

Wood Frame Multi-Family Housing in Boston, 1865-1900

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Abstract:

This research will broaden the historical knowledge of Boston's built environment by focusing on wood frame multi-family housing and its impact on Boston's urban evolution. Although Boston's historic core is primarily built of masonry construction, wood frame multi-family housing constitutes a vast majority of residential buildings in Boston's peripheral neighborhoods built between the Civil War and the end of the nineteenth century. First, this research will identify and explicate the significance of wood frame multi-family housing to Boston's social and urban patterns. Second, this research will document and analyze in drawings the architecture of wood frame multi-family housing in categories of three configuration types: row houses, three-family houses known as "triple-deckers," and two-family houses. Third, this research will document in three-dimensional models the construction of wood frame multi-family housing in detail.

The growth of industry in Boston and the influx of immigrants from Europe and rural America in the late nineteenth century forced the boundaries of urban development outward from the historic core to accommodate an expanding metropolis. The burgeoning streetcar system could transport the new city inhabitants out of the downtown core to Boston's peripheral neighborhoods. These neighborhoods, called "streetcar suburbs" by Sam B. Warner, Jr., in his 1962 book of the same title, were the first ring of Boston's outward development. New communities were rapidly constructed along the major transportation routes delineated by the radiating streetcar lines in a tightly-spaced pattern of free-standing wood frame houses. These neighborhoods became the place for the working class to escape the congestion, disease, and crime of the urban core. In 1920, Robert Woods and Albert Kennedy identified the expanding suburban ring as "the zone of emergence" in their book of the same title. Not only was this zone a place for the immigrant population to improve its living conditions, but also it was a place for this group to improve their economic and social standing by becoming property owners.

The predominance of wood frame multi-family housing in the emerging suburbs is due to its relative low cost and its ease of construction. Although wood frame construction was labeled "balloon framing" due to its thin, membrane-like enclosure and lightweight structure, this new building technology revolutionized the construction of domestic architecture in Boston and across America. Mass-produced, standardized wood members could be assembled with a modicum of typical framing details and a minimum amount of skill making the knowledge of building accessible to all. To further simplify the production of this domestic architecture, a limited number of house-plan types were repeated consistently throughout Boston's new suburbs. Wood frame construction democratized the building of domestic architecture by making its processes available to the commoner. This new building technology, combined with the streetcar, was the perfect engine for the rapid development of Boston's zone of emergence.

My research explicates the interrelationship between urban expansion, transportation, land-use patterns, and the construction of wood frame multi-family houses in Boston.

Wood Frame Multi-Family Housing in Boston, 1865-1900

My research focuses on wood frame multi-family housing and its impact on Boston's urban evolution. Housing as a topic of inquiry is inherently comprehensive in scope: it necessarily incorporates issues from the urban scale of the city and urban planning to the architectural scale of the building and construction detail. Although Boston's historic core is primarily built of masonry construction, wood frame multi-family housing constitutes a vast majority of residential buildings in Boston's peripheral neighborhoods built between the Civil War and the end of the nineteenth century. Wood frame housing is often discussed in a multitude of publications on the city's urban development and morphology, such as Walter Muir Whitehill's seminal book, *Boston: A Topographical History*,¹ and more recently, Lawrence W Kennedy's, *Planning the City upon a Hill: Boston since 1630*.² Similarly, there have been several books that focus on the great architectural heritage of Boston such as Douglass Shand-Tucci's, *Built in Boston: City and Suburb, 1800-2000*.³ Most pertinent to the study of Boston's wood frame housing, however, is Sam Bass Warner Jr.'s study of nineteenth century suburban development, *Streetcar Suburbs*.⁴ Warner's book explicates the interrelationship between urban expansion, transportation, and land-use patterns. None of these studies, however, has concentrated on wood frame housing at the smallest scale: its form and its construction.

My research will complete the full range of knowledge of Boston's urban evolution by including the configuration of wood frame multi-family housing types and detailing their construction. First, I will identify and explicate the significance of wood frame multi-family housing to Boston's social and urban patterns. Second, I will analyze the architecture of wood frame multi-family housing in categories of three configuration types: row houses, three-family houses known as "triple-deckers," and two-family houses. Third, I will analyze the construction of wood frame multi-family housing in detail.

Boston's Expanding Suburbs

At the beginning of the nineteenth century, Boston was a seafaring settlement of less than 25,000 people located on the Shawmut Peninsula.⁵ This land mass of approximately one square mile projected into the Boston harbor and was attached to the mainland by an isthmus called the "Neck." At low tide, the Neck would measure no more than one hundred feet wide, and at extreme high tides, it would all but disappear. All land travel had to negotiate the Neck to gain access to Boston's active port. Beyond the Neck and across the Charles River to the north and the South Boston Bay to the south, the surrounding region was open farmland.

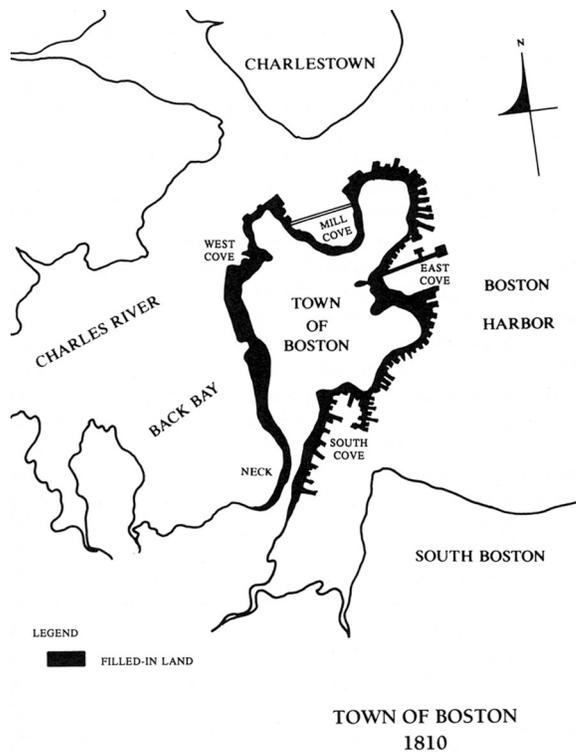


Figure 1: Boston City Limits in 1810 (from Kennedy, *Planning the City upon a Hill*)

At the end of the American Civil War, there was an influx of immigrants from Europe, Canada, as well as migrants from rural America---all seeking peacetime manufacturing opportunities, and Boston's population had grown to 140,000: more than five times greater than the turn-of-the-century population.⁶ Housing in the historic core of Boston rapidly became insufficient to accommodate the increasing population. Poor and congested living conditions in the masonry tenements of the West End and the North End fueled the fires of drunkenness, immoral behavior, disease, and crime.⁷ Massive land-fill projects had reclaimed enough land to create two whole neighborhoods for a wealthier upper class on either side of the original Neck: the Back Bay and the South End. These newly developed areas were populated primarily with four-to-five story, single-family masonry row houses. During this period, access from the original peninsula to the surrounding region was significantly improved by new roads built on the expanding landfill, and by new bridges that traversed the surrounding water ways.

After the economic depression of the early 1870s, the population growth intensified, and demographically, Boston represented an increasingly diverse population.⁸ As economic opportunities increased and the mid-century immigrant families became established as skilled workers and business people, they became part of a burgeoning middle class. Hordes of new immigrants were arriving in the Port of Boston every day to fill the void left by their upwardly mobile predecessors. This created a demand for better living conditions away from the poverty-stricken tenements, yet still affordable to working families. The growth of industry in Boston in the late nineteenth century forced the boundaries of Boston's urban development outward from the historic core to accommodate an expanding metropolis. This outward expansion was facilitated by a loose network of privately run streetcar lines.⁹ Together, these lines provided an

imperfect yet serviceable transportation system that could transport the new city inhabitants out of the downtown core to Boston's peripheral neighborhoods. These neighborhoods, dubbed "streetcar suburbs" by Warner, were the first ring of Boston's outward development.¹⁰

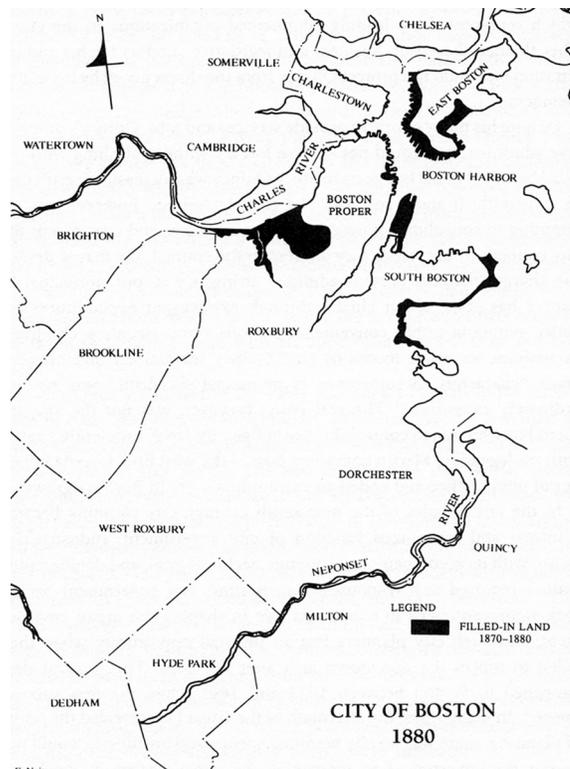


Figure 2: Boston City Limits in 1880 (from Kennedy, *Planning the City upon a Hill*)

By the end of the nineteenth century, Boston had quadrupled its post-Civil War population to 560,000 inhabitants.¹¹ Through the annexation of many of the surrounding towns, including East Boston, Charlestown, Brighton, Roxbury, West Roxbury, and Dorchester, and South Boston, Boston's land area increased to over twenty square miles. All of Boston's newly acquired land areas became connected directly to the downtown center of commerce through the streetcar lines. Although the towns of Brookline, Cambridge, and Somerville resisted annexation, these communities were also serviced by the streetcars, and therefore, they too were directly influenced by Boston's late nineteenth century physical, economic, and demographic transformations.

The Patterns of Suburban Settlement

The original streetcar lines of the mid-nineteenth century were horse-drawn coaches that followed preexisting roads and pathways that connected Boston's rural hinterland to the city.¹² The pattern of the original routes was generated over time by following the natural contours of the countryside and connecting dispersed centers of settlement. Dorchester Avenue in Dorchester, for example, follows the geologic interface between a hilly plateau and the flat lands next to the harbor. A road in some form has persisted in this location since Massachusetts was first settled by following the natural configuration of the land. Similarly, the present day Washington Street in Roxbury marks where the Neck was located: it represents the original land-bridge from the Shawmut Peninsula to the mainland. Both of these routes were subsequently serviced by streetcar lines and became the primary transportation arteries during the nineteenth

century. The myriad of land routes emanating from Boston's historic core formed a radiating pattern like the spokes of a wheel.

Charles W. Cheape, in his book, *Moving the Masses*, describes in detail the evolution of Boston's mass-transportation system.¹³ He explains how the independent competing streetcar companies were consolidated in the 1880's into one transportation monopoly: the West End Street Railway Company. During this period, it became obvious that the horse-drawn coaches were unable to satisfy the increasing demand for transportation services, so the streetcar lines were electrified. These new mechanized coaches could travel faster and hold more people than their horse-drawn antecedents. This also eliminated the necessity of maintaining large animal stables. Towards the end of the 1890s, the management of the streetcar system was transferred to municipal control.

Once streetcar transportation was provided along each radiating spoke, a new pattern of settlement and commercial activity developed. Unlike the distinct and isolated centers of commercial activity that were formed before the streetcar, the new development pattern was a continuous and linear settlement along the full length of these main arteries. The land area between each finger, however, was open farmland that was organized by a grid of parallel farm roads. The resultant pattern provided an ideal infrastructure for rapid suburban development: finger-like boulevards replete with all the urban amenities and services; direct access via streetcar to the plethora of employment opportunities in Boston's downtown; open land between the primary transportation arteries that was easily subdivided into discreet building plots.¹⁴

New communities were rapidly constructed along the major transportation routes delineated by the radiating streetcar lines. Unlike the continuous rows of masonry housing of downtown Boston, the suburbs pursued a pattern of tightly-spaced free-standing wood frame houses. These houses quickly populated the farmland between the primary streetcar boulevards and created an interstitial grid of residential side streets. The individual building plots were long and narrow, so two plots back-to-back could stretch between the parallel side streets. This provided each house with both a front façade towards the street and a private backyard.

The new suburban land-use pattern offered more light, air, and open space for each living unit. These neighborhoods became the place for the working class to escape the congestion, disease, and crime of the urban core. In 1920, Robert Woods and Albert Kennedy identified the expanding suburban ring as “the zone of emergence” in their book of the same title.¹⁵ Not only was this zone a place for the immigrant population to improve its living conditions, but also it was a place for this group to improve their economic and social standing by becoming property owners. Working class families could buy a building lot and build a wood frame multi-family house relatively inexpensively. Owners of multi-family houses would then rent out the other living units in their building, thereby greatly increasing their income. The rented units allowed newcomers to get established in the city and eventually save enough money to become land-owners in turn.

Configuration of Housing Types

The configuration of wood frame multi-family housing types in Boston's expanding suburbs of the late nineteenth century was remarkably consistent given the general lack of zoning restrictions and the plethora of architectural styles prevalent in the United States at the time.¹⁶ There were three basic multi-family housing types built repeatedly during this period: row

houses, triple-deckers, and two-family houses. The row house type was an inexpensive derivation of the masonry row houses so predominant in pre-Civil War Boston, but it did not proliferate due to a series of factors. First, even though the wood row houses were built with a masonry bearing wall between each unit, there was still a significant and inherent danger of fire spreading easily from unit to unit. Destruction by fire, in fact, is one of the main reasons why so few examples exist today. Second, this type was generally constructed as worker's housing, so it did not satisfy the new suburban ideal of one's own plot of land and detached house. The social connotations of the row house were too reminiscent of the blighted downtown neighborhoods that the new suburbanites were trying to escape. Third, since each unit within a row was bound on two sides like its masonry predecessor, the depth of the building was too shallow for sufficient natural light and air to penetrate into all of the habitable spaces. All in all, the row house type did not conform well to the deep and narrow plots that proliferated in the streetcar suburbs, so the wood frame row houses were built either directly on the main streets or on the building plots that could not efficiently be subdivided for the other detached types.



Figure 3: Typical Three-Story Row House (Photo by Author)

Most wood frame row houses were approximately 30 feet deep, and each unit was between 18 to 24 feet wide. They were either two or three stories tall which further distinguished them from the four-to-five story masonry row houses of the historic core. The two story versions were typically a single-family unit with an internal stair for access to the upper level. The three story row houses could either be a single-family, a two family, or a three family unit. The two and three family units have a single front door that leads to an internal common stair with a privatizing door at each level, and another external stair attached to a porch on the back. Given the restricted dimensions of the plan, the multi family row houses were particularly small in area, and therefore, were the domain of the poorest group of suburbanites.

Very few wood frame row houses were built after the triple-decker became the dominant choice of home builders in the 1870's. Warner argues, however, that the row house type may have been the precursor to the triple-decker: tall, slender buildings with the short side facing the street, and the long side extending into the depth of the lot.¹⁷ The triple-decker consists of three one-family flats stacked on top of one another. Unlike the row house, however, there are no common walls,

so the triple-decker could have windows around its entire periphery. This would allow for significantly larger floor plans and an abundance of natural light and air. Douglas Shand-Tucci explains that the origin of the term "triple-decker" most probably was derived from the naval description of a battle ship with cannons on three decks. He also describes the basic layout of this type as "a three story house with one apartment of six or seven rooms on each floor, opening off common front and rear stairwells."¹⁸



Figure 4: Typical Triple-Decker (Photo by Author)

Since the triple-deckers were constructed by a multitude of different independent contractors, there was no set footprint for this type. The dimensions did, however, typically fall within a fairly limited range from 22 to 28 feet wide and from 45 to 55 feet deep.¹⁹ Most triple-deckers have a horizontal cornice line that hides a gently sloping roof to the back of the house, although a significant percentage do have mansard or gable roofs. Most triple-deckers also have a porch attached either to the front or the back of the house, and often they have porches in both locations. The variations of plan configuration, façade treatment, and optional architectural elements such as porches and bay windows that could be attached to the basic triple-decker volume provided a versatile building type that could be constructed for wealthy upper-class families as well as families of modest income. A prevalent building type derived from the triple-decker is the six-family type. This is an aggregate of two triple-deckers, side-by-side, sharing a central common wall.

The two family houses in Boston's streetcar suburbs have the greatest variation of configuration and style of the wood frame multi-family types. Although two family houses proliferate in Boston's streetcar suburbs, this type is not unique to Boston or New England like the triple-decker: two family houses were common in most American cities that were expanding in the late

nineteenth century. In spite of the variations in style, two family houses are typically two story buildings with just two basic plan sub-types: a pair of two story one-family houses sitting side-by-side and sharing a common wall down the center, or two flats stacked one on top of another. Since the stacked flats typically have a smaller footprint, this sub-type is in the majority in Boston. A gable or mansard roof would add to the overall square footage of the house on the third level. These uppermost levels were used as either storage or as an extension of the habitable spaces of the house. Since it was socially prestigious to reside in a single-family house, often the two family homes had been articulated architecturally to appear as a large single-family house. This was achieved by having a common front porch and front door and a roof form that would span the full width of the house.



Figure 5: Typical Two Family House (Photo by Author)

Warner notes that the congested tenements in downtown Boston occupied 80 to 90 percent of their lot area while a triple-deckers and two family houses of the streetcar suburbs occupied only 50 percent of their lot area.²⁰ The greater open space, coupled with the fact that the wood frame buildings were free standing, provided both more light and air for the interior spaces and more green space surrounding the buildings. In contrast to the continuous masonry street facades created by the downtown row houses, the suburban streetscape provided a more porous street edge. This does not mean, however, that the suburbs lacked definition of the street space. On the contrary, the wood frame housing developments were tightly spaced and highly repetitive with rigorously aligned architectural elements such as front porches and front facades.

Since the typical footprints of the triple-deckers and two family houses were relatively consistent, the plot sizes were the determining factor for how closely spaced the houses would be. Naturally, the wealthier neighborhoods had larger yards, and therefore, a more porous street definition and a

more bucolic character in general. Conversely, the triple-deckers and two family houses in the lower middle class neighborhoods stood as close as 6 feet apart on extremely narrow plots. In these cases, the natural light was still available along the entire perimeter of the building, but the light entering from the side walls adjacent to a neighbor would be greatly diminished. Also, this extremely proximity to neighbors would decrease a sense of privacy within the house since the neighbor's windows were so close. The exterior spaces were also dramatically affected by such close spacing: the side yards became little more than a dark alley between the front and rear yards. Ironically, the aggregate effect of such closely spaced houses created neighborhoods of tremendous density and all but eliminated the beneficial aspects of building in the countryside.

The styles of these three wood frame multi-family house types kept pace with the prevailing architectural fashions from across America in the nineteenth century, from Greek Revival to Queen Anne, and from Shingle Style to Victorian. Variations in the three basic configuration types also occur with the addition of architectural elements, such as a bay window or a porch structure. It is important to recognize these variations, because they occur with great regularity and consistency. These added elements provide an identifiable difference between neighborhoods consisting of buildings of a similar type.

Wood Frame Construction

The predominance of the detached wood frame multi-family housing in Boston's emerging streetcar suburbs was not only predicated on the desire for more interior light and exterior open space, but also its popularity derived from its relative low cost and its ease of construction. Wood frame construction evolved from a confluence of three technological developments of the late eighteenth and early nineteenth centuries: mechanized saw mills, machine manufactured nails, and the balloon frame.²¹ The newly developed water-powered saw mills could produce the wood framing members, known as studs, joists, and rafters, with more accuracy and a greater efficiency than the traditional hand-sawn methods.²² This made more economical use of each logged timber, thus reducing the cost of the primary structural frame. This also made the framing members easier and less costly to ship, so wood could be harvested farther from its ultimate destination. Since these mass-produced framing members could be fabricated to standardized dimensions, wood frame construction materials and procedures became universally consistent in all regions of the country.

Hand-forged nails gave way to machine manufactured nails, further reducing the overall material costs of wood framing.²³ Once the cost of the mass-produced nails dropped to an insignificant proportion of the overall building costs, a new type of wood framing based on nailing instead of mortise and tenon joints was developed: the "balloon frame." Balloon framing became the prevailing wood frame construction method, thereby eliminating the necessity for cumbersome heavy timber frames. Labeled "balloon framing" due to its thin, membrane-like enclosure and lightweight structure, this new building technology revolutionized the construction of domestic architecture in Boston and across America.²⁴

There have been numerous attempts to pinpoint the date, the place, and the inventor of the balloon frame, but there is too much counter-evidence to assume that one particular person is responsible for its development. Sigfried Giedeon, in his book, *Space, Time, and Architecture*, makes an argument for crediting George Washington Snow with the invention of the balloon frame in the 1830s.²⁵ This version of the origins of the balloon frame is repeated frequently in

prominent studies of building technology, including Cecil D. Eliot's *Technics and Architecture: The Development of Materials and Systems for Buildings*, and the popular collegiate textbook, *Fundamentals of Building Construction: Materials and Methods*, by Edward Allen.²⁶ Ted Cavanagh, in his article "Balloon Houses: The Original Aspects of Conventional Wood-Frame Construction Re-examined," offers significant evidence that the balloon frame was not the invention of one person.²⁷

Cavanagh argues that the balloon frame is the result of an evolution of building practices spread over long periods of time and throughout the expanding limits of the young nation. Initially, there was great variation in the constructional detail of wood framing due in part to the lack of standardized building codes or the presence of the architectural pattern books that became prominent in the late nineteenth century. Wood frame houses were typically produced by small groups of craftspeople with a diverse set of building traditions which lead to a plethora of construction methods. The one thing, however, that builders of the rapidly expanding cities had in common was the desire to build economically.

By striving to produce buildings more easily and less expensively, builders realized that the repetitive, slender, vertical wood pieces that filled-in between the timbers of a traditional heavy timber frame could by themselves constitute a rigid structural frame. Eliminating the heavy timbers from the construction also eliminated the need for skilled craftsmen to produce the mortise and tenon joints required for heavy timber framing. The lighter, standardized wood members could be assembled with a modicum of standard framing details, making the knowledge of balloon framing accessible to all. The construction of wood frame houses, therefore, did not require great skill, sophisticated tools, or a great number of laborers. Instead, a pair of relative amateurs could erect a wood frame house with a few hand tools in a matter of months. The economic and constructional efficiency of the balloon frame put home ownership within reach of the growing working class.

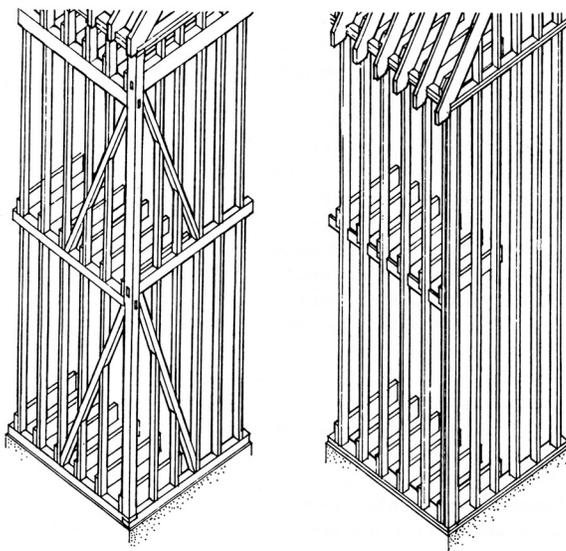


Figure 6: Left: Braced Frame; Right: Balloon Frame (from Elliott, *Technics and Architecture*)

To further simplify the production of domestic architecture, a limited number of house-plan types were repeated consistently throughout Boston's streetcar suburbs.²⁸ Given that the primary vertical wood members of a balloon frame were two stories tall, the two-family houses were perfectly suited for balloon framing. A balloon frame consists of a "sill plate" that is fastened to the foundation walls, then the two story 2" x 4" vertical framing members are nailed to the sill plate and terminated by a "top plate" running horizontally. The first level floor joists rest directly on top of the sill plate. A wood "ribbon" is recessed into the vertical members half way up to act as the bearing support for the second level floor joists. Finally, the roof framing is nailed to the top of the top plate.²⁹

The finished surfaces and the architectural details of both the interior and the exterior of the balloon frame house were layers of material that were also simple to construct. A layer of 1" x 8" horizontal sheathing boards were nailed to the vertical studs, and the exterior siding was simply nailed to the sheathing. Similarly, layers of wood lath and plaster were added to the inside of the studs. Architectural detail, such as windows, doors, bay window units, and wood trim were available from catalogues of factory-produced, prefabricated elements. The larger elements such as the windows were complete units with integral window frame, sashes, pulleys and counterweights. They were easily set into place and simply nailed to the rough frame. The installation of the trim required just a few saw cuts to the correct dimension and they could be nailed in place, too. Typically, the trim was designed to cover and hide the joints between the rough framing and the other layers and elements.

The row houses and triple-deckers are typically three stories tall, so the construction of these types employs a variation of the standard balloon frame to extend an extra level vertically. Having inspected numerous wood frame houses while their frame is exposed during current renovations, I have found that the framing of the row houses and the triple-deckers are strikingly similar. The one major difference between these types is that the row house has a masonry dividing wall between each house. Otherwise, the row houses and the triple-deckers frame the first level as a more traditional braced frame. A braced frame is reminiscent of heavy timber framing: large posts in the corners that are supported laterally with diagonal bracing.³⁰ The first level vertical members are just one story tall, and they are terminated by a large 4"x 6" girder running horizontally. The next two levels are then framed like a standard balloon frame house sitting on top of the braced frame below. The construction of the three story houses is a hybrid of both a braced frame and a balloon frame.

Conclusion: Cycles of Expansion

Theodore Dreiser, in his 1900 novel, *Sister Carrie*, describes a scene common to most major American urban centers in the late nineteenth century when he writes, "Trains flashed by them. Across wide stretches of flat, open prairie they could see lines of telegraph poles stalking across the fields toward the great city. Far away were the indications of suburban towns, some big smoke-stacks towering into the air. Frequently there were two-story houses standing out in the open fields, without fences or trees, lone outposts of the approaching army of homes."³⁰ Although Dreiser was describing the periphery of Chicago, the imagery connotes both the industrial and residential expansion experienced across urban America. Like Chicago, the last third of the nineteenth century in Boston was a period of astonishing growth. A series of technological, economic, and demographic factors created a series of self-reinforcing cycles that propelled the discrete port town on the Shawmut Peninsula to develop into a sprawling

metropolis. A cycle at the scale of the regional economy was created when a steady stream of immigrants were flooding into Boston to take advantage of the new economic opportunities wrought by the industrial revolution. The abundance of available labor was like fuel for the industrial fire: the growing population of wage earners in manufacturing created an even greater demand for the industrialized goods. The population in Boston began to grow geometrically, so the city limits had to expand to accommodate the masses.

A number of urban problems, however, quickly arose from the pressures of this intense cycle of production and consumption. First, the city became over crowded. Even though the perimeter of the peninsula had been expanded out further into the harbor, the urban core became intensely congested. Second, the income disparities between the established Boston families and the newly arriving immigrants grew exponentially. The poorest inhabitants incited frequent outbreaks of unrest due to the social and economic barriers that surrounded them. Third, the living conditions in Boston's core were increasingly unbearable for the middle and low-income groups. The row houses and tenement dwellings became over populated and bred disease, immoral behavior, and crime. Even working families had little opportunity for improved living conditions in the city due to the high demand and low supply of decent housing.

Expansion beyond the existing city limits and the construction of new housing was mandatory to feed the cycle of production and consumption progressing. This mandate for growth, however, was not the result of a governmental policy: instead, it was the rapaciousness of capitalism that demanded that the city expand to accommodate the emergent industries and the necessary populace both to work in the factories and to buy the goods that were being produced. The city government did, nonetheless, react to the pressures of capitalism to insure that urban and industrial development progressed in a mutually beneficial way. This generated another cycle of development at the scale of the city. An amalgam of private and public interests emerged where a farmer would sell his land to a developer, the City of Boston would build the roads and provide the services such as sewer and electricity, the developer would sub-divide the farm land and sell the plots to the middle-class working families, the families would build houses and pay taxes back to the city. As the population increased, the demand for services increased, and the tax revenues paid to the city would also increase commensurately.

The two technological advancements that were critical to the explosive development of the late nineteenth century city were the streetcar and balloon frame construction. The streetcar put the surrounding countryside in reach of the downtown core, and balloon frame construction offered a rapid and economical way to settle large tracks of available land with housing. The combination of these two factors became both the resolution to the deleterious effects of urban congestion and the instigation of yet another social/economic cycle at the scale of the individual house. Economical multi-family housing was built so that home owners could afford their mortgages by leasing out the other units in their house. The incoming immigrants were eager to lease a unit until they could afford to build their own multi-family house.

Balloon frame construction democratized the building of domestic architecture by making its cost and processes available to the commoner. Newly mechanized saw mills made lumber in more economical, standardized shapes and lengths that were far easier to transport than heavy timber framing. The tools required for balloon frame construction, namely a level, a hand held saw, and a hammer, were affordable and few in number. Additionally, the details of wood frame

construction were simple and easy to master, and the layered nature of wood frame construction could hide all the rough framing with factory produced architectural elements and trim. This new method of building houses perfectly complimented the rapid development of Boston's nineteenth century suburbs.

Notes:

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- ¹ Walter Muir Whitehill, *Boston: A Topographical History, 2nd ed* (Cambridge: Belknap Press of Harvard University Press, 1968)
 - ² Lawrence W. Kennedy, *Planning the City upon a Hill: Boston since 1630* (Amherst: The University of Massachusetts Press, 1992)
 - ³ Douglass Shand-Tucci, *Built in Boston: City and Suburb, 1800-1950, 2nd ed.* (Amherst: The Massachusetts University Press, 1999)
 - ⁴ Sam Bass Warner, Jr., *Streetcar Suburbs: The Process of Growth in Boston 1870-1900, 2nd ed.* (Cambridge: Harvard University Press, 1978)
 - ⁵ Kennedy, *Planning the City upon a Hill*, 39, 261
 - ⁶ Kennedy, *Planning the City upon a Hill*, 261
 - ⁷ Henry C. Binford, *The first Suburbs: Residential Communities on the Boston Periphery, 1815-1860* (Chicago: The University of Chicago Press, 1985), 179; see also Warner, *Streetcar Suburbs*, 10
 - ⁸ Warner, *Streetcar Suburbs*, 43
 - ⁹ Kennedy, *Planning the City upon a Hill*, 99
 - ¹⁰ Warner, *Streetcar Suburbs*, 3, 21-29
 - ¹¹ Kennedy, *Planning the City upon a Hill*, 261
 - ¹² Warner, *Streetcar Suburbs*, 22
 - ¹³ Charles W. Cheape, *Moving the Masses: Urban Public Transport in New York, Boston, and Philadelphia, 1880-1912* (Cambridge: Harvard University Press, 1980), 107-125
 - ¹⁴ Warner, *Streetcar Suburbs*, 61, 138
 - ¹⁵ Robert A. Woods and Albert J. Kennedy, *The Zone of Emergence: Observations of the Lower Middle and Upper Working Class Communities of Boston, 1905-1914* (Cambridge: The MIT Press, 1962)
 - ¹⁶ Warner, *Streetcar Suburbs*, 117
 - ¹⁷ Warner, *Streetcar Suburbs*, 108
 - ¹⁸ Shand-Tucci, *Built in Boston*, 120
 - ¹⁹ Robert Rugo, *Boston's Triple-Deckers* (Boston Redevelopment Authority, 1978), 4, 8, 9
 - ²⁰ Warner, *Streetcar Suburbs*, 140
 - ²¹ Edward Allen, *Fundamentals of Building Construction: Materials and Methods, 2nd ed.* (New York: John Wiley & Sons, 1990), 125
 - ²² Cecil D. Elliott, *Technics and Architecture: Development of Materials and Systems for Buildings* (Cambridge: MIT Press, 1992), 18, 19
 - ²³ Elliott, *Technics and Architecture*, 18
 - ²⁴ Allen, *Fundamentals of Building Construction*, 125
 - ²⁵ Sigfried Giedion, *Space, Time, and Architecture: The Growth of a new Tradition, 5th ed.* (Cambridge: Harvard University Press, 1967), 352
 - ²⁶ Elliott, *Technics and Architecture*, 18, and Allen, *Fundamentals of Building Construction*, 125

²⁷ Ted Cavanagh, "Balloon Houses: The Original Aspects of Conventional Wood-Frame Construction Re-examined," *Journal of Architectural Education*, September (1997), 5-15

²⁸ Warner, *Streetcar Suburbs*, 76, 130

²⁹ Elliott, *Technics and Architecture*, 18

³⁰ Elliott, *Technics and Architecture*, 18

³⁰ Theodore Dreiser, *Sister Carrie*, (New York: W. W. Norton & Company, Inc., 1970), 6