REPORT OF THE

HOUSING PRODUCTION INNOVATION WORKING GROUP

Prepared for the
Joint Standing Committee on Housing and Economic Development

Augusta, Maine

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Cover photo: Floor cassettes being placed at an Avesta multifamily development in Westbrook.

Executive Summary

Maine needs an estimated 84,000 additional housing units by 2030. Slow productivity growth and rising costs in construction have resulted in high prices and limited availability of housing, especially for starter and middle-market homes. As part of its response to this challenge, the Maine Legislature passed a resolution establishing the Housing Production Innovation Working Group to explore how the State could better realize the potential of industrialized systems to lower costs and accelerate delivery of housing.

Achieving the full potential of housing systems like modular and closed wall panel construction requires greater economies of scale. In Maine, that scale is currently limited by varied local regulations, code interpretations, builder processes, and consumer preferences. This report provides the Working Group's recommendations to reduce those barriers. By improving our regulatory framework and increasing adoption of new building systems across the industry, Maine can unlock swifter production and more attainable, quality housing.

The recommendations are to:

1 - Industrialized housing code and licensing

1.1 - Remove State licensing requirements for the installation and sale of modular housing systems

1.2 - Replace the housing manufacturer license with a State approval system

1.3 - Synchronize industrialized housing code with MUBEC and cover residential buildings of all sizes

1.4 - Expand industrialized housing definition to cover closed wall building systems once regulations are updated

1.5 - Update HUD-code housing regulation as needed to align with administrative changes

1.6 - Improve standardization of code, permitting, and land use decisions

2 - Incentives to improve housing productivity

2.1 - Implement a per-unit incentive for industrialized housing systems manufactured in Maine

2.2 - Expand the sales tax exemption for industrialized housing

2.3 - Establish a prize competition for cost-effective home building

2.4 - Ensure alignment in public procurement with industrialized housing systems

2.5 - Assemble development-ready land for housing construction

2.6 - Align municipal policies and comprehensive planning with industrialized State housing production goals

3 - Training and Workforce Development

3.1 - Pilot a Construction Extension Partnership

3.2 - Include required material on industrialized construction in code enforcement officer training

3.3 - Integrate material on industrialized construction into community college, CTE, and other trades programming

3.4 - Educate consumers on the value of industrialized construction and the importance of housing in general

Introduction

Purpose

Maine faces a severe housing shortage, with demand far exceeding supply in many communities. To meet this demand, the state needs to create an estimated 84,000 housing units by 2030.[1] At the current pace and cost of residential construction in Maine, that is not achievable.

Multiple barriers have slowed housing production in Maine over the years. Productivity in the residential construction industry has stagnated nationwide, which has also affected Maine's housing market. The lack of productivity gain paired with rising costs across all categories (labor, supplies, permit and pre-development costs, land costs, etc.) has resulted in the current environment of high prices for new construction and unmet demand for lower and moderately priced homes. (See Appendix B for more background on industry challenges.)

As one of multiple initiatives and workstreams aimed at solving the state's housing needs, the Legislature passed and the Governor signed PL 2025, ch. 105, Resolve, to Establish the Housing Production Innovation Working Group.[2] The Working Group was tasked with identifying ways the state could unlock the potential of innovative construction technologies to reduce the cost and accelerate the production of housing in Maine.

This report represents the Working Group's recommendations to the Joint Standing Committee on Housing and Economic Development for how to improve the use and effectiveness of industrialized construction in Maine to advance the State's housing goals.

Project Costs

Understanding the potential for industrialized construction methods to reduce housing costs in Maine requires understanding construction costs generally. Appendix C includes additional detail and resources on residential construction costs in Maine and nationally. To summarize, hard construction costs (site development, foundation and above grade building) typically represent about 55-65% of the costs of a single-family home project and

[1] HR&A Advisors, *State of Maine Housing Production Needs Study* (2023), https://mainehousing.org/docs/default-source/default-document-library/state-of-maine-housing-production-needs-study_full_final-v2.pdf.
[2] Resolve, to Establish the Housing Production Innovation Working Group, LD 1453, Maine Legislature (2025), https://legislature.maine.gov/backend/App/services/getDocument.aspx?documentId=120802.

65-75% for multifamily projects. This varies with building type, size, number of stories, land cost, etc.

Building the same project with an offsite system as opposed to stick-built can be directly cheaper in some circumstances, but typically the most savings, if any, come from reducing the time to completion and associated interest costs.[3] However, the greatest cost advantage is seen when manufacturing repeatable, affordable designs at scale—not when swapping out building systems in one-off, custom projects. HUD-code homes have the highest level of completion in-factory and are the most standardized, since they adhere to a federal code, and they are often less than half as expensive per square foot as traditional homes, when looking solely at the cost to build. They are not directly comparable to stick-built homes in terms of code standards, but that points to the need to consider both what is being built as well as how it is built. Streamlined building codes and standardized designs conducive to manufacturing at scale have the largest impact on improving housing costs.

Barriers to Scale

Manufacturing lowers the costs of goods through economies of scale; the more the same product is sold, the more efficiencies can be created in its production. The same potential exists for manufactured housing products, but in practice the fractured residential market has limited those economies of scale. In Maine, almost no two residential builds are alike, whether a single-family home or large multifamily building, due to varied local regulations, code interpretations, builder processes, and consumer preferences.

Removing these barriers will require two simultaneous efforts: improving Maine's regulatory landscape for industrialized construction and increasing production and adoption of industrialized building systems among manufacturers, distributors, retailers, builders, developers, and homeowners. Each recommendation below aims at one or both of those needs, growing the market and cost-effectiveness of industrialized construction through an even regulatory environment and greater knowledge and use of new systems.

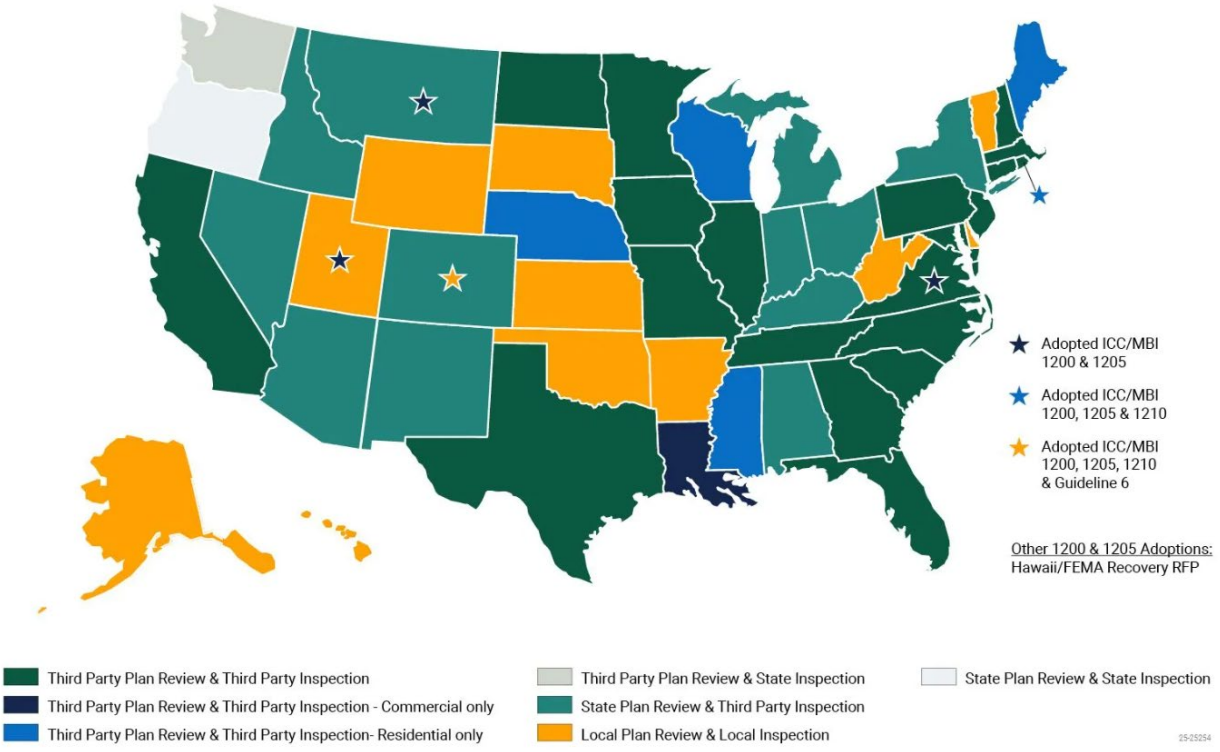
[3] National Institute of Building Sciences, *The Opportunities and Challenges of Modular Construction – National Institute of Building Sciences*, July 30, 2024, http://nibs.org/the-opportunities-and-challenges-of-modular-construction/.

Recommendations

1 - Industrialized housing code and licensing

To ensure Maine has a clear and rational set of rules manufacturers and builders can more easily follow, the State must modernize its regulatory regime for industrialized housing products. Maine's Manufactured Housing Act should be reenvisioned as an Industrialized Construction Act to create a more unified market for building systems and foster a more productive industry.

The Working Group considered multiple approaches to industrialized building regulation and identified promising systems in other states that appear to be working well. While no two states are exactly alike in their approach, Maine is an outlier in many respects. For example, no other state in the Northeast requires a specific license for installing modular homes; requires a professional license for manufacturers, as opposed to state approval or certification; or only accepts third-party plan review and inspection for 1-2 unit modular buildings but not 3+ unit buildings covered by commercial code. The recommendations below would bring Maine more in line with other states in terms of industrialized building regulation by relying less on a licensing regime and more on a product quality assurance approach to overseeing the industry.



Map showing acceptance of third-party plan review and inspections for offsite construction by state.
Source: ICC-NTA, https://www.icc-nta.org/services/off-site-construction/jurisdictions-map/

1.1 - Remove State licensing requirements for the installation and sale of modular housing systems

Maine is the only state in the Northeast U.S., and one of very few in the country, that requires a specific license for the installation and sale of modular homes. The State should remove that requirement. The license system creates a bottleneck that impedes Maine's ability to utilize industrialized housing without creating significant enough consumer protection benefit. There is sufficient responsibility on the manufacturer to ensure the final product is delivered in compliance with their specification and third-party quality assurance inspections.

Licenses for installing HUD-code homes must remain due to federal requirements.

1.2 - Replace the housing manufacturer license with a State approval system

Maine currently requires modular and HUD-code housing manufacturers to be licensed. The State should instead move to a process that grants a letter of approval to manufacturers, which is common in other states. The process would involve similar requirements, namely that the manufacturer have product plans and manufacturing processes reviewed and approved by third-party quality assurance entities and participate in third-party factory inspection programs. Manufacturers would still pay for the certification labels they must place on each home produced.

The key difference is that instead of resulting in a license from a licensing board, which confers a property right interest to the license holder, the manufacturer will receive a letter of approval from a state regulator, which can be revoked for wrongdoing (and reinstated once corrected) through a more straightforward process. This ability for the state regulator to immediately correct issues with a manufacturer works in tandem with the removal of the installer license to create a more responsive system where the emphasis is on the manufacturer's provision of a product in compliance with quality standards.

1.3 - Synchronize industrialized housing code with MUBEC and cover residential buildings of all sizes

Modular housing in Maine is governed by a patchwork of codes. For 1- and 2-unit residential buildings and townhouses, it is governed by separately adopted iterations of International Code Council (ICC) codes, which can only be updated through formal rulemaking at the Manufactured Housing Board. For 3+ unit residential buildings and commercial buildings, there is no separate code or inspection system, meaning the Maine Uniform Building and

Energy Code (MUBEC) applies with no consideration for the different nature of the work done in-factory.

Maine should address this discrepancy by equalizing industrialized building code with MUBEC. The regulatory agency responsible for industrialized construction should be able to update code to be equivalent to the most recent MUBEC adoptions without formal rulemaking. Alternatively, MUBEC could incorporate ICC standards for offsite construction directly, which could remove the need for separately adopted industrialized building code.[4] Industrialized building code must also cover residential buildings of all sizes (both 1-2 unit buildings covered by the International Residential Code and 3+ unit buildings covered by the International Building Code).

Modules under construction at KBS Builders, South Paris, Maine

Industrialized building regulations should maintain clarity that buildings and components produced offsite are held to industrialized housing code and in-factory inspection regimes, and local inspectors are not responsible for "in the box" work. Additionally, in-factory work will be covered by the manufacturer's approval, meaning individual production workers do not need to be licensed to perform work that requires specific licenses if done on site, like electrical installation.

1.4 - Expand industrialized housing definition to cover closed wall building systems once regulations are updated

Maine's existing Manufactured Housing Act covers HUD-code homes and modular homes. In addition to the recommendations above, a reenvisioned Industrialized Construction Act should ultimately cover all closed wall building systems to provide a consistent market and regulatory environment. This would extend the standardized code and in-factory inspection regimes to products such as closed wall panels, structural insulated panels, and tiny homes

[4] Specifically the ICC/MBI 1205-2021 Standard for Off-site Construction and the ICC/MBI 1200-2021 Standard for Off-Site Construction: Planning, Design, Fabrication.

that arrive on the job site finished to a degree that does not allow for the usual suite of onsite inspections.[5]

However, the State should only adopt this broader coverage once the above recommendations to update industrialized building regulation have been implemented. Businesses that are currently not covered by Maine's definition of "manufactured housing" will then have time to adapt to a third-party plan review and inspection system.

1.5 - Update HUD-code housing regulation as needed to align with administrative changes

The previous recommendations in this section do not specifically address HUD-code home regulation since that is driven by federal requirements. However, there may be room to improve the way HUD-code products are regulated, and the changes to modular regulation will necessitate revisions. Updates to consider include:

- Defaulting to the HUD installer license system instead of maintaining a separate State of Maine license. MHB already accepts a HUD-issued license in lieu of the experience requirement for the Maine installer, dealer, and mechanic license, but in fifteen states, including most of the Northeast, there is no additional state-issued license required. However, there may be disadvantages related to pre-occupancy inspections of HUD-code homes if Maine gives up its State Administrative Agency designation from HUD. Additional research is needed to determine the right structure to reduce bottlenecks for both the licensing of HUD-code home installers and capacity for pre-occupancy inspections.
- Implementing a license that allows for an entity to sell HUD-code homes without performing installation themselves; installation would be performed by a third party with the appropriate license. Currently, to be licensed to sell HUD-code homes in Maine, an entity must also be qualified to install the homes. A license for selling the home is likely required to maintain chain of custody of the title, similar to vehicle sales (in fact, HUD-code home sellers are licensed the same as automobile dealers in some other states). However, sales and installation do not need to be linked under one license, and they could be separated to allow for greater participation without affecting consumer protection.
- If the State no longer requires a license for manufacturing, installing, or developing modulars, there would no longer be a need for a professional licensing board to

[5] The ICC standards for offsite construction referenced above include closed wall panels and may soon include tiny homes. If the State adopts those standards directly, that could have the effect of covering those product types.

oversee these licensees. Consideration should be given to the oversight of manufactured housing communities and what type of entity or structure would be most appropriate for that oversight.

1.6 - Improve standardization of code, permitting, and land use decisions

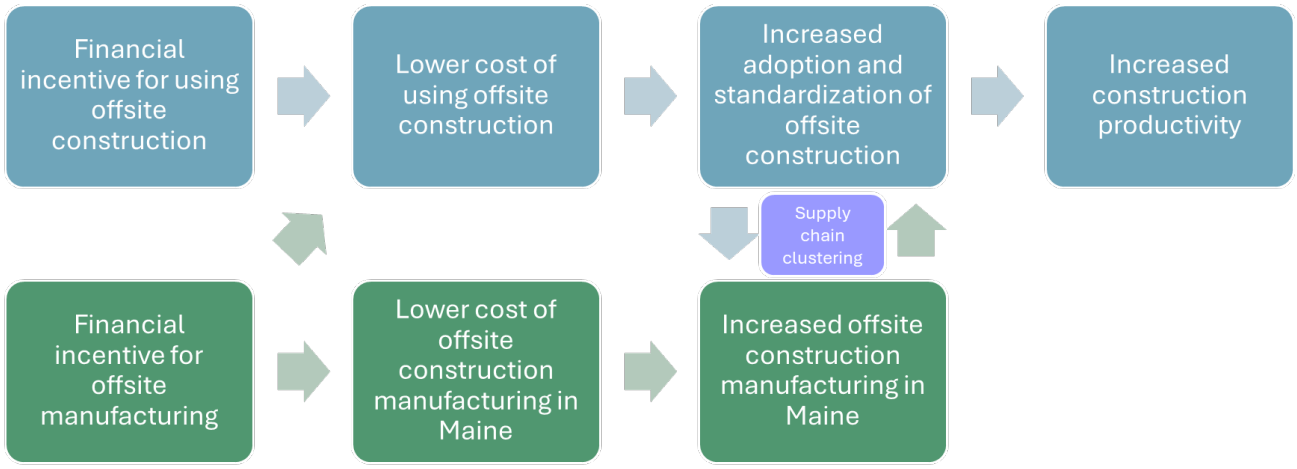
There are a number of actions the State should take to improve code and land use regulation beyond the scope of this Working Group. A separate group is working on these issues and preparing a report back to the Legislature pursuant to PL 2025, c. 64 (LD 1375). There are some items within the scope of the LD 1375 group that have additional relevance to offsite construction worth highlighting:

- Improve code enforcement. As much as Maine can do to ensure a standard building code statewide, there can still be local variation in the interpretation of that code. Ensuring quality training for all CEOs and sufficient State capacity to manage code enforcement needs will help ensure a standard housing construction market. Additionally, incentivizing a regionalized approach to code enforcement can improve consistency from town to town.
- Synchronize code adoption timings. Different schedules for building, energy, and fire safety code updates at the state level, plus local variations, can create a waterfall of changes that makes productization difficult. Synchronizing the timing of all code updates and ensuring a standard length of time between such changes can help ensure a manufactured housing product is marketable for a longer period.
- Promulgate and promote pre-approved designs. Establishing a set of residential designs, particularly for 1-4 unit buildings, could help streamline local approval processes and enable manufacturers to create products with a known demand.
- Incentivize local support for missing middle housing and industrialized construction. Through funding and technical assistance, the State can incentivize municipalities to adopt land use and approval policies that promote greater housing development and use of industrialized housing, including the pre-approved designs mentioned above.
- Improve building safety regulations, such as sprinkler systems and staircases, to allow for safe building designs that are more straightforward and cost-effective to produce.
- Improve DEP policies and processes to speed review timelines and increase standardization across municipalities.

2 - Incentives to improve housing productivity

Unlocking greater cost and time savings from industrialized construction in Maine requires greater economies of scale—more customers using more industrialized methods and products. Alongside improving the regulatory environment as addressed above, the State can directly boost adoption of these methods by incentivizing their use. This can help achieve better construction productivity and, as a secondary goal, rebuild the housing manufacturing industry in Maine.

Given the goal of achieving greater economies of scale, any financial incentive programs should have a target end date (likely 5-10 years). By that time, either the benefits of scale will have been unlocked and incentives should no longer be necessary; or the programs will not have met the goal and a new approach will be needed.



2.1 - Implement a per-unit incentive for industrialized housing systems manufactured in Maine

One of the most direct ways to incentivize both the use of industrialized housing products and their manufacture in Maine is to establish a payment for each unit produced and installed in the state. Colorado's Innovative Housing Incentive Program is the leading example of this type of program. Colorado offers manufacturers between $1,500 and $6,000 per unit, depending on affordability and energy efficiency.[6] Maine could pursue a similar variable approach or set a fixed amount as long as certain criteria are met. Ideally, the incentive would cover the full scope of industrialized buildings, from HUD-code and

[6] For more information, visit https://oedit.colorado.gov/programs-and-funding/grants/innovative-housing-incentive-program.

modular to closed wall panel systems, in which case the incentive should be adjusted by level of completion in factory.

2.2 - Expand the sales tax exemption for industrialized housing

At the time of writing, the Legislature's Committee on Taxation has voted to advance a bill (LD 1419) that would increase the sales tax exemption applied to modular and HUD-code housing to better align its taxation with stick-built housing. The Legislature should consider going a step further and temporarily exempting industrialized housing systems from sales tax entirely. This incentive would help encourage builders, developers, and homeowners to try out and ultimately adopt more productive systems.

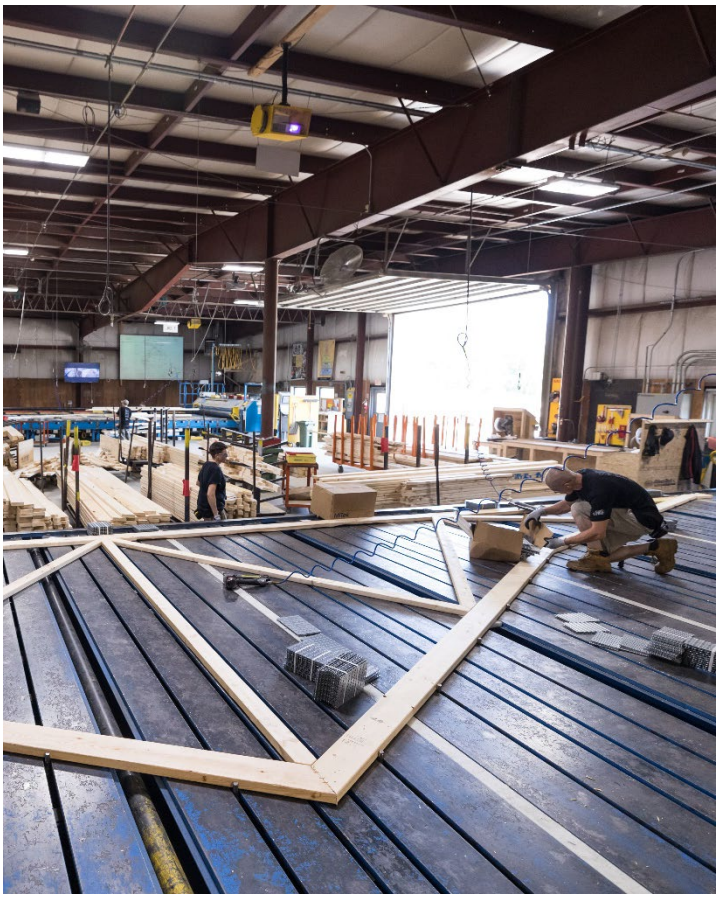
It is worth noting that this exemption is currently linked to the statutory definition of "manufactured housing". Broadening that definition, as stated in recommendation 1.4, would also broaden what is covered by this exemption.

2.3 - Establish a prize competition for cost-effective home building

Part of the challenge of using industrialized housing systems in Maine is the relative lack of familiarity among builders, developers, and homeowners. The State could promote adoption of existing systems and promote further innovation by supporting a prize competition for efficient homebuilding. For example, a selection of builders using their preferred systems could vie to build a home (perhaps a duplex or triplex) to set standards on lots provided by the State, with cash prizes awarded to the builders that achieve the lowest construction costs and quickest completion time.

2.4 - Ensure alignment in public procurement with industrialized housing systems

A significant amount of public funding flows into building construction each year. Maine should ensure that state programs, standards, and funding to procure or finance a building are compatible with industrialized construction. This could include ensuring draw schedules are compatible with methods like modular construction, which require earlier payment, and ensuring project specifications do not prevent use of structural elements like mass timber elevator shafts or components like modular MEP systems. Any state construction standards should be designed to accommodate the use of industrialized construction methods to ensure such methods are viable options when appropriate. The State could also consider prioritizing outcomes such as speed of construction or staying on schedule, which industrialized systems may be better able to meet, while not giving specific preference to one technology over another.



Roof trusses under construction at Mainely Trusses, Fairfield, Maine

2.5 - Assemble development-ready land for housing construction

As efficient as housing manufacturing could become, the availability and acquisition of land remains a fundamental constraint on the provision of housing. Yet, there is no shortage of vacant or underutilized lots in Maine's towns and cities with the potential for infill housing. The challenge is the acquisition and pre-development work to prepare a lot for housing construction is resource-intensive and risky—doubly so for lots in disrepair that are most in need of redevelopment.

The Maine Redevelopment Land Bank Authority is structured to address this type of issue, but initiating such a comprehensive site readiness program for housing would require procuring new upfront capital. Doing so at scale could dramatically increase the size of the housing pipeline in Maine, connecting development-ready lots with effective industrialized housing regulation, streamlined processes through pre-approved designs, and an improved industrial and contractor base ready to build more homes.

2.6 - Align municipal policies and comprehensive planning with industrialized State housing production goals

Aligning municipal policies and funding with housing and smart growth goals will create strong financial incentives for communities to prioritize housing development. Municipalities interested in promoting housing production often lack the capacity or expertise to implement necessary zoning and policy changes that support industrialized housing methods. To address these challenges, the State should expand its technical and planning assistance offerings, leveraging state agencies and quasi-public organizations to provide tailored support.

3 - Training and Workforce Development

To increase construction productivity, Maine will need to improve awareness of and capability with new building systems at all levels of the industry.

3.1 - Pilot a Construction Extension Partnership

Maine should pilot a construction extension partnership organization modeled on the Manufacturing Extension Partnership and Cooperative Extension programs. Increasing efficiency across an industry requires a broad-based effort to work with small and medium-sized businesses to improve processes on their terms. The U.S. has a strong history of public organizations performing this work in the agricultural and manufacturing sectors, but there is no equivalent for the construction industry focused on broadly improving methods. Maine can test a model based on those organizations, as well as more targeted private groups in the construction industry like Build It Green or Passive House.

A Construction Extension Partnership could establish a network of building experts to address a variety of training and industry needs, including:

- Facilitating adoption of and certification in industrialized construction systems relevant to a builder's needs. The program would cover panel building envelope, volumetric modular, cross-mod, and manufactured housing modalities and confer recognition as a quality industrialized system builder.
- Providing 1:1 technical support for builders.
- Coordinating industry knowledge to inform curriculum for trades programs at community colleges and CTE schools.
- Collecting data on residential construction cost and speed.

The organization should be structured as a public-private partnership, including leadership and funding from public and private organizations.

3.2 - Include required material on industrialized construction in code enforcement officer training

Crucial to the success of our recommendations to improve industrialized housing regulation in Maine is the understanding and buy-in of code enforcement officers (CEOs). Knowing what is the responsibility of CEOs, what is the responsibility of state regulators, and what is the responsibility of in-factory inspectors is key to making the whole system work. Consistent and ongoing trainings are essential to ensure that CEOs have a uniform understanding of all of the rules and laws related to all types of industrialized construction.

3.3 - Integrate material on industrialized construction into community college, CTE, and other trades programming

Improving residential construction productivity in Maine requires a workforce prepared to try and use new systems. Maine has an extensive education system for the construction trades across our community colleges and career and technical education (CTE) centers. The State should ensure that the programs at these schools include material on industrialized construction systems, such as modular and panelized building, and that they have the equipment, technology, and access to technical experts needed to do so. Training programs such as apprenticeships also play a key role in building the construction workforce, and the State should aim to further develop apprenticeship offerings at employers involved in industrialized construction.

This fits into the broader need to increase the pipeline of construction workers entering the industry. Industrialized construction systems can help broaden the net of potential workers by offering jobs that can be less physically demanding and offer surer schedules, both in-factory and on the job site.

3.4 - Educate consumers on the value of industrialized construction and the importance of housing in general

As much as the above recommendations may achieve, they can only do so much if consumers, neighbors, and policymakers are against industrialized building systems, such as HUD-code housing, or housing production in general. Better information is needed on multiple fronts: how construction affects home values; how housing affects municipal revenues and services; how housing affects local and regional economies; how housing affects community vibrancy; etc. The State has made strides in providing education and assistance on technical issues such as land use ordinance updates, but a further step may be needed to provide education and assistance to a broader array of stakeholders. This could include a housing-focused leadership development course, a Maine version of Vermont's "Homes for All" toolkit, consumer education on building systems and housing development, or assistance for communities in developing housing roadmaps.

Needs for further study

As with any industry and market so complex, there is room for further study of industrialized construction issues in Maine. Topics include:

- Research on the potential benefits and tradeoffs of closing the gap between MUBEC adopted codes and the ICC codes they are based on. Maine could benefit from a

more unified building product market if there were fewer code differences across state lines.

- Research on aspects of housing costs beyond above-grade construction could identify additional policy actions for housing production innovation. Foundation work, septic systems and water and sewer connection, excavation and soil remediation, pre-development planning, design, and engineering, and other components of construction projects are significant cost drivers. Studying innovative ways to reduce the cost and time required for those elements of the project would be worthwhile.
- Further data on housing demand, development, and construction methods would be valuable for future policymaking. Maine is in the midst of implementing new data collection for the state's 88 communities with more than 4,000 residents. Additional data on construction methods, vacant or underutilized lots, and utilization of alternative land arrangements such as community land trusts would require clear resources for collection and analysis but could unlock additional policy solutions for housing.

Multifamily modular buildings under construction by Greystar in Elizabethtown, Pennsylvania

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Implementation and long-term opportunities

Administrative responsibility

Implementation of the above recommendations will touch on multiple agencies, including:

- Department of Professional and Financial Regulation, which is home to the Manufactured Housing Board
- Maine Office of Community Affairs, which oversees code enforcement training, municipal planning assistance, and the Housing Opportunity Program
- Department of Economic and Community Development, which oversees incentive programs for manufacturers
- Maine Revenue Services, which oversees sales taxes
- MaineHousing, which is the state's housing finance agency
- Maine Redevelopment Land Bank Authority, which supports the redevelopment of vacant and underutilized property
- Department of Education, which oversees Career and Technical Education centers
- Maine Community College System, which offers multiple construction trade programs

The recommendations on industrialized housing code and licensing would significantly change the nature of the Manufactured Housing Board and what they oversee. There would be fewer professional licenses required, while code and manufacturing oversight would remain. In practical terms, reducing the number of licenses required for industrialized housing will also reduce the associated revenue to the licensing agency and the ongoing need for a licensing board. Addressing the administrative ownership of a revamped Industrialized Construction Act will need to be part of any legislation to implement those recommendations.

Timing and immediate needs

Immediate action is needed to address a regulatory issue with multifamily modular projects, sooner than the package of recommendations in section 1 of this report could take effect. The existing pipeline of multifamily modular projects in Maine may be halted by current Maine statute regarding licensed trades applying to modular factory workers. Most modular multifamily projects already built in Maine were not held to requiring individual factory workers to be licensed tradespeople. This is addressed for 1 and 2-unit and townhome projects by their coverage under Manufactured Housing Board rules, but the lack of coverage of 3+ unit multifamily projects, which fall under the separate commercial building code, leaves a gap.

Modular student housing buildings (lower right and left) built by KBS Builders at Colby College

The issue will be explicitly resolved once multifamily projects are fully covered by Maine's industrialized building regulation, per recommendation 1.3. In the meantime, stipulating that individual workers in a modular or manufactured home factory do not need to be separately licensed to perform regulated work like electrical installation would ensure existing practice can continue for projects currently in the pipeline.

Otherwise, the recommended changes to industrialized housing regulation in this report should be instituted as a package. Each regulatory change affects the other, and they will function better if implemented as one. For example, adding 3+ unit buildings to Maine's industrialized housing regulation without changing the requirement for installers to be licensed could create a major bottleneck.

Programs requiring new funding and/or staff will take time to reach full capacity, including recommendations to institute a per-unit manufacturing incentive, run a prize competition, assemble development-ready lots, and create a Construction Extension Partnership. Clear administrative responsibility and funding for these programs will determine their success.

Potential for interstate cooperation

Clayton Homes CrossMod example in Knoxville, Tennessee

Maine will achieve the greatest benefits from industrialized housing production if it is one part of a growing regional industrialized housing market. Improving Maine's landscape is critical, but with economies of scale being key to success, the state is still a small market relative to the investment required in housing manufacturing. Maine can seek partnerships with other states in the Northeast to help unify our housing product markets and increase the pipeline for manufacturers, such as through building code standardization, alignment of housing finance requirements, purchase agreements, and joint research.

Conclusion

Expanding the use of more efficient methods of construction will help Maine meet its housing needs. Doing so will require improving our regulatory landscape while providing incentives and training for adoption of these methods across the industry. Fortunately, Maine does not need to enter uncharted territory to do so. Maine can replicate successful regulatory approaches, incentives, and training initiatives in other states with robust offsite construction industries. When combined, these initiatives can put Maine a step ahead toward providing housing to meet not only our own needs but those of the region.

Of course, solving Maine's housing shortage will require more than new methods of construction. There must be local, regional, and state alignment on housing solutions ranging from land use planning to workforce training to swift permitting. Through coordinated strategies to support production and affordability, Maine can achieve a more balanced housing market that meets the needs of people across the state.

Appendix A – Member List and Acknowledgements

The appointed and designated members of the Housing Production Innovation Working Group were:

Senator Dick Bradstreet

Thatcher Butcher, President, KBS Builders

Joan Cohen, Commissioner, Department of Professional and Financial Regulation

John Crowley, Senior Advisor, Asahi Kasei

Senator Chip Curry

Mike Duguay, Commissioner, Department of Economic and Community Development

Hilary Gove, Housing Opportunity Program Coordinator, Maine Office of Community Affairs

Rebecca Hatfield, Chief Strategy + Growth Officer, Hancock Lumber

Brian Hubbell, Senior Policy Advisor, Governor's Office of Policy Innovation and the Future

Representative Marc Malon

Representative Arthur Mingo

The Working Group received information and assistance from many individuals across the industry, including several who formally presented during group meetings, participated in site visits, and hosted members of the group for tours:

Jessica Boatwright, Reframe Systems

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Tim Hebert, Hebert Construction

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Ryan Kanteres, Simons Architects

Chris Lee, Backyard ADUs

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Julia Trujillo Luengo, Maine Community College System

Andy Mest, Modern Living Solutions by Greystar

Dennis Michaud, CertainTeed Offsite Solutions

Mike Moglia, Pennsylvania Dept. of Community and Economic Development

Greg Payne, Governor's Office of Policy Innovation and the Future

Eva Phillips, HR&A Advisors

Felipe Polido, Reframe Systems

Rex Richey, Clayton Homes

Paige Roosa, City of Boston

Todd Rothstein, Avesta Housing

Jerome Smalley, Blueprint Robotics

Christiana Whitcomb, HR&A Advisors

Staffing for the Working Group was provided by Phoenix McLaughlin at the Department of Economic and Community Development.

Appendix B – Housing Market and Construction Industry Challenges

New build projects do not pencil at affordable prices

Maine incomes are a poor match for current housing production costs. With current interest rates and construction prices, even modest new builds in Maine result in monthly payments of over $2,000 per month for one unit.[7] Realistically, the sale or rent prices for unsubsidized, newly built homes often result in much higher payments than that. The average gross monthly wage in Maine was $5,278 in 2024,[8] meaning even the rosy scenario of a $2,000 payment would be 37% of gross income (the general rule for housing affordability is to aim for less than 30% of gross monthly income).

Often, a comparison of the costs of a newly built house to an average income is the wrong one to make. It has rarely been the case that a newly built housing unit was affordable on a single average income. Above-average income earners usually take up the new housing stock, while others fill in existing housing stock that is resold or rented. However, Maine has hit a wall here as well, as discussed below.

Housing construction has been low for years, creating a mismatch for our population and preference demands

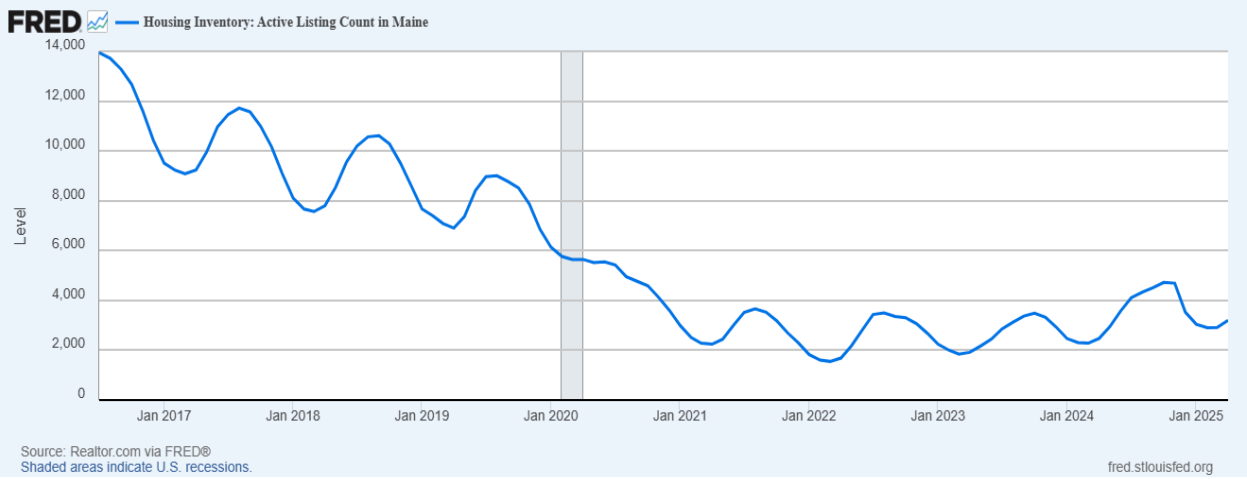
The construction industry in Maine and across the country was devastated by the 2007-2009 financial crisis. Housing production collapsed and remained below historic averages even after recovering somewhat in the 2010s. Today, the U.S. has fewer private housing starts than there were in the 1960s, when the population was a little over half its current size.

[7] A $300,000, 30-year loan at 7% interest would have a monthly payment of $1,995. Building costs alone on multi-unit buildings are often coming in higher than $300,000 per unit.

[8] Maine Department of Labor, Center for Workforce Research and Information, Quarterly and Annual Employment and Wages, https://www.maine.gov/labor/cwri/dashboards/quarterly-and-annual-employment-and-wages.

New privately-owned housing starts in the U.S. *Source: FRED, https://fred.stlouisfed.org/series/HOUST*

While the housing affordability crisis was brewing in many cities during the 2010s, it exploded outward following the COVID-19 pandemic as people moved to new places. Meanwhile, average household size fell, representing additional marginal housing demand for each person in Maine. An initial need to stay put during the pandemic saw few people selling their homes, which compounded when interest rates rose, further disincentivizing sellers who had more favorable rates from existing mortgages. Active housing listings in Maine have seen summer peaks around 3,000-4,000 since 2020, down from 14,000 in July 2016.

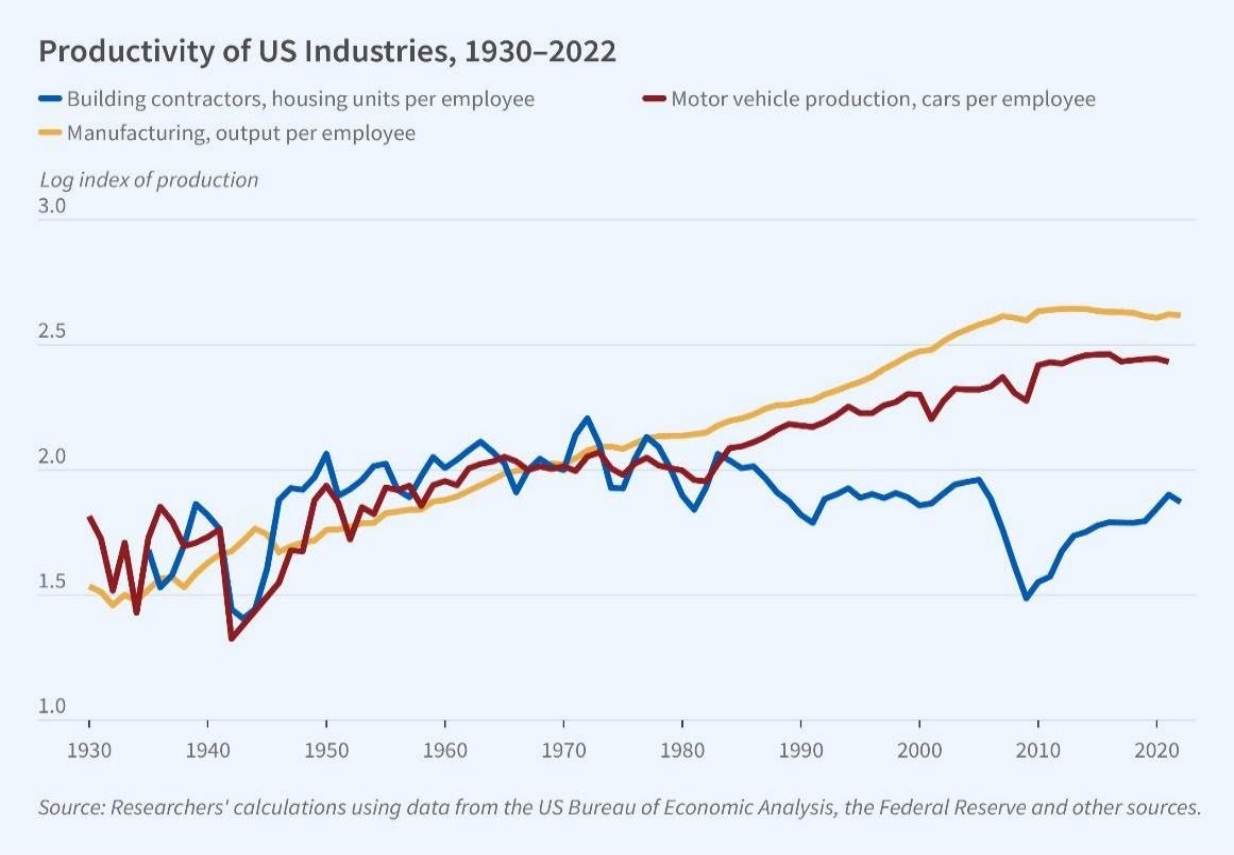


Active home listing count in Maine. *Source: FRED, https://fred.stlouisfed.org/series/ACTLISCOUME*

Demand for housing in Maine is outstripping its supply. Costs have exploded as a result, with home price growth since 2019 exceeding the national average.

Residential construction productivity has been stagnant for decades

A long-term challenge underlying the housing situation is the lack of productivity gains in residential construction. The number of units built per person in the industry is roughly the same today as it was in the 1950s, or even slightly lower, depending on the measure. This exposes the sector to the "cost disease" problem: if productivity in construction stagnates while productivity in other sectors grows, the wage gains in other sectors will necessitate wage gains in construction to hold onto workers; as a result, costs rise despite no rise in output.

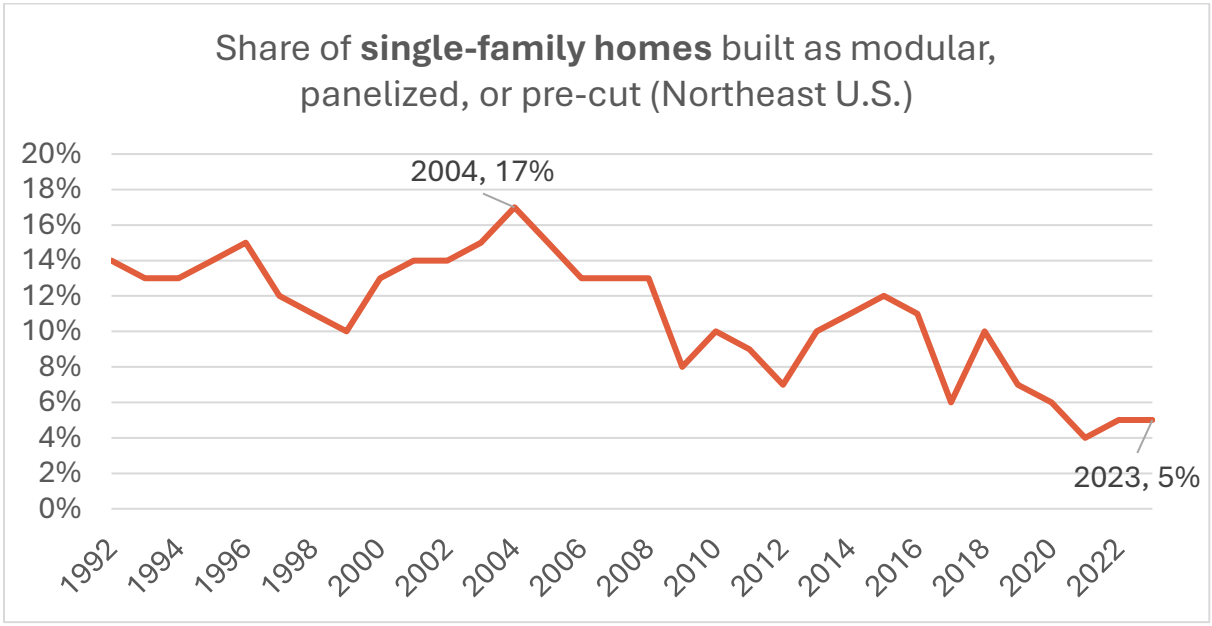


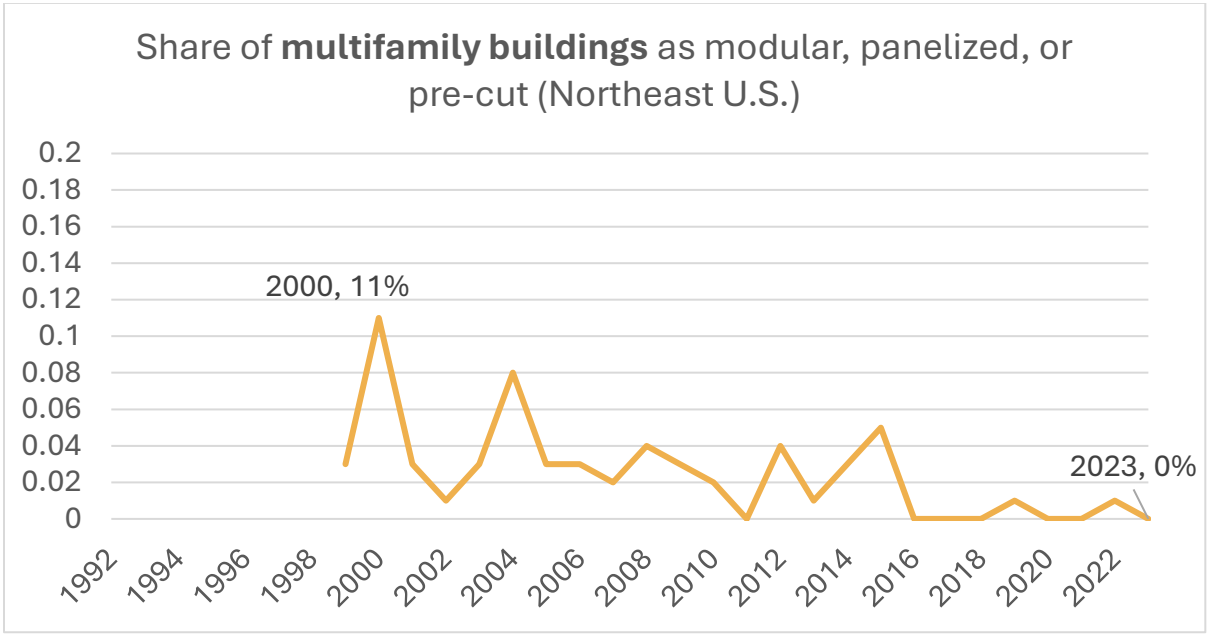
Productivity comparison of select industries. *Source: NBER, nber.org/digest/202502/stagnation-us-construction-productivity*

There are both regulatory and technological causes for this. Regulation on housing construction adds direct and indirect costs to each project and results in fewer units being built overall, reducing supply.[9] In terms of technology, housing (especially single-family) is

[9] One study found a negative correlation between the strictness of land use regulation and the productivity of construction firms. For more, see D'Amico et al., Why Has Construction Productivity Stagnated? The Role of Land-Use Regulation, HBS Working Paper 25-027, https://www.hbs.edu/ris/Publication%20Files/25-027_145e7f1b-f503-4fd9-bdfa-e57ca94e1fa3.pdf.

largely built now the same way it was seventy years ago, constructed on site by hand. Manufactured housing had a brief peak of 20% of all new U.S. housing units in the 1970s, but that has declined back to the mid-single digits. Similarly, other forms of prefabricated housing have declined in single-family home construction in the Northeast, as seen in the chart below.





Prefabricated housing construction for single-family homes. *Source: U.S. Census via the Governor's Office of Policy Innovation and the Future.*

Appendix C – Residential Construction Cost Resources

This appendix offers select construction cost information and references. It is not a comprehensive analysis of construction costs in Maine or nationally. Additional research on construction methodologies and costs in Maine is one suggested area of future study.

Table 1: Select single-family home cost examples

	NAHB Stick-built		Maine Stick-built		CrossMod - Well/Septic		CrossMod - Town Water/Sewer	
Total Sqft	2,647		960		1,422		1,422	
Total Cost	$665,298		$417,486		$319,548		$347,781	
Total Cost/Sqft	$251		$435		$225		$245	
	Dollars	**Percent**	**Dollars**	**Percent**	**Dollars**	**Percent**	**Dollars**	**Percent**
Above-grade Construction	$322,107	48%	$168,865	40%	$93,336	29%	$93,336	27%
A-G Const. Cost/Sqft	$122		$176		$66		$66	
Site Dev. & Foundation	$106,108	16%	$88,687	21%	$88,000	28%	$79,000	23%
Land Cost	$91,057	14%	$75,000	18%	$58,325	18%	$88,500	25%
Overhead, finance costs, RE costs, & profit	$146,027	22%	$84,935	20%	$79,887	25%	$86,945	25%
Notes	National Association of Homebuilders' report on average construction costs nationwide for 2024 (see *Lynch 2025* linked below).		Price example provided by a Maine homebuilder for a theoretical small home on a site in Waterboro. Includes site contingencies like blasting.		Estimated costs for a CrossMod single-family home located in Saco without access to town water or sewer.		Estimated costs for a CrossMod single-family home located in Saco with access to town water or sewer. Assumes land is more valuable relative to without access.	

Table 2: Average costs for MaineHousing supported projects 2023-2025 YTD

	LIHTC Projects		Rural Affordable Rental Projects	
Average Units	44.4		13.6	
Average Total Cost	$17,651,842		$4,668,309	
Total Cost/Unit	$397,564		$343,258	
	Dollars	**Percent**	**Dollars**	**Percent**
Average Construction Costs	$13,163,756	75%	$4,028,198	86%
Construction Cost/Unit	$296,481		$296,191	
Average Other Development Costs	$4,488,085	25%	$640,111	14%
Notes	Average costs and characteristics across 32 MaineHousing Low-Income Housing Tax Credit projects.		Average costs and characteristics across 5 MaineHousing Rural Affordable Rental projects.	

Notable reports and resources on housing construction costs:

Garcia, David, Terner Affiliate, Ian Carlton, Lacy Patterson, Jacob Strawn, and Ben Metcalf. *Making Missing Middle Pencil: The Math Behind Small-Scale Housing Development*. Terner Center for Housing Innovation, 2024. https://ternercenter.berkeley.edu/research-and-policy/making-missing-middle-pencil-the-math-behind-small-scale-housing-development-2024/.

Herbert, Christopher, Chadwick Reed, and James Shen. *Comparison of the Costs of Manufactured and Site-Built Housing*. Joint Center for Housing Studies, 2023. https://www.jchs.harvard.edu/sites/default/files/research/files/harvard_jchs_pew_report_1_updated_0.pdf.

Holt, Eric A., and Bill Ray. *The Skilled Labor Shortage and America's Housing Crisis*. Home Builders Institute; University of Denver, 2025. https://hbi.org/wp-content/uploads/2025/05/HBI-Denver-Study.pdf.

Hoyt, Hannah. *More for Less? An Inquiry into Design and Construction Strategies for Addressing Multifamily Housing Costs*. Joint Center for Housing Studies, 2020. https://www.jchs.harvard.edu/sites/default/files/harvard_jchs_gramlich_design_and_construction_strategies_multifamily_hoyt_2020_3.pdf.

Leonard, Seth, and Jeffrey Lubell. *Opportunities to Utilize Off-Site Construction to Meet Vermont's Housing, Workforce and Climate Goals*. 2025. https://vhfa.org/pubs/off-site-construction.

Lynch, Eric. *Cost of Constructing a Home - 2024*. National Association of Home Builders, 2025. https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2025/special-study-cost-of-constructing-a-home-2024-january-2025.pdf.

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Terner Center for Housing Innovation. “Demystifying Development Math: Interactive Resource.” Accessed November 20, 2025. https://www.ternercenter.app/demystifying-development-math.

Ward, Jason M., and Luke Schlake. *The High Cost of Producing Multifamily Housing in California: Evidence and Policy Recommendations*. 2025. https://www.rand.org/pubs/research_reports/RRA3743-1.html.

Appendix D - Definitions

There are a variety of terms used to describe housing products manufactured offsite. Here are definitions for key phrases as used in this document:

Closed wall panel: *See "Industrialized building system"*. A type of industrialized building system that is a wall, roof, or floor section with sheathing and insulation installed in the factory, as well as additional items like windows and wiring depending on the product.

CrossMod: *See "HUD-code housing"*. A type of HUD-code housing built to a specific set of standards to reflect features and aesthetics similar to traditional stick-built homes, such as adding a garage. This requires additional site work to complete.

Hard construction cost: All costs related to the process of physically constructing the buildings and the associated infrastructure of a project. For multifamily buildings, this generally includes the necessary site work to prepare for construction, the costs of equipment (e.g., rental or use costs of heavy equipment, fencing, onsite storage, and office space), materials (e.g., cement, wood, doors and windows, insulation, electrical, plumbing), life safety systems (e.g., sprinklers, fire alarms), interior finish materials (e.g., drywall, paint, trim), appliances, and all costs of common building features.

For single-family homes, hard construction is comprised of site development, foundation and vertical construction.

HUD-code housing: Factory-built homes constructed to meet U.S. Department of Housing and Urban Development (HUD) national building code standards first introduced in 1976. A key distinguishing feature of these homes is that they are attached to a steel chassis. Prior to the introduction of the HUD code, they were called "mobile homes", which is still used colloquially today. The term "manufactured home" also typically refers to HUD-code homes.

Industrialized building system; industrialized housing: Broad terms for buildings whose major components are fabricated in a controlled factory environment and then transported to the site for assembly or installation. This encompasses HUD-code and modular housing, as well as products like wall panels and roof trusses. "Industrialized housing" is the primary term used in this document to address the entire sector.

Manufactured housing: Under current Maine law, this includes HUD-code housing, pre-1976 mobile homes, and modular housing. Despite that statutory definition, typically “manufactured housing" only refers to HUD-code homes. Due to the overlapping meanings, this document instead relies on “industrialized housing” to encompass the full array of systems.

Modular housing: Homes built in sections (modules) in a factory and assembled on-site. The modules are shipped from the factory as a three-dimensional assembly, as opposed to wall panels or floor and roof trusses, which are shipped as a flat package and stood up at the job site.

Stick-built housing: The traditional method of building homes entirely on the job site using pieces of lumber.

Tiny home: A type of small home that meets specific standards, which under current Maine law include:

1. Complies with certain safety standards set for recreational vehicles.
2. Is under 400 square feet.
3. Can be transported on a public road.
4. Does not have its own “motive power”.