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# Standardization in the Lumber Industry: Trade Journals, Builder's Guides and the American Home

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## Abstract

This thesis provides a comprehensive analysis of the technical and structural changes that occurred within the American lumber industry in the half century after the Civil War. The format of this thesis is as follows: a review of relevant literature pertaining to all aspects of American wood-frame residential construction; a description and analysis of the lumber industry in America, focusing on how and why it reacted slowly to changes in demand for building supplies and was hesitant to adapt and incorporate new materials and technologies; an overview of the changes that occurred to residential wood-frame construction, e.g. the transition from heavy timber framing to light wood frame or “balloon”-style construction; an analysis of the varied ways in which the American lumber industry and others promoted standardized building materials. This thesis concludes by analyzing the impact that impact these changes had on American residential architecture. This thesis also acknowledges the ways in which this is relevant within the larger field of historic preservation, and how this information can be used to better understand, interpret and conserve wood-framed residential architecture in America. The purpose of this thesis is to offer a productive and useful document that will fill a void within the existing scholarship.



## Keywords

balloon framing, deforestation, transportation technology, grading, nail technology

## Disciplines

Architectural History and Criticism | Historic Preservation and Conservation

## Comments

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# STANDARDIZATION IN THE LUMBER INDUSTRY:
# TRADE JOURNALS, BUILDER'S GUIDES AND THE AMERICAN HOME

Winston Wallace Clement

A THESIS

in

Historic Preservation

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This thesis is dedicated to the memory of

Mary Lee Lowe Dayton

Who made this all possible.

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## CHAPTER 1 – INTRODUCTION

During the second half of the nineteenth century and early twentieth century, American residential architecture transformed dramatically with regard to construction methodology, style, and form. These changes were driven by several factors, including the professionalization of the architecture field in America, depleting forests, an increasing speed that information was circulated by the popular press, and standardization of methodology and production within the lumber industry. Of these reasons, all have received much scholarly attention except for the role of American lumber companies. This thesis attempts to fill that void in scholarship and link the changes in methodology, style, and form of American residential architecture to the lumber companies that provided the raw materials for each home.

This thesis provides a comprehensive analysis of the technical and structural changes that occurred within the American lumber industry in the half century after the Civil War. The format of this thesis is as follows: a review of relevant literature pertaining to all aspects of American wood-frame residential construction; a description and analysis of the lumber industry in America, focusing on how and why it reacted slowly to changes in demand for building supplies and was hesitant to adapt and incorporate new materials and technologies; an overview of the changes that occurred to residential wood-frame construction, e.g. the transition from heavy timber framing to light wood frame or "balloon"-style construction; an analysis of the varied ways in which the American lumber industry and others

promoted standardized building materials. This thesis concludes by analyzing the impact that impact these changes had on American residential architecture. This thesis also acknowledges the ways in which this is relevant within the larger field of historic preservation, and how this information can be used to better understand, interpret and conserve wood-framed residential architecture in America. The purpose of this thesis is to offer a productive and useful document that will fill a void within the existing scholarship.

A comprehensive review of literature, broken down by theme, provides key background information about my chosen topic because it presents the body of research that this thesis rests upon. Since the turn of the eighteenth century, the American lumber industry is a continual and recurring source of contention and inspiration for writers. Many of writings about the American home are directly or peripherally related to the American lumber industry. This body of written work ranges from scholarly theories, to historical analyses, to memoirs about one's experience in their home, to technical manuals and trade journals, based upon the desired audience. Authors explore the American home from many angles: descriptions of personal home construction, urbanization, suburbanization, and industrialization in twentieth century construction. Many published works link stylistic changes in building construction to a wide range of factors: technological improvements to building materials, new appliances for in-home use, the expanding role of women in the home, and the proliferation of pattern books due to improvements in book printing and distribution. Similarly, home construction is explored through the lumber production and the home improvement industry.

Within of these genres, unifying themes emerge and develop into a cohesive whole that shapes the way Americans think about the idea of home.

The lumber industry is among the oldest manufacturing industries in America. Its expansion was fueled by growing cities and expansion into the great west. The industry focused on logging and timber production to meet the growing demands of northeastern cities. Lumbering was known for its extreme fragmentation, as forests, sawmills, and retail outlets were often owned by different entities. Additionally, logging operations and transportation of products to the mills and lumber yards were controlled by still more companies. This far-reaching supply network was slow to react to changes in demand for products. As new materials were invented, including gypsum wallboard and mass-produced millwork, lumberyards were reluctant to stock these goods as they feared this would detract from their lumber sales. Additionally, lumberyards were often located on the outskirts of town along rail spurs due to their demands for easy rail access and large spatial requirements. The intended audience of lumber distributors was also in flux during this time period: while they needed to maintain their core audience of home-building professionals, many lumber dealers recognized that marketing their products directly to consumers (or "home handymen") could reap financial rewards. Their remote locations and limited audience also slowed their rate of change and insolated them from modernizations that were occurring elsewhere in society.

While the lumber industry was objectively resistant to changes in methods of production and distribution, great changes occurred during the second half of the nineteenth century and early twentieth century that necessitated modifications in

harvesting techniques and transportation methods. This period was marked by rapid deforestation in populated areas of North America. The ever-increasing need for lumber and wood products required loggers to move further afield to the far reaches of the south, Pacific Northwest, and up to the pine forests of Canada to meet this demand. As building lumber came from forests farther from the building sites, rivers were used to float wood down to sawmills. This required logs to be cut to a standard length in order to make the floats more manageable for the loggers. Additionally, technological improvements at saw mills, such as the shift from water to steam power and from circular saws to band saw blades, required a certain amount of standardization. Since the lumber had to travel farther and transportation costs escalated, initiatives were undertaken to reduce waste, including clear-cutting forestry techniques and implementation of thin-kerf saw blades. Despite initial resistance to change in business practices to keep up with a rapidly growing national economy, a variety of circumstances drove standardization as a means of increasing profit, streamlining operations, and meeting consumer demand.

During the second half of the nineteenth and early twentieth centuries, many improvements were made in the area of popular press and distribution of information in the United States. Trade journals formed for a variety of industries, including lumber and timber production. These publications were typically regional in scale, since the distribution of goods was limited by America's vast geography. Builder's guides were published to show carpenters how to construct increasingly complicated structures from readily available materials. Catalogs with kit house

plans and descriptions were widely circulated, promoting ready-cut house components that could be shipped by rail and assembled on site with minimal skill. Technological improvements including refined nail technology, innovative hand tools, and man-made building materials were promoted in advertisements in popular magazines favored by the middle class. Worker's rights, safety initiatives, and unionization efforts spread awareness of working conditions within the industry. All of these efforts forced standardization of material production techniques, labor practices, and supply chain formats upon an industry that was until this point highly resistant to change.

The standardization of lumber products had a bold impact on the style and form of American residential architecture. As balloon framing replaced timber frame construction, buildings took on a new undulating form that allowed for greater variation and irregularity in everything from room layout to roofline construction. New structural possibilities abounded as this framing technique allowed loads to be transferred farther and distributed among many smaller framing members. Authors and architects promoted a unified residential style with subtle regional variations. Design professionals could now generate plans for buildings far away without a specific knowledge of lumber industry operations within the area. This occurred simultaneously with the professionalization of the architecture and engineering fields in America.

This thesis attempts to fill a gap in scholarship within an area of architectural history that has received extensive scrutiny and interpretation. This thesis is relevant within the field of historic preservation because it analyzes the shifts that

occurred within American architecture. A comprehensive understanding of the reasons for these changes will help future preservationists interpret, promote understanding of, and protect our nation's built environment. It will conclude with an analysis of why this area has been neglected by scholarship, and what this says about the lumber industry's role in changes and developments to American residential architecture.

## CHAPTER 2 – REVIEW OF LITERATURE

Few building types have received more attention in American literature than the single-family detached house. Since the turn of the eighteenth century, the American home is a continual and recurring source of contention and inspiration for writers. This body of written work ranges from fictional novels, to scholarly analysis, to technical manuals and trade journals, based upon the desired audience. Authors explore the American home from many angles: descriptions of personal home construction, urbanization, suburbanization, and industrialization in twentieth century construction. They analyze the meaning of home, and link stylistic changes in house construction to a litany of factors: technological improvements, new materials, the expanding role of women in the home, and the proliferation of pattern books due to improvements in book printing and distribution. Similarly, home construction is explored through the lumber production and the home improvement industry. Within each of the above bodies of writing, unifying themes change and develop as time progresses. Despite the large amount of writing on the American home, an analysis of the role of lumber companies in promoting home ownership and the development of a singular style of residential construction has never been conducted. This gap in scholarship is one that I hope to fill with my thesis.

Authors repeatedly explore the role of the single-family house in American society. Similarly, the ideal of home ownership is described as the quintessential "American Dream." In *The American Family Home, 1800-1960,* Clifford Edward

Clarke, Jr discusses the notion of the "American Dream," including its history and precedents. Clarke generalizes that among the middle class, homes are a symbol of upward mobility. Specific housing types begin to dominate the landscape as features of everyday life are shared by most households. Clarke also describes that competition with one's neighbors often accompanies the notion of home ownership. Similarly, in *Where We Lived: Discovering the Places We Once Called Home: The American Home from 1775 to 1840*, Jake Larkin uses photographs, drawings, and documents from the Historic American Buildings Survey to reflect on the development of American home construction. Larkin's stated goal is to depict a house as a machine for living, while taking into account what those homes mean to the individuals or families that live there. In *The Evolving House: A History of the Home,* Albert Farwell Bemis and John Burchard show that homes evolve over time due changing societal expectations and inhabitant requirements.

Many authors have written scholarly books on the role of American home in society. These books place the home at the center of many societal reforms, including the women's movement and the settlement house movement. Gwendolyn Wright's *Building the Dream: A Social History of Housing in America* chronicles the American domestic environment as it evolves from the earliest colonial architecture through urban renewal schemes and mass-development projects. Wright links thirteen different kinds of dwellings to architectural and ideological models that play an important role in the development of American society and common culture. David Handlin's *The American Home: Architecture and Society, 1815*-1915 analyzes the diverse impacts of the home on the development of early American society and

popular culture. Handlin, an architect and teacher, begins with the Colonial period; and presents the role of Andrew Jackson Downing on the form of American homes as well as references to home in the writings of Walt Whitman and Henry David Thoreau. These books enrich our understanding of the home as they speak to the importance and relevance in a larger context.

The above studies that link sociology and architectural history provide a broader context in which to understand the place of the home in popular culture. General textbooks on American architecture, such as Leland Roth's *American Architecture: A History*, provide diverse depictions of the development of residential building styles and construction techniques. An understanding of the home within the broader context of American architecture is important since changes to one form of building tend to impact all others. Additionally, it goes without saying that lumber manufacturers and distributors rarely supplied only residential building projects.

The role played by urbanization on American residential architecture is a prevailing theme in other writings about the home. In *Making Houses, Crafting Capitalism: Builders in Philadelphia, 1790-1850*, Donna Rilling explores how residential construction and home ownership were important factors in Philadelphia's growth during the first half of the nineteenth century. The author divides her book into sections reflecting different sectors of the homebuilding industry: carpenters, building materials, millwork, construction sequence, and financing the work. Rilling recounts how several Philadelphia lumber dealers developed their businesses and prospered during this period. Her accounts link the

relative success of each carpenter to the economic conditions during their time of relevance, the amount of debt each took on, and the ways in which they kept their finances flexible in order to weather fluctuations in the economy. In *Nature's Metropolis: Chicago and the Great West*, William Cronon explores the growth of Chicago from treeless plane to great American city within a just a few decades. He organizes his book around the commodities that Chicago relies on, one of which is building lumber. Throughout the book Cronon explores how Chicago bridges the perceived dichotomy between the "natural" and "human" or built environment. Chicago is well-suited for this exploration since it is developed after the northeastern cities, and was seen as the gateway to the American west. Cronon also explores the role played by differences between urban and suburban locations, or town versus city.

As with urbanization, suburbanization is a common theme in literature about American homes. Suburbanization is perhaps the most American trends, and is tied directly to the ideal of home ownership. While the suburban ideal of a home to ones' self, on a small lot in a respectable community far enough from the center city to be free of urban vice, does not originate in America, it is a major part of our culture. Dolores Hayden's book *Building Suburbia: Green Fields and Urban Growth, 1820-2000* chronicles the growth of suburban zones around developing cities and characterizes them as places for noxious industry, light manufacturing, farming, and vice. In *Crabgrass Frontier: The Suburbanization of the United States*, Kenneth T. Jackson explores at great depth the rise of suburban residential zones. In his controversial book, one of Jackson's theses is that improvements to transportation

enabled the growth of suburbs. Omnibuses were the first mode of mass-transportation that allowed the common man to travel along established routes at scheduled times. Omnibuses were replaced by horse-drawn streetcars, and then by steam locomotives, and finally by electric trolleys. The acknowledgement of pre-automobile suburbs goes against the common assumption that the private automobile enabled the growth of suburbs. However prevailing arguments of the suburbs are constantly changing.

Housing changed dramatically as new industries emerged to drive population movement and enable mass-production of housing. In *Magnetic Los Angeles: Planning the Twentieth-Century Metropolis*, Greg Hise presents Los Angeles as a modern city whose development was quite different than that of Chicago or Philadelphia. Hise presents the development of Los Angeles as one fueled by federal government-sponsored large-scale housing developments following the format of modern community planning. He then discusses the idea of a new conception of modern houses: ones better suited to ever-changing social expectations and modern means of production. He discusses at length prefabricated housing manufactures, including Pacific Ready-Cut and Kaiser Community Homes. Similarly, in *194X: Architecture, Planning, and Consumer Culture on the American Home Front*, Andrew Shanken documents preparations for post-World War II growth undertaken by architects. While engineers and urban planners were in high demand during the war, architects had difficulty finding work and started a movement to change the course of their profession to include master planning for post-war large-scale projects. In *Building a Market: The Rise of the Home Improvement Industry, 1914-*

*1960*, Richard Harris uses the same period to show how the home improvement industry also altered its course to increase its customer base to include first-time homebuyers after the war effort. *Building a Market* depicts the lumber industry as one that is fragmented, outdated, and highly resistant to change.

One genre of writing within this category is the memoir, or books devoted equally to the physical structure of a house as well as the associations of life within it. In *The Big House: A Century of Life in the American Summer Home*, George Howe Colt describes at length his family's retreat in Buzzard's Bay in coastal Massachusetts. Howe tracks changes to building technology by chronicling the modernization campaigns and renovations that have occurred within his home. With each alteration that is made to the structure, Howe chronicles the history behind products used, analyzes what the changes show about expectations and standards for comfort within a home, and assesses how the alterations contribute to (or detract from) the functionality of the building. As an academic historian and preservationist, Howe's use of the memoir genre sheds light on not only the changes that are made, but the impact they have in both a personal and group setting. This book is particularly strong in its discussion of residential construction, including "balloon"-style framing, early iterations of gypsum wallboard, the safety hazards posed by outdated electrical systems, as well as general upkeep and maintenance items.

A common argument in literature about the American home is that technological developments in building materials directly caused great changes in American residential architecture during the nineteenth and twentieth centuries.

While this is not the only factor, technology did play an undeniable role in stylistic and programmatic changes that occurred in housing. In *Cheap, Quick, & Easy: Imitative Architectural Materials*, Pamela Simpson presents an encyclopedic list of materials that were invented during this period. The unending quest for material efficiencies and labor-saving practices drove much of this development, as did wartime advances in manufacturing and new applications for existing materials. So many new building materials were invented during the last century, for example, that entire books are devoted to the subject (such as *Construction Since 1900: Materials* by David Yeomans). H. Ward Jandl's *Yesterday's Houses of Tomorrow: Innovative American Homes, 1850-1950* argues that modifications in style to residential structures are caused by industrial and political revolutions that occurred during this period. Jandl presents the massive influx of immigrants who required immediate housing between the Civil War and World War I caused rapid and sweeping changes. In addition to population growth, new forms of transportation enabled outlying areas to be developed more easily. Increased household comforts and amenities such as indoor plumbing and gas lighting became commonplace during this period, followed by electricity and indoor climate control systems. Jandl cites improvements to building technology, including cut nails, Portland cement, and balloon framing, as driving forces in changes to residential housing in growing American cities and their environs.

While the above arguments for changes to domestic architecture are largely grounded in human geography and technology, changing perceptions within the home, largely coming from women, also played an important role in the design and

layout of the American home. Perhaps the first and most widely read work of feminist literature is *The American Woman's Home* by Catherine E. Beecher and Harriet Beecher Stowe. The Beecher sisters promoted their work as a guide to the formation and maintenance of economical, healthful, beautiful, Christian homes. They stressed the importance of the mother as the center of the family and the minister of the household. They recounted aesthetic and practical considerations for house design, and emphasized that a proper home required scientific planning. Their ideas for a modern kitchen, designed specifically for its primary user, standardized many features found in today's homes: built-in cupboards and shelving units, different areas for food preparation and dish washing, and purpose-built storage areas for different types of cooking ingredients. The Beecher sisters observed the trends that homes were increasingly becoming free of servants, and thus embraced newly invented technology such as ranges, refrigeration, and kitchen gadgets. This genre of literature continued throughout the following century and a half, and is documented in Dolores Hayden's *The Grand Domestic Revolution: A History of Feminist Designs for American Homes, Neighborhoods, and Cities*. Jane Davison and Lesley Davison's *To Make a House a Home: Four Generations of the American Women and the Houses they Lived in* chronicles the changes enacted by this genre of writing. In addition to books, many magazines published during this period presented tips to homemakers for improved quality of life. *Godey's Lady's Book*, published 1830-1878, promoted the "own your own home" movement. *Ladies' Home Journal*, initially published in 1883, offered advice to homemakers on architectural styles and furnishings to a wide circulation of over a million.

The pattern book movement played an important role in spreading a unified architectural style across all parts of the country. Asher Benjamin's *The American Builder's Companion* consisted of a set of builder's guides showing how to construct various buildings needed within a town. Samuel Sloan's *The Model Architect* and *City and Suburban Architecture* broadcasted plans that were universally applicable, and could be modified as needed to suit specific community requirements and site conditions. Andrew Jackson Downing and Alexander Jackson Davis's *Cottage Residences* presented elevation drawings of houses suited for different surroundings. *Cottage Residences* was organized on the principal that one's house should reflect one's profession and economic standing, and avoid ostentation in order to meld with the landscape. The pattern book movement is the subject of much scholarly work analysis, including Daniel Reiff's eponymous *Houses from Books: Treatises, Pattern Books, and Catalogs in American Architecture, 1738-1950: A History and Guide*.

In addition to literature on residential architecture, the lumber industry is subject to much description and critique in books published for members of the field as well as lay persons. Especially relevant are two books by Arthur Newton Pack: *Our Vanishing Forests*, and *Forestry: an Economic Challenge*. In both books Pack's anticipated audience is the educated public—those not directly involved in the lumber industry, but outside observers including potential first-time homebuyers. Each book was published during the first quarter of the twentieth century, and captures the lumber industry at a time when it was still lacking unity but struggling to promote its products to compete with man-made alternatives. Additionally, A.W.

Shaw's *Report on the Profitable Management of a Retail Lumber Business* provides a valuable reference point for this thesis since it includes a survey of nearly 400 lumber companies and the steps they have taken to modernize and streamline operations in an attempt to remain profitable.

During the nineteenth century, the publication of trade journals proliferated across many industries within America's growing economy. The lumber industry was at the center of this development, as lumbermen began publishing journals in many areas of the country to market their products, promote new technology, and share prices across different market sectors. Within the lumber industry, trade journals were the force that began to organize and unify a part of the commodities trade that was notoriously segmented and lacked integration either vertically or horizontally. In short, trade journals initiated a movement to modernize the industry and streamline operations through shared information and mass-marketing.

For the purposes of this thesis, trade journals provide a fascinating opportunity to delve more deeply into the industry as it attempts to overcome hurdles caused by fragmented supply chains and increasingly complex supply networks between lumber sources, sawmill, wholesaler, retailer, and buyer. Relevant journals include *American Lumberman* (active starting 1898) and *Building Supply News* (active starting 1917) will factor into this thesis. Each journal provides a wealth of primary sources, including advertisements with detailed illustrations and topical articles chronicling industry trends.

Finally, technical reference manuals written for building professionals show how trends in building construction alter requirements for carpenters. Written descriptions often include references to the specific tools and prevailing techniques used for each phase of construction within the building sequence. The four volume set *Audel's Carpenter and Builder's Guides* provides an invaluable description of construction practices at the turn of the twentieth century. Much has been written about the configuration of framing members of early American timber frame buildings, and historical analysis is omnipresent. However contemporary technical reference manuals, including Francis D.K. Ching's *Building Construction Illustrated* and Edward Allen and Joseph Iano's *Fundamentals of Building Construction: Materials and Methods* avoid historical construction techniques and instead stress the state-of-the art. Through a working understanding of today's methods combined with a comparative analysis of previous techniques, one can determine the great changes that have occurred in the field of residential home construction throughout the past two centuries.

While the American home is the subject of countless written works, the role played by the lumber industry in promoting new, mass-produced products has not received sufficient analysis. Descriptions about mass-production and changing industrial practices typically shy away from the lumber industry for the following three reasons. First, lumber is considered to be a commodity, so the focus is on the amount generated (in "board-feet") and not the manufacturing process itself. Second, the lumber industry is arguably the oldest industry in the United States, and up until the second half of the twentieth century refused to modernize its methods

of supply and production. Finally, and perhaps most importantly, during this period the lumber industry is highly fragmented and divided by geographic region. This thesis will address each of these three concerns while filling the void in literature pertaining to the lumber industry's role in promoting new, mass-produced products to retailers and potential consumers.

## CHAPTER 3 – MARKETING AND PROMOTION IN THE AMERICAN LUMBER INDUSTRY

The lumber industry is among the oldest commodity trades in the United States. The distribution of wood products began with the earliest European settlers, and manifested itself as individuals and loosely affiliated groups of lumbermen working to serve their village. The formalization of the lumber trade was born out of the need to supply growing cities with building products, and further expanded as forests surrounding these cities were depleted and lumbermen had to go further afield to cultivate their stock. Since the United States developed largely without the trade guilds present in Europe, there were few governing bodies or professional organizations to link and coordinate between lumbermen. Any semblance of a professional trade group was not established until much later, and by this time the lumber industry was slow to react and embrace new technologies.

### Background and History

When settlers first arrived in the New World, they found an unbroken expanse of timber. The American ideal of home-sweet-home consisted of a wooden cottage, not a stone palace as in other areas of the world. Even stucco houses were wooden, albeit disguised in a masonry coating to simulate stone. With old-growth trees at lumbermen's disposal, durability was not an issue. Rot and insect resistance was created through inherent characteristics of the material, or through an applied

finish or preservative.[1] To mitigate the risk of fire danger to wooden structures, roofing materials of different structures (including shingles made of non-wood products) were applied to prevent the spread of fire from airborne sparks. A variety of wood species were used, based upon regional variation in forest growth, and wood was the basis of many other household products around the home, including lamps, clocks, and broom handles.

Outside of the home, wood products proliferated throughout the built environment. Wood was used for railroad ties due to its ease of use and durability. Utility poles, usually of cedar or creosoted pine, grew to accommodate new developments in communication technology. Packing boxes, and crates, hard and soft wood barrels, and wooden paving blocks were also embraced by manufacturers as the population grew and the economy became increasingly industrialized. Printing of books, magazines and newspapers also contributed to deforestation.

Unlike Europe, which was largely coal-dependent, wood was also used as a fuel source throughout the United States because it was both affordable and readily available. Wood heat was more labor-intensive than coal, as it requires constant stoking to throw consistent heat, but was used due to the fact that alternative fuel sources proved to be prohibitively expensive. Use of cord wood and forestry byproducts as a fuel source for home heating contributed to the rapid deforestation of North America.

[1] Arthur Newton Pack, *Our Vanishing Forests* (New York: The Macmillan Company, 1923), 4.

Deforestation forced lumber producers to harvest their goods further and further away from the urban centers where demand was highest. This drove up production costs and necessitated technological improvements in transportation, including a growing network of railroads and canals.[2] To compensate for this, lumber manufacturers turned to lumber production methods that created less waste, including thin-kerf saw technology, as well as vertical integration between timber source owners, sawmills, and transportation companies; and standardized lumber sizes.

Standardization and Marketing

At the turn of the twentieth century, the American lumber industry was notoriously entrenched in its ways and highly segmented by regional geography. The lumber industry was slow to react to changes for products, as the industry lacked a single trade magazine until 1895. Lumber dealers were predominantly located at the outskirts of town, along rail spurs. This was a result of limitations in the transportation of goods, and was not conducive to responding to consumer demands. With regard to ownership, lumber yards were lacked horizontal integration: typically, an owner either possessed a single retail location, or a small regional chain of distributors. Lumber yards were slow to diversify their offerings to include other building materials such as masonry products or millwork, and resisted consumer demands to stock panelized products such as wallboard, since they

[2]Donna J. Rilling, *Making Houses, Crafting Capitalism: Builders in Philadelphia, 1790-1850*, (Philadelphia: University of Pennsylvania Press, 2000), 93.

worried this would cut back on their sales of traditional wood products. This resistance backfired, however, as manufacturers of these products marketed them directly to consumers and bypassed lumber dealers altogether. Thus modernization of the lumber industry only came about as economic demands necessitated it.

By the early 1900s, new building materials were developed that replaced traditional wood products, including gypsum wallboard, cinderblock, Beaverboard, and asphalt roof shingles. These materials were easy to acquire and install, and in the case of Beaverboard, featured instructions printed on the reverse of each board. Additionally, tools for the "do-it-yourself" market were available, including the electric drill and scroll saw, which helped promote the idea of the home handyman.[3] However despite these advances, consumer-oriented lumberyards still did not exist by the 1920s. Instead, large lumber manufacturers distributed their goods to small retailers, who in turn distributed products directly to builders.

At the turn of the twentieth century, there was still no standardization of lumber size, grade or species. Wood was sold in various types, sizes, and qualities, determined largely by the vendors. Standardization took place slowly; Yale University founded its School of Forestry in 1901, which taught industry best practices and the first of its kind in the United States.[4] The first trade organization to deal specifically with enforcement of lumber quality control standards, Northeastern Retail Lumberman's Association, began operating in the 1920 and

[3] Richard Harris, *Building a Market: The Rise of the Home Improvement Industry, 1914-1960* (Chicago: University of Chicago Press, 2012), 57.
[4] Harris, *Building a Market*, 60.

developed standards for grading. Northeastern Retail Lumberman's Association stamped grading standards directly onto each board at the end grain so as not to be visible once the board was in utilized. The introduction of grading standards was necessitated by the intermixing of wood species with the rapid expansion of Western Fir and the lack of uniformity of finished lumber sizes.

While manufacturers of specialized building materials turned to promotion in the popular press in order to generate brand recognition, the lumber industry was among the last industries to adopt advertising. The first lumber advertisements were printed in 1923.[5] At first, advertisements only advertised their particular species of wood, not their entire product line. Advertising was slow to take off, due to variability in the lumber supply chain: some mills only operated when demand for their products was strong. Additionally, striking combativeness between different regional trade organizations hindered cooperation between manufacturers. In 1921, the American Hardwood Manufacturing Association limited competition among manufactures of different species.[6]

Distribution of lumber proved to be another hindrance to advertising of building materials. Distribution networks were complex and not integrated across the country. Middlemen were everywhere, and regional and local variations in sizes and grading standards further complicated the industry.[7] These characteristics meant that cost increases were everywhere: between the manufacturer and retailer,

[5] Harris, *Building a Market*, 65.
[6] Pack, *Our Vanishing Forests,* 27.
[7] Harris, *Building a Market*, 70.

between the retailer and the railroad, and between the railroad and wholesaler. Obviously costs increased as well between the wholesaler and the consumer.

By the 1920s, lumber manufactures responded to the above challenges through vertical integration between lumberyards and sawmills. Also during this period, mail-order home building companies began. The main problem for mail-order builders was distribution. New homes are built of various materials from different sources, all of which came from specialized retailers. Mail-order lumber companies were a major driving force in diversifying product lines at lumber dealers. New materials such as wallboard and asphalt shingles were now sold at lumberyards. Significantly, many of these products replaced wood products. Mail-order builders were also among the first to incorporate branded products, such as Beaverboard, to make a sale.

Lumber Yards & Distribution

American lumberyards have struggled to meet the demands of modernizing consumers. Unlike in other industries, lumber dealers did not immediately see the need to create a more consumer-friendly interface for their patrons. At the turn of the twentieth century, lumber dealers were not equipped to deal directly with consumers. Manufacturers provided ads for lumberyards to distributors. Beaverboard was the first product to do this, in 1903.[8] Chains were predominantly metropolitan in scale, and lumberyards serving urban areas tended to be larger and located within closer proximity to one another than rural yards. Line yards, or

[8] Harris, *Building a Market*, 76.

lumberyards owned by a single operator spread out along a rail line, were the extent of horizontal integration. Profit margins were tight, and resentment was widespread when new lumberyards opened up nearby existing retailers. Mail-order catalogs, which will be discussed in more detail below, experienced similar resistance.

Lumberyards lacked a standard system of accounting or ability to compare costs between distributors or retailers. While small-town dealers were more diversified, urban lumberyards remained wood-only. Urban dealers resisted the demands of consumers to broaden their product lines as they worried this would cut down on sales of lumber, which historically had been the basis of their business.

At the turn of the twentieth century, locations of American lumberyards were limited by available methods of transportation. The yards had to be located close to rail lines or large harbors. These locations were typically far from central business districts, in neighborhoods that were often unattractive or threatening. Lumberyards were slow to adapt, and refused to offer credit to consumers, which was the norm in other industries. The commonly-accepted issue was that lumber dealers thought of themselves as lumbermen first, retailers second. They were reluctant to make lumber manufacturers more marketable, and reluctant to diversify their offerings to suit the consumer.

Mail Order Catalogs and the Advent of the Kit House

The rise of mail-order catalogs played a large role in the unification of the lumber industry, as it was perceived as a threat to unite against. Mail order catalogs

were enabled by the advent of rural free delivery mail service from the United States Postal Service. Rural free delivery started at the end of the nineteenth century, and became a country-wide service in 1902 designed to provide mail delivery service to rural farmers. Mail took off at this point due to rural free delivery.[9] The first companies to promote kit house were lumber companies, especially Aladdin Company, based in Bay City, Michigan and founded in 1906. Aladdin advertised its houses as "Readi-cut" and "Built in a Day."[10] Aladdin sold more than 75,000, mostly in the Midwest, in its 75 years of business.

The kit house industry forced the lumber industry to break the mold of the typical lumberyard. Kit house manufacturers were sophisticated wholesalers and manufacturers that shipped their products directly to consumers. Until the 1920s, shipment of kit housing was only possible by rail, and the customer had to arrange for pickup and transfer from the station. Yet as Aladdin honed its products and improved its distribution systems, it had to dramatically alter its marketing program. The promotion of kit houses through a mail-order catalog was fundamentally different than marketing for lumber products. With kit houses, the customer was a consumer, not a contractor. Marketing techniques were used to appeal mainly to women, and promoted a house that was less labor-intensive for the homemaker.[11] Kit house marketing stressed modernity and efficiency, but also

[9] United States Postal Service, *History of the United Postal Service, 1775-1993* (Washington: The U.S. Postal Service, 1993), 7.
[10] Aladdin Company, *Aladdin "Built in a Day" House Catalog, 1917* (New York: Dover Publications, 1995), 102-105.
[11] Harris, *Building a Market*, 106.

affordability. By selling directly to the consumer, kit house manufacturers such as Aladdin cut out any opportunity for a middle-man to hide cost increases.

Kit houses represented a new form in home construction: they saved time, generated less waste, and required less skill to erect. In response to initial pushback from the building trades, Aladdin placated tradesmen by marketing the kits to carpenters as well as potential homebuyers, and stressed the quality of the lumber that was shipped.[12] With kit houses, Aladdin claimed, carpenters were more productive, and could complete more houses per summer than with standard balloon-frame construction. Yet lumber dealers realized that a potential new revenue stream, via direct sale to consumer, was being siphoned off by kit house manufacturers.

In order to prevent loss of new business to mail-order home manufacturers, lumber dealers modernized their marketing practices to directly market products to the consumer. In 1915, the newly-established trade journal *Building Supply News* initiated monthly publication to promote unified marketing standards and distribution standards. This was undertaken specifically to reform an industry that was notoriously slow to keep up with sweeping changes in the field of home construction, residential design, and marketing techniques.[13] Trade journals such as *Building Supply News* promoted better marketing among national and regional

[12] Ronica Roth, "Built in a Day: Capturing the Era of Catalog Architecture," *Humanities: The Magazine of the National Endowment for the Humanities*, vol. 19, no. 5 (September/October 1998), 19, accessed April 20, 2014, http://www.neh.gov/humanities/1998/septemberoctober/feature/built-in-day.
[13] *Building Supply News*, Volume 12, Number 1, (Chicago: Cahners Publishing Company, 1922), p. 104.

manufacturers, experienced challenges since lumber advertisements lacked the convincing prose found in kit house promotional materials.[14]

The formation of kit housing manufacturers such as the Aladdin Company, followed by its main competitors Montgomery Ward and Sears, Roebuck and Company (both based in Chicago, Illinois) and T. Eaton & Company (based in Toronto, Ontario) forced lumber distributors to modernize and streamline their operations. Lumber dealers had to push for a better public face, and create a brick-and-mortar showroom for their diversified product lines in downtown locations. Yet kit house manufacturers held a distinct advantage over lumber dealers in that kit houses could provide financing options to consumers through loans and selling upon credit. Thus lumber dealers maintained the upper hand at the turn of the twentieth century.

Looking Ahead Within the Industry

Dramatic change occurred in the American lumber industry at the turn of the twentieth century. Technological innovations allowed rapid improvements in forestry techniques, transportation, sawmill production, and distribution to retail outlets. Retail outlets, too, diversified their offerings beyond traditional lumber. While rail and harbor geography still limited locations where lumberyards could exist, expansion towards central business districts came in the form of brick-and-mortar display storefronts. Finally, the mail-order catalog business forced the lumber industry to unite and speak in forms that the modern consumer could

[14] Harris, *Building a Market*, 118.

understand and appreciate. Yet despite these changes, the lumber industry still trailed consumers with regard to housing form and lifestyle changes that occurred during this period.

## CHAPTER 4 – LUMBER: LABOR AND TECHNOLOGY

The American lumber industry grew significantly during the nineteenth century to meet needs of the nation's growing cities. Forestry techniques, transportation technology, sawmill operations, and lumber retail activities all changed dramatically. Lumber companies expanded their offerings to meet the challenges of deforestation: by the middle of the nineteenth century, available woods included oak, walnut, maple, ash, tulip, hemlock, birch, and pine. These industry shifts coincided with changes to building styles and patterns of settlement that forever changed the course of American residential development.

### Forestry Techniques

Harvest, transport, manufacture of lumber required extensive labor and capital. Before 1860, logging activities occurred predominantly during the winter months, since felled trees were hauled out of the forest on skids across ice. As rivers and lakes began to freeze over in October or November, logging crews descended into the forest to prepare shelters and camps that would last them through the winter. Lumberjacks labored until April or May, when rivers and streams thawed and began flowing again.[15] This schedule dovetailed with the planting season, which enabled many farmers to work in the forests during the winter. In frontier cities,

[15] Donna J. Rilling, *Making Houses, Crafting Capitalism: Builders in Philadelphia, 1790-1850* (Philadelphia: University of Pennsylvania Press, 2001), 97.

these dual livelihoods provided a worker with enough income to sustain a family and warrant the move out west.

During the 1850s, lumbering took place in a variety of working situations. The average crew size was 15 men, which grew to 50-100 workers after the Civil War.[16] Initially, the industry lacked vertical integration: source owners, sawmills, transporters, lumber yards, and consumers were all separate entities. Many lumber camps consisted of small independent operators managed by a single entrepreneur that were contracted by sawmills or absentee landlords to cut the trees. However larger lumber firms owned their own land and hired crews of seasonal workers. Each crew was expected to construct their accommodations near the property that was to be lumbered. Conditions improved over time, and by the 1880s lumber camps consisted of several buildings and moderately comfortable living quarters.

The fact that much of the lumber industry was dependent upon climate (out of everyone's control) further complicated the lumber production process. Logging operations focused around the winter cutting season. Workers felled trees with axes or saws; axes remained more popular than saws until the 1870s. The felled trees were then stripped of branches, and cut to manageable lengths of 12' to 16'.[17] Workers then stacked the prepared logs onto skids, secured the logs in place with chains, and hitched the whole assembly behind teams of horses or oxen using a block and tackle. To make the skids easier to maneuver, workers created icy

[16] William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W. W. Norton & Company, 1992), 156.
[17] Rilling, *Making Houses, Crafting Capitalism*, 98.

skidways through the forest to reduce friction under the skids.[18] Workers attempted to moderate the speed that the loaded skids traveled by applying sand and other aggregates to the skidways. Careful preparation of the skidways was imperative since a fully loaded skid contained 10,000 or more board-feet of lumber.[19]

Log Transportation

Once logs were hauled out of the forest, water carried the wood the remaining distance to the mill in a dangerous and labor-intensive process. Oxen and horse teams carried the lumber to stream banks where workers unloaded and stacked the logs close to the ice. Logs were then punched with an identification stamp at the end grain to denote ownership and enable sorting of the lumber once the logs reached the mill. During the two or three weeks of heavy spring snowmelt, the rising water carried the assembled logs downstream. Log jams often proved deadly, and when they formed workers had no choice but to climb on top and attempt to dislodge them with long picks called peaveys. Log jams could back up the flow of a river for miles, and lift up to heights exceeding 40'.[20] It was imperative that lumberjacks catch log jams early in order to keep the wood moving downstream to the mill in a safe and efficient manner. Priorities within the industry included cost-effective manufacturing, as well as timely delivery of the product.

[18] Cronon, *Nature's Metropolis,* 159.
[19] A board-foot is a unit of measure for the volume of lumber. It is used within the American and Canadian lumber industries to denote quantities of finished lumber. it is the volume of a one-foot length fo a board one foot wide and one inch thick.
[20] Michael Williams, *Deforesting the Earth: From Prehistory to Global Crisis* (Chicago: University of Chicago Press, 2010), 246.

When the rough logs reached the mill, they were pulled ashore and sorted by a boom company. A boom, or floating log corral, consisted of chained-together logs anchored by log-and-stone cribs, which served as a collection point for logs floating downstream.[21] Boom companies shared the expense of building and managing dams, booms, and holding basins where logs were sorted. Using the identification markings that were applied to the end grain of the logs, the boom companies were responsible for delivering the logs to the appropriate mill.

As deforestation expanded and lumbering activities extended further to the hinterlands, lumber companies turned to new strategies to remain profitable. Transportation innovations, including canals and railroads, led to cost and time savings for manufacturers. Dependence upon rivers and streams to move logs decreased as lumber companies turned to these new technologies. Transport by rail meant that lumber could arrive at mills consistently throughout the year, since it was no longer dependent on spring floods. This also meant that lumber companies could now transport hardwoods that did not float, including ash, oak, hickory, and maple. Shipment by rail also had indirect effects on industry practices: since railroads charged by weight, it became financially prudent for lumber companies to dry their products before shipment, since "green" lumber weighed considerably more than seasoned lumber. Choice timber disappeared quickly; this scarcity shifted regional competition and forced lumber companies to go farther afield, which necessitated transportation improvements. Additionally, since choice trees in many

[21]Kyle R. Weaver, ed., *Pennsylvania Lumber Museum: Pennsylvania Trail of History Guide* (Mechanicsburg, PA: Stackpole Books/Penna. Lumber Museum, 2005), 17.

forests had already been cut, lumber companies turned to the practice of clear-cutting forests. Since the price per board-foot increased as demand for dimensional lumber skyrocketed, lumber companies now found it profitable to cut trees as small as 6" to 8" in diameter.[22]

Sawmill Technology

Similar to lumbering techniques, sawmill technology changed dramatically during the nineteenth century. Sawmill operators needed capital for initial construction, repairs and replacement of equipment to keep up with changing industry standards, and daily operation. Additionally, sawmill operators also had to keep reserve funds to pay for injuries and delays. The lumber milling process varied widely to meet seasonal peaks in supply and demand. Mills were busiest after spring thaws, when most lumber arrived from the boom companies. To meet demands from lumber consumers in isolated locations sawmills cut boards of standard length and dimensions. Standardization was necessary to appease buyers who purchased their lumber from remote producers without the possibility of a visual inspection before making payment. Early mills used gangs of rip saws (called "muley" saws) mounted on light vertical frames that could cut a log into several boards simultaneously.[23] Later mills used massive iron circular saw blades which provided a more consistent cut and were easier for mill workers to control. At the end of the nineteenth century, lumber mills began using band saw blades, which were thinner

[22] Cronon, *Nature's Metropolis,* 194-201.
[23] Carroll W. Pursell, *The Machine in America: A Social History of Technology* (Baltimore, MD: Johns Hopkins University Press, 2007), 157.

and generated less waste wood (known as "kerf") than earlier forms of saws.[24] Once cut, lumber was stacked and air dried to reduce moisture content. Kiln drying was not embraced by larger mills until 1920, and among smaller mills until much later.[25] Until the 1870s, only the finest "clear" parts of the log were retained after milling (the rest was discarded or used for fuel). But as the nineteenth century drew to a close and costs of lumbering operation increased due to deforestation, wood of varying grades was retained and shipped to the wholesaler.[26] Once cut, lumber was loaded onto ships and carried to market. Rather than wait for air drying to occur, wood often arrived with high moisture content and was left to dry once it arrived at the lumberyard.[27]

At the turn of the twentieth century, the American lumber industry was marked by vertical integration across all phases of lumber production. Most lumber dealers were located in large cities and owned interests in forests and mills in the hinterlands. Because so much lumber production was done without knowing when or by whom the lumber would be purchased, a great deal of funding had to be generated to finance the whole operation. The time between initial lumber harvest and retail sale tied up funds. Lack of capital was a major problem within the industry, as were inability to secure credit and pay back wages. Many of the challenges to keeping lumber companies afloat were caused by water. Lumber ships

[24] Bill Gove, *Logging Railroads in the Adirondacks* (Syracuse, NY: Syracuse University Press, 2006), 33.
[25] Kenneth L. Smith, *Sawmill: The Story of Cutting the Last Great Virgin Forest East of the Rockies* (Fayetteville, AR: University of Arkansas Press, 1986), 27.
[26] James Elliott Defebaugh, *History of the Lumber Industry in America, vol. 2* (Chicago: The American Lumberman, 1907), 357.
[27] Cronon, *Nature's Metropolis,* 163.

periodically ran aground or sank; similarly, too little snow in the winter months prevented successful log drives, and spring flooding or droughts both caused log jams. And during the fall and winter seasons, thousands of workers earned wages (and required food and other supplies) while lumber lay dormant waiting for spring. A wide range of natural and man-made variables prohibited consistent income streams and dependable sales figures.

Financial Constraints

The unpredictable nature of the industry caused perennial cash-flow problems for lumber company owners and operators. Cash shortages meant that workers were often slow to receive their wages during winter months.[28] Lumber companies dealt with this problem by employing cost-cutting measures such as not buying supplies, reducing production, not paying off debts, and laying off workers during the lean months. Vertical integration of lumber companies was beneficial since it allowed them to shift funds around seasonally to where it was needed: from logging operations, to mills, to lumber yards.

Given the tight financial constraints of the lumber industry, mill owners were eager to ship all of their products to market regardless of the grade or quality. Little effort was paid to separating the good from the bad. Wood was often shipped to market "green" to meet demand, since wood drying in yards was not earning money. The wood that was shipped varied widely in dimensions, dryness, knottiness,

[28] Wilson Martindale Compton, *The Organization of the Lumber Industry: With Special Reference to the Influences Determining the Prices of Lumber in the United States* (Princeton: Princeton University Press, 1916), 18.

sappiness, degree of finish, and quality.[29] Initially, wood was sorted into categories according informal rules superficially resembling those used for grain: how many knots, and how large? How wide and long is the board stock? Are sap stains present? Is the wood warped, cupped, checked, racked, twisted, split, or deformed in some other way? Different standards were employed depending upon the end use: building lumber, roofing shingles, and plaster lath had separate standards identifying them as clear, first common, second common, end so forth. Generally speaking, clear lumber was used for finishing, and common is of lower quality. The creation of a standardized grading scheme was necessary since consumers often paid for their lumber orders first without seeing the actual goods they were purchasing. This pattern increased once railroads were used to ship lumber greater distances from mills and lumberyards.[30]

Lumber Dimensions and Grading

As publication of pattern books and builders' manuals increased in both numbers and geographic range, a standardized system for lumber grading and dimensions became necessary. Regional grading schemes with effective enforcement did not appear in the lumber industry until the 1890s. Grading systems varied by region, and usually were set by industry leaders in regional cities that controlled the area's economy, such as Buffalo and Chicago.[31] In addition to building

[29] J.F.C. Walker, *Primary Wood Processing: Principles and Practice* (Dordrecht, The Netherlands: Springer, 2006), 341.
[30] Cronon, *Nature's Metropolis,* 178.
[31] Agnes Mathilda Larson, *The White Pine Industry in Minnesota: A History* (St. Paul, MN: University of Minnesota Press, 1949), 381.

lumber, wooden products like fence posts and railroad ties necessitated rigid consistency across individual units for the larger system to function properly. As pattern books and builders' manuals (such as Asher Benjamin's *The American Builder's Companion*) circulated across the country during the early nineteenth century, boards of standard quality and dimension were needed to meet the specifications in those books. This created a fundamental shift within the building industry: for the first time, sawmills supplied wood with identical width and depth. Carpenters could now skip the labor-intensive process of planing a board to size and instead only cut a proper length, reducing the labor of construction.

Balloon Framing

Similar to pattern books, balloon framing dramatically changed the lumber market and increased demand for dimensional lumber products. Balloon framing is a modular system of repetitive components that are modified as needed to create the desired shape and form. During the early- to middle-nineteenth century, balloon framing was adopted by builders for its economical and time-saving framing system. Instead of using standard timber-frame construction with heavy beams held together by hand-carved mortise-and-tenon joints, the balloon-frame system consists of mass-produced lumber attached with steel nails.[32] Balloon framing consists of a structural skeleton of sills, floor joists, studs, and roof rafters, nailed together and covered with wooden sheathing. Once this framing technique caught

[32] George Howe Colt, *The Big House: A Century in the Life of an American Summer Home* (New York: Simon & Schuster, 2003), 76.

on, builders' manuals promoted the use of balloon framing to unskilled workers as a viable means of construction.[33]

Because of the relatively simplicity of balloon frame construction compared with mortise-and-tenon structural systems, the framework of many lightweight studs and joists rather than a few massive wooden columns and girders constituted an architectural revolution in the world of wooden buildings. Instead of highly-skilled craftsmen working with assistance from apprentices, a large number of workers could erect buildings framed in this manner quickly and with less skill than before. These characteristics make it infinitely adaptable for buildings of different shapes and forms.

After balloon framing expanded in use at the middle of the nineteenth century, a major drawback appeared: the tall 2x4 studs that framed the wall assembly and supported the floors and roof also created continuous air spaces that ran from the basement to the attic. These created fire hazards in walls, which acted as chimneys when buildings caught fire. To prevent this from occurring, builders began installing fire blocking between the floor levels, and later. Today, instead of continuous wall studs running the full height of the building, builders use a framing method called platform framing where exterior and interior load-bearing walls only

[33] Ted Cavanaugh, "Oliver Smith, Housewright and Itinerant Architect," in *American Architects and Their Books, 1840-1915*, Kenneth Hafertepe and James F. O'Gorman, eds. (Amherst, MA: University of Massachusetts Press, 2007), 52.

extend for a single floor level. Stud cavities are not continuous, and sills and top-plates at each floor slow the spread of fire from one level to the next.[34]

Vertical Integration

During the nineteenth century, the American lumber industry shifted from a disjointed collection of independent lumberjacks, mill operators, and lumber dealers to a vertically integrated and unified industry with trade journals, grading standards, and consistent pricing. As settlement patterns fanned out across the continent, these helped to unite the industry across entire geographic regions. Now a lumber manufacturer and supplier in one area could do competitive business with consumers many hundred miles away. These sweeping changes in the industry planted the seeds for a dramatic shift in housing form and construction practice that would occur throughout the first years of the twentieth century.

[34] David Owen, *The Walls Around Us: The Thinking Person's Guide to How a House Works* (New York: Villard, 1991), 94.

## CHAPTER 5 – HOUSING

Fundamental changes in the way the American lumber industry produced, distributed, and marketed building lumber directly caused dramatic changes within the housing construction industry. Advances in the lumber industry changed the way we perceive and use building materials. Additionally, advances in materials changed the way people live; a house was no longer merely a form of shelter built out of necessity but a record of a homeowner's place in life and a symbol of his future aspirations. Accompanying this were social changes to houses: the rise of settlement houses, communal kitchens, as well as advances in childcare within the home and improved conditions and recognition for women homemakers. As new materials became available on the marketplace, new methods were developed to promote and develop these new materials. Finally, trade networks and supply chains shifted from one-on-one personal connections to a new professional network that relied on standardized lumber sizes and grading systems as well as transportation improvements to allow consumers to purchase their goods sight unseen from suppliers across the continent. With all of these advances, lumber was at the center as the industry modernized and coalesced into a leader within the commodity trades in America.

### Changes in Perception and Use of Building Materials

New process innovations in the harvest, manufacture, transport, and sale of lumber products caused great changes in the way Americans perceived of and interacted with lumber products. As deforestation spread across developed portions

of the country, and building materials traveled farther from building sites, a vast supply network was established to bring goods to market in a reliable and cost-efficient manner. As the country's population expanded across the continent and the vast western frontier closed, supply chains stretched farther and building materials became standardized to a degree that consumers rarely communicated with manufacturers.[35]

Dramatic changes to the ways in which consumers purchased lumber also occurred after the turn of the twentieth century. During this period, sales of lumber lost ground to other cheaper materials that were safer and easier to work with, such as non-combustible materials and man-made alternatives to natural building products. Additionally, after this time period Americans spent less on houses and more on appliances within those houses and vehicles used outside of the home. Lumber demand in America peaked in 1906, and then lost ground to four primary building materials: steel, cement, brick, and stone. While lumber made up 60% of all new construction in 1919, only 40% of money spent on construction materials went towards lumber in 1940.[36] These new materials followed the model path taken by the lumber industry, and provided consumers with alternative products that could outlast and outperform the materials they replaced. The building supply industry changed considerably as lumber uses changed and expanded in other areas.

[35] Andrew M. Shanken, *194X: Architecture, Planning, and Consumer Culture on the American Home Front* (Minneapolis: University of Minnesota Press, 2009), 79.
[36] Harris, *Building a Market*, 128.

Changes to Housing Form and Construction

From the written descriptions of American life, the predominant iconic form of housing has been the detached rural or suburban single-family dwelling. This type of housing typically consists of wood frame construction (or half-timbered wood frame with brick infill) is often interpreted to symbolize virtuous living, hard work and industriousness.[37] Since that time period residential dwelling layouts modernized as interior spaces became designed for specific uses. Construction guides such as Owen Biddle's *Young Carpenter's Assistant* (1805) and *The American Builder's Companion* (1816) promoted new construction techniques and spatial arrangements to increase construction efficiency and building quality.[38] [39] A national style of residential construction arose from these published reference manuals, which transcended geographic divisions and united many regions of the country with a singular style of architecture. While regional variations persist today, to accommodate differences in climate and land-use patterns, the sweeping modernization in the lumber industry at the turn of the twentieth century provided builders across the country with sufficient access to lumber in standard sizes and of predictable quality to produce a consistent product with positive results.[40]

As American cities grew, regional variations prevailed upon common architectural forms. When fire ordinances prevented the use of wood as an exterior

[37] Gwendolyn Wright, *Building the Dream: A Social History of Housing in America* (Cambridge, MA: The Massachusetts Institute of Technology Press, 1983), 15.
[38] Owen Biddle, *Biddle's Young Carpenter's Assistant* (Mineola, NY: Dover Publishing, 2006). Note: Originally published in 1805 by Benjamin Johnson, Philadelphia, and Ronalds & Loudon, New York.
[39] Asher Benjamin, *The American Builder's Companion* (Boston: Etheridge and Bliss, 1806). Publishing, 2009). Reprint of the sixth (1827) edition.
[40] Owen Bernard Maginnis, *How to Frame a House, or Balloon and Roof Framing* (New York: Owen B. Maginnis Co., 1896). 5.

material, wood framing continued to be used within brick exterior envelopes.[41] The scale of housing development shifted from individual homes to large tracts of land, and wood remained the material of choice due to its availability and workability.[42] In the age of mechanical efficiency, wood maintained its supremacy despite its natural origins.

As the twentieth century progressed, wood frame construction continued to take precedence in private development initiatives as well as public housing programs. Wood was used due to its low cost, speed of erection, and universal workability regardless of carpenter skill level or experience. The repetition of wood framing, as well as ease of alteration requiring minimal deviation from a standard framing module, allowed suburban developers to create similar housing styles with only minimal cost differences from each standard model. This became especially important with postwar housing—specifically prefabricated, low-cost housing included in larger urban- and community-planning schemes.[43] Despite the frantic pace of new construction within suburban developments, wood frame construction retained its prominence despite new alternatives available on the marketplace and changing skillsets amongst American builders.[44]

Direct and Indirect Promotions and Demonstrations

At the World's Columbian Exposition in Chicago in 1893, fairgoers witnessed new ideas, technologies, and products, and materials. Perhaps more importantly, the

[41] Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States*, (New York: Oxford University Press, 1985), 129.
[42] Shanken, *194X*, 129.
[43] Ibid., 115.
[44] Dolores Hayden, *Redesigning the American Dream: Gender, Housing, and Family Life* (New York: W.W. Norton & Company, 1984), 21.

Exposition served as an opportunity for planners, architects, and builders to come together to unveil a new approach to highly programmed urban spaces. The exhibition halls, which together were known as the "White City" due to their staff and plaster façades, were all built a "neoclassical" style and centered along a massive court in the "city beautiful" school of urban planning. The fair buildings, while designed to mimic the solidity and permanence of stone, were built entirely of wood rendered in plaster. This was done to speed the construction, lower the expense of materials, and enable a semi-skilled workforce to construct the complex. Moreover, the buildings were impermanent and designed to last only for the duration of the Exposition. While the fairgrounds themselves left a lasting influence on many fairgoers, the new building technologies that were showcased were of primary importance to the building industry.[45]

Events like the World's Columbian Exposition played an important role in the creation of reform movements that permeated throughout the United States at the end of the nineteenth century. Housing reforms took many forms: women's rights movements, the many ideas pertaining of how best raise children in the home, settlement houses, and experiments in communal living. Many of these movements were created in response to problems that developed during the industrial revolution: water and air pollution, factory housing, and urban tenements. In many cases, the American single-family home was at the center of the proposed solution:

[45] Hayden, *The Grand Domestic Revolution: A History of Feminist Designs for American Homes, Neighborhoods, and Cities* (Cambridge, MA: The Massachusetts Institute of Technology Press, 1982), 151.

the home was the "woman's sphere" now that the man no longer worked alongside her husband on the proverbial family farm of the preindustrial era.[46]

Trade Networks and Supply Chains

Throughout the nineteenth century, American lumber companies struggled to unite horizontally across regions and vertically across different phases of the lumber harvest, production, supply, and distribution system. Efforts at collaboration were hindered by different levels of mechanization utilized by each trade involved in the process.[47] Steam, horse, water, and hand power were all used before mechanized production systems took over after the industrial revolution. Transportation improvements such as railroads and canals allowed suppliers to compete for diverse products across vast distances within each region. The construction industry, like agriculture, integrated cities with their surrounding areas. By the middle of the eighteenth century, oak, walnut, maple, ash, tulip, hemlock, birch, and pine traveled through streams and rivers towards sawmills across the northeast. However choice lumber disappeared quickly and scarcity forced patterns of regional competition to shift dramatically.

Improvements in transportation technology, especially in the nation's burgeoning rail system, increased availability of different types of lumber. Transportation also served as a partial solution to the problem of deforestation around northeastern cities. Coastal pine, cedar, and oak from forests in Delaware, Maryland, and Virginia traveled north to cities via rail. Additionally, woods from

[46] Hayden, *Grand Domestic Revolution*, 12.
[47] Rilling, *Making Houses*, 93.

South America, such as Brazilian mahogany, made their way north by sea. Yet as lumber was transported from farther afield, the delay between wood harvesting and sale increased, which tied up funds for longer periods of time.[48] Additionally, once a standardized grading system was implemented, lumber dealers needed to let their products air dry and season, which could take up to a year. Air drying further contributed to delays, which meant that only those with capital (or ability to secure credit) could compete in the lumber industry. While lumber is not perishable easily like other commodities, losses in value were possible based upon the local economy and fluctuating levels of demand set by builders and developers. Moreover, subsistence farming families could no longer compete in the lumber industry as they previously could to generate extra revenue during the winter months.

The expansion of lumber offerings in American cities improved the quality of life for city dwellers and enabled architects and builders to create structures with more speed and cost economy than before. Supply networks streamlined their operations in order to remain profitable despite fierce completion and tight margins. Simultaneously, trade unions promoted education of their members which increased employment stability and helped to make those jobs desirable amongst the working class. The result was higher quality dwellings built in an efficient manner, which benefitted both the workers who built the buildings as well as the end users: the buyers and renters who ended up living in them. Mechanization impacted all phases of life, including the domestic sphere, as new in-home applicances such as vacuums and clothes washing machines made their way into

[48] Rilling, *Making Houses*, 95.

commonplace society.[49] Yet despite all of the changes in the way people lived and worked, lumber still remained the primary building material at the center of the American home.

[49] Hayden, *Grand Domestic Revolution*, 17.

## CHAPTER 6 – CONCLUSION

This thesis is relevant within the field of historic preservation in the United States because it provides practicing professionals with decision-making tools that are applicable to all phases of heritage conservation. This document establishes a context for preservationists to more effectively determine which buildings are worth saving. Additionally, this document provides architectural conservators with relevant technical information about wood framing methods that impacts many tasks typical to their profession. Within the field of industrial heritage, this thesis seeks to provide new insight into how technological changes within the lumber industry manifest themselves across the built environment. And as an academic research paper that is deeply rooted in architectural history, it provides architectural historians with an insightful way to analyzing the history of wood frame construction.

Practicing preservationists, architectural conservators, and cultural resource managers are constantly faced with a series of difficult decisions about the built heritage that they work to protect: what is important and worth saving? How can one determine what is most important, and why? Whose opinion matters most? This thesis will be successful as a preservation document if it forces a preservationist to re-think previous decisions, change a long-established viewpoint, or broaden a perspective on what matters most.

Historic preservation is a dynamic field that is constantly changing. The American lumber industry, with its near-constant attempts at besting nature,

increasing speed and efficiency, and remaining profitable, exhibits a similar degree of change and fluctuation. Thus it is crucial that the technical ingenuity and industrial heritage of the American lumber industry is preserved before all remains are relegated to a museum and replaced by new technology. While the production of modern engineered wood products has created a niche market within the industry, new modified and augmented lumber released each year slowly replace their predecessors that contain only wood. Historians, documentarians and preservationists must soon act to record this stalwart of American manufacturing before the lumber industry ceases to exist altogether.

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