132a-4aab-5cd5-9d78-cff7abe51902.html.

Cambridge Community Development Department. “100 Percent Affordable Housing Overlay.” Accessed January 17, 2025. https://www.cambridgema.gov/CDD/housing/housingdevelopment/aho.

CIMC. “Chinese Modular Construction Gaining Recognition around the World” (press release). PR Newswire, November 18, 2022. https://www.prnewswire.com/news-releases/chinese-modular-construction-gaining-recognition-around-the-world-301682620.html.

City of Los Angeles Housing and Community Investment Department. “Request for Qualifications/Proposals.” March 20, 2017.

City of Minneapolis Department of Community Planning and Economic Development. “Minneapolis 2040 - The City’s Comprehensive Plan.” October 25, 2019. https://minneapolis2040.com/media/2018/pdf_minneapolis2040_updated-june-2024.pdf.

Come Dream Come Build. “DreamBuild: About Us.” Accessed March 7, 2025. https://dreambuild.org/about-us.

Council of State Governments. “States Loosen Manufactured Housing Restrictions.” May 30, 2024. https://csgerc.wpengine.com/states-loosen-manufactured-housing-restrictions/.

Davis, Katie. “NBC 10 I-Team: Deadly Providence Fire Highlights City’s Housing Crisis.” WJAR, January 10, 2018. https://turnto10.com/i-team/nbc-10-i-team-deadly-providence-fire-highlights-citys-housing-crisis.

DJR Architects. “MPHA Family Housing Expansion.” DJR. Accessed June 7, 2025. https://www.djrarch.com/modular/mpha-family-housing-expansion.

Enterprise Community Partners. “Cdcb | Come Dream. Come Build.” June 7, 2024. https://www.enterprisecommunity.org/housing-affordability-breakthrough-challenge/2020-winners/cdcb-come-dream-come-build.

Faiola, Josh. “WPRI: Site of Deadly 2018 Fire in Providence Transformed into Affordable Housing.” One Neighborhood Builders, March 4, 2022. https://oneneighborhoodbuilders.org/wpri-site-of-deadly-2018-fire-in-providence-transformed-into-affordable-housing/.

H+M EPC. “On-Site vs. Off-Site Construction: The Pros and Cons.” December 9, 2021. https://www.hm-ec.com/blog-posts/on-site-vs-off-site-construction-the-pros-and-cons-hm.

Hamann, Jeff. “Apartment Construction Costs in 2025: Calculator & Investor Guide.” Janover Multifamily Loans, November 7, 2024. https://www.multifamily.loans/apartment-finance-blog/multifamily-construction-costs-an-investor-guide/.

Hansen, Paige. “One Roof Community Housing To Receive $50 Million in Funding.” Fox21, December 16, 2023. https://www.fox21online.com/2023/12/15/one-roof-community-housing-to-receive-50-million-in-funding/.

Hansen, Sheri. “Two Minnesota Projects Recognized with Affordable Housing Design Awards.” ENTER, November 23, 2022. Accessed January 10, 2025. https://www.entermn.com/articles/two-minnesota-projects-recognized-with-affordable-housing-design-awards.

Herbert, Christopher, Alexander Hermann, Daniel McCue, and Chadwick Reed. “A Review of Barriers to Greater Use of Manufactured Housing for Entry-Level Homeownership.” Joint Center for Housing Studies of Harvard University, 2024. https://www.jchs.harvard.edu/sites/default/files/research/files/harvard_jchs_barriers_manufactured_housing_2024.pdf.

Herbert, Christopher, and Chadwick Reed. “Overcoming Barriers to Manufactured Housing: Promising Approaches from Five Case Studies.” Joint Center for Housing Studies of Harvard University, 2024. https://www.jchs.harvard.edu/research-areas/working-papers/overcoming-barriers-manufactured-housing-promising-approaches-five.

Herbert, Christopher, Chadwick Reed, and James Shen. “Comparison of the Costs of Manufactured and Site-Built Housing.” Joint Center for Housing Studies of Harvard University, 2023. https://www.jchs.harvard.edu/research-areas/working-papers/comparison-costs-manufactured-and-site-built-housing.

Hubler, Shawn. “Homeless Population Declines in Los Angeles for a Second Straight Year.” *New York Times*, July 14, 2025. https://www.nytimes.com/2025/07/14/us/los-angeles-homeless.html.

HUD (US Department of Housing and Urban Development). “Glossary of Terms to Affordable Housing,” August 18, 2011. https://archives.hud.gov/local/nv/goodstories/2006-04-06glos.cfm.

———. “HUD Updates Regulations to Lower Housing Costs and Build Safe and Affordable Manufactured Homes” (press release). September 11, 2024. https://www.hud.gov/press/press_releases_media_advisories/hud_no_24_233.

Huff, Jess. “An East Texas Town Has Put Strict Limits on Mobile Homes — Again.” *Texas Tribune*, February 28, 2024. https://www.texastribune.org/2024/02/28/huntington-texas-mobile-home-law/.

Ikenson, Ben. “An Old Median near a Los Angeles Freeway Sat Empty for Years. Now It’s Affordable Housing.” *Fast Company*, November 27, 2023. https://www.fastcompany.com/90988021/an-old-median-near-a-los-angeles-freeway-sat-empty-for-years-now-its-affordable-housing.

JCHS (Joint Center for Housing Studies of Harvard University). “Cost Burdens High Across the Country.” 2024. https://www.jchs.harvard.edu/son-2024-cost-burdens-map.

———. “Millions of Americans Burdened by Housing Costs.” 2017. https://harvard-cga.maps.arcgis.com/apps/MapSeries/index.html?appid=6177d472b7934ad9b38736432ace1acb.

———. “The State of the Nation’s Housing 2024.” 2024. https://www.jchs.harvard.edu/state-nations-housing-2024.

JLL (Jones Lang LaSalle). *2025 U.S. Construction Outlook: Shifting Foundations*. 2024. https://www.us.jll.com/content/dam/jll-com/documents/pdf/research/americas/us/jll-us-2025-construction-outlook.pdf.

Kaul, Karan, and Daniel Pang. *The Role of Manufactured Housing in Increasing the Supply of Affordable Housing*. Urban Institute - Housing Finance Policy Center, 2022. https://www.urban.org/sites/default/files/2022-07/The%20Role%20of%20Manufactured%20Housing%20in%20Increasing%20the%20Supply%20of%20Affordable%20Housing.pdf.

Kelly, Burnham. *The Prefabrication of Houses: A Study by the Albert Farwell Bemis Foundation of the Prefabrication Industry in the United States*. New York: MIT Press and John Wiley & Sons, 1952. Accessed January 8, 2025. https://hdl.handle.net/2027/uc1.b4171303?urlappend=percent3Bseq=9.

Kelly, Mary Louise. "Housing Experts Say There Just Aren't Enough Homes in the U.S." NPR, April 23, 2024. https://www.npr.org/2024/04/23/1246623204/housing-experts-say-there-just-arent-enough-homes-in-the-u-s.

Lauer, Caroline. "Bounce Forward, Not Back: Leveraging Resiliency to Promote Equity." Joint Center for Housing Studies of Harvard University, 2018. https://www.jchs.harvard.edu/research-areas/working-papers/bounce-forward-not-back-leveraging-resiliency-promote-equity.

Layton, Donald H. "Manufactured Housing Is a Good Source of Unsubsidized Affordable Housing - Except When It's Not: Q&A on Eight Key Policy Topics (Part 2)." NYU Furman Center, April 3, 2023. https://furmancenter.org/thestoop/entry/manufactured-housing-is-a-good-source-of-unsubsidized-affordable-housing-except-when-its-not-qa-on-eight-key-policy-topics-part-2.

Local Housing Solutions. "Affordable Manufactured and Modular Housing Strategies from Norwood, CO; Minneapolis, MN; and Halifax, MA." May 10, 2023. https://www.localhousingsolutions.org/housing-policy-case-studies/affordable-manufactured-and-modular-housing-strategies-from-norwood-co-minneapolis-mn-and-halifax-ma/.

Los Angeles Homeless Services Authority. "2017 Greater Los Angeles Homeless Count - Data Summary." May 17, 2018. https://www.lahsa.org/documents?id=1354-2017-homeless-count-total-point-in-time-homeless-population-by-geographic-areas.pdf.

Manufactured Housing Institute. "HUD Manufactured Housing Construction and Safety Standards." June 12, 2023. Accessed January 8, 2025. https://www.manufacturedhousing.org/news/hud-manufactured-housing-construction-and-safety-standards/.

Michael Maltzan Architecture. "Star Apartments." 2014. https://www.mmaltzan.com/projects/star-apartments/.

Miguelez, Cristina. "Homebuilding Across the States with Totals vs. Per Capita Rates." Fixr, April 12, 2019. https://www.fixr.com/articles/looking-at-homebuilding-across-the-states-with-totals-vs-per-capita-rates.

Modular Building Institute. *2024 Permanent Modular Construction Report*. 2024. https://mbimodularbuildinginstitute.growthzoneapp.com/ap/CloudFile/Download/pGnDJN6r.

———. "Colorado OEDIT Announces $24 Million in Proposition 123 Funding for Modular and Innovative Housing Projects." September 13, 2024. https://www.modular.org/2024/09/13/oedit-announces-24-million-in-proposition-123-funding-for-modular-and-innovative-housing-projects/.

———. "Modular Building Institute Defeats Davis-Bacon Expansion." August 8, 2023. https://www.modular.org/2023/08/08/mbi-defeats-davis-bacon-expansion/.

———. "What Is the Davis-Bacon Act and How Does It Affect Modular Construction?" May 5, 2022. https://www.modular.org/2022/05/05/how-does-davis-bacon-affect-modular-construction/.

NAHB (National Association of Home Builders). "Cost to Construct a Home Rose Significantly Over Last Two Years." January 29, 2025. https://www.nahb.org/blog/2025/01/cost-of-construction-survey-2024.

———. "How Soaring Prices for Building Materials Impact Housing." July 26, 2024. https://www.nahb.org/blog/2024/07/how-soaring-prices-building-materials-impact-housing.

———. "Modular Building Systems: Overview and Benefits." Accessed May 5, 2025. https://www.nahb.org/other/consumer-resources/types-of-home-construction/modular-building-systems.

Nanayakkara-Skillington, Danushka. "Market Share for Modular and Other Non-Site Built Housing in 2023." National Association of Home Builders: Eye on Housing, September 12, 2024. https://eyeonhousing.org/2024/09/market-share-for-modular-and-other-non-site-built-housing-in-2023/.

National Low Income Housing Coalition. *The GAP: A Shortage of Affordable Homes*. 2024. https://nlihc.org/gap.

National Multifamily Housing Council. "National Multifamily Housing Council (NMHC) Statement on Tariffs Impacting Housing Affordability." February 4, 2025. https://www.nmhc.org/news/press-release/2025/national-multifamily-housing-council-nmhc-statement-on-tariffs-impacting-housing-affordability/.

Neighborhood Partnership Housing Services. "Factory-Built Housing: Solution to Affordable Homeownership." n.d. Accessed August 1, 2025. https://nphsinc.org/factory-built-housing/.

Nelms, Ben. "National Manufactured Home Locations According to State Statistics." ManufacturedHomes.com, July 19, 2024. https://www.manufacturedhomes.com/blog/national-manufactured-home-locations-according-state-statistics/.

———. “Top 10 States with Largest Manufactured Home Share of All New Single-Family Homes.” ManufacturedHomes.com, September 26, 2022. https://www.manufacturedhomes.com/blog/top-10-states-largest-manufactured-home-share-new-single-family-homes/.

One Neighborhood Builders. “Bowdoin Street Rowhouse Installation Starts.” February 28, 2022. https://oneneighborhoodbuilders.org/bowdoin-street-rowhouse-installation-starts/.

Preservation of Affordable Housing. “Clarendon Hill Apartments.” 2025. https://www.poah.org/property/massachusetts/clarendon-hill.

Redfin. “San Bernardino County, CA Housing Market: House Prices & Trends.” Accessed July 11, 2025. https://www.redfin.com/county/338/CA/San-Bernardino-County/housing-market.

Revere, Patrick. “An Introduction to CrossMod Homes.” *MHInsider*, January 17, 2020. https://mhinsider.com/introduction-crossmod-homes/.

———. “Manufactured Housing Industry Trends & Statistics.” *MHInsider*, May 30, 2024. https://mhinsider.com/manufactured-housing-industry-trends-statistics/.

San Bernardino County. “Median Household Income and Cost of Living.” *San Bernardino County Community Indicators Report*, n.d. Accessed July 28, 2025. https://indicators.sbcounty.gov/income/median-household-income-and-cost-of-living/.

St. Louis County. “St. Louis County Homelessness & Outreach Response.” November 16, 2024. https://duluthmn.gov/media/fkddr5ds/2024-11-26-slc-homelessness-response.pdf.

Stepping On Up. “Salvation Army Plover Place.” Accessed July 6, 2025. https://steppingonupduluth.org/plover-place.

Sullivan, Esther. *Manufactured Insecurity: Mobile Home Parks and Americans’ Tenuous Right to Place*. University of California Press, 2018.

Terner Center for Housing Innovation. *Low-Income Housing Tax Credit Construction Costs: An Analysis of Prevailing Wages*. 2024. https://ternercenter.berkeley.edu/research-and-policy/lihtc-construction-costs-prevailing-wages/.

US Census Bureau. “Nearly Half of Renter Households Are Cost-Burdened, Proportions Differ by Race.” Census.Gov, September 12, 2024. https://www.census.gov/newsroom/press-releases/2024/renter-households-cost-burdened-race.html.

———. “Quarterly Residential Vacancies and Homeownership, Fourth Quarter 2024.” CB25-10. February 5, 2025. https://www.census.gov/housing/hvs/files/qtr424/Q424press.pdf.

US Department of Labor. “Frequently Asked Questions: Updating the Davis-Bacon and Related Acts Regulations Final Rule.” 2023. https://www.dol.gov/agencies/whd/government-contracts/construction/rulemaking-davis-bacon/faqs.

Viall, Tim. “MAPC Awarded $3M to Bring a Modular Housing Construction Facility to Greater Boston.” Metropolitan Area Planning Council, July 25, 2024. https://www.mapc.org/news/3m-to-bring-modular-housing-construction-facility-greater-boston/.

Wallis, Allan D. *Wheel Estate: The Rise and Decline of Mobile Homes*. Oxford University Press, 1991.

Welch, Sharon. “Participatory Models of Housing: Promising Design Practices for Affordable Housing on Tribal Lands.” Joint Center for Housing Studies of Harvard University, 2023. https://www.jchs.harvard.edu/research-areas/working-papers/participatory-models-housing-promising-design-practices-affordable.

Wessel, David. “Where Do the Estimates of a ‘Housing Shortage’ Come From?” Brookings Institution, October 21, 2024. https://www.brookings.edu/articles/where-do-the-estimates-of-a-housing-shortage-come-from/.

Whitney, Peyton, Alexander Hermann, and Whitney Airgood-Obrycki. “Housing Cost Burdens Climb to Record Levels (Again) in 2023.” Joint Center for Housing Studies of Harvard University, December 3, 2024. https://www.jchs.harvard.edu/blog/housing-cost-burdens-climb-record-levels-again-2023.

Wisconsin Department of Safety and Professional Services, Division of Industry Services. “Chapter SPS 320: Administration and Enforcement.” 2016. https://dsps.wi.gov/Documents/Programs/UDC/CodeArchives/SPS320Commentary.pdf.

Wolf, Justin R. “A New Prototype for Building Affordable Houses on Narrow Lots in Duluth.” *ENTER*, April 7, 2022. https://www.entermn.com/articles/a-new-prototype-for-building-affordable-houses-on-narrow-lots-in-duluth.

Yglesias, Matthew. “Trailer Park Blues.” *Slate*, October 2, 2012. https://slate.com/news-and-politics/2012/10/mobile-homes-the-absurd-economy-killing-rules-towns-have-passed-against-manufactured-houses.html.

Zonta, Michela. “Increasing Affordable Housing Stock Through Modular Building.” Center for American Progress, February 6, 2024. https://www.americanprogress.org/article/increasing-affordable-housing-stock-through-modular-building/.

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