

What Is A Housing System Certification?

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The Three Sources

1. **The Unfinished Breakthrough** — Dr. Ivan Rupnik's written testimony before the House Select Committee on Small Business (May 21, 2026). This is the advocacy document: a 10-page statement recommending that Congress direct NIBS to build the housing system certification framework it was authorized to create in 1974. It draws on and condenses the HUD Action Plan below, adding two live operational case studies (JPI and Fading West Development) not found in the other two sources.
2. **HUD's Past, Present, and Future Role in Accelerating U.S. Offsite Construction for Housing: A Comparative Study and Action Plan** — Smith, Rupnik, and Schmetterer (2026), published by HUD's Office of Policy Development and Research. This is the primary research report the testimony is built on. It contains the full definition of housing system certification, the historical account of the 1974 NIBS mandate, and detailed international case studies (Japan, Sweden, UK).
3. **Offsite Construction for Housing: Research Roadmap** — Smith, Rupnik, Schmetterer, and Barry (2023), also published by HUD's Office of Policy Development and Research. This is the earlier, exploratory document that first identified "Regulatory Framework" as the industry's top research priority, but it does not yet define housing system certification as a concrete framework — it only gestures toward the need for one.

SOURCE 1: *The Unfinished Breakthrough* — Written Testimony of Dr. Ivan Rupnik

House Select Committee on Small Business, "Building the Future: How Small Home Builders are Closing America's Housing Gap," May 21, 2026 (10-page PDF)

Framing / Recommendation

"My central recommendation is concrete: this Committee should support the National Institute of Building Sciences — NIBS — in initiating development of a housing system certification framework, initiatable without new appropriations or new authority. Our report recommends three actions to achieve this: standardize federal terminology and award criteria; direct NIBS to develop the certification framework Congress already authorized; and use that framework as the bridge toward performance-based code reform." (p. 1)

Historical basis

"The 1968 Housing Act authorized HUD to pilot a national housing system certification program. That pilot, Operation Breakthrough, validated the institutional architecture, the performance-based system certification approach, even where commercial scale was not achieved. The gap was not in the demonstrated framework. It was in sustained implementation." (p. 1)

"The second was the establishment of the National Institute of Building Sciences, mandated to continue the work Operation Breakthrough had started: developing a performance-based fast track for scaling innovative housing systems." (p. 2)

"Our research pointed to it as the most promising path forward for three concrete reasons: it was proven at a pilot level in the United States through Operation Breakthrough; it has been operating successfully for more than fifty years in Japan; and it is essentially the same framework that already governs every other consequential American manufactured product. This framework isn't speculative. It is already validated, internationally and in our own economy." (p. 2)

"The 1974 Act explicitly mandated NIBS to continue the housing system certification work that Operation Breakthrough had piloted. That mandate has never been exercised, but it has also never been rescinded. If Congress is looking for powerful housing legislation already on the books, the NIBS mandate is one of the most powerful unused levers available." (p. 2)

"The 1974 authority granted to NIBS to develop and implement this framework has never been exercised. Congress passed the law. The framework was sound. The implementing institution was established. What ran out was political continuity, not policy validity. The authority is still on the books today." (p. 4)

What Is Housing System Certification? (definition section)

"Before explaining what certifying a housing system means, it is worth being precise about what a housing system is — because the term is doing real work here." (p. 2)

"A housing system is essentially a product definition — the design logic, the structural and material systems, the offsite manufacturing and onsite assembly process, the supply chain, the quality controls, and the performance characteristics of a defined, repeatable housing offering — treated as a unified whole rather than a collection of discrete decisions made project by project." (p. 2)

"A housing system may involve significant factory production, but it can also be primarily site-built. What defines it as a system is the integration — design for manufacturing and assembly, coordinated supply chains, serial production, continuous improvement — rather than where production physically occurs. A factory helps. The organizational method matters more." (p. 2–3)

"No housing system certification framework currently exists in the United States. Congress authorized NIBS to develop one in 1974, but that work was never carried out. NIBS, with industry participation, is now beginning that development work." (p. 3)

"The target market is not speculative. MOD X Advisory is currently working with partners in Washington State on the first statewide initiative specifically designed to apply housing system certification to starter homes — the attainable housing that working families at moderate income levels need most and that the current project-by-project regulatory burden makes hardest to deliver at scale." (p. 3)

How it would work

"Today, nearly every residential project is treated as a unique event. The design is reviewed against the prescriptive building code project by project. The construction is inspected project by project. The financing is underwritten project by project. The insurance is priced project by project. Every approval is relitigated every time, even when the underlying system is the same one a company has used a hundred times before." (p. 3)

"Housing system certification would work differently. Under such a framework, a company's integrated delivery system — the design logic, the offsite manufacturing and onsite assembly process, the quality controls, the performance characteristics — would be reviewed once, against performance criteria, by an independent expert body. Once the system was certified, individual projects using the system would inherit that approval. As in aerospace, a configuration space would be created,

allowing for variations within the preapproved framework. Permitting would be streamlined. Lenders and insurers could rely on the certification as a basis for underwriting. Code officials would retain their authority but exercise it against a known and tested baseline." (p. 3)

"This is not a proposal to preempt local code officials — it is a proposal to give them a tested performance baseline against which to exercise their authority." (p. 3)

"The savings would come from not redoing the same approvals on every project. The quality gains would come from concentrating expert review at the system level rather than diffusing it across thousands of individual project reviews. This is what most other manufactured products in the American economy already do — automobiles, aircraft, medical devices, consumer electronics, agricultural equipment. Housing remains an outlier among major American sectors that produce complex, safety-critical products, even though Congress identified the solution in 1968, demonstrated it between 1969 and 1973, and authorized its implementation in 1974." (p. 3)

"Certification is also inherently evolutionary — and that is perhaps its most important feature. A certified system would not be a frozen specification but a living baseline that the responsible company refines as evidence accumulates." (p. 3)

"Japan adopted a similar framework in 1973, based in part on a close dialogue with the Operation Breakthrough team. Housing system certification is the framework that would finally make that vision operational in American housing. The design principle: think sector wide, experiment at the company and team level." (p. 3)

Evidence — Japan

"Other countries built what we authorized but did not implement. Today, more than twenty-eight percent of Japanese housing units pass through their housing system certification program. Certified buildings are significantly more resistant to natural disasters — certified housing is nearly three times less likely to suffer severe earthquake damage, two-thirds achieves net-zero energy performance, and sixty-four percent meets barrier-free accessibility standards for an aging population. Insurance discounts of between ten and fifty percent are tied to certification, and mortgage rate reductions are also commonly available." (p. 4)

Evidence — Fading West Development

"In the U.S., the strongest endorsement of housing system certification in our research has come not from the largest players but from small, vertically integrated companies and integrated project teams working in long-term relationships — firms already committed to industrialized housing delivery, absorbing the

project-by-project approval burden on every job, unable to amortize their system-level investments across a pipeline the current regulatory environment makes unpredictable." (p. 4)

"Fading West Development, the Colorado-based factory-built modular homebuilder testifying alongside me today, is exactly this kind of firm — building starter homes, operating across multiple jurisdictions, and navigating a different permitting, inspection, and financing landscape in every one of them. Certification is not a policy preference for firms like Fading West. It is the reform that would make their business model viable at scale. And it benefits factory, site, and hybrid delivery equally — because what it certifies is the integrated system, not the venue." (p. 4)

Evidence — JPI

"What struck us was a different and in some ways more significant endorsement. JPI is one of the largest multifamily developers in the United States — and also happens to be owned by Sumitomo Forestry, a Japanese company deeply involved in housing system certification there. MOD X Advisory currently advises JPI, which gives us direct access to the operational data cited in this section." (p. 4)

"JPI invests at least six percent of its annual return in research and development. By any measure, that commitment is an order of magnitude higher than the American construction industry average. This level of private investment is precisely what housing system certification would encourage sector wide — and it requires no federal funding. The framework would simply remove the institutional barrier that makes the investment irrational for most firms operating in the current regulatory environment. Certification is the institutional reform that would unlock private capital that is otherwise sitting on the sidelines waiting for regulatory clarity." (p. 4–5)

"On large multifamily projects, they have compressed timelines from twenty-six months to eighteen — a thirty percent reduction, achieved through technology-enabled rigorous organization across design, procurement, scheduling, and onsite assembly." (p. 5)

"Interior finishes illustrate the framework with particular clarity: JPI cut completion time from one hundred eighty days to one hundred twenty days through industrialized organization alone, then from one hundred twenty days to seventy days by using qualified third-party inspectors rather than waiting on local jurisdictional inspection cycles. The first step is industrialization itself. The second step is what third-party inspection can deliver even within the current regulatory environment. Housing system certification would generalize the second step across all sub-tasks and all projects, with qualified inspectors working to a certified process specification." (p. 5)

"To preserve their project-wide gains under current conditions, JPI works with third-party inspectors that run alongside their construction schedule rather than gating it. This process remains an analog approach with many of the archaic challenges of normal AHJ inspection. Under housing system certification, with qualified inspectors working to a systems- and technology-enabled certified process specification rather than to default jurisdictional standards, JPI estimates — based on their own operational data — they could make another significant step toward the technical limit of fifty-eight percent project-wide time savings, substantially higher than their current thirty percent." (p. 5)

"JPI also believes certification would help local code authorities do their job with more certainty in less time, by giving them a tested baseline against which to apply their continuing oversight authority. AHJs would retain authority; the framework would give them better tools to exercise it." (p. 5)

"Housing system certification would serve firms as different as JPI — which is site-built — and Fading West Development, the Colorado-based factory-built modular homebuilder that testified before the House Financial Services Committee last summer, with the same instrument. Both firms are already participating alongside other industry partners in the NIBS Steering and Technical Committee that is currently doing the development work — different industrialization strategies converging on the same institutional reform, and doing so actively." (p. 5)

"And both represent something the small innovators who first endorsed this framework already understood: the regulatory barrier is not a barrier to any particular method of construction. It is a barrier to the organizational commitment that industrialization requires." (p. 5)

"The implementation challenges are real — inspector certification, AHJ capacity, liability allocation — and NIBS's development work would address each of them. That is exactly what the framework development process is designed to produce." (p. 5)

Three Recommended Actions (full context)

"The HUD report we co-authored proposes a path toward a clear long-term goal: a performance-based regulatory framework for housing, harmonized across jurisdictions where harmonization serves shared public purposes, and rationally accommodating local difference where local conditions actually require it." (p. 6)

[Action One — Standard Award Criteria] "First, immediately: conduct an agency-wide review of federal award criteria across all programs that affect housing

delivery — a preliminary version of which we delivered to HUD. Like every country we studied, the United States first needs to clarify and standardize the terminology used to describe industrialized housing delivery before coordinated criteria can do their work. Consider what a small innovative builder faces today: terminology for industrialized housing delivery is inconsistent across federal agencies; financing and underwriting criteria treat factory-built and site-built systems differently depending on the program; and resilience and performance standards vary by agency and sometimes conflict. A large national builder has the compliance capacity to navigate this fragmentation. A small firm building starter homes does not. Consistent language and criteria across **HUD**, the **Federal Housing Finance Agency**, **USDA Rural Development**, the **Department of Veterans Affairs**, **FEMA**, and others would generate the demand aggregation that early-adopter manufacturers and small builders need — without new federal spending, without new authority, and without picking winners among construction methods." (p. 6)

[Action Two — Housing System Certification] "Second, as the early adopters establish themselves: direct NIBS to initiate development of a housing system certification framework under the authority Congress granted in 1974 — a framework that would allow lenders, insurers, and code officials to rely on a single performance-based approval rather than the project-by-project review that drives much of the current cost burden on small builders. This can be initiated through committee report language. It does not require new appropriations or new authority. It requires direction to exercise authority that has been on the books for fifty-two years. NIBS already exists. Industry partners are already engaged. What's needed is congressional support for this work to proceed." (p. 6)

[Action Three — Performance-Based Building Code Reform] "Third, as a certification framework matures: support performance-based building code reform, building on the precedent of the HUD Code and the existing work of the International Code Council. Performance-based regulation, where it has been adopted, has consistently produced four results: increased competitiveness, faster innovation, lower costs, and improved quality. This is not a theoretical claim. It is the empirical record of Japan, the United Kingdom, and the entire European Union, and it is also the operational reality of every other consequential sector of the American economy that produces complex manufactured products. These sectors are regulated against what the product must achieve, not against how it must be built. Housing is the outlier. The 1976 HUD Code is the only sector of American housing that operates on this principle, and it has delivered nine million units of affordable manufactured homes at roughly half the cost of comparable site-built housing on a per-square-foot basis." (p. 6–7)

"They also compound through network effects. Standard award criteria would give early-adopter manufacturers and builders a viable demand pipeline. Housing

system certification, once developed, would give lenders, insurers, and code officials a basis for relying on certified systems across multiple projects. Performance-based code reform would create the long-term regulatory environment in which the framework becomes self-sustaining." (p. 7)

Closing

"Congress passed the law. The authority has not been used. We are not asking for new authority — we are asking for support to exercise what is already on the books." (p. 7)

"What this Committee can enable is straightforward. Innovative American firms get the regulatory environment they need to invest in industrialized housing delivery without the institutional barriers that currently strand their capital. Local code authorities get a tested baseline that helps them exercise their authority with more certainty in less time." (p. 7)

Endnote citations referencing certification directly

Endnote [8]: "This authority remains to this day but is not being currently exercised. The need for a national institution is more acute than ever to streamline regulations to achieve the rapid supply of affordable housing through offsite construction." (quoting *HUD Action Plan*, p. 36) — testimony endnotes appear on p. 8

Endnote [22]: "Congress granted HUD and NIBS the authority and responsibility for developing, disseminating, facilitating, and maintaining a building systems standards and certification program based on performance criteria... This authority remains to this day but is not being currently exercised." (quoting *HUD Action Plan*, p. 36) — testimony endnotes appear on p. 10

SOURCE 2: HUD's Past, Present, and Future Role in Accelerating U.S. Offsite Construction for Housing: A Comparative Study and Action Plan

Smith, R.E., Rupnik, I., and Schmetterer, T. (2026). Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research.

Executive Summary

"The Action Plan outlined in the report offers immediate, intermediate, and long-term strategies—from standardizing federal award criteria to advancing

housing system certification and performance-based building codes—that are grounded in careful analysis and pragmatic." (p. vii)

"Intermediate Timescale Strategy: HOUSING SYSTEM CERTIFICATION — Goal: The intermediate goal is to cost-effectively streamline building regulations to expand the overall supply, variety, and performance of housing. Strategy: The strategy for accomplishing the intermediate goal is to develop and implement a performance-based, federally sanctioned housing system certification program for offsite housing construction." (p. vii)

"Standard award criteria as a means of demand aggregation should be applied to housing system certification. Likewise, housing system certification is intended to work in concert with a performance-based code as parallel regulatory reform action." (p. viii)

"The Offsite Action Plan calls for the intentional and persistent leadership of HUD in developing standard award criteria, housing system certification, and a performance-based code framework to foster a national innovation system and high-technology housing sector." (p. viii)

Section 2.2 — What Is a Housing System Certification Program?

"Most of the essential products used in daily life in the United States are regulated at the system or overall product level. Even relatively complex products like automobiles and airplanes are regulated in this manner. A regulatory framework supports the essential means and methods of industrialization, including the design for manufacturing and assembly, modularization of a product into subassemblies, efficient operation of supply chains and manufacturing facilities, and the ability to offer customers true mass customization. Regulation supports the continual improvement of production processes and products, and, in an increasing number of markets globally, regulations are essential for resource accounting and circularity." (p. 17)

"Unlike other essential products, mass housing is generally treated like other buildings requiring an assessment of how a particular structure satisfies prescriptively regulated specifications in every building iteration. This requirement continues to be the case even if a housing product has been designed, manufactured, and delivered utilizing IHD. Housing system certification allows IHD-based offsite construction to operate more efficiently by creating an appropriate regulatory environment that acknowledges the significant upfront planning involved in industrialization and the continual improvement derived from its serial production and use over time." (p. 17)

Why is a Housing System Certification Program Needed?

"The intermediate goal is to improve the offsite sector's ability to produce and deliver housing types cost-effectively while achieving societal goals, such as resilience from natural disasters and other criteria that conventional construction is currently not able to realize at scale economically. These limits are due primarily to an existing regulatory framework that is not optimized to support offsite construction and housing innovation more broadly." (p. 17)

"The researchers recommend that HUD lead in the development and adoption of a performance-based housing system certification program for all federally funded projects, incentives, and subsidies that affect offsite construction for housing." (p. 17)

"Over time, the research suggests that the benefits of housing system certification will be acknowledged by private sector financial and insurance industries, thereby creating demand for this form of certification for housing projects outside of federally funded programs." (p. 17)

"The potential positive effect of housing system certification on offsite construction and housing supply acceleration is significant. This type of program benefits companies that have already invested in the development of a housing system to scale and realize the return on investment of R&D. The certification program would also encourage existing companies inside and outside of the housing sector, where regulatory frameworks more closely resemble traditional manufacturing industries, to increase the use of offsite construction." (p. 17)

"A federally supported system certification program would create more housing supply while maintaining affordability and increasing quality in the intermediate term by allowing companies to invest more profits in R&D to foster the 3Cs and less in project-by-project design and engineering fees and permitting and inspection costs." (p. 17–18)

"The strategy of standard award criteria recommended in the Action Plan will create the essential catalyst for demand aggregation that would be further strengthened through additional subsidies and incentives connected to the award criteria. The research findings supporting the Action Plan indicate that current regulatory barriers will nevertheless blunt the effect of this action without prerequisite regulatory reform. A housing system certification program that builds on and expands the standard award criteria strategy and coordinated federal incentives and subsidies would provide a streamlined process for innovative companies to navigate the

current prescriptive regulatory framework without the significant effort required for a shift to a general performance-based regulatory environment." (p. 18)

"In support of this endeavor, the researchers recommend that HUD collaborate with other federal agencies and nongovernmental entities involved in building regulation to develop a federally sanctioned housing system certification program. This government-led action will provide a rapid and cost-effective form of regulatory streamlining to accelerate offsite construction for housing, further building on immediate standard award criteria and creating a functional foundation for developing a long-term HTHS and NIS." (p. 18)

How Does a Housing System Certification Program Work?

"In a typical housing development project, a design team considers the general specifications defined by an existing client. The regulatory framework governing the project provides a multitude of specifications about spatial planning, structural and material performance, and how the building will respond to the site. In most cases, various builders using multiple forms of production, including offsite construction, estimate costs referring to the design and specifications. After preliminary pricing is formulated, the design is typically reformulated based on the specific conditions defined by a particular production process. During various phases throughout the process, regulatory permitting and inspection phases occur that often require additional design and production considerations." (p. 18)

"Housing system certification utilizes an entirely different process. Instead of the typical prescriptive building regulations, housing system certification requires the authorizing certification body to define performance criteria broken down into subcategories of criteria (Gallagher, 1979). An entity applying for housing system certification first reviews these categories and performance criteria and develops or amends a housing system to comply with the requisite categories and criteria. The housing system certification can then be utilized to serve several functions, including the following:" (p. 18)

"Housing system certification as an alternative means for code compliance.

When a specific instance of a housing system is configured for a particular use on a specific site, that project is permitted and inspected in reference to that certification and not to the general building code. This method creates cost savings for the housing system developer in terms of project development, permitting, and inspection, and allows production of more units in each development cycle." (p. 18)

"Housing system certification as an award criterion for project awards, subsidies, and incentives. When a specific instance of a housing system is configured for a particular use, future owners can access certain project awards,

subsidies, and incentive programs without going through a lengthy and often unpredictable review process. This approach creates market demand for the system developer and generates savings for the owner. System certification can increase the confidence of financial and insurance entities backing housing construction by virtue of quality assurance that results in a reduced risk profile." (p. 19)

"Housing system certification as a basis for manufacturing certification. A primary driver of housing system certification for companies investing in offsite construction 3Cs is to establish confidence that the housing product will benefit from a more streamlined permitting and inspection process and potential eligibility for additional incentives and subsidies. Housing system certification serves not only as a product certification but also as the foundation for the certification of a manufacturing process and facility. The certification of a manufacturing process in support of a housing system serves to create more confidence for regulators managing housing standards, and financial and insurance entities backing the housing projects." (p. 19)

Footnote 37: "For example, in the United States, HUD and NIST developed four essential criteria groupings: (1) detached structures, (2) semi-detached structures, (3) low-rise multistory buildings, and (4) mid-rise multistory buildings. In Japan, the performance criteria groupings are based on two broad factors: (1) number of stories equal to or less than three stories and (2) basic load-bearing structure, including wood, steel, concrete, or volumetric modular (in steel or concrete), resulting in 15 broad categories. In both cases, these broad categories share various performance criteria regarding the structure and final product performance." (p. 18, footnote)

"Standard award criteria should be used in concert with the housing system certification program because they will inform the evolution of one another. The researchers recommend that HUD start internally with a systems certification program for its projects and awards to pilot the program." (p. 19)

Who Develops and Implements a Housing System Certification Program?

"HUD's Operation Breakthrough culminated with a U.S. congressional mandate for HUD and the newly formed National Institute of Building Sciences (NIBS) to partner on creating the Advanced Building Technology Council and the Advanced Building Technology Program. Following a similar pattern, the researchers recommend that HUD establish a new partnership with NIBS to define future performance-based regulatory reform, starting with housing system certification." (p. 19)

"The research demonstrates that cultivating targeted strategic partnerships to implement a performance-based, federally sanctioned housing system certification program for offsite construction is a cost-effective strategy for streamlining building regulations to expand the overall supply, variety, and performance of housing." (p. 19)

Section 2.3 — Performance-Based Building Code (certification as the intermediary step)

"The researchers recommend that HUD utilize the immediate strategy of standard award criteria and an intermediate strategy of a housing system certification program as critical steps toward the creation of a functional NIS and related HTHS." (p. 20)

"To develop a performance-based building code and associated performance-based building product standards and certification process, HUD can turn to various precedents in the United States and overseas, all which share common characteristics and benefits." (p. 21)

A.3 Action Plan Conclusion

"Standard award criteria as a means of demand aggregation should be applied to housing system certification. Likewise, housing system certification is intended to work in concert with a performance-based code as parallel regulatory reform action. The Offsite Action Plan calls for the intentional and persistent leadership of HUD in developing standard award criteria, housing system certification, and a performance-based code framework to foster an HTHS and NIS." (p. 22)

Historical Section — Operation Breakthrough / NIBS Mandate

"1. HUD and the National Bureau of Standards (NBS) developed a regulatory framework appropriate for offsite construction. With the congressional mandate to assess the cost of regulatory barriers, HUD worked with the U.S. Department of Commerce's NBS to develop a regulatory framework more appropriate for an HTHS, namely a performance-based housing system certification program. HUD and NBS, renamed the National Institute of Standards and Technology (NIST), also collaborated on award criteria for selecting participants in Phase I of the program." (p. 30)

"2. HUD and the offsite construction industry identified housing systems for certification and further development. Before the housing systems certification program was completed, HUD invited hundreds of American companies, including offsite construction companies (e.g., National Housing Corporation), onsite builders (e.g., Levitt and Sons), and innovative companies from other parts of the economy

with an interest in housing (e.g., Boeing and General Electric), to submit proposals for housing systems, with 25 companies ultimately selected to participate in the program." (p. 30)

"Operation Breakthrough proved successful in the two key areas HUD was tasked with, including: 1. HUD identified which housing systems had the most potential for further demand aggregation efforts in Phase III. 2. HUD also identified a cost-effective regulatory reform compatible with state industrialized building programs through the NBS housing system certification program." (p. 31)

"The New Technologies Program provided much of the funding to build the nearly 4,000 housing units. It also supported the work of HUD and NBS in developing the housing system certification program. Regardless, the 25 companies made significant investments in capacity, competency, and capability that could only be amortized through some degree of pipeline security, which ideally would come in the form of subsidized and market-rate housing. With both forms of housing depleted, most companies went bankrupt by the end of the decade (Chicago Tribune, 1987). In Japan and Sweden, a similarly severe crisis proved less devastating for countries accelerating their offsite construction sectors because of small but significant differences in strategies and tactics, presented in sections Part B, 3.1 and 3.2." (p. 31–32)

Footnote 64: "Charles Biederman referenced the name 'National Institute of Building Sciences' as part of his testimony to Congress in 1969. Biederman had previously worked in France, where a similar certification program for nationally funded housing had been in place for some time. Biederman noted that most of the countries where offsite construction was delivering results, including Sweden, had similar certification systems. Biederman also advocated for a second entity, the National Institute of Environmental Sciences, to standardize regulations and do for zoning what NIBS would do for building code." (p. 34, footnote)

"Because this national institution did not exist during Operation Breakthrough, HUD had to negotiate the use of new technologies, certified through an innovative regulatory framework, on a case-by-case basis. The additional time and monetary costs limited the increase in housing supply and the acceleration of the offsite sector in becoming the HTHS that the country urgently required." (p. 34)

Congress, 1974 (quoted in report): "...the lack of an authoritative national source to make findings and to advise both the public and private sectors of the economy with respect to the use of building science and technology in achieving nationally acceptable standards and other technical provision for use in Federal, State, and local housing and building regulations is an obstacle to efforts by and imposes severe burdens upon all those who procure, design, construct, use, operate,

maintain, and retire physical facilities, and frequently results in the failure to take full advantage of new and useful developments in technology which could improve our living environment." (Public Law, 1974: 97) **(p. 34)**

"Operation Breakthrough successfully confirmed the 1968 hypothesis that the regulatory framework was a key barrier to increased housing supply because the 'lack of uniform housing and building regulatory provisions increases the costs of construction and thereby reduces the amount of housing and other community facilities which can be provided.' It had also demonstrated that 'a single authoritative nationally recognized institution' could provide 'the evaluation of new technology that could facilitate the introduction of such innovations and their acceptance at the Federal, State, and local levels' despite a general regulatory framework that blocked innovation and supply." (Public Law, 1974: 97) **(p. 35)**

"Based on these findings, in 1974 Congress granted NIBS 'functions and responsibilities in four general areas, relating to building regulations,' as follows (Public Law: 1974: 98):

1. Development, promulgation, and maintenance of nationally recognized performance criteria, standards, and other technical provisions for maintenance of life, safety, health, and public welfare suitable for adoption by building regulations jurisdictions and agencies, including test methods and other evaluative techniques relating to building systems, subsystems, components, products, and materials with due regard for consumer problems.
2. Evaluation and prequalification of existing and new building technology in accordance with the previous function and responsibility. Congress essentially outlines a role for NIBS that is similar to that of Building Center Japan (BCJ) in regard to system certification.
3. Conduct of needed investigations in direct support of 1 and 2.
4. Assembly, storage, and dissemination of technical data and other information directly related to 1, 2, and 3." **(p. 35)**

"In summary, Congress granted HUD and NIBS the authority and responsibility for developing, disseminating, facilitating, and maintaining a building systems standards and certification program based on performance criteria. The standards and program were to be adopted by local or state AHJs to promote innovations that balance quality and protection of occupant health, safety, and welfare with rapidly increasing supply and, by extension, affordability to meet societal needs. This authority remains to this day but is not being currently exercised." **(p. 36)**

Case Study: Japan's Housing System Certification Program (1962–Present)

"The three initial goals of the program were defined as follows: 1. Accelerating the growth of offsite construction, particularly the 'prefabricated house' sector, through demand aggregation. 2. Encouraging the improvement of the quality of the 'prefabricated house' sector through the support of a system-based approach to the full spectrum of housing production and delivery activities. 3. Streamlining the permitting and inspection process using system certification." (p. 39)

"Market Share Targets and GHLC Prefabricated House Certification. The three ministries published their 15-percent market share target for Japanese prefabricated houses. In this report, GHLC was the key agency for initial acceleration efforts, forming a committee of experts from academia and industry to review project candidates for the program. The three following actions enabled acceleration: 1. Developing a simple certification program for awarding financing for prefabricated house designs constructed of light-gauge steel, a newly introduced noncombustible structural material with an ample supply chain developed through Japan's automotive industry. 2. Expanding securitized mortgages to homeowners of light-gauge steel prefabricated houses. 3. Streamlining local permitting and inspection by circulating and explaining certified designs to local building inspection departments that were still under the authority of the Ministry of Construction, to help them become more familiar with offsite construction (i.e., education)." (p. 40)

"These initial efforts proved effective, with pioneering companies like Daiwa House (1955) and Sekisui House (1960) benefiting from demand aggregation and regulatory reform even before a fully-fledged housing system certification system was enacted in 1973." (p. 40)

"Industry Consolidation and Expansion of Certification. Following the initial success of the GHLC program and the growth of the offsite construction industry, MLIT together with the offsite industry founded the Japan Prefabricated Construction Suppliers and Manufacturers Association. This association brought together prefabricated house companies, like Daiwa House and Sekisui House, precast construction companies, and suppliers to the industry. GHLC's certification program expanded from steel to concrete to wood prefabricated house systems." (p. 40)

"Further Expansion of Certification and the Creation of BCJ. The certification program expanded from detached and semi-detached housing to low-rise multistory structures of up to three stories through the Ministry of Construction's 'Basic Plan of the Industrialization of House-building.' Due in part to the growth of the sector and the expansion of the certification program, prefabricated house certification fell

under the jurisdiction of a new entity, the BCJ, now directly under the Ministry of Construction, but with a continued direct link to GHLC financing programs." (p. 40)

"The Uchida Delegation visited Operation Breakthrough sites and was presented with a comprehensive overview of the U.S. housing system certification that HUD and NBS were developing." (p. 41)

"Creation of a Fully Functioning Housing System Certification Program. Following the successful completion of the Pilot competition, the Ministry of Construction utilized the performance-based approach to housing system certification to update the existing program overseen by BCJ and linked to GHLC financing. The new program, called the Certification Program for the Performance of Prefabricated Houses, combined aspects of regulatory reform and demand aggregation to ensure a steady acceleration of the capacity, competency, and capability (3Cs) of the prefabricated house subsector of the Japanese offsite construction industry." (p. 42)

"Japan's certification system first began as a more straightforward award criterion for access to securitized mortgages that encouraged offsite construction. Certification criteria first mirrored the prescriptive code that regulated all housing, with completed certifications essentially being standard, repeatable designs. The program grew more sophisticated in 1973, when criteria shifted from prescriptive- to performance-based and certification resulted in a certified system that could be configured to different designs as opposed to a repeatable, set housing product. Since then, the housing system certification program has proven to be (1) resilient, continuing to certify systems based on performance criteria, and (2) flexible, able to respond to external pressures while maintaining comparable results. In Part A of the Action Plan, the researchers recommend a similar system certification program for the U.S. offsite construction industry." (p. 42)

"Privatization and Expansion of Housing System Certification (1987). In 1987, BCJ became a private entity independent of the Ministry of Construction. The Ministry of Construction, in turn, established a program for accrediting private certification agencies, the 'provisions for accreditation of building performance and business registration,' leading to the establishment of several more certification companies that could support the continued growth of the offsite construction industry." (p. 42)

"Housing System Certification After Industry-Wide Transition to Performance-Based Codes (2000). Japan's national building code transitioned from prescriptive- to performance-based criteria in 2000, affording the housing system certification program, which had been using performance-based criteria for nearly 30 years, the opportunity to further evolve and continue growing. Portions of the housing system certification were reworked to align with general performance-based code criteria and procedures. A larger number of housing production and delivery systems could

now access some of the precertification benefits afforded to prefabricated house systems. As of 2021, one in three housing units in Japan utilizes this expanded form of precertification, with more than 50 percent as non-prefabricated units." (p. 43)

"Sumstock Certification for Existing Prefabricated Houses. The most recent development in the long line of system certification and demand aggregation actions in Japan is the addition of Sumstock Certification. In this program, JHF supports an additional certification system for purchasing or renovating existing prefabricated houses." (p. 43)

"The current housing system certification process in Japan's offsite construction industry is conducted following six key steps:

1. Application for Certification: The home builder develops a housing system design and applies to an accredited housing system certification entity (BCJ or equivalent).
2. Certification: The accredited housing system certification entity certifies the home builder's system.
3. Application to JHF: The home builder applies to JHF using the certification from the accredited housing system certification entity.
4. Registration: JHF registers the housing system for use in local inspections and for potential access to reduced-rate mortgages.
5. Application to Local Inspection Entity: Upon receiving certification and registration, the home builder can apply for a streamlined permitting and inspection process from a local inspection entity.
6. Certification of Conformity: On completion of the specific project, the local inspection institution issues a certification of conformity to the certification registered with JHF. Three inspections occur: 1. Inspection of technical drawings and specifications. 2. Inspection of the structure during onsite construction. 3. Inspection of the structure on completion. The final certification of conformity is issued on completion of the onsite construction. Currently, 130 private inspection agencies have contracts with JHF to conduct certification of conformity. JHF monitors these agencies and supplies them with inspection manuals." (p. 43–44)

"Housing System Certification Today. In 2021, the housing system certification program, which had been in place since 2000, was utilized by 28.2 percent of housing units, approximately 50 percent detached and 50 percent multi-unit." (p. 44)

"These customer benefits include:

1. Loans: Since 1962, one key benefit of certification for the home builder and the owner has been access to securitized mortgages. With the shift in housing finance policy since 2007, JHF provides mortgage rate reductions for the following performance criteria as part of their Flat 35S Program: Highly energy-efficient housing. Superior seismic resistance. Superior barrier-free housing. Superior durability and flexibility of the housing structure.
2. Subsidies: The Ministry of Forestry has been promoting the increased use of home-grown wood, combined with incentives for housing to be net-zero energy, through regional housing projects and programs.
3. Tax Reduction: Housing system certification grants homeowners reduced liability on income tax, registration and license tax, real estate tax, and property tax.
4. Insurance: 10- to 50-percent discount on earthquake insurance is determined based on performance criteria met during the housing system certification process." (p. 44)

"Housing System Certified House Overall Performance Results. In addition to benefiting home builders and owners in terms of cost, certification has helped Japanese society reach many of the goals for which the program was restructured to address, including:

- Increased disaster-resilient housing stock: Housing system-certified housing is nearly three times less likely to experience "severe damage" during earthquakes.
- Increased energy-efficient housing stock: Sixty-seven percent of housing system-certified housing is Net Zero Energy Buildings (ZEB), with many of the leading "prefab house" companies producing 90 percent or more ZEB units. Japan plans to reach 100 percent ZEB for new construction by 2030.
- Increased barrier-free housing stock: Sixty-four percent of housing system-certified housing is barrier-free, a key metric for Japan's aging population.
- Increased durable and reusable housing stock: One hundred percent of system-certified housing is deemed "durable" and appropriate for multiple generations of use and renovation simplicity." (p. 44–45)

"This need led to the development of a system certification regulatory program that aggregated demand and created more affordable and safer housing. Today, the same certification system is being used to meet additional societal goals." (p. 45)

Key Lessons From Japan

"7. Performance-based housing system certification has proven to be a successful intermediary strategy in transitioning from a prescriptive- to a performance-based regulatory environment." (p. 62)

Sweden Case Study

"1. Further Increasing Affordability—Housing System Certification for Public Housing Projects. Albeit much less acute than that of the United States, Sweden is experiencing its own housing affordability crisis (Eurostat, 2021). One new program currently being piloted involves housing system certification for industrialized home builders that are interested in delivering housing to Sweden's public housing agencies. Public housing agencies are tasked with reinvesting funds from existing facilities to create new housing to maintain affordability and access. More recently, Sveriges Allmännyttan | Public Housing Sweden, the association of Sweden's municipal public housing agencies, has developed a housing system certification process (SABO, n.d.). Companies that pass certification can be awarded projects at a fixed cost without the usual public tender process. One of the largest and most innovative industrialized home builders, Lindbäcks Bygg, has already undergone this transition, avoiding the typical design-bid-build process that is more suited to onsite construction." (p. 53)

"Sweden had building products and assembly certification systems comparable with Germany's DIN-Norm program and France's agreement system, providing a performance-based approval process for more advanced building components within a prescriptive building code environment." (p. 46)

United Kingdom Case Study

"Performance-Based Criteria for Standards and Assemblies—the British Agreement System. Following the French Agreement program, on which HUD's Operation Breakthrough was based, the British agreement system was developed and operates today to provide a performance-based certification route for building products and assemblies. The British Board of Agrément (BBA) is a nongovernmental organization providing a construction products certification service that approves compliance with relevant standards. In 2001, BBA represented the UK in the European Organization for Technical Assessment to be able to issue European Technical Assessments for performance-based criteria. BBA also performs product and assembly testing as well as permitting and inspection, although it is not the only accredited entity to do so, and has issued more than 6,000 certificates." (p. 56)

"Since 2013, the legal requirement has been for European Technical Assessment compliance with the EU standard Conformité Européenne (CE) under CPR. Although no longer an EU member, harmonizing a system certification program with an overarching performance-based building code allows the UK to operate considerably more agilely in adopting and adapting to offsite construction technologies in the EU market." (p. 56)

"The results from the British functional-based system of Building Regulations 2010, Building (Scotland) Regulations 2004, and the BBA system certification have led to a proliferation of imaginative design and MMC factory-produced solutions." (p. 56)

Footnote 81: "Following a tragic gas explosion on an upper floor of a precast systems building tower in London, critics claimed that the designers, builders, and code officials did not take proper precautions regarding certification, testing, and continuous improvement of the system. At the same time, precast buildings from the 1940s started cracking and leaking." (p. 54, footnote)

"Compounded by the evolution of performance code, system certification, and adoption of BIM standards, a series of offsite construction for housing actions were developed and implemented, as the following outlines." (p. 57)

Cross-Country Synthesis / Findings

"In Japan, initial industry growth starting in the mid-1950s, coupled with government-led acceleration action, did increase housing supply and offsite construction market share, but it did not adequately ensure improved quality and resilience until the introduction of more advanced housing system certification in 1973. Since 2000, prefabricated houses have often been appraised as higher quality and higher resilience than their conventional counterparts." (p. 65)

"In many cases, this shift toward performance-based regulations required an intermediary step, the performance-based certification of assemblies or entire housing systems. System certification can be defined within a confined scope, such as HUD-funded projects, or broader to include all federally funded housing projects, motivating the industry to evolve toward using performance-based certification for offsite construction over time." (p. 65–66)

"In Japan, performance-based specifications were first introduced through the 1975 housing system certification program, with full adoption of performance-based building codes occurring in 2000." (p. 65)

SOURCE 3: Offsite Construction for Housing: Research Roadmap

Smith, R.E., Rupnik, I., Schmetterer, T., and Barry, K. (2023). Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research.

This earlier document does not define "housing system certification" as its own framework the way the 2026 Action Plan does. It only mentions certification in passing — as an open research question, a workforce-training concept, and in reference to HUD Code product labeling. Every certification-related sentence in the document is quoted below, exactly as written.

"Skills and Training: Support an offsite construction workforce and a trades-training and certification program to improve factory labor practices and onsite assembly quality control, as well as partnerships with union labor organizations." (p. vi)

"A HUD Code home is a single-wide or double-wide transportable section manufactured to the HUD Manufactured Home Construction and Safety Standards, 24 CFR Part 3280, administered by the U.S. Department of Housing and Urban Development (HUD Code). HUD Code homes were known as mobile homes until the 1970s and today are often referred to as 'manufactured homes.' HUD Code homes display a red certification label on the exterior of each transportable section." (p. 10, footnote 2)

"Likewise, in Japan, the Ministry of Housing, along with a prefabrication trade association, have continuously advanced offsite construction for housing since the 1970s through a factory certification process (Matsumura, 2004, 2006; Buntrock, 2017; Hall, 2008)." (p. 27)

"What is a program for education and certification in the United States that can be applied in the offsite construction industry workforce training to address the unique skills needed for project delivery?" (*Related Research Question, Workforce section*) (p. 56)

"Offsite construction stakeholders are considering certification programs for setting subassemblies onsite to reduce the risk of handling. Additional research is required to assess the impacts and project performance outcomes with each of these parties performing onsite assembly work. Research is needed to develop alternatives or future practices for the parties that are currently managing onsite assembly." (p. 56)

"The regulatory environment and associated industry standards for product certification have significant impacts on innovation and adoption of offsite construction in housing." (p. 64)

"As the industry progresses, more inventors and innovators will enter the market to offer new and improved solutions for subassemblies and products, requiring the certification process to be more equitable and accessible." (p. 64)

"Skills and Training: Support a training and certification program for the offsite construction workforce to improve factory labor practices and onsite assembly quality control and support partnerships with union labor organizations." (*repeated in the strategy appendix*) (p. 68)