

Old Bricks, New Roots:
Seismic Retrofit and Adaptive Reuse of
Unreinforced Masonry Buildings with Mass Timber and Urban Infill

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Abstract

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Unreinforced masonry (URM) buildings are an integral part of the urban fabric of West Coast cities due to their historic significance, material richness, and contribution to human-scaled streetscapes. Despite their cultural and architectural value, these structures are highly vulnerable to seismic activity and are increasingly threatened by demolition within rapidly densifying urban environments. Conventional seismic retrofit systems rely heavily on carbon-intensive steel and concrete interventions that are environmentally costly and architecturally intrusive.

This thesis proposes a novel mass timber retrofit system that simultaneously seismically reinforces and adaptively transforms an existing URM building in Seattle for long-term use. Urban analysis conducted in the Seattle neighborhood of Belltown identified a recurring

relationship between URM buildings and adjacent vacant lots, revealing opportunities for new structural and spatial interventions. The project leverages this condition by introducing a mass timber structure on an adjacent site that provides lateral reinforcement while incorporating new vertical circulation and programmatic expansion for the existing building.

The design draws from the tectonic language and geometries of historic regional timber structures, positioning mass timber not only as a sustainable structural material but also as a continuation of the Pacific Northwest's timber heritage. By integrating contemporary mass timber systems with historic masonry construction, the thesis reframes a seismic retrofit as both a preservation strategy and an architectural opportunity capable of extending the cultural, spatial, and urban relevance of existing URM buildings.

Old Bricks New Roots

A Master of Architecture Thesis by:

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*Exploring the intersection of unreinforced brick masonry and mass timber.
Challenging the potential of adaptive reuse, tectonics, and urban space.*

May 26 / 1 pm / Arch Hall 250

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*Fig 1: The west facade of the Barnes Building in Seattle, Washington.
Source: Photo by author*

1

Introduction

1.1 Origins of Unreinforced Masonry Buildings

The unreinforced masonry buildings of the late nineteenth and early twentieth centuries represent a significant period of urban growth throughout the western United States. As port cities such as Seattle, Portland, and San Francisco expanded through trade, resource extraction, and railroad connections to the rest of the country, early wood-frame commercial buildings increasingly gave way to more permanent brick construction. Masonry was valued for its durability, fire resistance, and visual permanence, becoming a physical presence of economic growth, civic identity, and urban maturity.

Although these western brick buildings are strongly associated with the development of American cities, unreinforced masonry has a much longer global history. Masonry is one of humanity's earliest structural systems, relying on individual, human-scaled units assembled into walls that transfer loads primarily through compression. From mud brick and adobe structures to stone walls and fired clay masonry, these systems were shaped by local materials, climates, and building traditions. As societies developed, masonry construction became increasingly refined in scale, ornament, and architectural expression, yet its fundamental structural logic remained consistent with small units, bonded together, resisting gravity through mass and compression.¹

The durability of unreinforced masonry is one of its defining characteristics. Many masonry structures have stood for centuries, demonstrating the material's strength when properly maintained and suited to its environment. At the same time, this durability is accompanied by specific vulnerabilities. Weathering, moisture, settlement, and neglect can weaken the connections and materials of masonry walls over time. More sudden events, particularly earthquakes, can expose the limitations of this construction system, which was mainly intended for vertical loads rather than lateral forces.² These strengths and vulnerabilities would become especially significant in the rapidly growing cities of the American West, where unreinforced masonry emerged as a defining urban building type.



1.2 URM Buildings on the West Coast

Fig 2: Typical West Coast historic downtown street scape, composed of URM buildings.

Source: <https://nomadicniko.com/washington/seattle/downtown/>

While the West Coast has a relatively short history of building with brick compared to other parts of the world, brick masonry remains one of the most recognizable historic building types throughout Western cities. Large concentrations exist in cities such as Los Angeles, San Francisco, Portland, and Seattle, with Seattle alone containing more than one thousand officially designated URM structures.³ These buildings are distributed throughout historic downtowns, neighborhood commercial districts, and former industrial areas, where they continue to serve as highly visible components of the urban fabric and are often among the oldest structures in their surroundings.

The character of many Western cities is closely tied to the physical presence of these buildings. Weathered brick facades, ornamental cornices, detailed storefronts, and carefully crafted masonry contribute to a level of material richness that is often less common in contemporary construction. Typically ranging from one to six stories in height, URM buildings help establish a human-scaled streetscape that encourages pedestrian activity and fosters a sense of place.⁴ Together, these qualities contribute to the visual identity and lived experience of the neighborhoods in which they stand.

Beyond their architectural character, URM buildings continue to serve important functional and cultural roles. They comprise a significant portion of the existing building stock and accommodate a wide variety of uses, including commercial, residential, civic, industrial, and mixed-use programs. Rather than existing solely as artifacts of the past, many remain active contributors to contemporary urban life. Their interiors often feature exposed masonry walls, heavy timber framing, tall ceilings, large windows, and durable wood finishes. These qualities, originally developed for warehouse and commercial spaces, are increasingly valued in contemporary adaptive reuse projects.⁵

Although thousands remain today, many URM buildings have been lost through successive periods of urban transformation. Redevelopment, street widening, highway construction, changing economic conditions, and evolving building technologies have all contributed to the demolition of historic masonry structures. The widespread adoption of steel and reinforced concrete construction during the early twentieth century marked the end of unreinforced masonry as a dominant building method, leaving the remaining building stock as a finite and irreplaceable resource.



Fig 3: Typical URM building storefront.

Source: <https://pioneersquare.org/>

Recognition of this loss helped instigate preservation efforts throughout the twentieth century.⁶ Today, URM buildings are valued not only for their architectural qualities but also for their cultural and historical significance. They represent formative periods of urban growth, embody construction methods and craftsmanship that are no longer commonplace, and contribute to the identity of historic districts. Many continue to host long-standing businesses, institutions, and community spaces, creating tangible connections between past and present. More recently, the environmental value of existing buildings has further strengthened the case for preservation. As concerns about climate change and embodied carbon have grown, retention and adaptive reuse have emerged as important strategies to reduce the environmental impacts of demolition and new construction.⁷

Despite their continued relevance, URM buildings face significant challenges. The West Coast is one of the most seismically active regions in North America, and earthquakes pose one of the greatest threats to this building type. At the same time, increasing development pressure, urban densification, and changing performance expectations continue to place demands on an aging building stock. As western cities evolve, the challenge is no longer whether these buildings possess value, but how they can be preserved, strengthened, and adapted to serve future generations. Addressing these challenges requires approaches that can address the critical need for seismic retrofitting, while supporting preservation, adaptive reuse, and long-term environmental goals. An emerging building material that is capable of balancing these objectives is mass timber, presenting a particularly compelling opportunity.

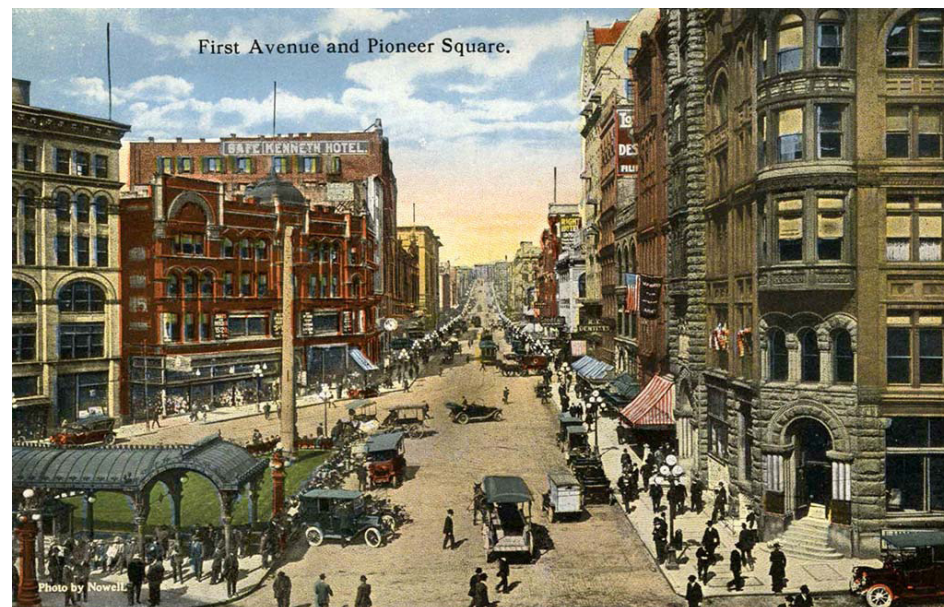


Fig 4: Historic view of downtown Seattle.
Source: <https://www.historylink.org/File/2950>



Fig 5: Mass timber construction of the Northlake Commons building in Seattle, Washington.
Source: <https://kalesnikoff.com/projects/northlake-commons/>

1.3 Emerging Opportunities for Mass Timber

Mass timber is presently one of the most innovative and rapidly developing structural building technologies in the United States construction industry. The term refers to a family of engineered wood products, including cross-laminated timber, glue-laminated timber, nail-laminated timber, and dowel-laminated timber, that are manufactured into large structural panels, beams, and columns. Unlike light-frame wood construction, mass timber is capable of forming substantial structural systems for larger commercial, residential, and institutional buildings. Its growing appeal is tied not only to its structural capacity, but also to its potential environmental benefits as a renewable, carbon-storing material, particularly in heavily forested regions such as the Pacific Northwest.⁸

Over the last two decades, mass timber has grown from an emerging construction method into an increasingly recognized alternative to conventional steel and concrete systems. Its development has been shaped by earlier precedents in Europe, expanding North American manufacturing capacity, evolving building codes, and a growing interest in lower-carbon construction. While adoption of mass timber in the United States remains relatively recent, it is gradually being used in commercial, residential, institutional, and civic projects, especially in regions where timber resources and construction expertise are readily available.



Fig 6: Old growth logs harvested in the Pacific Northwest in 1891. Source: Columbia Mill Company Sawmill, Seattle, 1891, UW SPEC

Despite this growth, mass timber is still typically associated with new construction. Its use in adaptive reuse projects remains quite limited, and its application as a seismic retrofit strategy is minimal. A small number of projects and research efforts suggest that mass timber may have potential beyond new building construction, particularly where structural performance, material qualities, reduced embodied carbon, and architectural expression are all important considerations. However, the use of mass timber to support the seismic retrofit and adaptive reuse of URM buildings remains relatively underexplored.

This topic is especially relevant in the Pacific Northwest, where timber has long shaped regional building culture. Long before the construction of URM buildings in the region, timber was widely used by Indigenous communities and later became central to Euro-American settlement, resource extraction, transportation infrastructure, and early urban development.⁹ The region's architectural identity has been repeatedly shaped by wood construction, from utilitarian structures and warehouses to later expressions of Pacific Northwest regional architecture. Contemporary mass timber can therefore be understood not only as a new technology, but also as a renewed expression of a longstanding regional material tradition.

The convergence of these histories creates a compelling opportunity for architectural exploration. URM buildings require strategies that can address seismic vulnerability, preservation, adaptive reuse, and long-term environmental responsibility. Mass timber offers a potential means of engaging these needs through a material system that is both contemporary and regionally significant. Rather than treating historic masonry and new timber construction as separate architectural languages, this thesis investigates how the two might be integrated to support a dialogue between old and new, permanence and renewal, preservation and transformation.

1.4 Thesis Statement and Objectives

Thesis Statement:

Unreinforced masonry buildings are an important part of the architectural, cultural, and environmental fabric of many West Coast cities, yet they face significant challenges related to seismic vulnerability and ongoing urban development pressures. Recently, mass timber has emerged as a contemporary structural system with the potential to support sustainable and resilient forms of construction. This thesis investigates how mass timber can be integrated with unreinforced masonry buildings to provide seismic retrofit, adaptive reuse, and long-term preservation while creating new opportunities for architectural expression and urban vitality.

Thesis Objectives:

1. Understand the architectural and structural challenges facing URM buildings.
2. Evaluate the potential of mass timber as a seismic retrofit strategy.
3. Explore opportunities for adaptive reuse and preservation in conjunction with a mass timber seismic retrofit strategy.
4. Develop a design proposal demonstrating integration between mass timber and an existing URM building.
5. Assess how such an approach can support cultural, environmental, and urban goals.



2

Unreinforced Masonry Buildings

2.1 Historical Background

The settlement of the American West Coast by Euro-Americans occurred during the eighteenth and nineteenth centuries. Long before this period, Indigenous communities throughout the region had developed sophisticated building traditions that responded to local climates, resources, and cultural practices. In the Pacific Northwest, for example, Coast Salish peoples constructed longhouses from western red cedar harvested from the region's abundant forests.¹⁰ As Euro-American settlement expanded westward, settlers were drawn by the promise of economic opportunity and access to natural resources. Fur trading, agriculture, fishing, timber production, the California Gold Rush, and the Alaska-Yukon Gold Rush all contributed to the growth of cities such as San Francisco, Portland, and Seattle. As these cities demonstrated their economic potential, the completion of transcontinental rail connections in the late nineteenth century linked the West Coast to the rest of the country, accelerating urban growth and commercial development.

As these settlements evolved into major urban centers, their built environments transformed alongside them. Timber was a primary construction material of the early West Coast economy, used extensively for buildings, infrastructure, and transportation networks.¹¹ Warehouses, mills, agricultural structures, docks, and rail facilities relied heavily on the vast timber resources of regions such as the Pacific Northwest. Residential neighborhoods and commercial districts soon followed, providing housing and services for rapidly growing populations. During this period, most buildings were constructed of wood, due to the abundance of the local material and its ability to accommodate rapid growth.

Fig 7: Photo taken of the Barnes Building in 1938.
Source: <https://digitalarchives.wa.gov/Record/View/C58B08F-C2747AFFE92A8BF87440D1AAF>

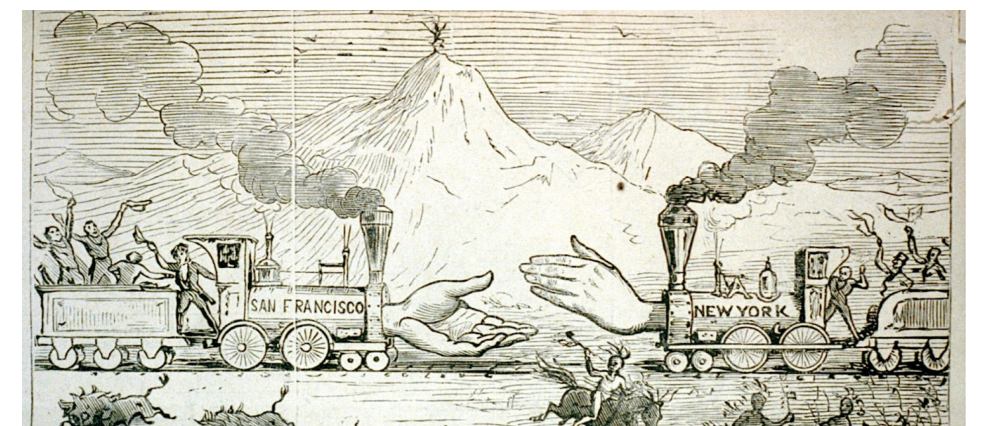


Fig 8: Illustration of the completion of the transcontinental rail connections.
Source: <https://www.national-parkstraveler.org/2024/12/frenzied-completion-transcontinental-railroad>

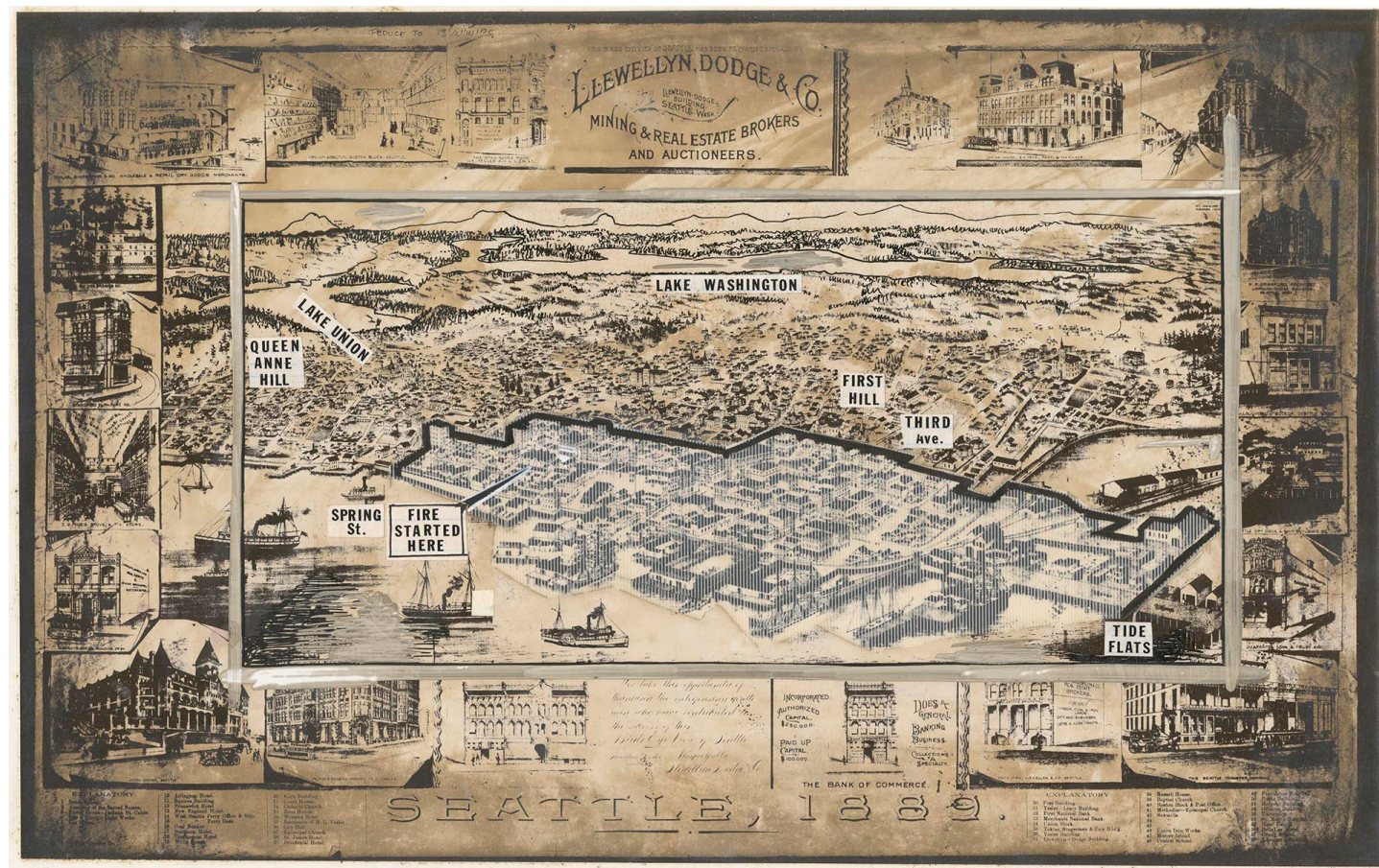


Fig 9: Map depicting the extent of the Great Seattle Fire in 1889.

Source: <https://mohai.org/collections-and-research/search/item/2000.107/-273.03%23.01/?searchQuery=%22great+seattle+fire+%281889%29%22&modules%5B0%5D=item&modules%5B1%5D=collections&modules%5B2%5D=library>

Several factors contributed to the gradual transition from wood construction to masonry construction in urban environments. One was a desire for permanence and civic status as western cities sought to establish themselves alongside older urban centers such as Chicago, St. Louis, and New York. Masonry commercial blocks, civic buildings, hotels, and theaters became physical expressions of economic growth and urban maturity. An equally influential factor was the threat of urban fire.

Large fires affected many American cities during the nineteenth century, encouraging the adoption of more fire-resistant construction methods. The Great Seattle Fire of 1889 provides a particularly influential West Coast example. The fire destroyed approximately twenty-five city blocks in downtown Seattle, fueled in large part by the concentration of wood-frame buildings.¹² In response, new building regulations, informed by lessons learned elsewhere and reinforced by pressure from insurance companies, encouraged the widespread use of fire-resistant masonry construction.¹³ At the same time, regional brick manufacturing expanded to meet growing demand, accelerating the adoption of unreinforced masonry throughout western cities. By the turn of the twentieth century, URM buildings had become the dominant form of urban construction across much of the West Coast.



Fig 10: Photo depicting the widespread damage from the 1906 San Francisco Earthquake.

Source: <https://www.conservation.ca.gov/cgs/earthquakes/san-francisco>

While masonry construction helped address concerns related to fire, another threat would soon reveal its limitations. The 1906 San Francisco earthquake and resulting fires that followed devastated much of the city, destroying thousands of buildings and displacing hundreds of thousands of residents.¹⁴ The disaster exposed the vulnerability of unreinforced masonry construction to seismic forces and became one of the earliest large-scale demonstrations of earthquake risk in urban America. Although the event initiated discussions regarding seismic design and building regulations, widespread adoption of seismic provisions would not occur for several decades.

The dominance of unreinforced masonry construction gradually declined during the early twentieth century as steel and concrete frame systems became increasingly common. These emerging structural technologies allowed buildings to reach greater heights while accommodating larger floor plates and denser urban development. Although masonry continued to be used as an exterior cladding material, its structural role diminished as cities embraced new methods of construction. By the 1930s, unreinforced masonry had largely ceased to be a typical urban building type. Despite this transition, thousands of URM buildings remain throughout West Coast cities today, serving as physical records of the region's growth and development. Understanding their material composition, structural behavior, and architectural characteristics is essential to evaluating both their vulnerabilities and their potential for continued use.

Fig 11: Photo of the Alaska Building, the first steel frame building in Seattle, built in 1904.

Source: <https://www.historylink.org/File/1975>

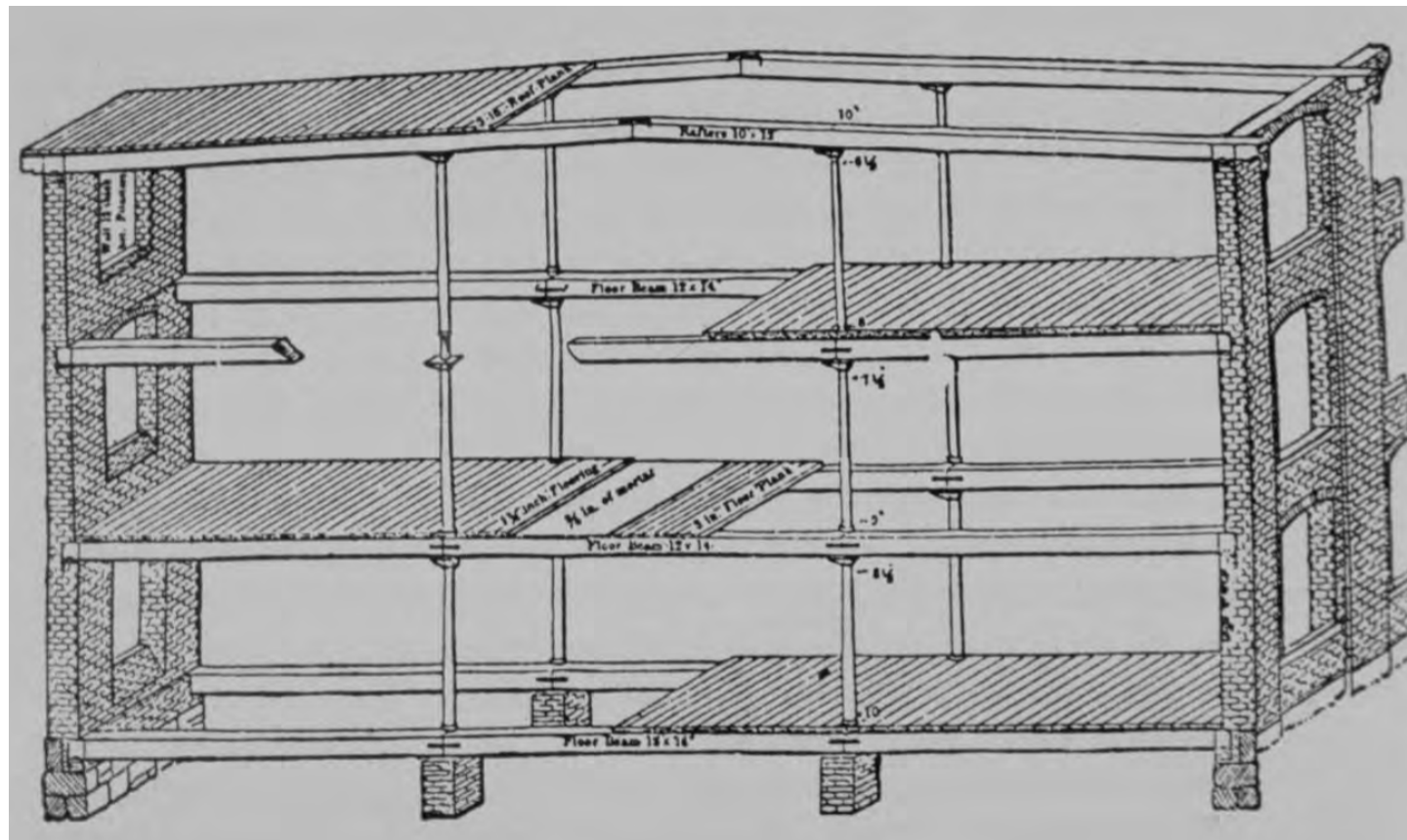


2.2 Materiality and Structural Behavior

Unreinforced masonry buildings are often recognized by their brick exterior, but their construction is more accurately described as a hybrid system of masonry, timber, stone, concrete, and metal. In many West Coast examples, the masonry walls form the primary exterior enclosure and load-bearing structure, while timber framing creates the interior floors, roof, and secondary structural support. This combination enabled buildings to achieve durable urban facades while using readily available wood construction for the interior structural system.

The exterior walls are typically composed of multi-wythe brick masonry, with higher-quality face brick used on prominent street-facing elevations and more utilitarian common brick used on secondary or concealed surfaces. Because these walls function as load-bearing elements, they generally increase in thickness at lower levels and taper as they rise, reflecting the accumulation and transfer of gravity loads through the masonry structure.¹⁵ Stone or terra cotta may be used for bases, lintels, sills, belt courses, cornices, and ornamental details, while wood trim commonly appears around doors, windows, and storefronts. Foundations are generally constructed of stone, brick, or concrete and often support basement levels below the primary occupied floors.

Fig 12: Illustration of a typical URM assembly.
Source: Architects and Builders Pocketbook



Inside the masonry shell, the structural system is commonly composed of wood joists, beams, columns, and decking. In commercial, warehouse, and industrial buildings, heavy timber post-and-beam systems were frequently used to support larger open floor plates and heavier loads. In smaller residential, hotel, or mixed-use buildings, lighter wood framing systems were more common. These interior timber systems allowed floors and roofs to span between masonry bearing walls or to intermediate wood columns when spans became too large. As a result, many URM buildings are not purely masonry structures, but rather mixed systems in which brick and timber work together to resist gravity loads.

The gravity load path in a typical URM building is relatively direct. Roof and floor loads are carried by wood decking and joists, transferred into larger beams or directly into the masonry walls, and then carried down through the brick walls and interior columns to the foundation. Wood beams and joists that bear on masonry walls are typically pocketed into the brick or supported by corbels. Interior columns transfer loads to isolated footings, such as stone pads, brick piers, or concrete foundations, below.¹⁶ This system was efficient for the vertical demands of its time and allowed buildings to be constructed with familiar materials and methods.

Typical URM buildings also share common formal characteristics that reflect this structural logic. Many occupy narrow urban lots with rectangular floor plates, party walls, and street-facing commercial frontages. Heights commonly range from one to six stories, with taller examples found in denser commercial districts. Basement levels are frequent, and upper floors often contain offices, apartments, hotels, or storage uses depending on the original program. The regularity of masonry walls, timber bays, and repetitive openings produced buildings that were both structurally legible and capable of shifting uses.

While this combination of masonry and timber created durable and efficient buildings for gravity loads, it also introduced vulnerabilities that become more apparent under lateral forces. Heavy masonry walls possess limited tensile strength and ductility, while flexible timber diaphragms and inadequate wall-to-floor connections can allow structural elements to move independently during seismic events. As a result, URM buildings commonly experience cracking around openings, separation between floors and walls, out-of-plane wall failures, and parapet collapses during earthquakes.¹⁷ These structural limitations do not diminish the architectural and historical value of URM buildings, but they help explain why their continued use often requires careful evaluation, seismic strengthening, and adaptive intervention.

2.3 Architectural Characteristics

The architectural character of West Coast unreinforced masonry buildings emerges directly from their material construction. Brick, stone, terra cotta, timber, and glass were not only functional building components but also expressive materials that shaped the identity of commercial streets, industrial districts, and historic neighborhoods. Because these buildings were constructed during a period of rapid urban growth and civic ambition, their facades often communicate permanence, craftsmanship, and economic achievement.¹⁸

On the exterior, URM buildings frequently rely on masonry articulation to create depth, rhythm, and visual hierarchy. Brick walls are organized with pilasters, recessed panels, corbeled details, belt courses, rustication, and projecting cornices. Windows are often arranged in repeated bays that emphasize vertical proportion, while storefronts at the ground level create a more transparent and active relationship with the street. Arched openings, decorative lintels, parapets, and terra cotta ornamentation reflect the influence of nineteenth and early twentieth-century architectural revival and commercial vernacular styles, including Italianate, Romanesque Revival, Classical Revival, and various commercial vernacular traditions.¹⁹

These exterior features contribute to the human-scaled quality of many historic urban districts. Unlike larger contemporary developments, URM buildings often create a fine-grained rhythm along the street through repeated entries, varied facade details, and changes in height. Ornamented storefronts and recessed entryways create moments of transition between public sidewalk and interior space, while upper-story windows provide a sense of occupation and activity above the street. The result is an urban environment defined not only by individual buildings, but by the cumulative texture of masonry, openings, shadows, and detail.²⁰

The interior character of URM buildings is equally important to their continued value. Many contain tall ceilings, large windows, hardwood floors, exposed brick walls, and timber beams and columns. In some cases, structural materials remain visible, while in others they are covered in plaster, trim, or other finishes. Generous floor-to-floor heights and large window openings enable daylight to reach deeply into the interior, while repetitive structural bays create spaces that can accommodate a range of programs over time.



*Fig 13-16: Photos of typical URM building architectural features.
Source: Photos by author*

These spatial and material qualities have become increasingly valued in adaptive reuse projects. Former warehouses, hotels, commercial blocks, and industrial buildings often contain flexible floor plates and durable interior finishes that can support new residential, office, cultural, or mixed-use programs. Their architectural appeal is not limited to nostalgia or historic appearance but is also rooted in the capacity of these buildings to allow for change. The combination of material character, structural regularity, and spatial flexibility allows URM buildings to remain active participants in contemporary urban life.

Understanding the architectural characteristics of URM buildings is therefore essential to understanding why they are worth preserving. Their value lies not only in their age or historic designation, but in the way their materials, proportions, details, and interior spaces continue to shape urban experience. This architectural significance must be considered alongside their structural vulnerabilities, particularly when evaluating retrofit and adaptive reuse strategies.

2.4 Building Typologies and Uses

The widespread adoption of unreinforced masonry construction throughout the late nineteenth and early twentieth centuries resulted in its use across a broad range of building types. From commercial storefronts and warehouses to hotels, apartments, schools, churches, and civic buildings, URM construction became a common building type for the rapidly growing cities of the American West. Although these buildings varied considerably in size, appearance, and program, many shared common organizational principles and spatial characteristics that continue to influence their use today.²¹

Commercial buildings were among the most prevalent URM typologies in urban environments. Located along primary streets and in neighborhood commercial districts, these structures typically featured retail spaces on the ground floor, with offices, meeting halls, or storage areas above. Large storefront windows and direct street access supported commercial activity, while upper levels provided flexibility for a variety of tenants. The repetitive nature of these commercial blocks allowed them to be constructed efficiently while contributing to the cohesive character of historic downtown districts.

Residential and lodging uses also played a significant role in the development of URM buildings. Hotels, boarding houses, apartments, and mixed-use buildings emerged to accommodate growing populations associated with industrial expansion, trade, and transportation networks. Many combined commercial activity at the street level with residential uses above, creating building types that contributed to active, densely occupied urban neighborhoods. These mixed-use arrangements remain common in many surviving URM buildings today.



*Fig 17: Photo of a commercial/residential mixed use URM building.
Source: Photo by author*



*Fig 18: Photo of a residential URM building.
Source: Photo by author*



*Fig 19: Photo of a commercial mixed-use URM building.
Source: Photo by author*

Industrial and warehouse buildings formed another important category of URM construction, particularly in port cities and manufacturing districts. These structures were often designed around heavy timber post-and-beam systems capable of supporting substantial loads and open floor areas. Large windows provided daylight to interior workspaces, while straightforward structural layouts facilitated storage, manufacturing, and distribution activities. Although originally designed for industrial purposes, many of these buildings possess spatial qualities that have proven highly adaptable to contemporary uses.

URM construction was also widely employed for civic and institutional buildings. Schools, churches, theaters, libraries, government buildings, and community halls frequently utilized masonry construction to convey permanence, stability, and civic importance. These buildings often occupied prominent sites within the urban landscape and served as important social and cultural anchors for surrounding neighborhoods. As a result, they continue to hold significance not only as architectural resources but also as sources of collective memory and community identity.

Despite their varied functions, many URM building types share characteristics that contribute to their continued relevance. Durable construction, generous floor-to-floor heights, regular structural bays, and central urban locations allow these buildings to accommodate changing programs over time. Their ability to handle change has enabled many URM structures to remain active participants in urban life long after their original functions have ended.²²

This adaptability is one of the defining strengths of the URM building type. While these buildings were originally constructed to serve the needs of a rapidly expanding industrial economy, many possess qualities that remain desirable today. Their continued use demonstrates that historic buildings can provide value beyond preservation alone, serving as opportunities for reinvestment, transformation, and sustainable urban development. At the same time, their age, structural limitations, and seismic vulnerability present significant challenges that must be addressed if they are to continue serving contemporary cities. Understanding both the opportunities and constraints of adaptive reuse is therefore essential when considering the future of unreinforced masonry buildings.

Fig 20: Photo of an industrial warehouse URM building.
Source: https://en.wikipedia.org/wiki/National_Building



Fig 21: Photo of a civic URM building.
Source: <https://www.djc.com/news/co/pow.html?id=12023102>





3.1 Seismic Risk on the West Coast

The western United States lies within one of the most seismically active regions of North America. From Southern California to the Pacific Northwest, cities and communities exist within a complex network of fault systems capable of generating significant earthquakes.²³ The San Andreas Fault system extends through California, while the Cascadia Subduction Zone stretches from Northern California to British Columbia. In addition to these regional systems, numerous local faults pass directly beneath major urban centers, including the Seattle Fault, which runs through the Seattle metropolitan area.

The historical record demonstrates the consequences of these seismic hazards. Since the 1857 Fort Tejon earthquake, numerous major earthquakes with magnitudes exceeding 6.0 have occurred throughout the region, including the 1906 San Francisco earthquake, the 1949 Olympia earthquake, and the 2001 Nisqually earthquake. Geological evidence also indicates that the Cascadia Subduction Zone produced a magnitude 9.0 earthquake in the year 1700 and is capable of generating similar events in the future.²⁴

While all buildings are vulnerable to seismic activity, unreinforced masonry structures are among the most susceptible to earthquake damage. Their heavy masonry walls, limited ductility, and lack of reinforcement make them particularly vulnerable to cracking, separation, and collapse when subjected to lateral forces. The concentration of URM buildings in many historic urban districts therefore represents not only a preservation challenge, but also a significant life-safety concern. As future earthquakes remain inevitable throughout the region, addressing the vulnerability of existing URM buildings has become an increasingly important priority for cities, building owners, and preservation advocates.

Fig 22: Illustration of west coast seismic concerns.
Source: <https://www.economist.com/united-states/2018/02/03/america-is-not-prepared-for-the-next-big-earthquake>

3.2 Existing Retrofits

Retrofitting an unreinforced masonry building is rarely a straightforward undertaking. Existing buildings vary considerably in age, condition, occupancy, and historic significance, requiring retrofit strategies to be tailored to individual circumstances. As a result, seismic interventions often occur along a spectrum ranging from relatively targeted upgrades to comprehensive structural interventions.

The most common retrofit strategies focus on localized vulnerabilities. Parapet bracing, wall anchorage, and roof-to-wall connections are frequently implemented to address components most susceptible to failure during an earthquake.²⁵ These interventions are often among the least expensive and least disruptive approaches, as they can typically be completed with limited impact to tenants and existing building functions.

More comprehensive interventions may include diaphragm strengthening, out-of-plane wall bracing, and improvements to load transfer throughout the structure. These strategies seek to improve the building's overall seismic behavior by creating a more continuous load path between walls, floors, roofs, and foundations.²⁶ Although effective, these modifications often require greater levels of construction, increased cost, and more significant disruption to occupied spaces.

At the highest level of intervention, entirely new structural systems may be introduced to resist seismic forces. Steel brace frames, steel moment frames, and reinforced concrete shear walls are among the most common approaches for strengthening URM buildings.²⁷ These systems are typically inserted within the building or attached to existing structural elements. Such interventions can substantially improve seismic performance, but they often introduce architectural challenges related to space planning, tenant displacement, historic preservation, and visual impact. In rare cases, adjacent parcels or exterior setbacks create opportunities for seismic systems to be located outside the historic structure, reducing impacts to significant interior spaces.²⁸



Fig 23: A typical steel frame used for seismically retrofitting a URM building.
Source: <https://millerhull.com/project/populus-seattle/>

The desired performance objective also plays an important role in determining the level of retrofit. Some interventions are intended primarily to protect life safety and allow occupants to evacuate during an earthquake, even if the building experiences severe damage afterward. Others seek to preserve functionality and enable continued occupancy following a seismic event. The level of investment required increases significantly as performance expectations rise.

Because comprehensive seismic retrofits are costly, they are often undertaken only when major renovations, occupancy changes, or adaptive reuse projects are already being planned. As a result, seismic retrofit and adaptive reuse are frequently interconnected processes rather than separate considerations.

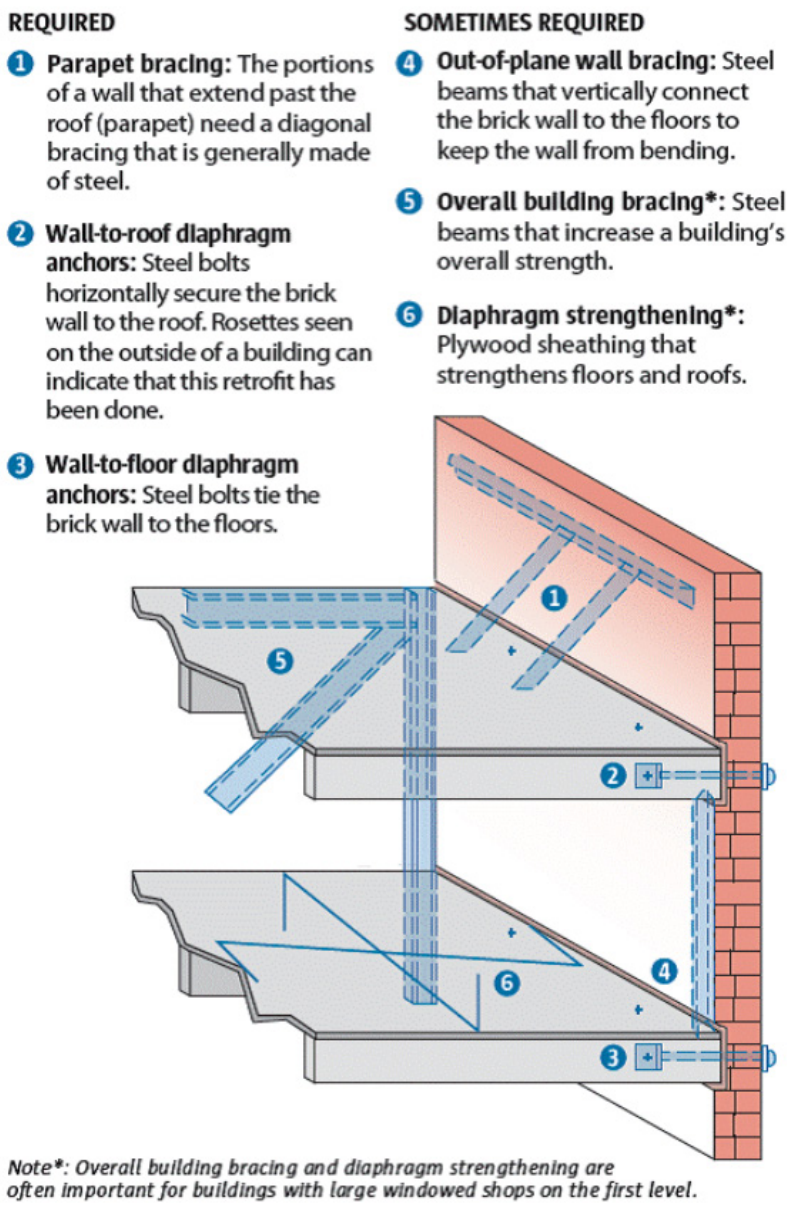


Fig 24: Typical URM building seismic retrofit strategies.
Source: <https://www.seattle.gov/emergency-management/disaster-impacts/all-hazards/unreinforced-masonry-buildings-%28urm%29->

3.3 Adaptive Reuse Considerations

When substantial modifications to an existing URM building are required, seismic retrofit becomes inseparable from broader questions of adaptive reuse and historic preservation. Unlike new construction, interventions within historic buildings must balance structural performance with the preservation of architectural character, cultural significance, and existing material resources.

Adaptive reuse projects can be understood along a spectrum of intervention.²⁹ At one end is preservation, where the primary objective is to retain as much of the original building as possible. Structural interventions are often concealed within existing assemblies and designed to minimize visual impact. This approach is commonly used for buildings with high levels of historic significance, including museums, libraries, civic buildings, and other cultural landmarks.

A more common approach is integration, in which new systems and interventions are introduced while substantial portions of the existing structure remain intact. Seismic upgrades may require selective demolition, coordinated with new circulation cores, updated building systems, accessibility improvements, and changes in occupancy. While the building is transformed to meet contemporary needs, historic materials and defining architectural features remain visible, continuing to shape the project's character. Many warehouse-to-residential, warehouse-to-office, and commercial-to-hotel conversions fall within this category.

At the opposite end of the spectrum is facadism, where only portions of the original building, often exterior walls or primary facades, are retained while an entirely new structure is built behind them. Although this approach preserves elements of the historic streetscape, it typically results in the loss of much of the original building fabric and spatial character.

Regardless of the level of intervention, adaptive reuse projects must address a wide range of contemporary requirements beyond seismic performance. Accessibility, vertical circulation, fire protection, building systems, energy performance, and evolving programmatic needs all influence the scope and nature of interventions. Successful adaptive reuse therefore requires a careful balance between preservation, transformation, and long-term functionality.

Fig 25: Diagram explaining facadism in terms of adaptive reuse.
Source: <https://www.instagram.com/p/DSa--mdgWrV/>

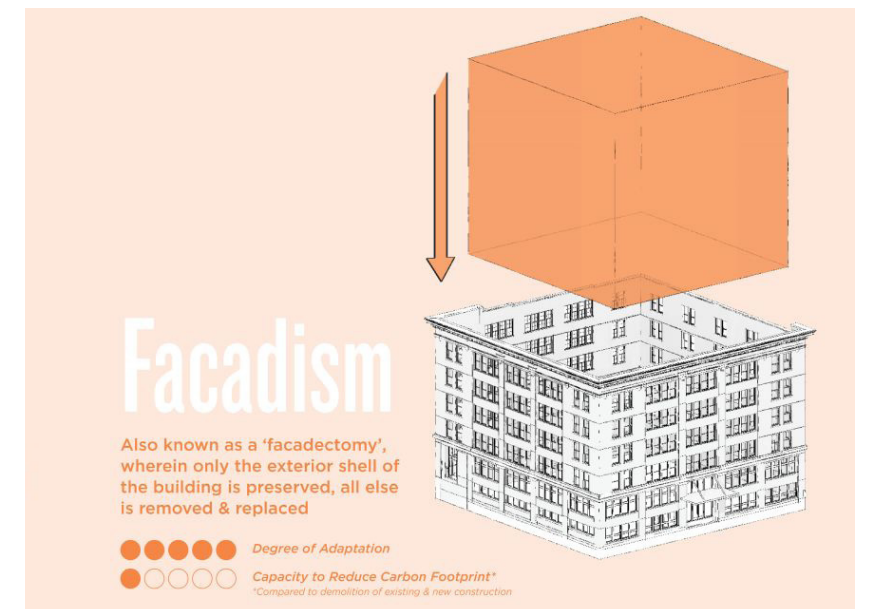


Fig 26: Diagram explaining integration in terms of adaptive reuse.
Source: <https://www.instagram.com/p/DSa--mdgWrV/>

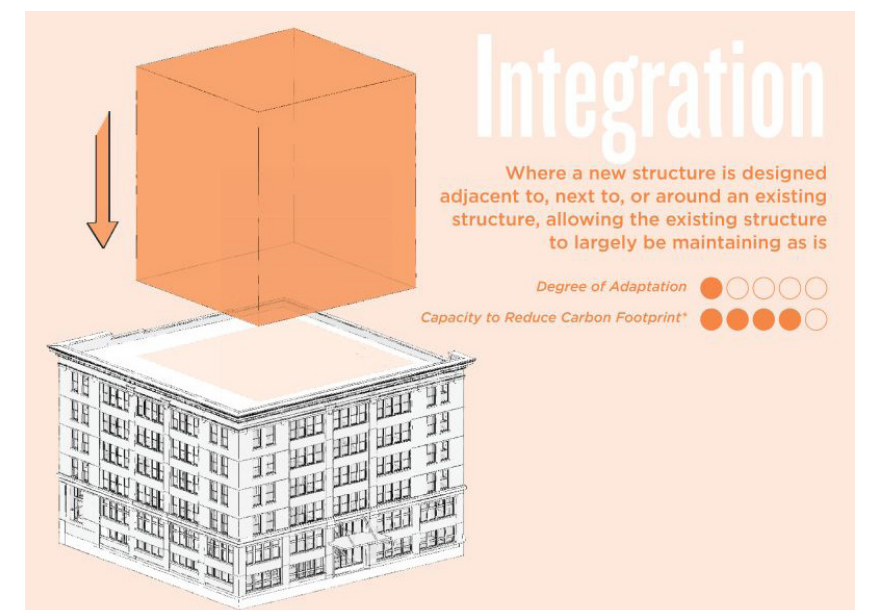


Fig 27: Diagram explaining preservation in terms of adaptive reuse.
Source: <https://www.instagram.com/p/DSa--mdgWrV/>



Fig 28: Photo depicting extensive selective demolition for integration of steel bracing in a URM building seismic retrofit.
Source: Swenson Say Faget



3.4 Limitations of Current Seismic Retrofit Approaches

Although existing retrofit strategies have successfully improved the safety and longevity of many URM buildings, they are often accompanied by significant limitations. Cost remains one of the largest barriers to implementation, particularly for privately owned buildings where extensive structural upgrades may be difficult to justify financially. Construction schedules, tenant displacement, and operational disruptions further complicate the feasibility of major interventions.

Architectural considerations introduce additional challenges. Comprehensive retrofit systems can require substantial modifications to historic interiors, reduce usable floor area, or obscure significant architectural features. In some cases, achieving higher levels of seismic performance may conflict directly with preservation objectives, forcing difficult decisions about which aspects of a building should be retained, altered, or replaced.³⁰

Fig 29: Image depicting extensive mining required for resource extraction for steel production.
Source: <https://greenerideal.com/news/the-impact-of-metal-extraction-to-the-environment-economy-and-society/>



Increasingly, environmental considerations are becoming part of this discussion. The most common seismic retrofit systems rely heavily on steel and reinforced concrete, two of the most carbon-intensive materials used in the construction industry. While these systems can be highly effective structurally, their environmental impacts may conflict with broader sustainability goals associated with preserving and reusing existing buildings.³¹ This tension is particularly relevant as cities seek to reduce embodied carbon while extending the lifespan of existing building stock.

These limitations do not diminish the value of existing retrofit approaches, but they do suggest opportunities for alternative strategies that can address multiple objectives simultaneously. As preservation, adaptive reuse, seismic resilience, and sustainability become increasingly interconnected, there is growing value in exploring new materials and systems capable of responding to these challenges holistically. The emergence of mass timber presents one such opportunity and serves as the focus of the following chapter.



4

Mass Timber as a Retrofit Strategy

The growing interest in mass timber construction has emerged alongside broader conversations regarding sustainability, material innovation, and resilient design. While mass timber has become increasingly common in new construction across North America, its application as a seismic retrofit strategy for existing unreinforced masonry buildings remains relatively uncommon. This gap presents an opportunity to investigate whether mass timber can address some of the structural, architectural, and environmental challenges associated with preserving and adapting historic URM buildings. Understanding the characteristics of mass timber, its sustainability benefits, its regional significance, and its relationship to Pacific Northwest architectural traditions provides a foundation for evaluating its potential role in seismic retrofit and adaptive reuse projects.

Fig 30: Exposed mass timber being used for public infrastructure in New York City.

Source: https://wnn-files-live.s3.us-east-2.amazonaws.com/s3fs-public/styles/webp/public/2024-05/Mercer%20Mass%20Timber_High-Line_3-edited.jpg?VersionId=AK_AU4IoYJAMN7Ub2Z6wZY_Tx-QUqUpwA&itok=Hysiah7B

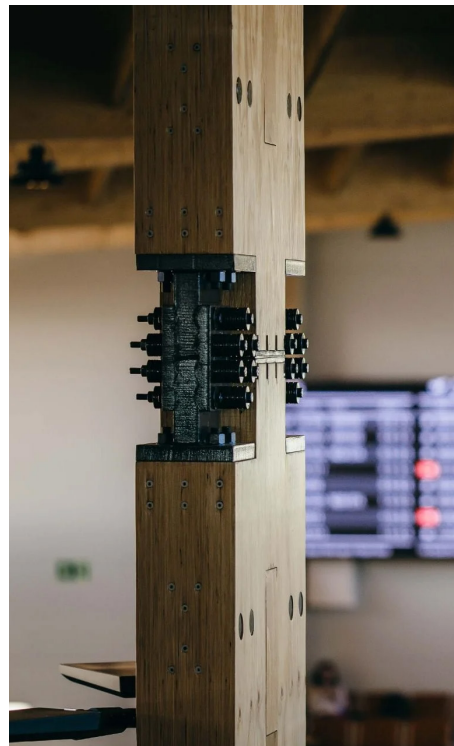
4.1 Structural Characteristics

Mass timber refers to a family of engineered wood products designed to function as primary structural elements within a building. Unlike conventional light-frame wood construction, mass timber products are manufactured by combining multiple wood members into larger structural assemblies capable of supporting significant loads and spanning substantial distances. Common products include glue-laminated timber (glulam), which is frequently used for beams and columns, and cross-laminated timber (CLT), which is commonly used for floor, roof, and wall panels.³²

The growing adoption of mass timber is driven by a combination of structural performance, construction efficiency, and architectural versatility. Engineered wood products provide high strength relative to their weight and perform efficiently in both compression and bending, allowing them to function as beams, columns, floor systems, and roof structures. Mass timber components can also be prefabricated with a high degree of precision, reducing construction time, improving quality control, and simplifying on-site assembly.³³ These characteristics have contributed to the increasing use of mass timber in commercial, institutional, and residential construction throughout North America.

While mass timber possesses several characteristics that make it an effective structural material, its application in seismic regions presents unique challenges. The relatively low weight of timber can reduce overall seismic forces because earthquake demands are directly related to building mass. However, seismic performance depends on more than weight alone. Unlike steel and reinforced concrete systems, which have decades of established seismic design precedent, mass timber seismic systems remain an area of active research, testing, and development.

Fig 31: A Tectonus steel connection allowing for movement in a highly seismic region.
Source: <https://www.tectonus.com/projects/nelson-airport-terminal>



A critical aspect of mass timber seismic design is the behavior of its connections. Modern systems rely on steel brackets, rods, hold-downs, fasteners, and other hardware to transfer forces between timber members and accommodate movement during seismic events. These connections often serve as the primary source of ductility and energy dissipation within the structure.³⁴ As a result, contemporary mass timber seismic systems are best understood as hybrid assemblies that combine the compressive and bending capacity of wood with the ductile behavior of steel connectors.

This evolving relationship between timber and seismic design presents both opportunities and challenges for adaptive reuse and retrofit applications. The material's reduced weight, prefabricated construction, and architectural qualities suggest potential advantages when working with existing buildings. At the same time, the relative novelty of mass timber seismic systems highlights the need for continued exploration into how they can be integrated with historic structures, particularly in highly seismic regions such as the West Coast of the United States.

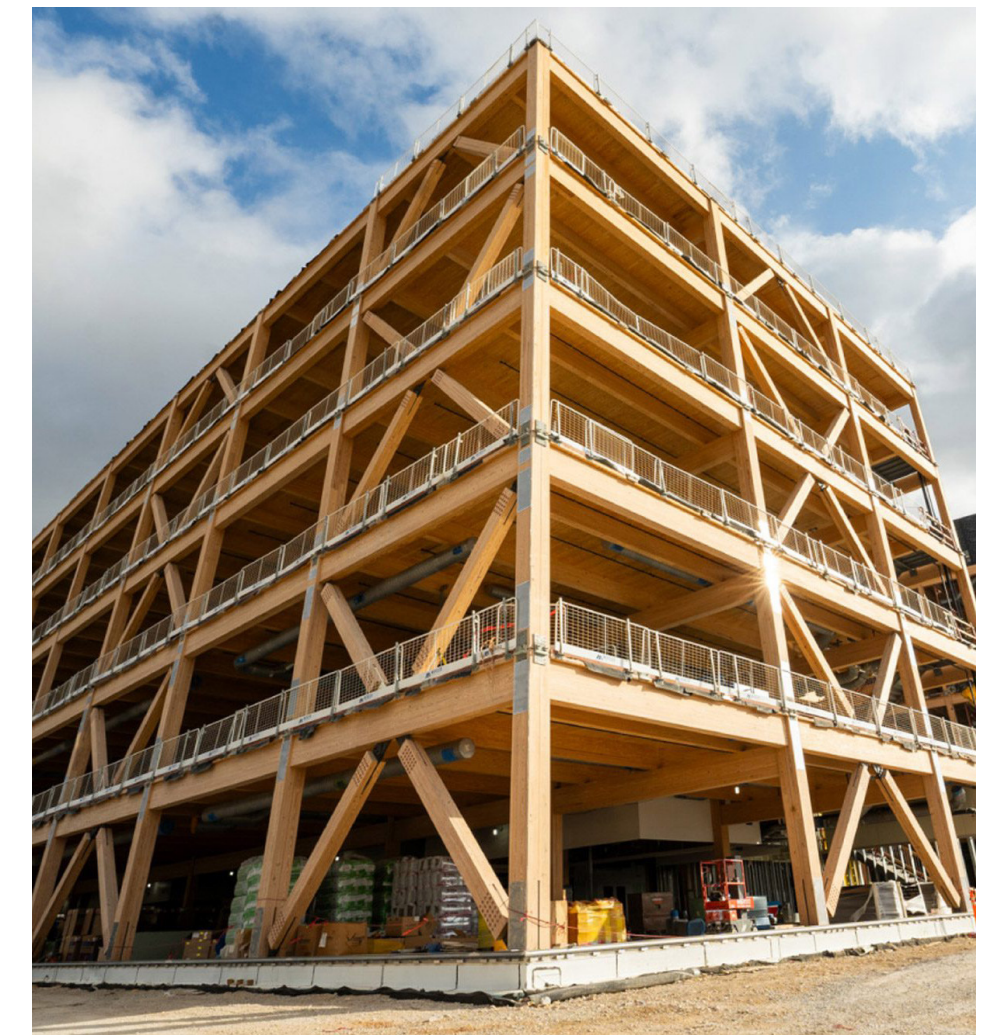


Fig 32: Mass timber being used for seismic bracing in a lower risk seismic zone.
Source: <https://www.dezeen.com/2025/01/21/walmart-mass-timber-arkansas-hq-gensler-swa/>

4.2 Sustainability Benefits

Much of the interest surrounding mass timber is tied to its potential environmental benefits. As the construction industry seeks to reduce greenhouse gas emissions and embodied carbon, attention has increasingly shifted toward materials that can reduce the environmental impacts associated with building construction.

Life-cycle assessment provides one method for evaluating these impacts. The environmental performance of a building material can be considered across multiple stages, including raw material extraction, manufacturing, transportation, construction, operation, end-of-life processing, and potential reuse beyond its initial service life. Compared to many conventional structural materials, mass timber can offer advantages at several points within this process.

Unlike steel and concrete, which require significant amounts of energy during manufacturing, timber originates from a renewable biological resource. During growth, trees absorb carbon dioxide from the atmosphere and store carbon within their fibers. When timber is incorporated into long-lasting building products, a portion of this carbon remains stored for the duration of the building's life.³⁴ This characteristic has contributed to growing interest in mass timber as a means of reducing the embodied carbon associated with new construction.

Fig 33: Life cycle assessment diagram of mass timber.
Source: <https://www.canr.msu.edu/news/marco-lo-ricco-comparative-whole-building-lifecycle-assessment-of-mass-timber-buildings>

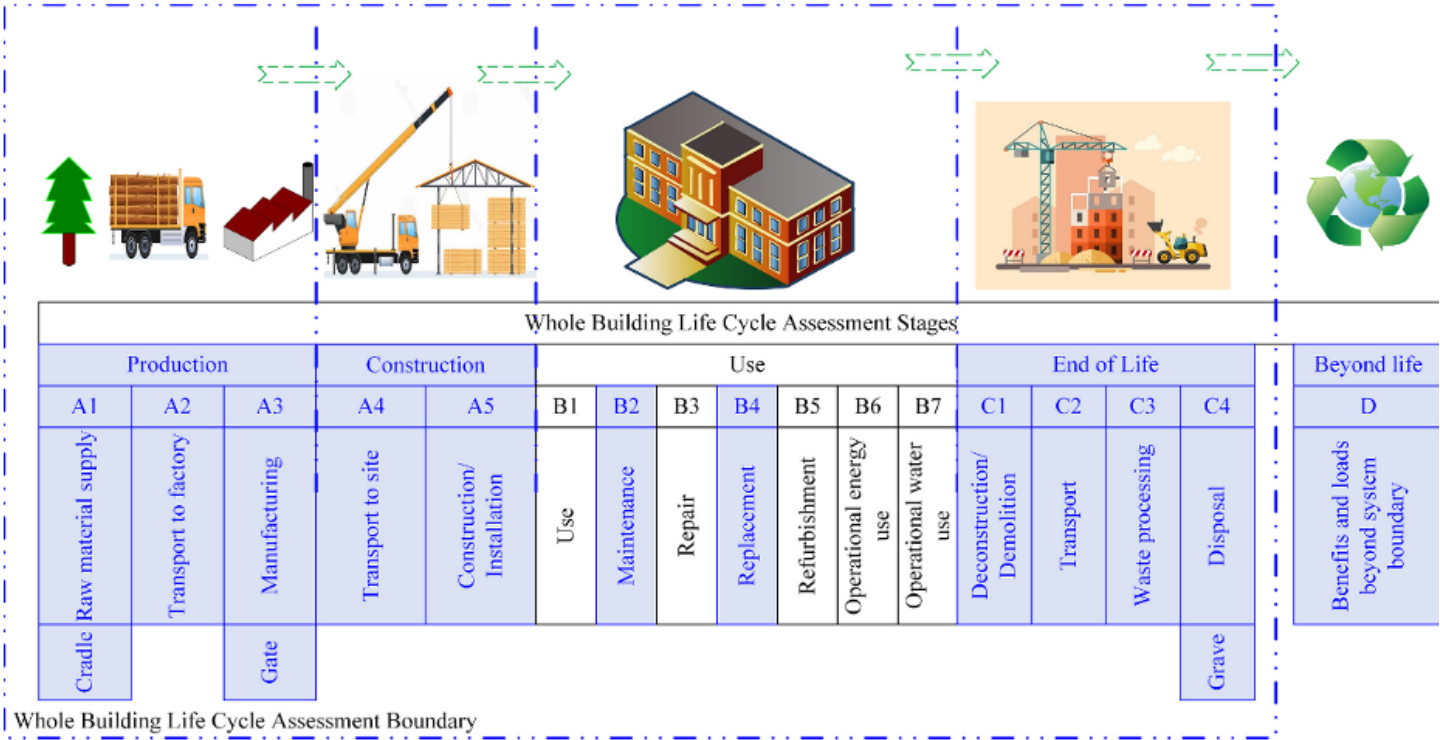


Fig 34: Aerial photo of vast forests of the Pacific Northwest.
Source: <https://www.architecturalrecord.com/articles/15796-mass-timber-a-new-chapter-in-sustainable-forestry>

Transportation impacts can also be reduced when timber is harvested, manufactured, and fabricated within the same region where it is ultimately used. In heavily forested areas such as the Pacific Northwest, locally sourced mass timber has the potential to shorten supply chains while supporting regional production networks.

Perhaps most relevant to this thesis is the relationship between mass timber and adaptive reuse. The retention of existing buildings is increasingly recognized as one of the most effective strategies for preserving embodied carbon already invested in the built environment.³⁵ When adaptive reuse is combined with a lower-carbon structural material such as mass timber, two complementary sustainability strategies begin to operate simultaneously. Existing materials are preserved rather than discarded, while new interventions are introduced using a material with comparatively lower embodied carbon. Together, these approaches suggest a framework in which preservation and sustainability are mutually supported rather than competing objectives.

4.3 Regional Resources and Economy

The Pacific Northwest has a long-standing relationship with forests and wood products. Extensive forests throughout Washington, Oregon, and British Columbia have historically supported industries related to logging, milling, manufacturing, and transportation. These resources played a central role in the development of many Western cities and continue to influence regional economies today.

The emergence of mass timber has created new opportunities within these established forestry and manufacturing networks. Forest owners, sawmills, manufacturers, fabricators, engineers, and contractors increasingly participate in supply chains associated with engineered wood products. As demand for mass timber grows, investments in manufacturing facilities and fabrication technologies continue to expand throughout the region.³⁶

This growth extends beyond large-scale industrial production. Smaller manufacturers, fabrication shops, research institutions, and technology developers are also contributing to innovation within the industry. Organizations such as the Composite Recycling Technology Center (CRTC) demonstrate how research, advanced manufacturing, and product development can support both economic growth and innovation within the region's evolving wood products industry.³⁷ These investments strengthen local expertise while creating opportunities for collaboration between designers, engineers, builders, and manufacturers.

The regional concentration of resources, manufacturing capacity, and technical knowledge positions the Pacific Northwest as a leading environment for exploring new applications of mass timber. As interest in resilient and sustainable construction continues to grow, the region is uniquely positioned to advance the evolution of timber-based building systems.

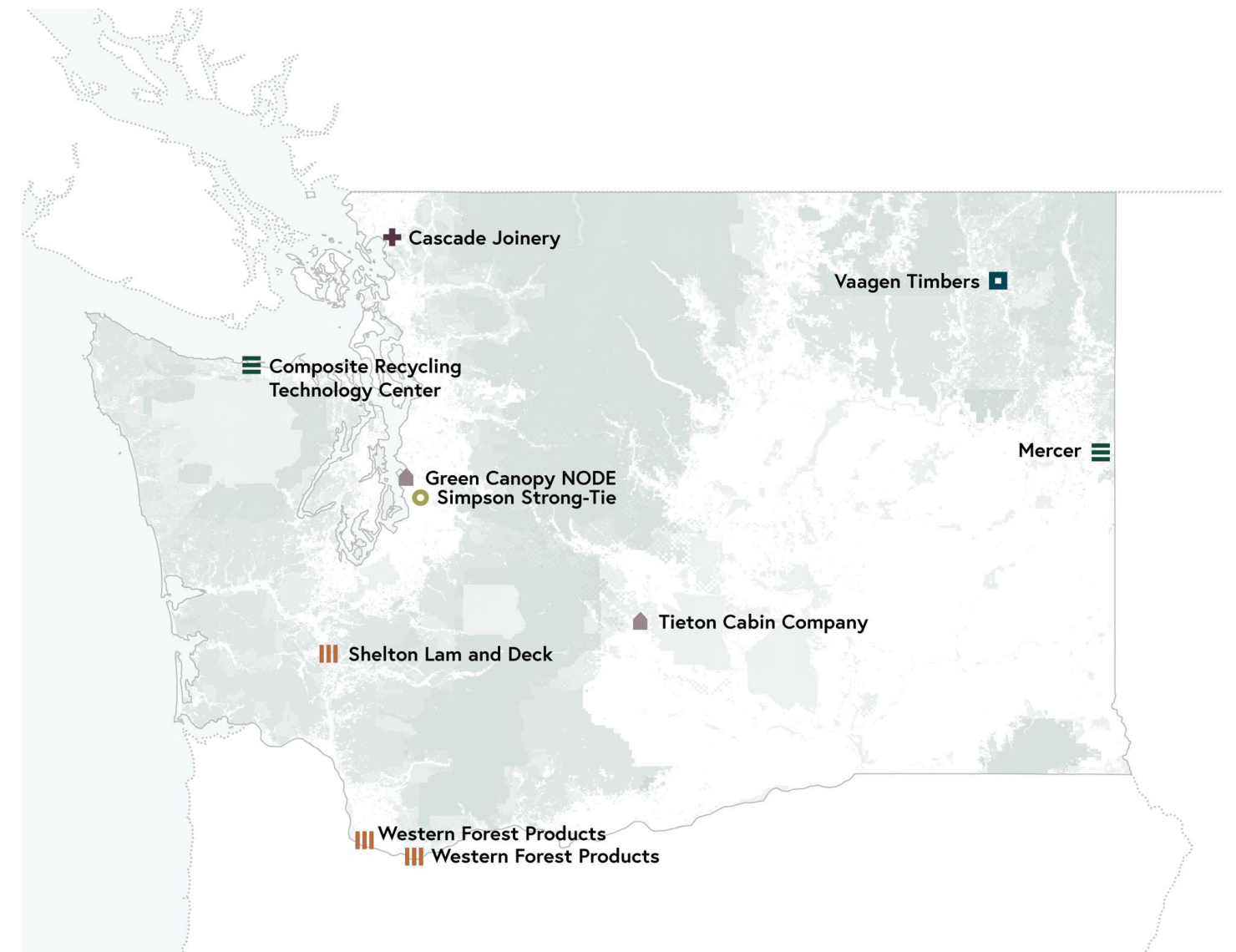


Fig 35: Map of mass timber suppliers in Washington.
Source: <https://www.wamasstimmer.org/suppliers>

4.4 Pacific Northwest Heritage

The relationship between the Pacific Northwest and timber extends far beyond contemporary mass timber construction. Long before contemporary engineered wood products were developed, timber served as the primary material for buildings, infrastructure, and transportation systems throughout the region. Indigenous communities relied on wood as a fundamental building resource, while later Euro-American settlement depended heavily on timber for housing, warehouses, mills, rail infrastructure, and port facilities. In many ways, the growth of Western cities was inseparable from the forests that surrounded them.

Although many of these early structures were utilitarian in nature, they often exhibited a directness of construction and material expression that reflected the logic of timber construction. Heavy wood framing, exposed structural systems, and straightforward geometric forms became common throughout industrial districts and transportation networks. While the material was primarily valued for its availability, it also inadvertently shaped the character of its surrounding environment.

These influences would later contribute to the development of Pacific Northwest Regionalism during the mid-twentieth century. Architects such as John Yeon and Paul Hayden Kirk explored ways of integrating architecture with landscape, climate, and local materials. Their work frequently emphasized exposed wood structure, natural finishes, large windows, strong indoor-outdoor relationships, and a sensitivity to topography and regional identity. Influences from Japanese architecture further reinforced an appreciation for material honesty, craftsmanship, and the expressive potential of wood construction.³⁸



Fig 36: Image of Seattle Public Library Magnolia Branch, depicting typical timber construction and architectural expression.
Source: <https://www.spl.org/hours-and-locations/magnolia-branch/magnolia-branch-highlights>



Fig 37: Image of Winkenwerder Hall, depicting typical timber construction and architectural expression.
Source: <https://www.docomomo-wewa.org/architect/cherve-nak-robert-a/>

While many of these ideas remain influential, the widespread adoption of steel and concrete systems in larger commercial construction has reduced timber's visibility as a primary structural material in contemporary cities. Mass timber presents an opportunity not simply to replicate historical forms, but to reinterpret these practical geometries with contemporary technologies and building practices. By combining technical engineering with a material significant to the Pacific Northwest's history, mass timber offers the potential to create architecture that is both innovative and regionally grounded.

For URM buildings, this relationship presents an especially compelling opportunity. Rather than treating retrofit as a purely technical exercise, mass timber introduces the possibility of architectural expression rooted in both regional heritage and contemporary design. This convergence of structural performance, sustainability, and cultural continuity forms the basis for the precedent investigations explored in the following chapter.



5

Case Studies

The following case studies were selected to investigate approaches relevant to the seismic retrofit and adaptive reuse of unreinforced masonry buildings. While the adaptive reuse and timber architecture precedents are predominantly located within Seattle, the structural mass timber precedents are drawn from projects and research throughout the West Coast. Together, these examples provide insight into preservation strategies, seismic design approaches, contemporary timber expression, and the relationship between historic buildings and evolving urban environments.

Rather than serving as direct models for replication, these case studies are examined for the lessons they offer on integrating existing and new construction. Collectively, they establish a framework for understanding how historic buildings can remain relevant within growing cities while accommodating contemporary structural, environmental, and programmatic demands.

*Fig 38: Populus Seattle building, designed by Miller Hull.
Source: <https://millerhull.com/project/populus-seattle/>*



Fig 39: Photo of Gridiron Condominiums, with historic URM construction on the lower level and new construction above.
 Source: <https://hewittseattle.com/project/gridiron-condos/>

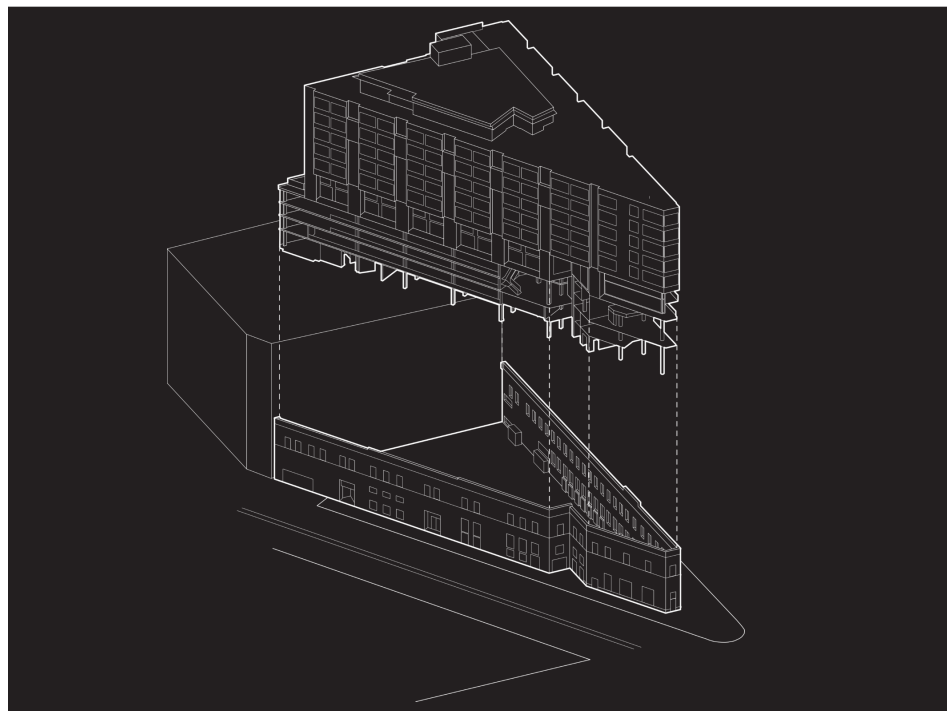


Fig 40: Diagram depicting the insertion of new within old.
 Source: <https://hewittseattle.com/project/gridiron-condos/>

5.1 Adaptive Reuse Precedents

The adaptive reuse precedents selected represent a spectrum of intervention strategies. Together, they demonstrate different approaches toward historic buildings and reveal how decisions regarding retention, demolition, new construction, and response to adjacent spaces shape architectural outcomes, long-term building viability, and urban engagement.

Gridiron Condominiums

Location: Seattle, WA
 Architect: Hewitt
 Year Completed: 2018

The Gridiron Condominiums provide an example of facadism, in which the historic exterior walls were retained while an entirely new structure was constructed within and above them.³⁹ While facadism can sometimes be criticized for reducing preservation to an exterior image, this project demonstrates a condition in which the strategy may be appropriate. The original interior was significantly deteriorated and no longer viable for meaningful preservation. This highlights the importance of evaluating the various components of an existing building individually, considering not only their historic significance, but also their structural integrity, functional utility, and long-term adaptability. In this case, retaining the exterior masonry walls allowed the building to continue contributing to the historic streetscape, while the deteriorated interior was replaced with a new structure capable of supporting contemporary use. The project illustrates how facade retention can serve as a pragmatic preservation strategy when existing conditions limit the feasibility of more comprehensive approaches.



Kolstrand Building

Location: Seattle, WA
 Architect: Graham Baba Architects
 Year Completed: 2010

The Kolstrand Building represents a more integrated approach to adaptive reuse. Historic materials, structural systems, and architectural character remain legible while contemporary interventions allow the building to accommodate new uses and performance requirements.⁴⁰ Rather than separating preservation and modernization into opposing objectives, the project demonstrates how both can operate simultaneously. The building illustrates the value of selective intervention, where strategic modifications strengthen long-term viability while preserving historic identity.

Fig 41: Street facing facade of the Kolstrand building.
 Source: <https://grahambaba.com/kolstrand-building>



Fig 42: Diagram depicting the new construction integrated into the existing Kolstrand building.
 Source: <https://grahambaba.com/kolstrand-building>



Fig 43: Rendering of a new proposed building next to two Seattle landmark URM buildings.
Source: <https://www.herzogdemeuron.com/projects/524-belltown/>



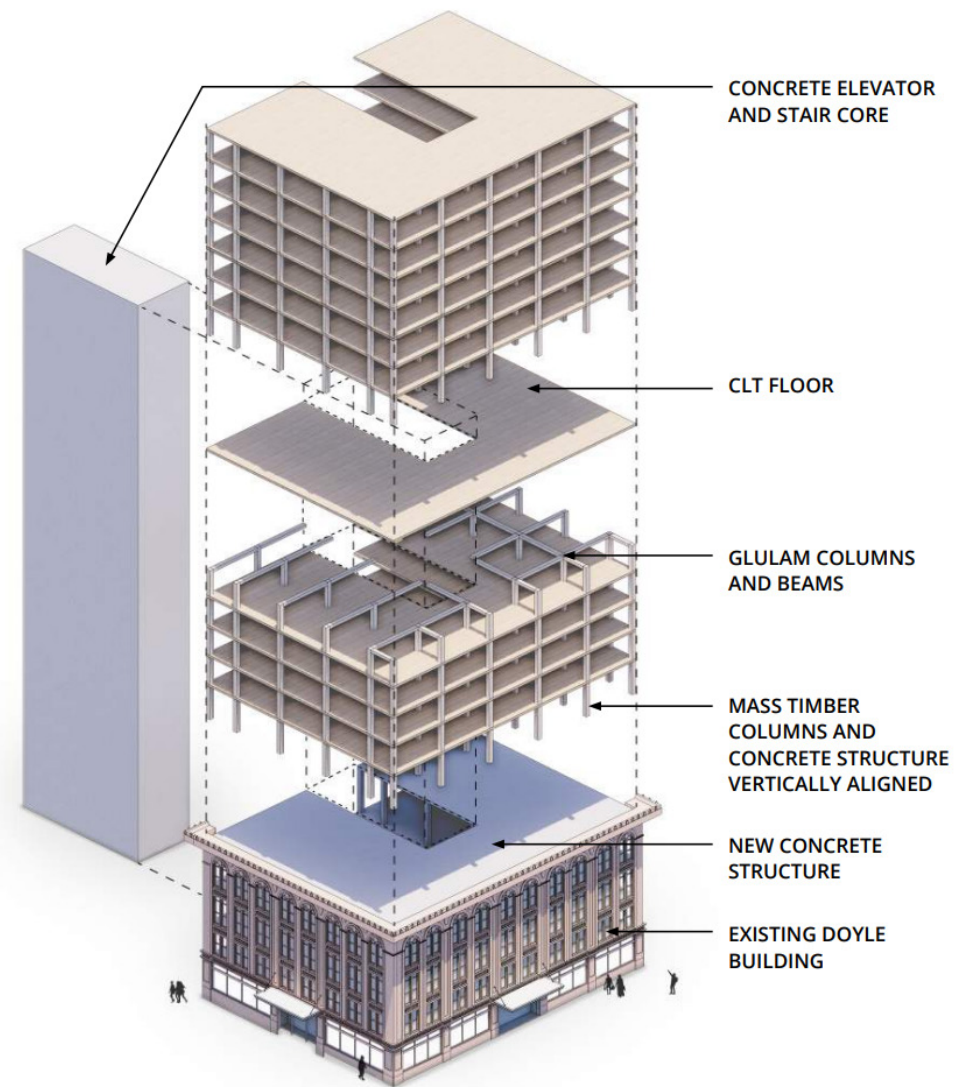
Fig 44: Street scape of proposed 524 Belltown building.
Source: <https://www.herzogdemeuron.com/projects/524-belltown/>

524 Belltown

Location: Seattle, WA
Architect: Herzog & de Meuron
Year Completed: Proposal

The proposed redevelopment at 524 Belltown provides an important example of new construction adjacent to existing historic buildings.⁴¹ While the project is not built work, it is useful as a study of how vacant or underutilized lots beside URM buildings are often approached within contemporary development pressures. In many cases, separate ownership, zoning requirements, financial feasibility, and parcel boundaries make independent development the most practical path. As a result, new construction may occur beside historic buildings without necessarily forming a deeper architectural or programmatic relationship with them.

This condition is not a failure of the project, but rather an observation of a common urban circumstance. Adjacent lots often represent significant opportunities for added density, but they may also offer possibilities for shared circulation, public space, structural collaboration, or architectural dialogue when ownership and project scope allow. The project, therefore, highlights an important question for this thesis: how might new construction beside an existing URM building become more than a neighboring development and instead become part of a more integrated preservation and adaptation strategy?



Doyle Building Mass Timber Tower Addition

Location: Seattle, WA
 Architect: Clark / Barnes
 Year Completed: Proposal

The proposed Doyle Building mass timber tower addition explores the challenge of adding new density above an existing historic structure.⁴² As a proposal rather than built work, the project is especially useful for understanding the tensions that can arise between preservation goals, development pressure, and contemporary construction methods. Its review by the Seattle Landmarks Preservation Board demonstrates how vertical additions to historic buildings can become contested architectural questions, particularly when new massing may alter the scale, visibility, or character of the original structure.⁴³

The project raises important considerations for this thesis. Vertical additions can provide a means of increasing density while retaining historic fabric, but they also risk overwhelming the existing building if scale, proportion, and structural relationships are not carefully resolved. The Doyle proposal, therefore, serves as a useful precedent for understanding both the opportunity and difficulty of pairing historic masonry with new mass timber construction.

Fig 45: Diagram of a proposed mass timber structure to be built on top of a landmark URM building in Seattle.
 Source: <https://www.theurbanist.org/downtown-mass-timber-tower-project-meets-resistance-at-seattle-landmark-board/>



Fig 46: The historic Doyle building in Seattle.
 Source: <https://www.theurbanist.org/downtown-mass-timber-tower-project-meets-resistance-at-seattle-landmark-board/>



Fig 47: The primary facade of the Populus Seattle building.
Source: <https://millerhull.com/project/populus-seattle/>

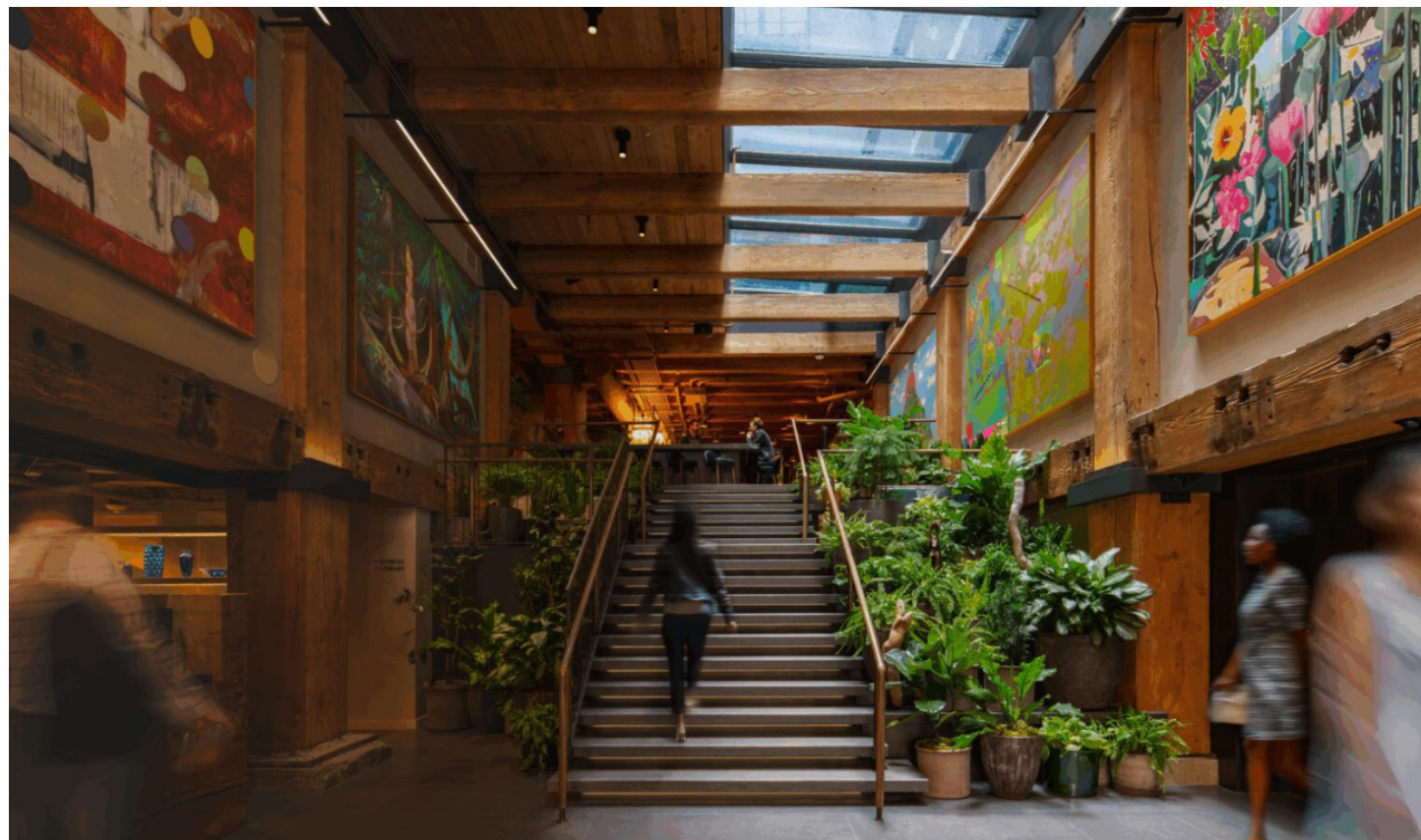


Fig 48: The redesigned lobby space of the Populus Seattle building.
Source: <https://millerhull.com/project/populus-seattle/>

Populus Seattle

Location: Seattle, WA
Architect: Miller Hull
Year Completed: 2025

Populus Seattle provides one of the most relevant adaptive reuse precedents for this thesis. The project is an exceptional example of integrated adaptive reuse, transforming an existing historic warehouse into a contemporary hotel. Historic fabric remains central to the identity of the project, while strategic interventions allow the building to accommodate updated programmatic, technical, and experiential requirements.⁴⁴

A significant aspect of the project was the careful evaluation of the existing heavy timber structure and how it related to contemporary building codes. Originally constructed as a warehouse, the building's timber framing was designed to support substantially higher floor loads than those required for hotel occupancy. This change in use allowed much of the existing structure to remain exposed and celebrated as a defining architectural feature of the project. Rather than viewing the existing building solely through the lens of its original purpose, the design team evaluated how its structural capacity could be leveraged within a new occupancy classification. The project demonstrates how adaptive reuse decisions are often driven by a detailed understanding of the relationship between existing construction, proposed use, and contemporary code requirements.



Fig 48: The roof top bar of the Populus Seattle building.
 Source: <https://millerhull.com/project/populus-seattle/>

Populus Seattle

The project also illustrates how adaptive reuse can extend beyond the boundaries of the original building envelope. A rooftop bar was introduced above the historic structure, creating a new public destination while capitalizing on views of the surrounding city. Achieving this intervention required navigating significant zoning, code, and preservation considerations while working closely with the City of Seattle. Similarly, a ground-floor restaurant addition extends into the adjacent alley space, activating an underutilized portion of the site and strengthening the building's connection to the public realm. These interventions demonstrate that preservation does not necessarily require strict adherence to the original building envelope. When carefully executed, additions and extensions can enhance both the functionality and long-term viability of a historic building.

The significance of Populus lies in its willingness to evaluate each component of the existing building independently and strategically. Structural systems, occupancy classifications, public spaces, programmatic opportunities, and historic fabric were each assessed for their potential contribution to the project. The result is an adaptive reuse strategy that preserves the character of the historic building while allowing it to evolve in response to contemporary needs. For this thesis, the project demonstrates that successful preservation is often less about maintaining a building exactly as it was and more about understanding how existing conditions can create opportunities for new forms of use, occupation, and urban engagement.



Fig 49: The restaurant addition of the Populus Seattle building.
 Source: <https://millerhull.com/project/populus-seattle/>



Fig 50: Overhead view of the Railspur alleyway connection between historic URM buildings in Pioneer Square.
Source: <https://railspurseattle.com/>

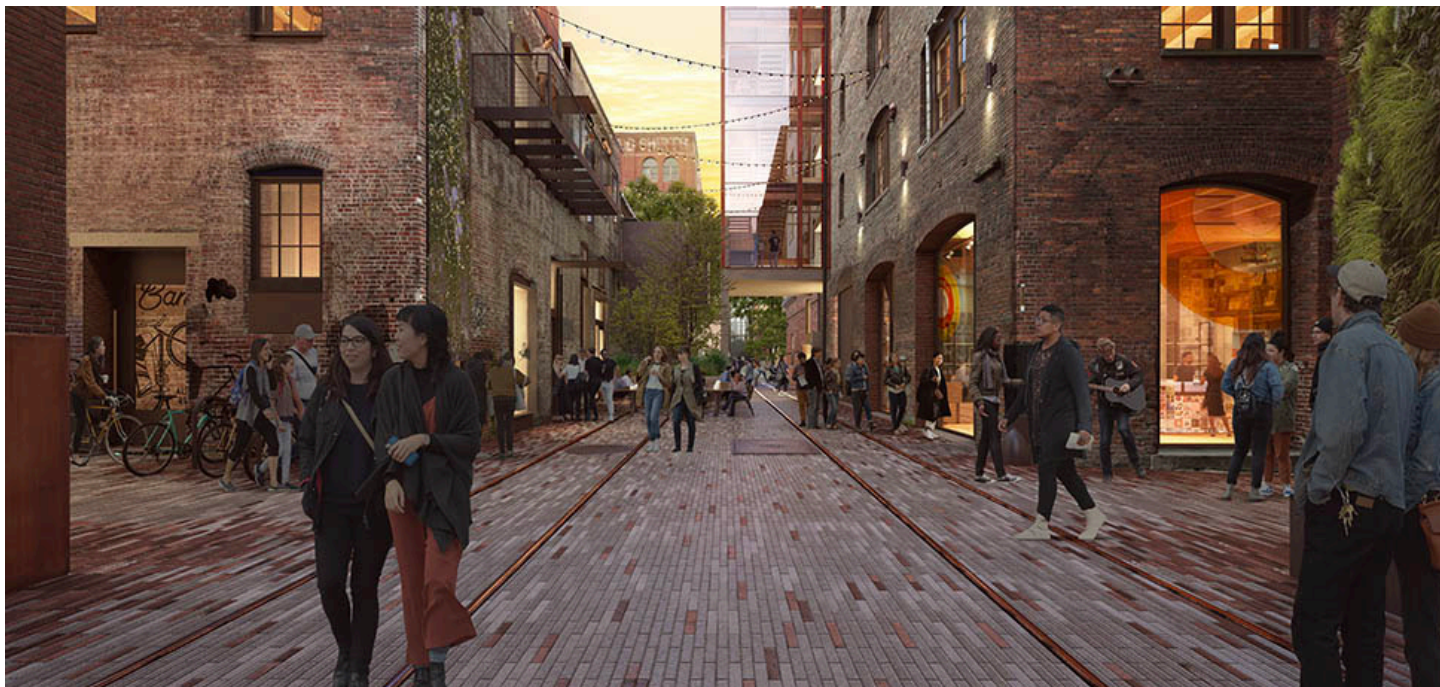


Fig 51: Rendering of the Railspur alleyway connection between historic URM buildings in Pioneer Square.
Source: <https://railspurseattle.com/>

Railspur

Location: Seattle, WA
Developer: Urban Villages
Year Completed: 2025, On-Going

Looking at the larger urban scale, Populus is part of the broader RailSpur collection of buildings in Pioneer Square. RailSpur expands the idea of adaptive reuse beyond the individual building and into the relationships between buildings, alleys, circulation, and public space. Historic structures are not simply restored in isolation but are connected through a broader urban strategy that transforms the spaces between them into active pedestrian environments.⁴⁵

This larger framework is especially important to the direction of this thesis. RailSpur demonstrates that the long-term value of historic buildings depends not only on preserving their walls, but also on integrating them into contemporary patterns of urban life. Alleys, shared entries, pedestrian paths, and adjacent spaces become connective tissue that allows historic buildings to remain active, accessible, and socially relevant. In this instance, the space between buildings becomes part of the adaptive reuse strategy itself.



Fig 52: The Hive office building in Vancouver, using timber brace frames as a seismic structural system.
Source: <https://www.fastapp.com/portfolio/2150-keith-drive/>

5.2 Mass Timber Structural Precedents

The mass timber structural precedents selected for this section are not intended to provide systems for direct replication. Instead, they demonstrate how new and relatively experimental mass timber seismic strategies are beginning to emerge. These projects help establish the research gap this thesis occupies. While mass timber has gained momentum in new construction, its use as a seismic retrofit strategy for existing URM buildings remains largely unexplored.

The Hive

Location: Vancouver, B.C.

Architect: DIALOG

Year Completed: 2025

The Hive provides an important example of mass timber used within a seismic structural system. The project employs glulam bracing members in combination with Tectonus steel connections to create a lateral system that functions similarly to conventional steel braced frames.⁴⁶ In this configuration, the timber members work in tension and compression, while the steel connections provide controlled movement and energy dissipation during seismic events.

Although the structural system is not exposed on the exterior, the building expresses its seismic logic through diagonal cladding that visually references the bracing system behind it. This distinction is important: the project does not simply display structure directly, but translates structural behavior into architectural expression. For this thesis, The Hive is significant because it demonstrates that mass timber can participate in lateral seismic design while also influencing the visual language of the building.



Fig 53: The Tectonus RSFJ system used in conjunction with timber brace frames.
Source: <https://www.fastapp.com/portfolio/2150-keith-drive/>



Fig 54: Construction of the 10-story CLT shake table test.
Source: <https://timberlab.com/projects/nheri>

NHERI Ten-Story CLT Shake Table Test

Location: San Diego, CA
Fabrication and Erection: Timberlab
Year Completed: 2023

The ten-story CLT shake table test conducted through the NHERI TallWood Project provides a rigorous demonstration of mass timber seismic performance.⁴⁷ Through full-scale testing, researchers evaluated the behavior of a mass timber building subjected to simulated earthquake conditions. The project confirmed the ability of mass timber systems and their steel connections to achieve high levels of seismic resilience while limiting structural damage.

Although the test represents new construction rather than adaptive reuse, it provides important validation for the broader use of mass timber in seismic design. The research demonstrates that engineered timber systems can achieve significant seismic performance while benefiting from reduced structural weight and prefabricated construction methods.

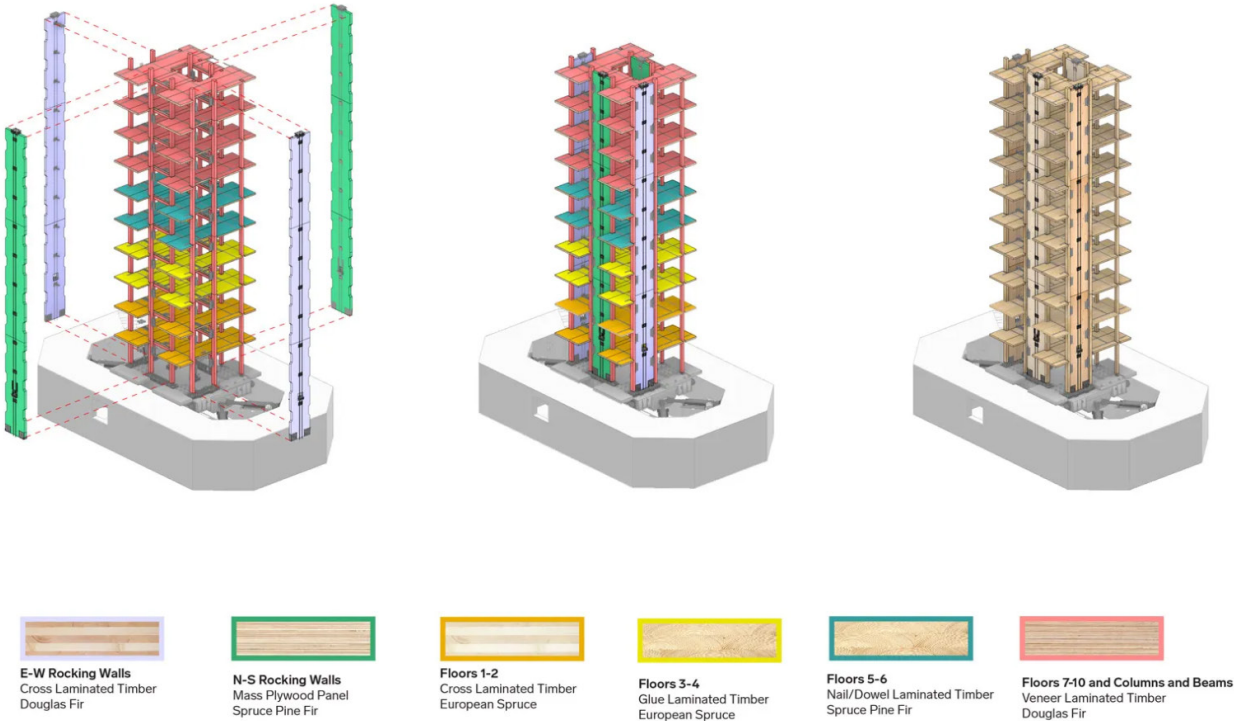


Fig 55: Diagram explaining the different types of panels used for the test and where in the structure.
Source: <https://timberlab.com/projects/nheri>



*Fig 56: Photo of the central portion of the Wilburton Trestle bridge.
Source: Photo by author*



*Fig 57: Photo looking down the length of the repeated bays of the trestle.
Source: Photo by author*

5.3 Regional Timber Precedents

The regional timber precedents establish a lineage of timber expression in the Pacific Northwest. Rather than focusing only on contemporary mass timber, this section traces a broader narrative from historic timber infrastructure, to mid-century regional architecture, to current urban mass timber projects. Together, these examples provide a material and architectural context for understanding mass timber not simply as a new technology, but as part of a longer regional tradition.

Wilburton Trestle

Location: Bellevue, WA
Rail Network: Northern Pacific Railway
Year Completed: 1904

The Wilburton Trestle represents a significant example of large-scale timber infrastructure in the Pacific Northwest.⁴⁸ Originally constructed as part of the region's rail network, the trestle demonstrates the structural efficiency, repetition, and material directness characteristic of historic timber engineering. Its power lies in the clarity of its construction: repeated timber members, rhythmic bracing, and a legible structural hierarchy create an architectural presence from a primarily utilitarian system.

The trestle is also significant because of its current transformation into public park infrastructure. This evolution from transportation structure to civic landscape parallels several themes within this thesis. An aging timber structure is not simply preserved as a relic, but adapted into a new form of public urban use. In this way, the Wilburton Trestle demonstrates how historic infrastructure can be reinterpreted for contemporary civic life while retaining the expressive character of its original construction.



*Fig 58: Photo of the rhythmic, exposed timber facade of Winkenwerder Hall.
Source: <https://www.docomomo-wewa.org/architect/cherVENAK-ROBERT-A/>*



*Fig 59: Detail image of bypass construction technique.
Source: Photo by author*

Winkenwerder Hall

Location: Seattle, WA
Architects: Ross W. Copeland, Jr., Austin Grant, and Robert A. Chervenak
Year Completed: 1963

Completed in 1950, Winkenwerder Hall represents an important example of Pacific Northwest Regionalism.⁴⁹ The building combines exposed timber structure, large expanses of glazing, and a strong relationship to landscape and climate. Rather than treating wood solely as a structural material, the building uses timber to shape architectural experience through warmth, texture, and material expression.

The project reflects broader regional interests in natural materials, landscape integration, and human-scaled spaces that would come to define much of the Pacific Northwest architectural identity during the mid-twentieth century. Unlike the Wilburton Trestle, where timber is expressed primarily as infrastructure, Winkenwerder Hall demonstrates how exposed structural wood can become a defining architectural feature of a significant public building. The timber structure remains visible both inside and outside the building, reinforcing a direct connection between material, structure, and architectural identity.

The building also reveals the long-term challenges associated with exposing structural timber to the Pacific Northwest climate. While the overall structure remains in good condition after decades of use, areas of exposed end grain and weather-exposed members show signs of deterioration that benefit from regular maintenance. This raises important questions regarding the relationship between material expression and durability. Winkenwerder Hall demonstrates the architectural richness that can emerge when structure is honestly expressed through timber while highlighting the need to carefully balance visibility, protection, and long-term performance with the exposure of structural wood elements.



Fig 60: Aerial view of Northlake Commons, showing exposed timber columns on the ground floor.
Source: <https://www.weberthompson.com/project/northlake-commons/>

Northlake Commons

Location: Seattle, WA
Architect: Weber Thompson
Year Completed: 2024

Northlake Commons demonstrates a contemporary urban interpretation of regional timber architecture through mass timber construction.⁵⁰ While exposed timber is used throughout the project's office spaces, one of its most relevant features is the series of outdoor bridges that connect the two buildings on the site. These bridges extend mass timber beyond the interior workplace and into the public realm, helping frame a central plaza and creating a distinctive pedestrian experience.

This aspect of the project is especially relevant to the thesis proposal. Northlake Commons shows how mass timber can operate not only as an efficient structural system, but also as connective urban infrastructure. The bridges mediate between buildings, activate exterior space, and allow timber to become part of the public experience of the site. In this way, the project expands the role of mass timber from interior material expression to urban connector.



Fig 61: Exposed mass timber bridge structures connecting two wings of Northlake Commons.
Source: <https://www.weberthompson.com/project/northlake-commons/>



Case Study Conclusions

Several themes emerge from these precedents. The adaptive reuse projects demonstrate that preservation exists along a spectrum, with different strategies becoming appropriate depending on building condition, economic feasibility, and long-term use. The mass timber structural precedents show that seismic timber systems are still developing, particularly through hybrid approaches that rely on both engineered timber members and steel connections. The regional timber precedents establish a broader architectural lineage in which timber operates as structure, expression, infrastructure, and public experience.

Most importantly, these case studies suggest that the relationship between historic and new construction should be understood as more than a technical connection. Successful projects create meaningful relationships between preservation and growth, existing buildings and contemporary interventions, and architecture and the public realm. This idea is central to the design proposal that follows.

See previous instances of figures for source information.



6

Design Proposal

The preceding chapters established the architectural significance of unreinforced masonry buildings, the seismic challenges facing West Coast cities, the emerging potential of mass timber construction, and a series of precedents exploring adaptive reuse, preservation, and contemporary timber architecture. This chapter applies those findings through a design proposal for the Barnes Building in Seattle, Washington.

The proposal is not intended to represent a universal solution for all unreinforced masonry buildings. Rather, it serves as a design investigation into how mass timber can support seismic retrofit, adaptive reuse, preservation, and urban infill simultaneously. Through the Barnes Building, the project explores how a historic structure can continue to contribute to the evolving city while retaining the qualities that make it valuable today.

*Fig 62: Barnes building with new mass timber buttress system.
Source: Image by author*

6.1 Site and Building Selection

Seattle, Washington

Seattle was selected as the study city for this thesis because it represents a unique convergence of seismic risk, historic masonry construction, preservation culture, development pressure, and timber architecture. While many West Coast cities contain significant populations of unreinforced masonry buildings, Seattle is especially relevant due to its location along major seismic fault systems, its large inventory of URM buildings, and its growing relationship to the mass timber industry.

The Seattle Fault Zone runs east to west through the city, with potential earthquake epicenters located near the downtown core.⁵¹ This seismic condition has made the vulnerability of URM buildings a significant concern for the city. Seattle has adopted building code provisions addressing URM retrofits, but the development of mandatory retrofit requirements remains a slow and complex process involving questions of cost, enforcement, technical support, and resources for building owners.⁵² Within this context, new approaches to retrofit may help expand the conversation around how these buildings can be strengthened while remaining useful and economically viable.

Seattle also contains a substantial inventory of URM buildings.⁵³ The city’s database lists more than 1,100 URM structures, while the Washington Unreinforced Masonry Building Inventory Report suggests that the number within the city may exceed 2,000.⁵⁴ This issue extends beyond Seattle itself, with many additional URM buildings located in nearby cities such as Tacoma and Olympia. The scale of this building stock makes seismic retrofit not only an individual building problem, but a regional architectural and urban challenge.

At the same time, Seattle is increasingly connected to the growth of mass timber construction. The city is located within a region with extensive forestry, manufacturing, and fabrication resources, and it has become a testing ground for innovative mass timber projects, such as the Heartwood Apartments by atelierjones.⁵⁵ Programs and initiatives such as MASSTAC, the State Building Code Alignment process, the Housing Opportunities Program, and the Living Building Pilot Program reflect broader interest in supporting mass timber construction within the city.⁵⁶ While these programs may not apply directly to the proposed project, they demonstrate Seattle’s openness to exploring mass timber as a more widespread building system.

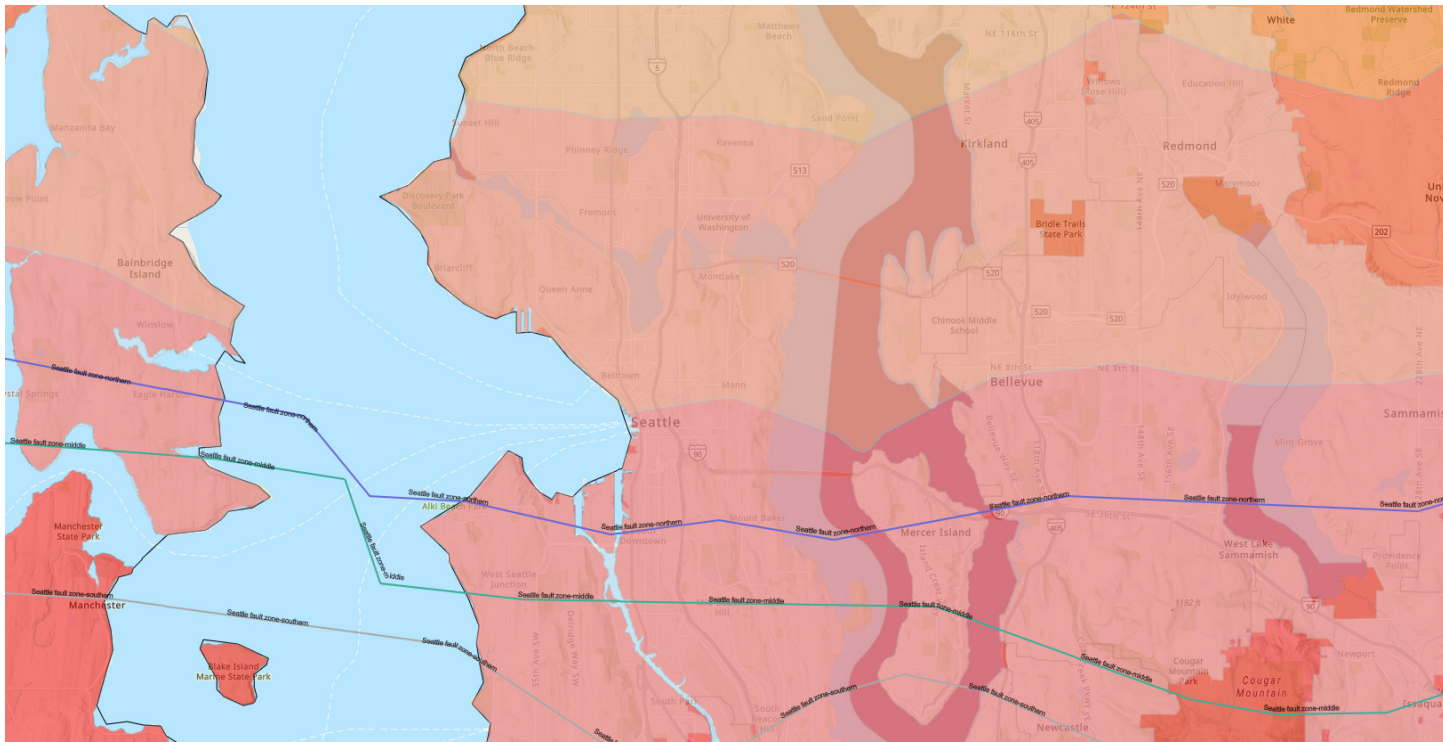


Fig 63: Seattle fault shake intensity map.
Source: <https://www.arcgis.com/apps/mapviewer/index.html?web-map=92eacf3b3e5e4dbc816d4a9f1043dccf>

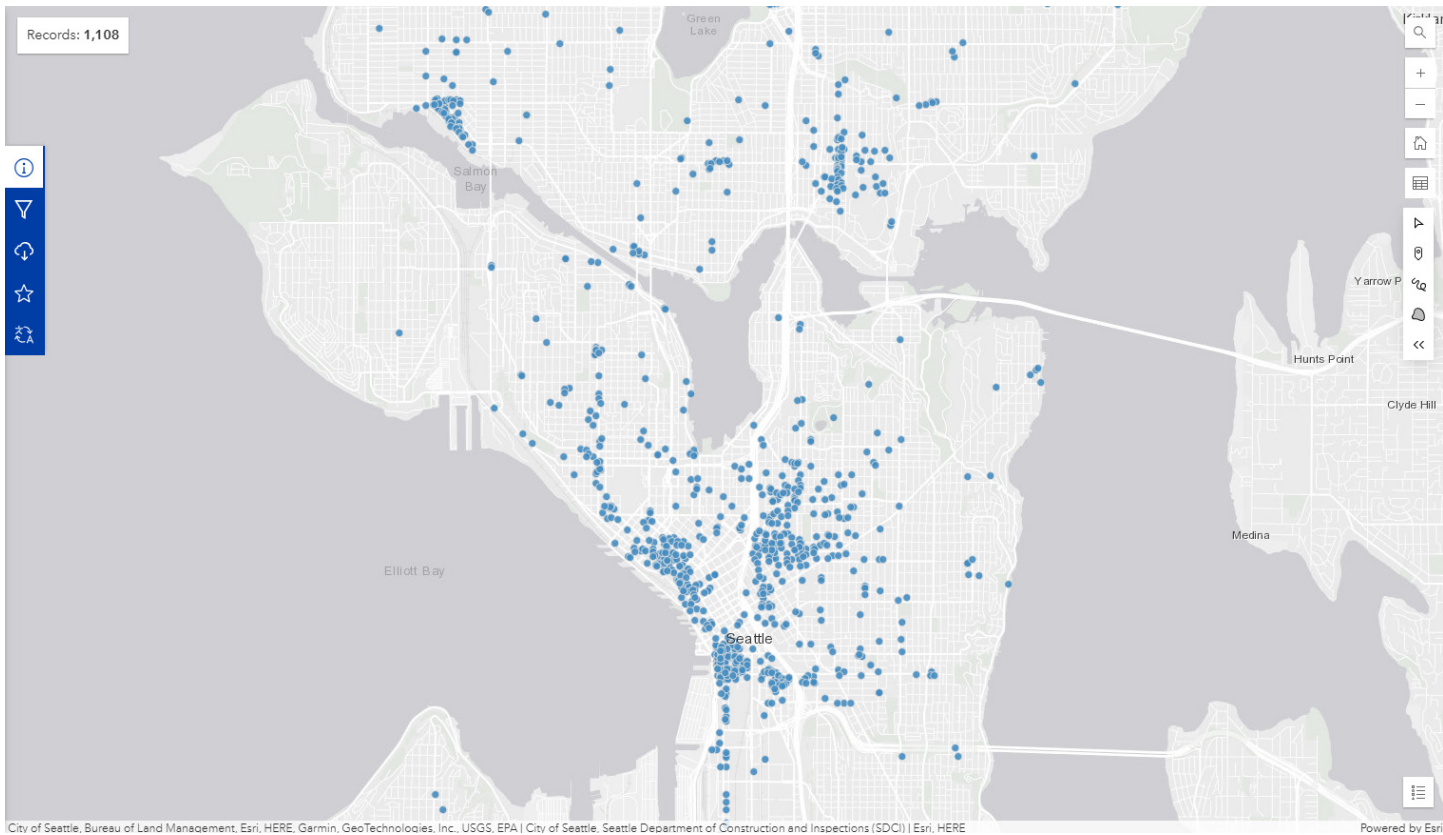


Fig 64: Seattle URM building map.
Source: <https://data-seattlecitygis.opendata.arcgis.com/datasets/SeattleCityGIS::unreinforced-masonry-buildings-urm/explore?location=47.621725%2C-122.334979%2C11>

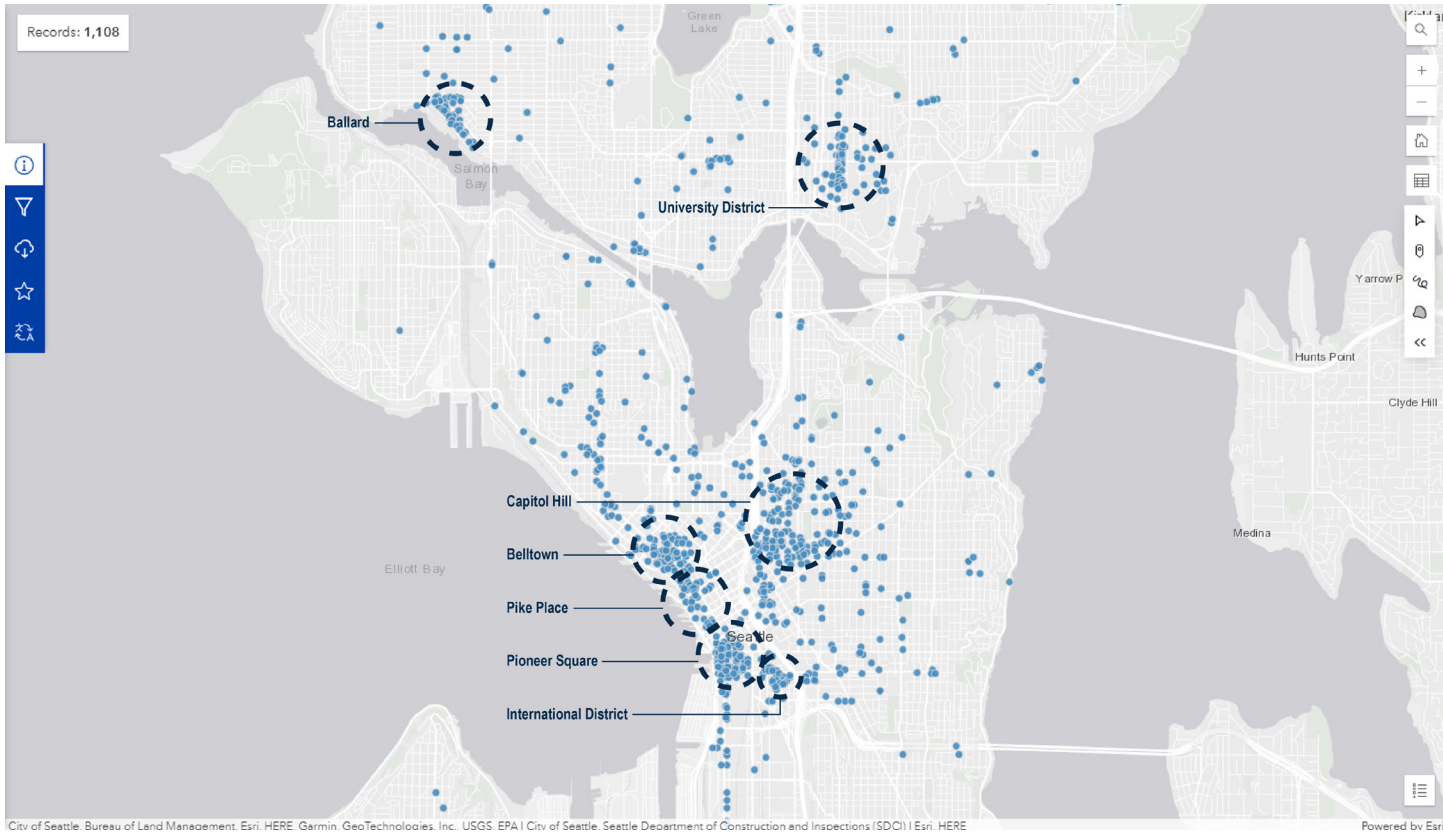


Fig 65: Seattle URM building map with major neighborhoods identified. Source: <https://data-seattlecitygis.opendata.arcgis.com/datasets/SeattleCityGIS::unreinforced-masonry-buildings-urm/explore?location=47.621725%2C-122.334979%2C11>

Seattle also contains both a strong preservation community and significant development pressures. Different neighborhoods negotiate these forces in different ways, with some areas offering substantial protections for historic buildings and others facing greater pressure for redevelopment. The proposal therefore seeks to operate within this tension, exploring how preservation and urban growth might be addressed together rather than treated as opposing objectives.

The neighborhood selection process began with Seattle’s Unreinforced Masonry Buildings GeoData map. Neighborhoods with significant clusters of URM buildings were identified, including Pioneer Square, the International District, Pike Place, Belltown, Capitol Hill, the University District, and Ballard. Selecting a site within a neighborhood with a high concentration of URM buildings was important because the project could then operate not as an isolated proposal, but also as a study with potential relevance and application to similar buildings within the immediate area.

A second criterion emerged from comparing these neighborhoods: the selected site should be located in an area where historic URM buildings face development pressure. Pioneer Square, the International District, and Pike Place all contain significant historic masonry buildings, but they also benefit from district-level protections and strong preservation backgrounds. Ballard contains a smaller landmark district, and both Ballard and Capitol Hill demonstrate strong patterns of adaptive reuse and cultural value placed on older buildings. By contrast, Belltown and the University District face stronger development pressures that may place smaller historic buildings at greater risk of demolition, neglect, or underuse.

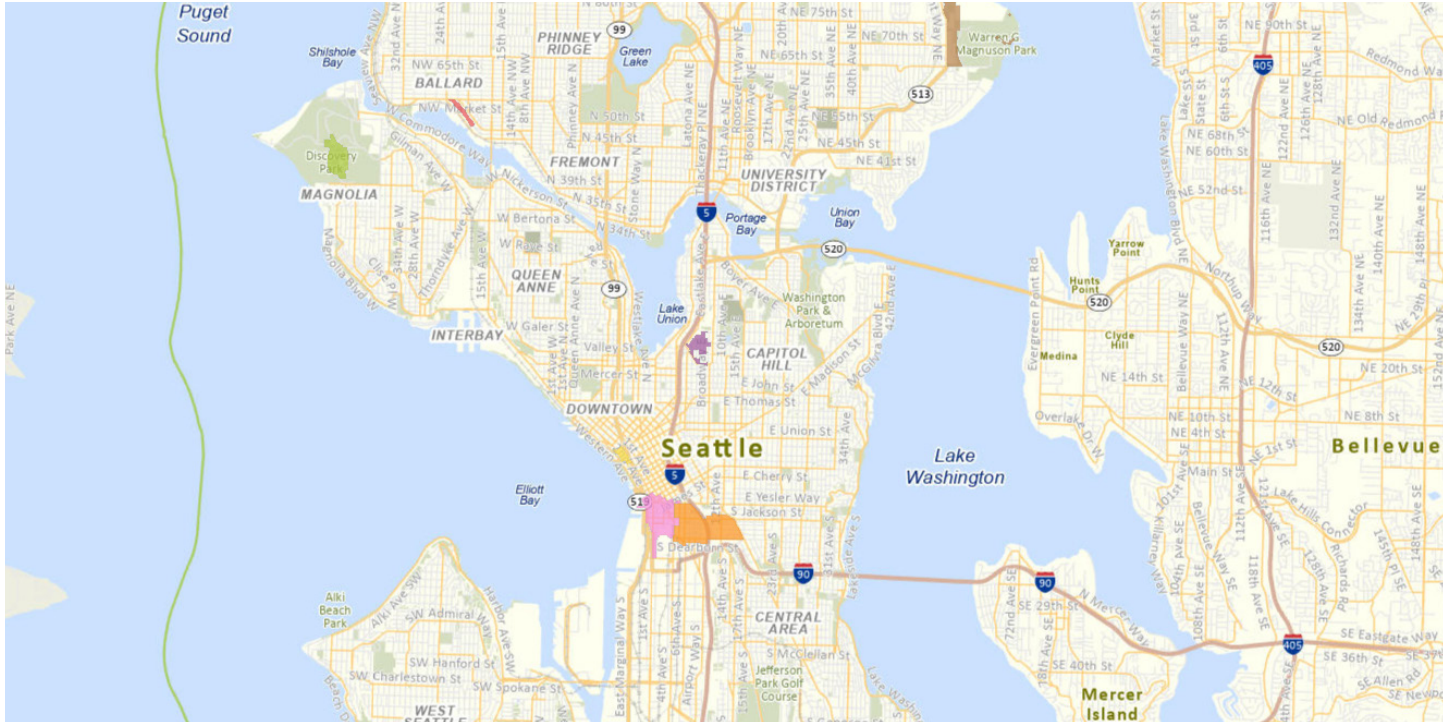


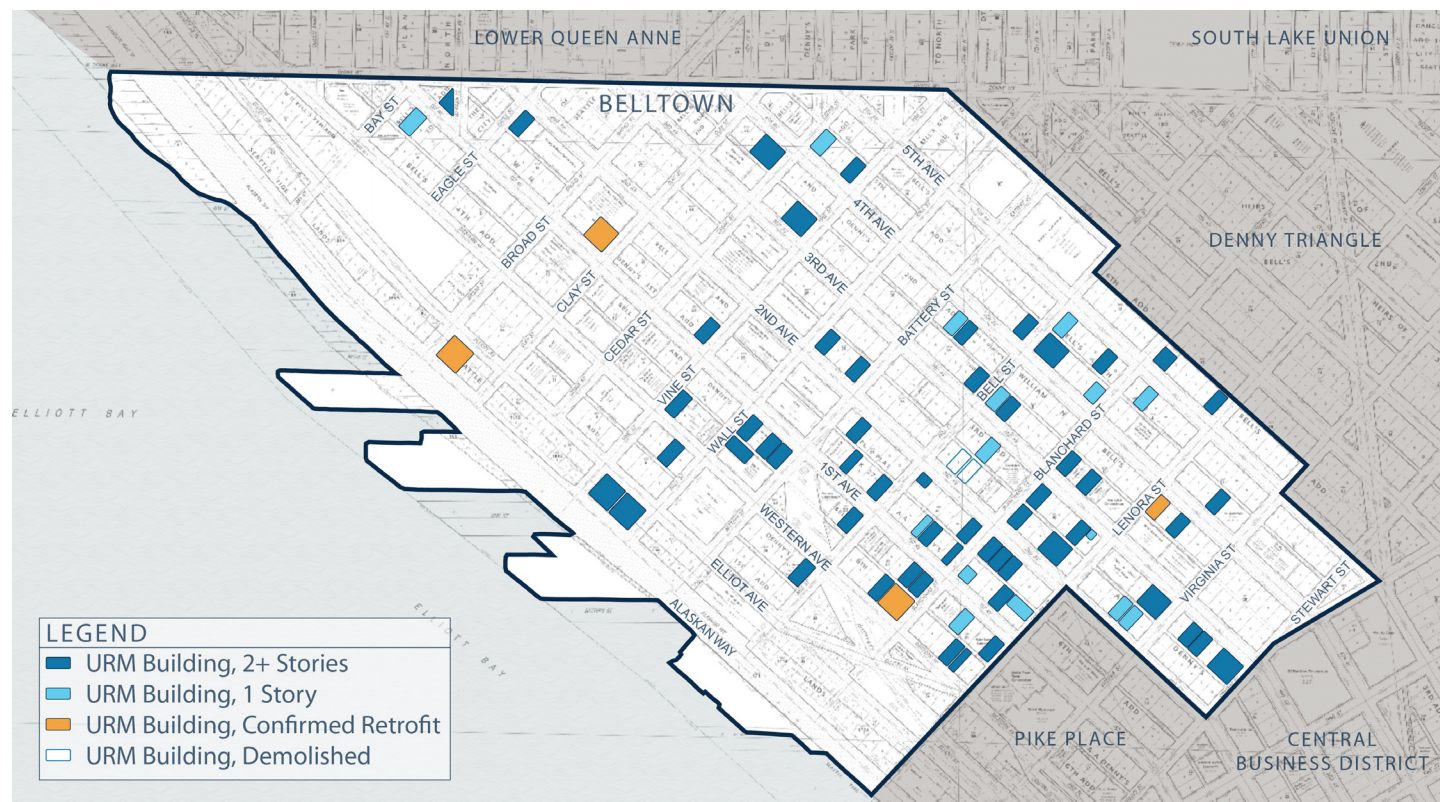
Fig 66: Seattle historic district map. Source: <https://www.seattle.gov/neighborhoods/historic-preservation/city-landmarks/landmarks-map>

Belltown Neighborhood

Belltown was ultimately selected due to its concentration of URM buildings, its proximity to downtown, and its role as a connector between the waterfront, downtown, and Seattle Center. The neighborhood contains seventy-six listed URM buildings and includes zoning areas that allow substantially taller development. Its combination of housing demand, commercial vacancy, cultural activity, and redevelopment pressure made it an appropriate setting for exploring adaptive reuse beyond conventional residential or commercial programs.

After identifying the seventy-six URM buildings in Belltown, a physical survey was conducted.⁵⁷ Each building was observed in person, with general notes taken regarding building condition, site context, adjacent parcels, and visible patterns. The buildings were then categorized using characteristics provided by Seattle's map tool, with number of stories and occupancy emerging as important factors in understanding the distribution and development of URM buildings in the neighborhood. Most were residential, mixed-use, or commercial buildings ranging from two to six stories tall.

*Fig 67: Map depicting URM buildings in the Belltown neighborhood.
Source: Diagram by author*



Four buildings were selected from these clusters for deeper study based on history, structural systems, occupancy, and adaptive reuse potential. Residential and mixed-use buildings with primarily light-frame interiors proved less suitable for the aims of the project because they offered less flexibility for large-scale programmatic adaptation. Commercial and commercial mixed-use buildings with post-and-beam interiors provided greater potential for adaptive reuse, larger open spaces, and clearer structural logic.

The Barnes Building

The Barnes Building was selected as the subject of the design proposal. The building offered several advantages, including its four-story height, strong historic facade, landmark status, relatively intact architectural character, and post-and-beam interior structure. Its upper floors contain large open spaces that suggest substantial potential for adaptive reuse. As-built drawings were made available to the author, allowing the building to be analyzed and digitally modeled with greater accuracy. Conversations and site visits with the building owner also provided insight into the building's current uses, challenges, and future possibilities. For these reasons, the Barnes Building presented both meaningful opportunities and significant challenges for a thesis investigation into seismic retrofit, adaptive reuse, and mass timber integration.

*Fig 68: The west and south facade of the Barnes Building.
Source: Photo by author*



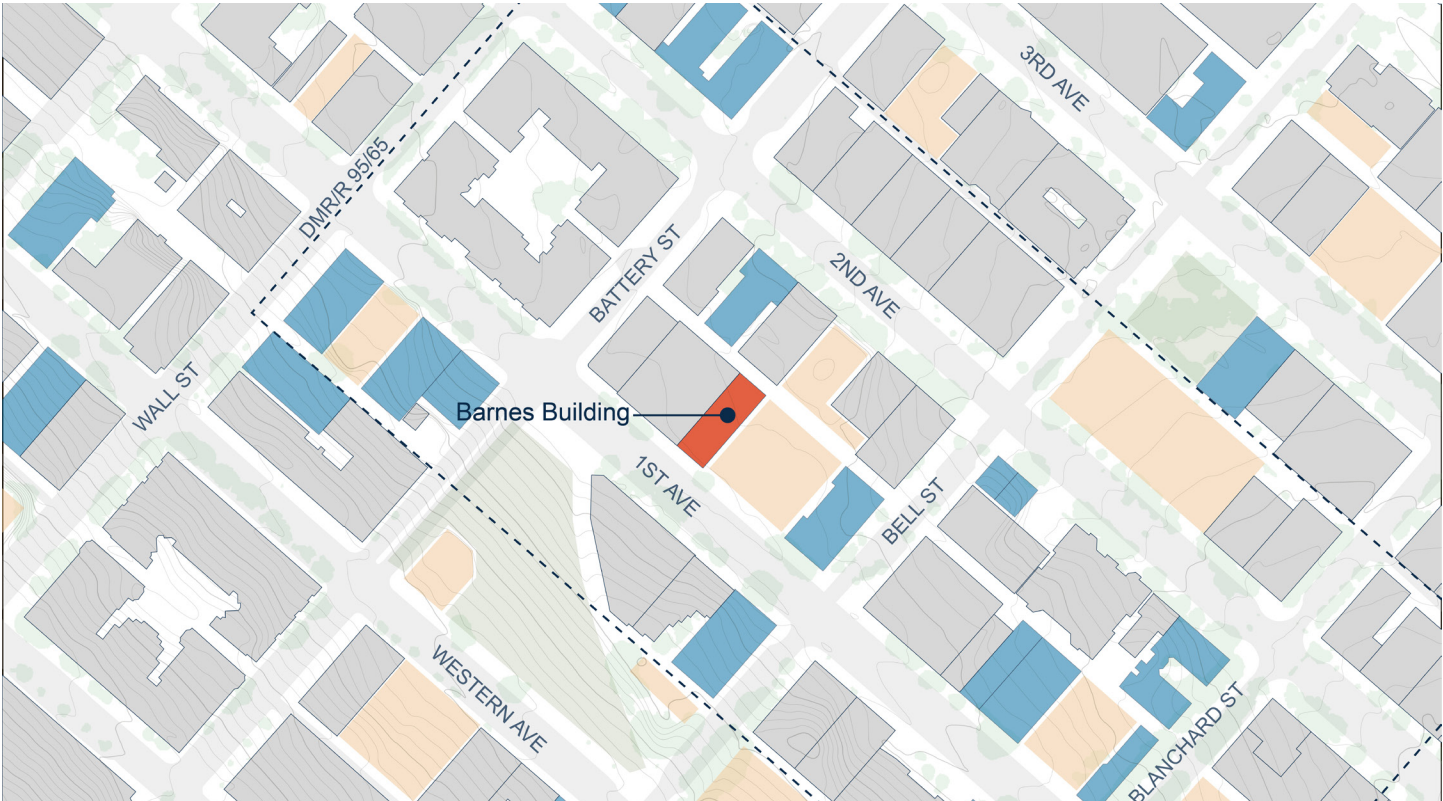
6.2 Site and Building Analysis

Site Analysis

The Barnes Building is located on First Avenue between Battery Street and Bell Street in Seattle’s Belltown neighborhood. The site exists within a dense and changing urban context shaped by historic masonry buildings, contemporary residential towers, mixed-use development, nightlife, music venues, restaurants, and vacant parcels. This mixture of conditions makes the site especially relevant to a thesis concerned with preservation, redevelopment pressure, and the future of historic buildings in growing cities.

Zoning and development trends were primary factors in the site analysis. Much of Belltown is shaped by Downtown Mixed Residential and Downtown Mixed Commercial zoning, which in many areas allows buildings over 200 feet tall.⁵⁸ This thesis does not argue that vertical growth is inherently negative. Rather, it considers the pressure that taller zoning and redevelopment incentives place on shorter historic buildings. The issue is not simply height, but the potential loss of urban grain, material character, cultural continuity, and embodied carbon when smaller older buildings are replaced.

Fig 69: Site plan of the Barnes building. URM buildings shown in blue and vacant lots shown in orange. Source: Diagram by author



The segment of blocks containing the Barnes Building is zoned DM-R/R 95/65, allowing a maximum height of ninety-five feet for residential buildings and sixty-five feet for many other uses, with some additional allowances. This height limit generally corresponds with the scale of several historic buildings along First Avenue, including the Barnes Building and the adjacent Austin A. Bell Building. Because the Barnes Building already reaches approximately sixty-five feet, it faces less immediate pressure under non-residential zoning than URM buildings located in taller zones. However, its condition still provides a valuable example for adjacent areas where smaller historic buildings may face stronger redevelopment incentives.

The surrounding urban context also suggested programmatic opportunities. Belltown contains a high concentration of residential buildings and is adjacent to a major downtown office district. This heavy presence of living and working spaces suggests the need for additional programs that support social, cultural, and community life. Belltown’s identity is already strongly connected to music, performance, food, and nightlife.⁵⁹ The Barnes Building contributes directly to this identity through the Belltown Yacht Club and Screwdriver Bar in the basement, a space associated with Seattle’s grunge music history. Other nearby venues, including The Crocodile, the Moore Theatre, and Dimitriou’s Jazz Alley, reinforce Belltown’s role as a vibrant music district within the city.

The block containing the Barnes Building also reveals important streetscape conditions. The block includes three older URM buildings with distinct red brick facades, two later buildings, and two vacant parcels located directly beside the Barnes Building. Outside of this gap, storefronts generally meet the sidewalk and maintain a consistent pedestrian rhythm. The street frontage is active, but there are few places for pause, refuge, outdoor seating, or gathering. Belltown contains several small public and green spaces, including Bell Street Park, Regrade Dog Park, and Belltown Cottage Park and P-Patch. These examples suggest that small pocket-style parks can play an important role in supporting the neighborhood’s dense urban fabric. This observation became significant in the development of the proposal’s public space strategy.

Fig 69: Existing street front of the Barnes building and adjacent buildings along First Avenue. Source: Diagram by author



Building Analysis



Fig 70: Photo from the basement level Screwdriver Bar.
Source: <https://www.google.com/maps/place/Screwdriver+Bar>

The Barnes Building itself is a four-story mixed-use structure built in 1889, shortly after the Great Seattle Fire. Designed by Boone and Meeker, a prominent Seattle architectural firm of the period, the building was originally associated with the Independent Order of Odd Fellows and later the Freemasons. These organizations used the building for member support, lodging, large ballroom gatherings, and ground-floor commercial activity.⁶⁰

Around 1946, the building was condemned by the fire marshal for lacking a fire stair. It was then purchased by Benton Sterling, who added a fire stair and service elevator at the rear corner of the building near the alley. The building was subsequently converted into a sleeping bag manufacturing facility, a use it maintained for approximately twenty-five years. During this period, a large mural depicting a camping scene was painted on the blank south facade, establishing a tradition of mural work on that prominent surface.

Later in the twentieth century, the building changed ownership and accommodated several different uses. The basement became particularly significant as a rehearsal space associated with Seattle's grunge music scene, including use by bands such as Nirvana.⁶¹ Today, the building is owned by Daniel Temkin, who has expressed interest in preserving the building and giving it a more meaningful use. The basement currently contains the previously mentioned bar and music venue, the ground floor houses a restaurant, and the upper floors are largely vacant despite containing architecturally compelling spaces that could support dance, office, and assembly uses.



Fig 71: Third floor ballroom space with cove ceiling.
Source: *The American Tyler*, 1908

Fig 72: Photo taken of the Barnes Building in 1938.
Source: <https://digitalarchives.wa.gov/Record/View/C58B08F-C2747AFFE92A8BF87440D1AAF>

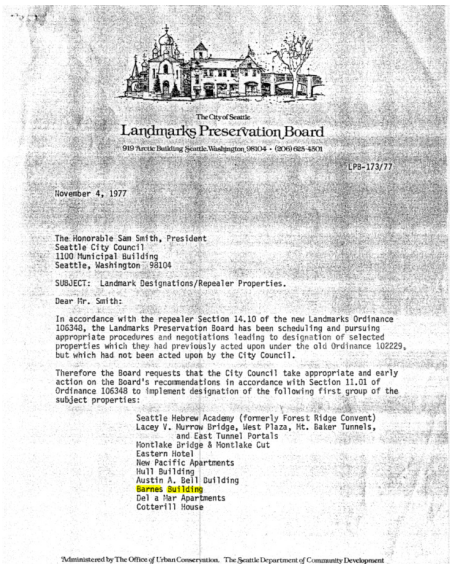
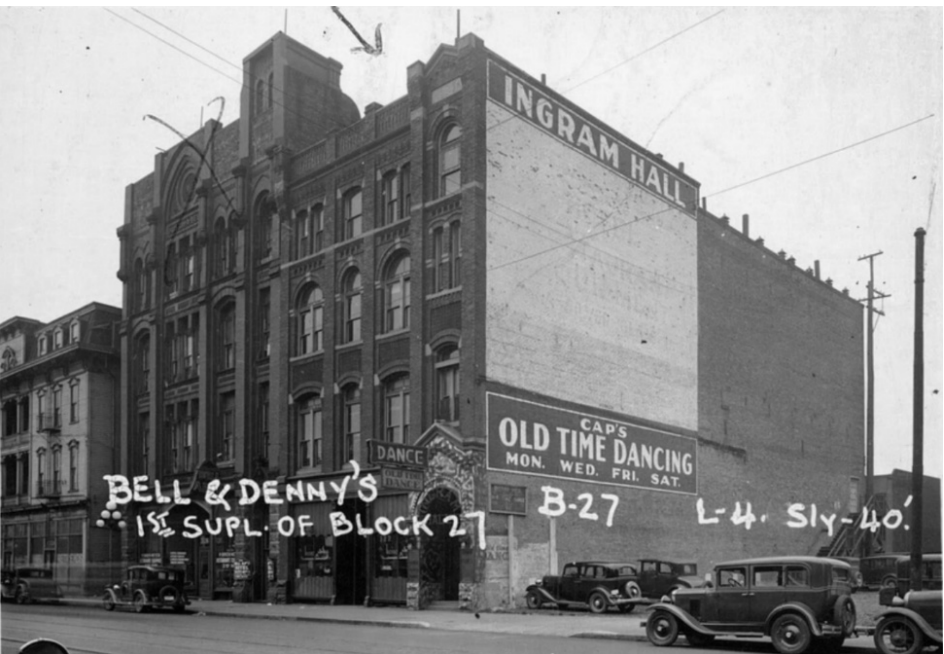


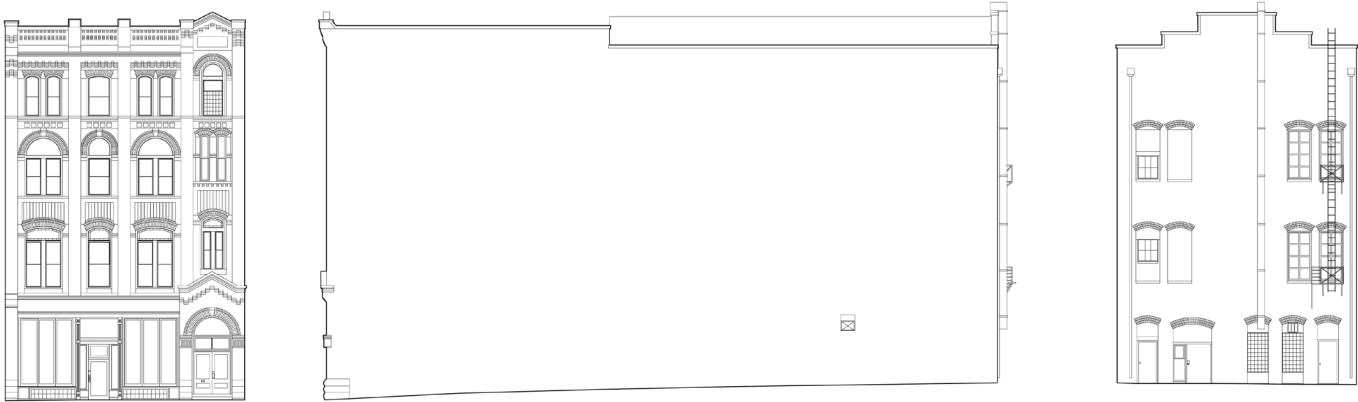
Fig 73: Landmarks Preservation Board document of designation for the Barnes building.
Source: *Seattle Landmarks Preservation Board*

Fig 74: West, south, and east facades of the Barnes building.
Source: *As-built drawings courtesy of Graham Baba Architects, modified by author*

The building was designated a Seattle Landmark in 1978, protecting its exterior facade while allowing interior work that does not negatively affect the exterior. This designation reinforces the value of the building's historic exterior while leaving room for thoughtful interior adaptation.

Physically, the Barnes Building occupies a mid-block site, sharing a party wall with the Austin A. Bell Building to the north and facing a vacant lot to the south. The building is rectangular in plan, measuring approximately forty feet along First Avenue, 110 feet from the street to the alley, and sixty-five feet in height. Its exterior consists of load-bearing unreinforced masonry walls. The primary west facade is highly ornamented and divided into four vertical bays. The ground floor contains a storefront and an emphasized entry to the upper floors. Brick detailing, window proportions, arches, corbeling, pilasters, granite elements, and a projecting parapet suggest a late Victorian eclectic commercial influence common to the period.

The secondary facades are more utilitarian. The south wall is a largely solid brick surface that has hosted murals over multiple periods. The east facade faces the alley and includes window openings that echo the front facade in a simplified form. The north wall functions as a party wall and is not visible from the exterior. The west facade uses higher-quality finish brick, while the south and east walls rely on more common brick. The brick is in moderately good condition on the primary facade and more varied in condition on the secondary elevations. Painted green wood trim at the windows and cornice contributes to the building's period character and relates to other historic buildings in the area.

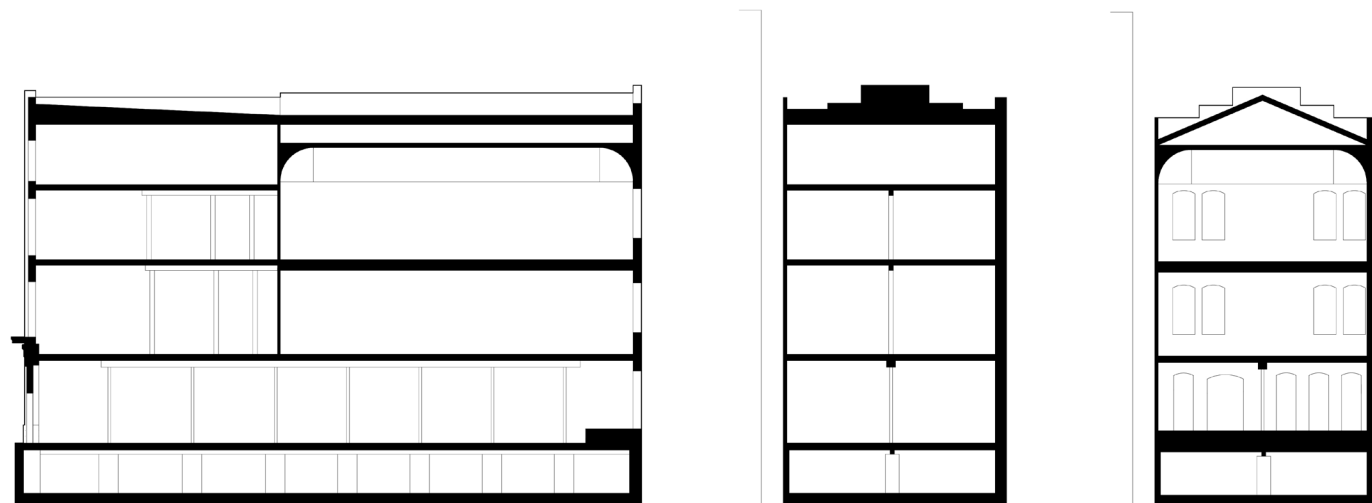


The interior structural system consists of central columns and wood floor framing supported by the load-bearing masonry walls. Columns vary by floor, with brick supports in the basement, iron posts at the ground floor, and wood posts on the upper floors. Wood joists span the shorter dimension of the building and support wood subflooring and hardwood finish flooring, much of which appears original. While joist dimensions cannot be fully confirmed, available drawings suggest members ranging from approximately one to two feet in depth.

One of the building's most unusual characteristics is its split upper-floor organization. The basement and ground floor have relatively consistent central column lines, while the second and third floors contain central columns only on the western half of the building. The eastern half remains more open, reflecting its original use for larger gatherings. The western portion includes a fourth floor, while the eastern portion terminates at the third floor, with taller floor-to-floor heights creating a similar overall building height. This irregularity creates both complexity and opportunity for adaptive reuse.

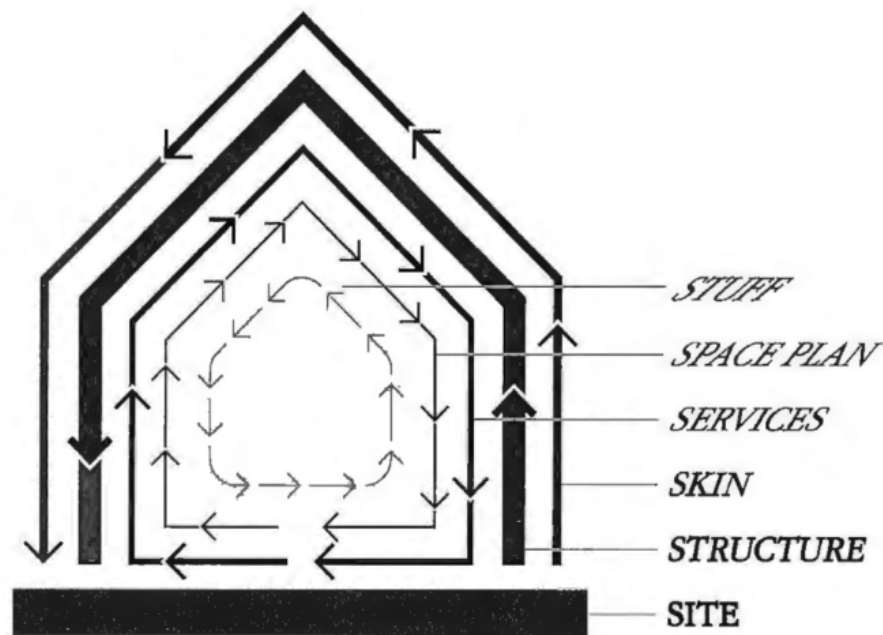
Interior conditions vary significantly by floor. The basement contains exposed brick walls, low ceilings, dim lighting, and extensive music memorabilia associated with the local rock and grunge scene. These qualities create a distinct atmosphere that is valued by patrons and contributes to the cultural identity of the building. The ground floor also contains exposed brick and visible corbeling, but its long, narrow configuration and mezzanine create a dense and somewhat constrained interior condition. The upper floors retain original trim, molding, hardwood flooring, plaster walls, and large windows. The large third-floor room, with its cove ceiling and generous proportions, is one of the building's most architecturally compelling spaces.

*Fig 75: Long and short sections of the Barnes building.
Source: Diagrams by author*



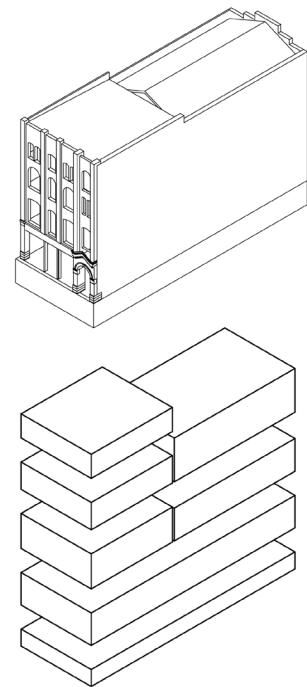
Environmental analysis further informed the proposal. Belltown's street grid is rotated approximately forty-five degrees from the north-south orientation of the adjacent downtown core. This orientation gives the primary street facade and the south-facing vacant lot side of the Barnes Building meaningful daylight exposure. Views from the upper floors include glimpses toward Elliott Bay, but most views are urban and constrained by surrounding buildings. Rather than orienting the project around long-distance views, the design therefore prioritizes internal relationships, daylight, and the creation of an inviting space between buildings.

Several key opportunities emerged from the site and building analysis. The Barnes Building contains a strong historic identity, valuable upper-floor spaces, a meaningful relationship to Belltown's music culture, and an adjacent vacant lot capable of supporting a new architectural intervention. The most significant constraints include seismic vulnerability, inadequate circulation, limited accessibility, and underused upper floors. These opportunities and constraints established the basis for the adaptive reuse and retrofit strategy developed in the following section.



SHEARING LAYERS OF CHANGE. Because of the different rates of change of its components, a building is always tearing itself apart.

Fig 76: Diagram by Stewart Brand depicting the different layers of buildings in relation to their lifespan. Source: *How Buildings Learn: What Happens After They're Built*



	Stuff	Space	Structure (Interior)	Structure (Exterior)	Circulation
R					
L4					
L3					
L2					
L1					
B					

Fig 77: Diagrammatic breakdown of the Barnes building, color coding each component's importance with green being high, yellow moderate, and red low. Source: Diagram by author

6.3 Adaptive Reuse and Retrofit Strategy

The design proposal sought to address two primary objectives. First, the project would provide a seismic retrofit capable of supporting continued occupancy following a major earthquake. Second, it would transform the building to support long-term adaptive reuse while preserving the qualities that contribute to its architectural and cultural significance. Although these objectives appear distinct, the design process revealed that they were deeply interconnected.

Adaptive Reuse Strategy

Adaptive reuse provided the initial framework for evaluating the building. Among the various theories surrounding adaptive reuse, Stewart Brand's concept of building layers emerged as a particularly useful lens for analysis. In *How Buildings Learn*, Brand describes buildings as a collection of interconnected layers that change at different rates over time. Site, structure, skin, services, space plan, and stuff each possess different lifespans and varying capacities for adaptation.⁶²

Rather than asking what should simply be preserved or removed, the project evaluated each component of the building according to its broader contribution to sustainability, preservation, cultural significance, functionality, and future adaptability. Through this process, the exterior masonry walls emerged as highly valuable due to their landmark status, embodied carbon, cultural significance, and architectural presence. The upper-floor spaces similarly demonstrated high value through their spatial qualities, original materials, and flexibility. Conversely, the existing circulation systems proved to be among the least valuable components, limiting accessibility, life safety, and future occupancy.

From this analysis, four primary design objectives emerged:

1. Sustainability through the preservation of as much existing structure as possible.
2. Preservation of historically significant architectural elements.
3. Support for the building's cultural identity, particularly its long-standing relationship with music, performance, and community gathering
4. Improved functionality through accessible circulation and adaptable floor plans.

Seismic Retrofit Strategy

The seismic retrofit strategy initially focused on introducing a mass timber system within the existing building envelope. Similar to conventional steel braced frames or concrete shear walls, these concepts relied on inserting new structural elements into the existing building. While technically possible, the current research surrounding interior mass timber systems is heavily focused on engineering solutions. They offered limited architectural expression and seemed to clash with the preservation goals established through the adaptive reuse analysis in the same way conventional systems would.

A significant shift occurred when attention turned to the vacant lot adjacent to the Barnes Building. Rather than viewing the neighboring parcel solely as a development opportunity, it began to be considered as part of the retrofit itself. This observation expanded the scope of the project beyond the building and into the broader urban context.

The resulting concept drew inspiration from a temporary timber buttressing system observed in Seattle's Wallingford neighborhood by the author. The question emerged: what if a buttress were scaled to the size of an urban building and transformed into something purposefully designed and occupiable? The historic precedent of a cathedral's flying buttress, much like that of Notre Dame in Paris, offered a useful comparison.⁶³ Rather than simply resisting lateral forces, the new structure could simultaneously support the masonry building, create occupiable space, and contribute to the public realm.

An idea began to emerge that pulled strengths from both Northlake Commons and Railspur. Visible mass timber for public awareness and creating a public, regionally expressive space, and utilizing spaces between spaces for engaging public circulation and gathering.

*Fig 78: Empty lot next the Barnes building.
Source: Photo/diagram by author
Bottom left*

*Fig 79: Flying buttress of the Notre-Dame in Paris and it's clear ability to be used as an occupiable, functional space.
Source: <https://docs.itascacg.com/itasca900/3dec/docproject/source/examples/Buttress.html>
Top right*

*Fig 80: Temporary timber buttressing on the Octopus Bar in the Wallingford neighborhood.
Source: Photo by author
Bottom right*

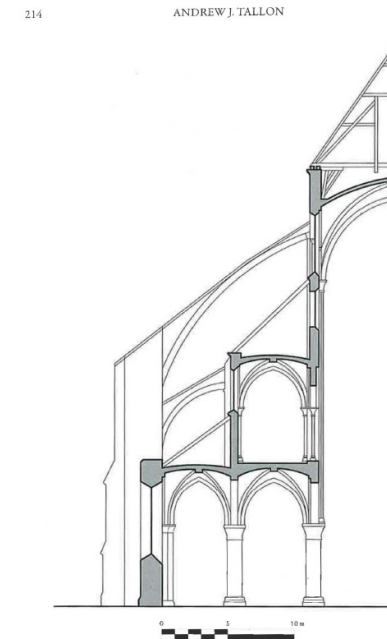


Figure 15.2 Paris, Notre-Dame, reconstruction section through S6, showing vaults through S5

Rather than functioning solely as a structural connection, the intervention began to operate as a spatial and urban connector between the existing building and new construction. This intermediary condition would later become central to the project, functioning as a kind of architectural gasket between historic and contemporary conditions.

At this point, urban infill became inseparable from the retrofit strategy. The proposal evolved to include both an external mass timber buttressing system and a new building occupying the adjacent lot. Together these interventions would address seismic resilience, accessibility, circulation, program expansion, and public space simultaneously. What began as a seismic retrofit ultimately became a broader investigation into how historic buildings might participate in the future growth of the city rather than being isolated from it.



6.4 Program Development

The program for the proposal emerged from both the building’s history and the surrounding neighborhood context. Throughout its life, the Barnes Building has repeatedly functioned as a place of gathering, performance, hospitality, and community. The original Odd Fellows and Freemasons utilized the upper floors for large social events and dances, while more recent occupants contributed to Seattle’s music culture through rehearsal spaces and live performance venues.

At the neighborhood scale, Belltown exhibits a strong identity centered around music, art, food, and nightlife. At the same time, the area contains a growing residential population with relatively few community-oriented spaces that exist between home and work. The proposal therefore seeks to reinforce existing cultural patterns while providing new opportunities for public engagement.

Music, performance, and community gathering emerged as the primary programmatic drivers. The historic ballroom spaces on the upper floors suggested opportunities for movement-based activities, while the cultural significance of the basement venue encouraged continued support for music, art, and performance. Rather than imposing an entirely new identity onto the building, the proposal builds upon themes already embedded within its history.

The resulting program establishes the Barnes Building as a cultural hub focused on music, dance, education, and community gathering. Flexible event spaces, rehearsal and performance areas, workspaces, and food and beverage programs support a range of users throughout the day and evening. The adjacent infill building expands these opportunities while providing the circulation infrastructure necessary to support contemporary occupancy requirements.

At the center of the proposal is a new public pocket park formed between the existing and new buildings. More than simply open space, this area functions as a shared social space connecting the various programs while extending activity into the public realm. The pocket park reinforces the project’s broader objective of creating meaningful relationships between preservation, adaptive reuse, and urban life.

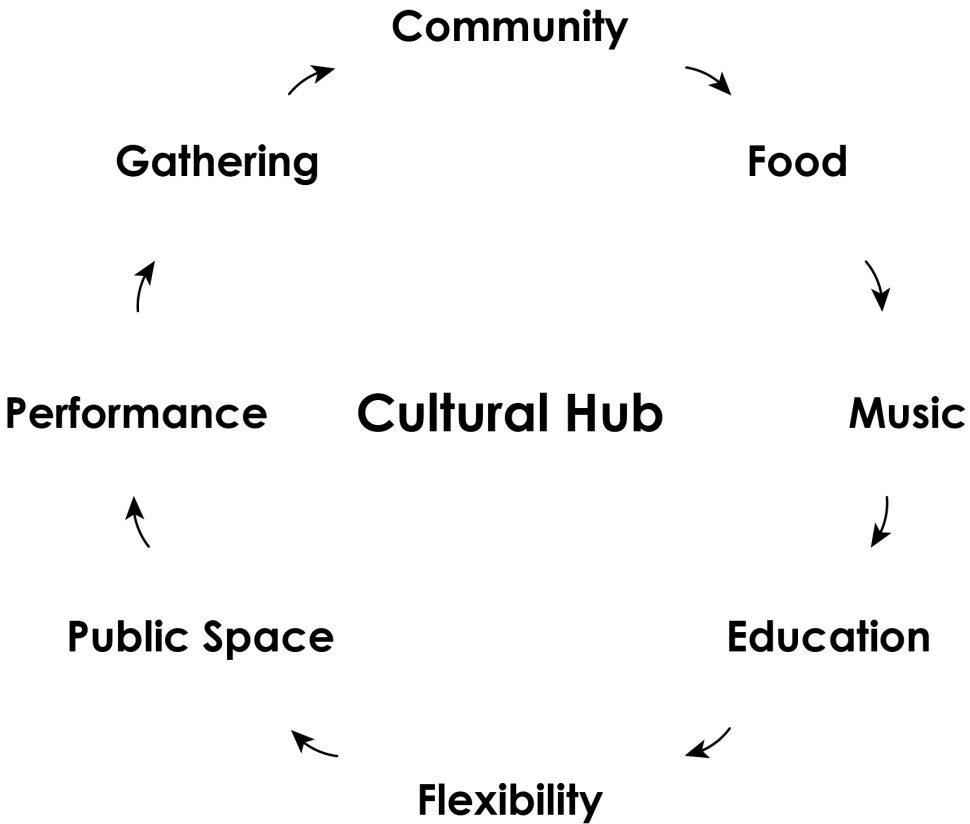


Fig 81: Components that make up the cultural hub of the proposed program. Source: Diagram by author

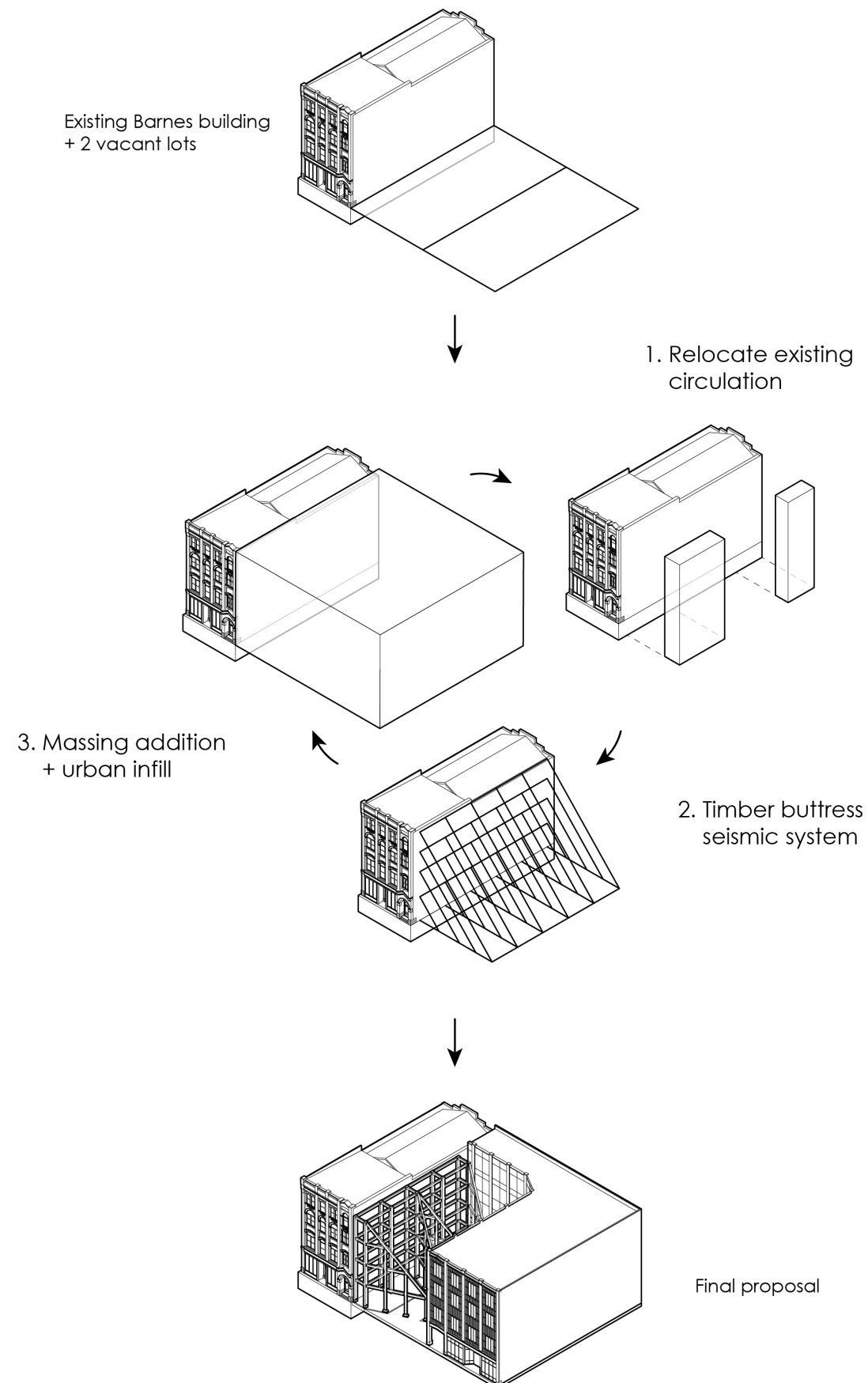
6.5 Design Process

Methodology

The design process evolved significantly over the course of the project. Initial investigations prioritized the adaptive reuse of the Barnes Building, focusing first on circulation and programmatic adaptation before introducing a mass timber seismic retrofit strategy and, finally, a new infill structure on the adjacent vacant lot. As the project developed, however, this sequence gradually reversed. The final proposal emerged from the design of the new building massing, to which both the circulation strategy and timber seismic intervention ultimately responded.

Rather than proceeding linearly, the design process evolved through iterative testing between three interconnected design objectives: adaptive reuse, seismic retrofit, and urban infill. Each carried its own set of priorities and constraints. The new building massing needed to respond appropriately to the urban context of Belltown and the development potential of the site. New circulation systems needed to provide accessible, intuitive, and code-compliant connections between old and new construction. The proposed timber buttress required sufficient architectural presence to contribute positively to the public realm while also functioning as a meaningful component of the seismic retrofit strategy.

The final proposal emerged through continuous negotiation between these objectives. Decisions made in one area frequently required reconsideration of another, resulting in a design process that was less a sequence of steps than a series of interconnected explorations. The following sections describe the development of the circulation strategy, timber buttress, and new building massing, and the reasoning that led to their final configuration.



*Fig 82: Design drivers that cyclicly drove iterations towards the final design.
Source: Diagram by author*

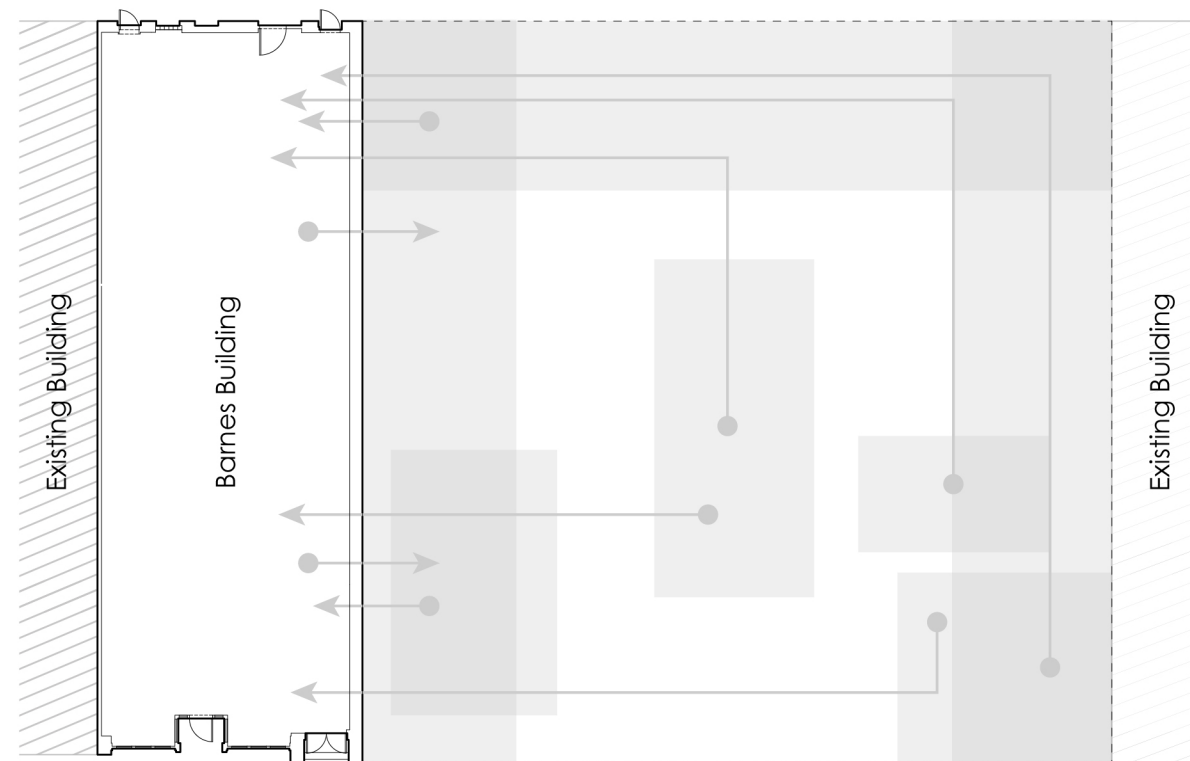
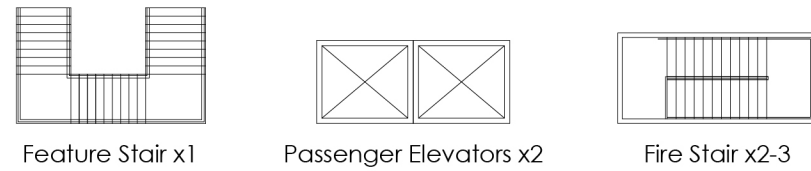
New Circulation

The circulation of the Barnes Building was identified early in the design process as one of the greatest barriers to its long-term adaptability. The building's narrow forty-foot width and historic floor plan created significant challenges when attempting to introduce a code-compliant stair, passenger elevator, and seismic reinforcement while maintaining the character-defining spaces identified through the adaptive reuse analysis. Accommodating all of these requirements within the existing building envelope would have required substantial alteration to the historic interior and significantly reduced the flexibility of future tenant spaces.

This observation led to the decision to relocate the primary vertical circulation outside of the existing building and into a new structure on the adjacent vacant lot. By effectively extending the width of the building, additional space could be provided for elevators, stairs, and shared tenant amenities while preserving the historic organization and character of the original structure.

Numerous circulation configurations were explored throughout the design process. Alternatives considered the placement of stairs along the perimeter of the addition or at its center, directly adjacent to the existing building or separated from it, and as either internal or external circulation systems. The most significant challenge involved reconciling the split floor levels of the existing building, which consists of four stories on the west side and three stories on the east side. Resolving this condition became a primary driver in the eventual organization of the new addition and its relationship to the Barnes Building.

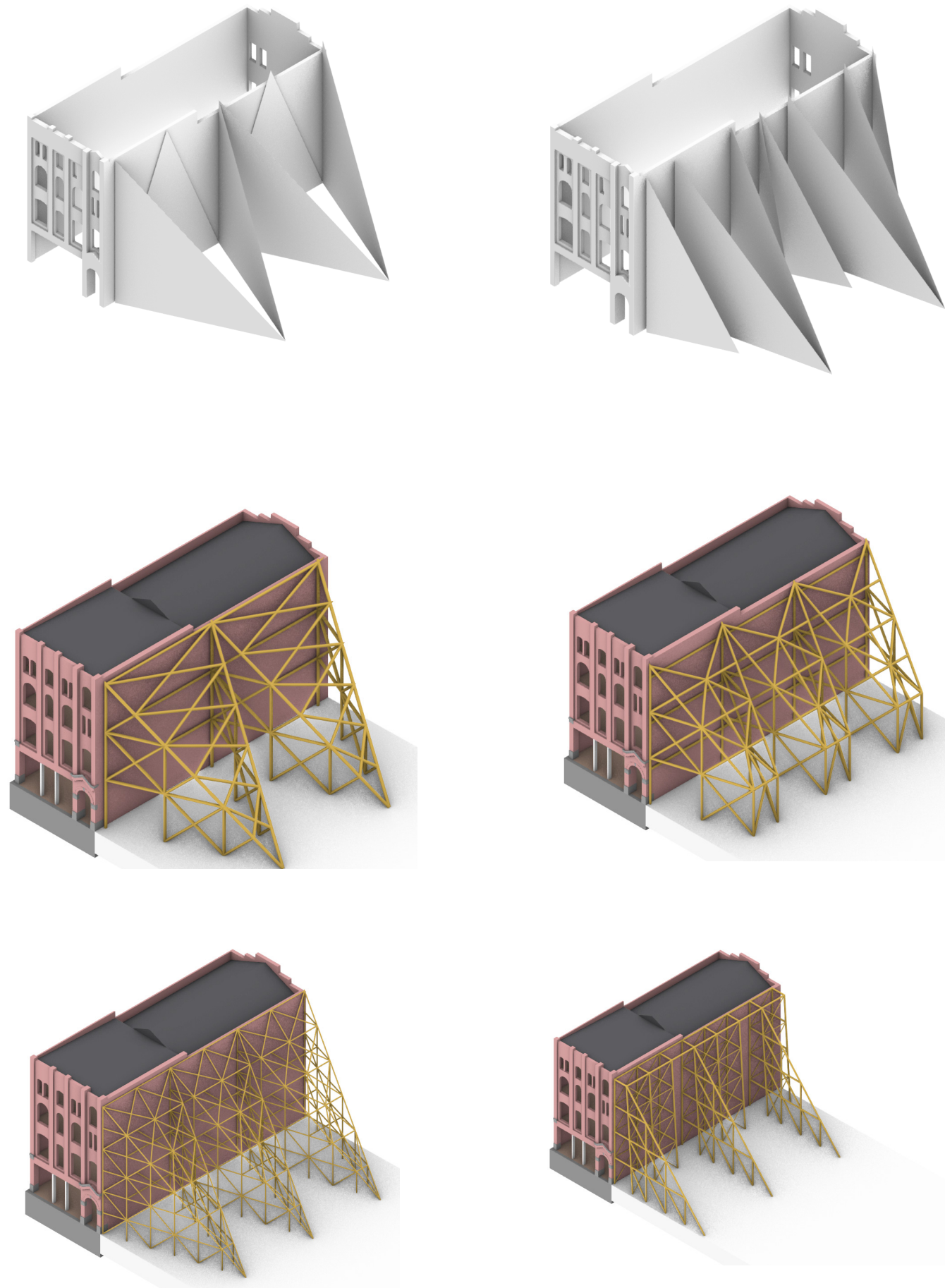
Needed vertical circulation systems:



Key circulation organizational drivers:

- Existing building adjacency
- Periphery versus centrally located
- Interior versus exterior fire stairs
- Existing building split level organization
- Access to existing basement level

*Fig 83: Components and spacial considerations that impacted locating new circulation routes.
Source: Diagram by author*



Timber Buttress Development

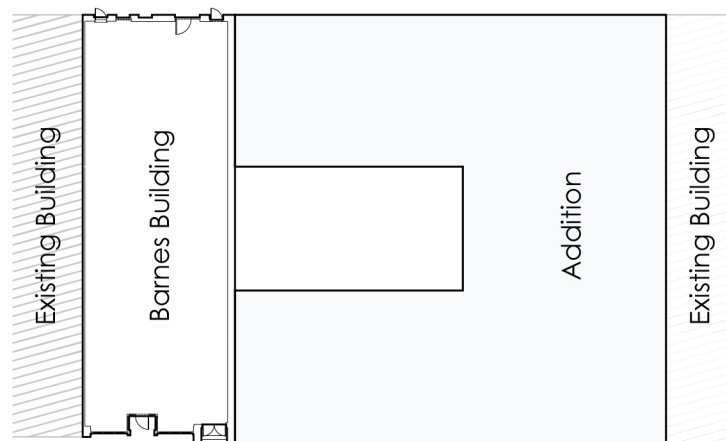
The timber buttress evolved from an initial exploration of how a mass timber system might provide seismic reinforcement to an unreinforced masonry structure. Early concepts assumed a continuous wall-like structure attached along the length of the south elevation to act as a lateral-force-resisting system in the parallel direction. Angled timber arms extending toward the ground were then introduced to address forces acting perpendicular to the wall. These elements were conceived as an architectural interpretation of conventional buttressing systems while responding to the dynamic loading conditions associated with seismic events.

Numerous configurations were explored, varying the number, spacing, and geometry of the structural bays. At this stage of development, these alternatives were evaluated primarily through architectural reasoning and structural intuition rather than detailed engineering analysis. The intention was not to resolve a final structural system, but rather to explore how seismic reinforcement might become a visible and expressive architectural element.

As the design progressed, inspiration was increasingly drawn from the Wilburton Trestle and the broader history of exposed timber infrastructure in the Pacific Northwest. The goal shifted from concealing the structural intervention to celebrating it as a new form of public timber infrastructure. This approach aligned with the thesis objective of creating a dialogue between historic masonry construction and contemporary mass timber systems while reconnecting the project to regional traditions of timber expression.

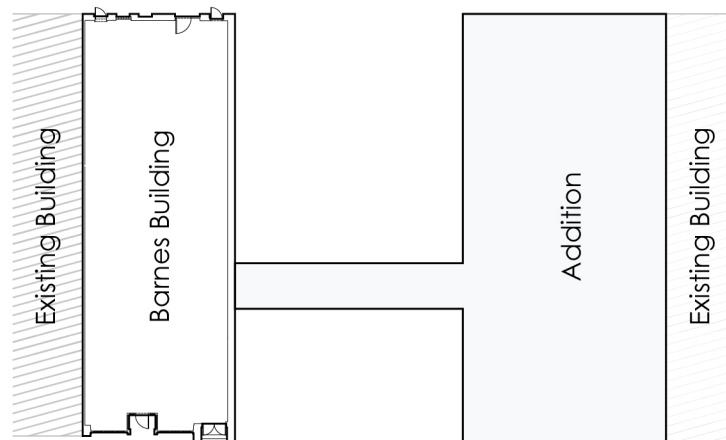
It was understood throughout the process that any viable seismic system would likely rely on hybrid construction. Steel connectors and energy-dissipating devices similar to those employed in contemporary mass timber seismic systems would be necessary to provide ductility and accommodate movement during seismic events. The timber buttress therefore became less a replacement for conventional seismic systems and more an exploration of how mass timber might participate within them.

*Fig 84: Evolution of the design of the timber buttress.
Source: Diagram by author*



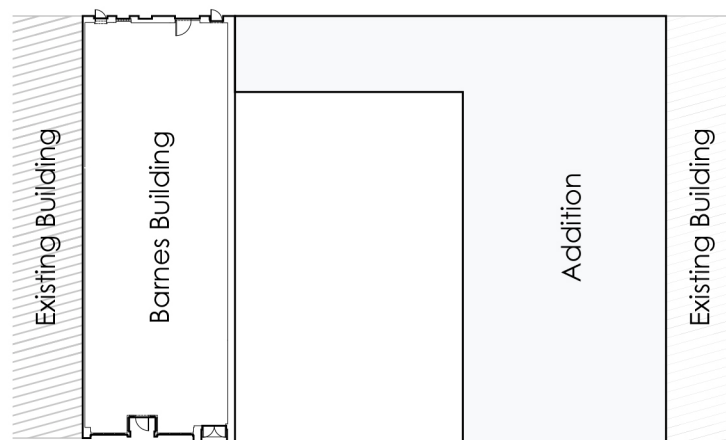
Courtyard

- Maximizes new construction floor area and new circulation possibilities
- Predominantly hides mass timber buttress system from public view



Two Buildings + Bridge

- Timber buttress fully exposed to public
- Poor circulation to upper floors of Barnes building



L-shaped Connection

- Central pocket for exposed mass timber buttress system and public space
- Centrally located vertical circulation services between old and new wings

New Building Massing

The role of the new infill building evolved substantially throughout the design process. Initial concepts envisioned a relatively small structure designed primarily to house circulation and portions of the timber seismic system. As the project developed, however, the addition increasingly became an opportunity to introduce new program, strengthen the adaptive reuse strategy, and contribute to the broader urban environment.

Early schemes explored a courtyard configuration that largely enclosed the timber buttress within the interior of the site. While this arrangement offered numerous circulation possibilities, it limited the visibility and public presence of the timber structure. Subsequent studies investigated a completely separate building positioned across the lot, leaving the timber buttress fully exposed and connecting the two buildings with an enclosed bridge. Although this approach successfully emphasized the structural intervention and created opportunities for public occupation, it resulted in circulation patterns that felt disconnected from the existing building and failed to establish a meaningful relationship with the adjacent alley.

The final proposal emerged through the development of an L-shaped addition that, together with the Barnes Building, forms a C-shaped composition. This configuration ultimately became the organizational framework for the entire project. Rather than adapting the massing to accommodate circulation and structure, the circulation strategy and timber buttress evolved in response to the spatial opportunities created by the massing itself.

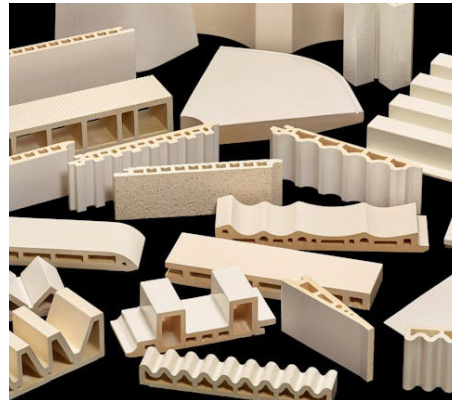
The resulting form creates a large central pocket that exposes the timber buttress to public view while providing sufficient space for gathering, circulation, and landscape. The central portion of the addition functions as the primary connector between old and new construction, creating seamless horizontal and vertical circulation throughout the combined complex.

While distinct from the urban relationships established by the Rail-Spur precedent, this arrangement responds specifically to the conditions of the site. Rather than completing the block with solid urban infill, the proposal creates a new public opening along First Avenue while allowing the alley to remain primarily service-oriented, consistent with the adjacent buildings. In doing so, the vacant parcels are transformed from an underutilized gap in the block into a meaningful public space.

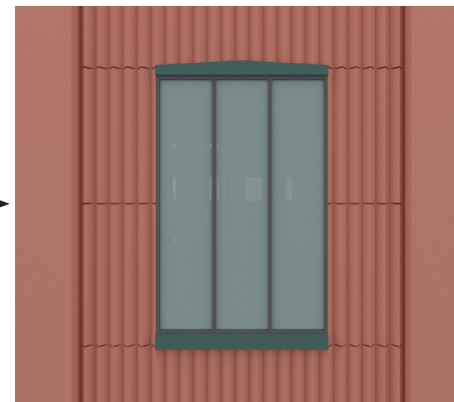
Fig 85: Massing schemes considered.
Source: Diagram by author



Barnes building brick detailing



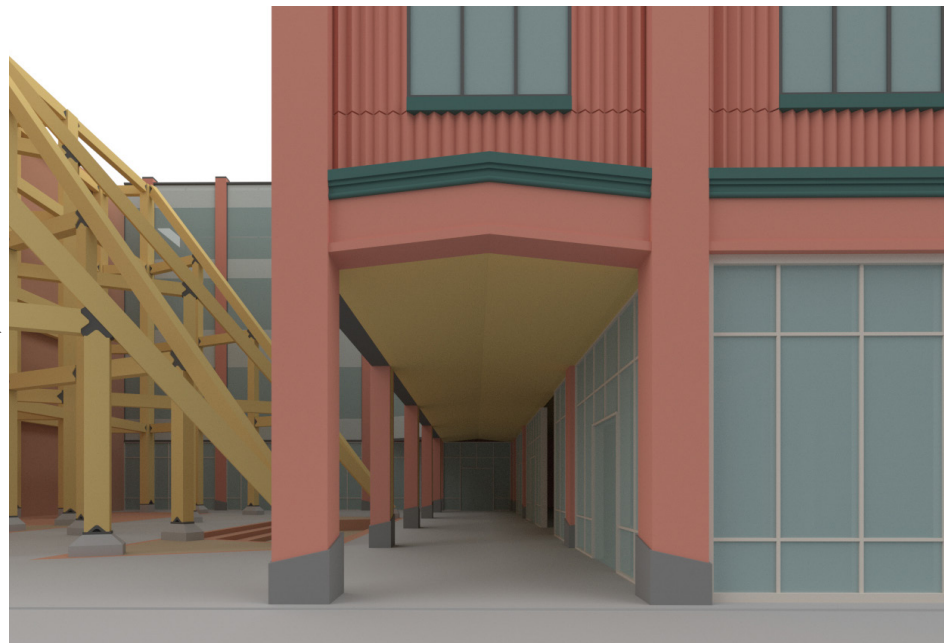
Shildan terracotta panels, profile and finish options



Barnes building addition terracotta panel design



Barnes building entry details



Barnes building addition entry details

New Building Materiality

The new addition is envisioned as a mass timber structure utilizing conventional hybrid seismic design principles and a straightforward structural grid. The intention was to create flexible floor plates capable of accommodating a range of programmatic uses while maintaining adaptability for future change.

Materially, the project seeks to establish a dialogue between contemporary construction and the historic character of the Barnes Building. The primary street-facing facade utilizes modern terracotta panels whose color and texture reference the brick masonry of the existing structure. Custom angled profiles draw inspiration from ornamental details found on the Barnes Building while emphasizing the vertical proportions of the facade. Window openings and facade rhythms similarly reference the scale and proportions of the historic building without directly replicating them.

At the base of the building, exposed concrete elements reference the stone foundations and granite detailing common to many historic masonry structures. Together, these components create a contemporary interpretation of the material hierarchy and articulation found in the original building. In contrast, facades facing the interior courtyard and timber buttress are composed primarily of glazing, maximizing daylight and creating visual connections between interior spaces, the timber structure, and the public realm below.

*Fig 86: Barnes building addition materiality design.
Source: Diagram by author, terracotta products by Shildan - <https://shildan.com/rainscreen-alphaton>*

*Fig 87: Barnes building addition materiality design.
Source: Diagram by author*

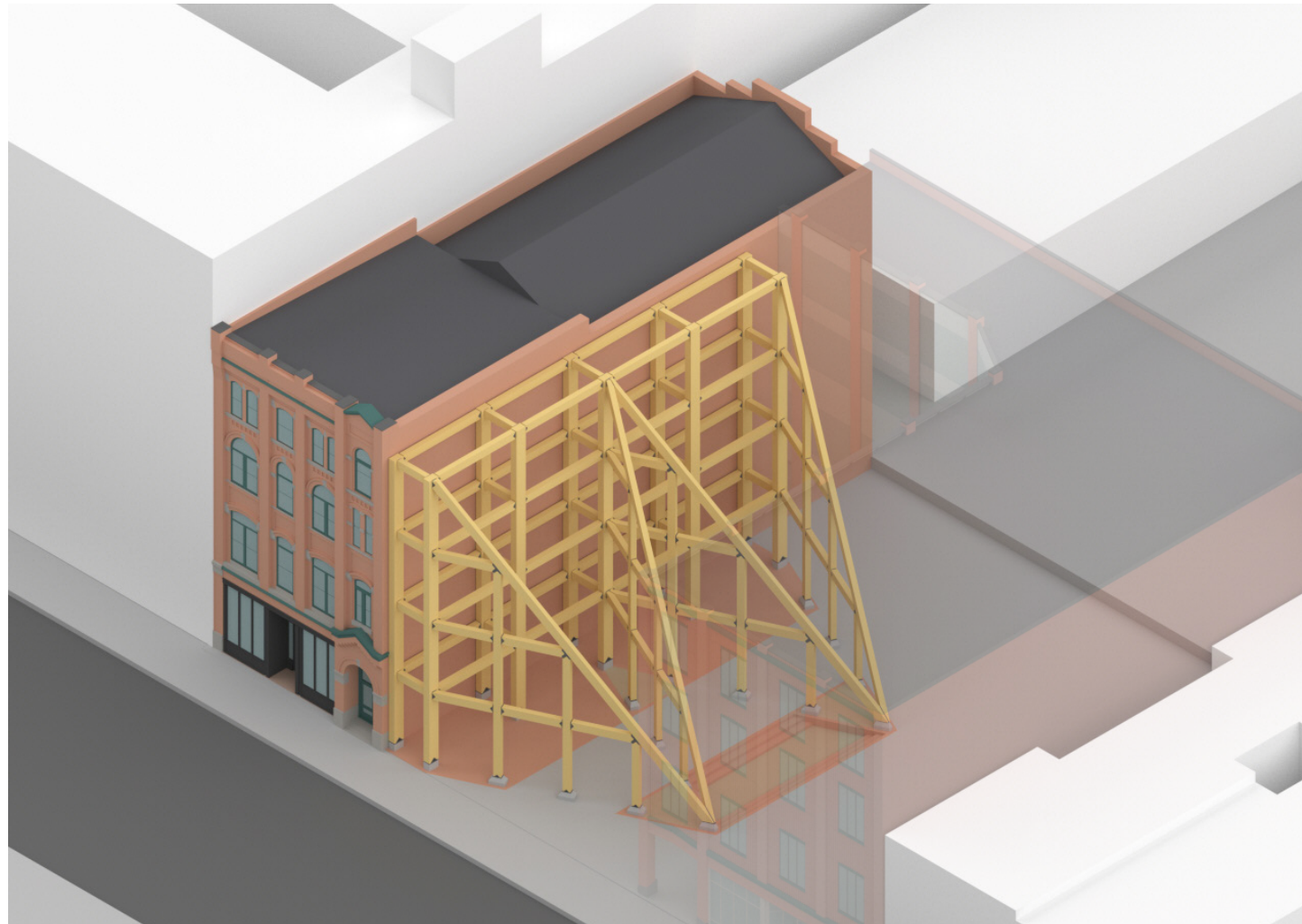


Fig 88: Final mass timber buttress design.
Source: Diagram by author

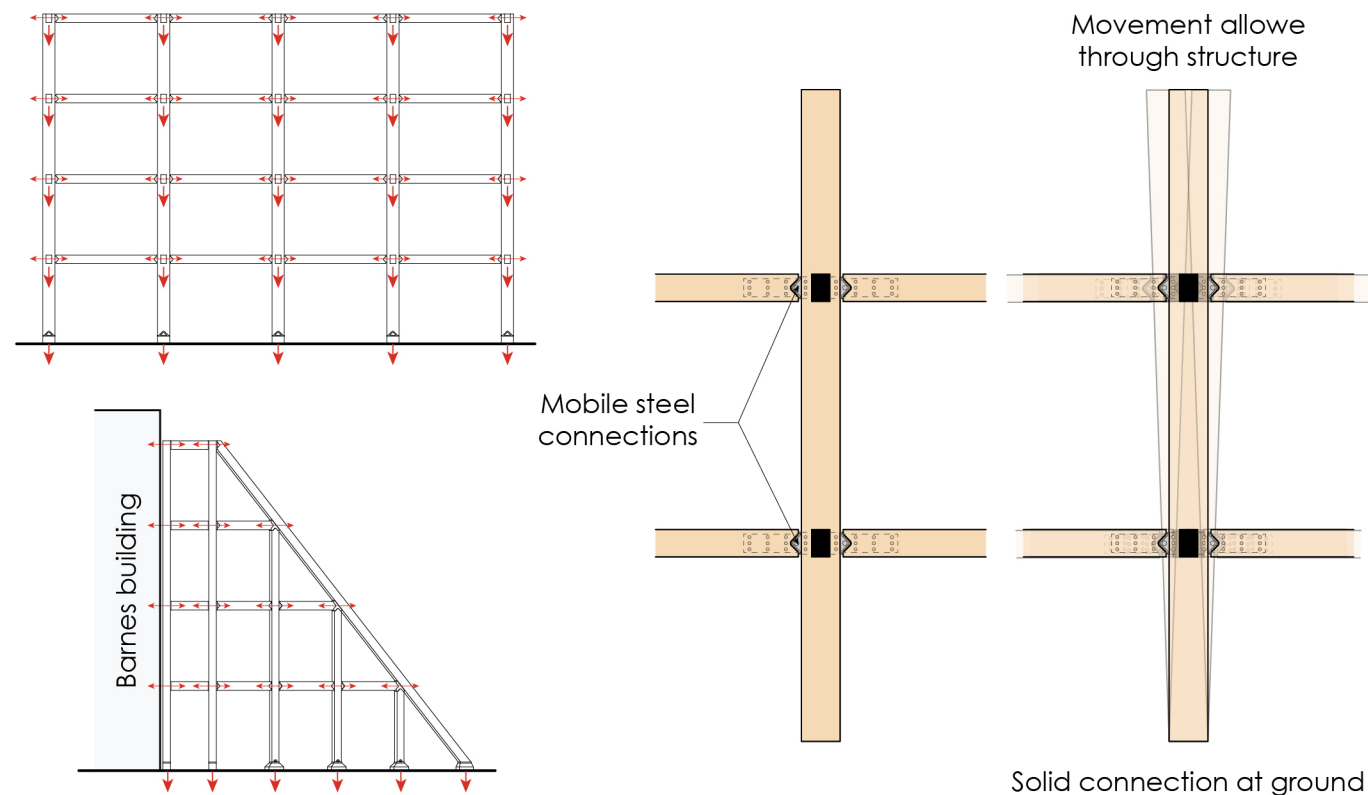


Fig 89: Force diagrams of mass timber buttress system.
Source: Diagram by author

Timber Buttress System

The final timber buttress proposal embraces the need for controlled movement within the structural assembly. Rather than relying on rigid connections between primary vertical and horizontal members with mobile, steel cross-bracing connections, similar to those used in The Hive precedent, the design explores the possibility of hinge-like, energy-dissipating connections located at the connections between the primary structural members. These connections would allow portions of the assembly to rock during seismic events, similar to the NHERI rocking shear wall precedent. This would reduce rigidity and increasing the system's capacity to absorb energy through a glulam assembly as opposed to a CLT shear wall assembly.

The precise technical resolution of this concept remains beyond the scope of this thesis and would require substantial structural analysis and testing. Nevertheless, the proposal suggests an alternative direction for mass timber seismic systems in which the expression of the necessity for movement in the system becomes an integral part of the architectural expression.

The proposed system is assumed to function as a hybrid assembly incorporating timber, steel, and concrete components. Concrete foundations would provide the necessary support for the structure and would likely require integration with the existing foundations of the Barnes Building. Steel connectors would transfer forces between the timber buttress and the existing diaphragms. Additionally, it is assumed that the adjacent shared party wall has a reinforced concrete shear wall on the opposite side of the Barnes building. This shear wall would be connected to the existing diaphragms and timber buttress system with further steel connections to allow the building to act as a unified system.

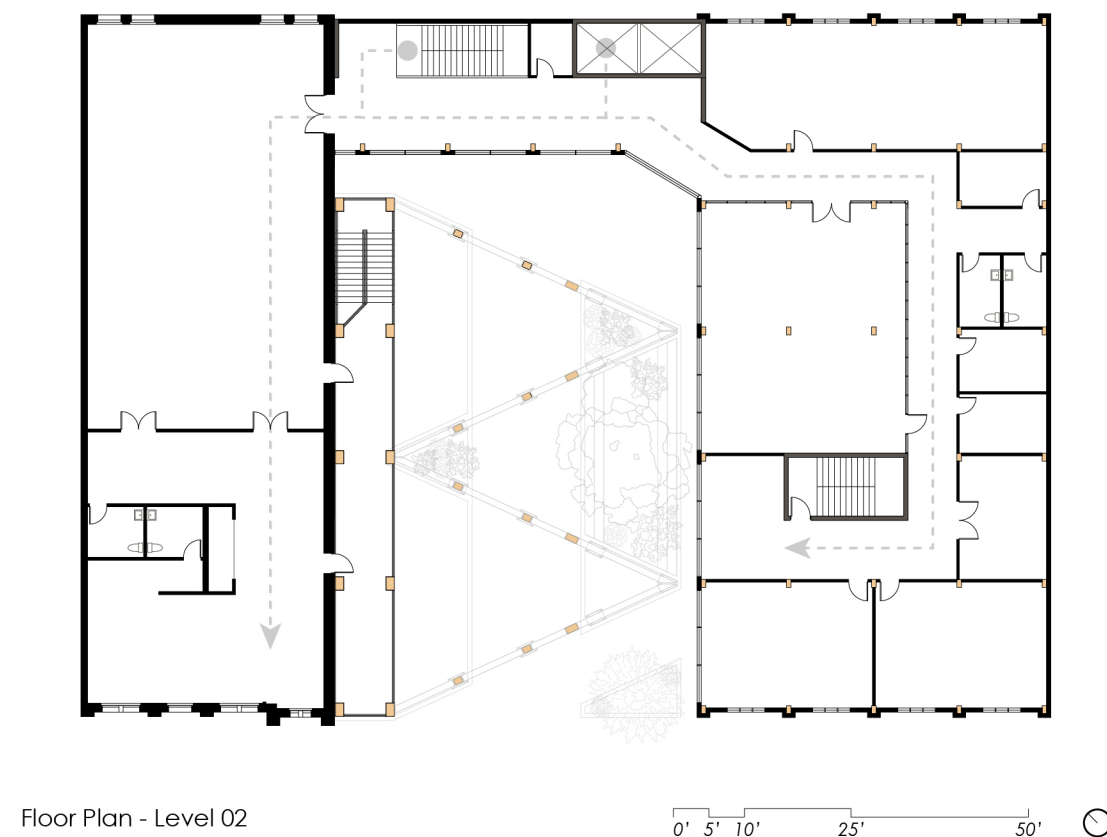
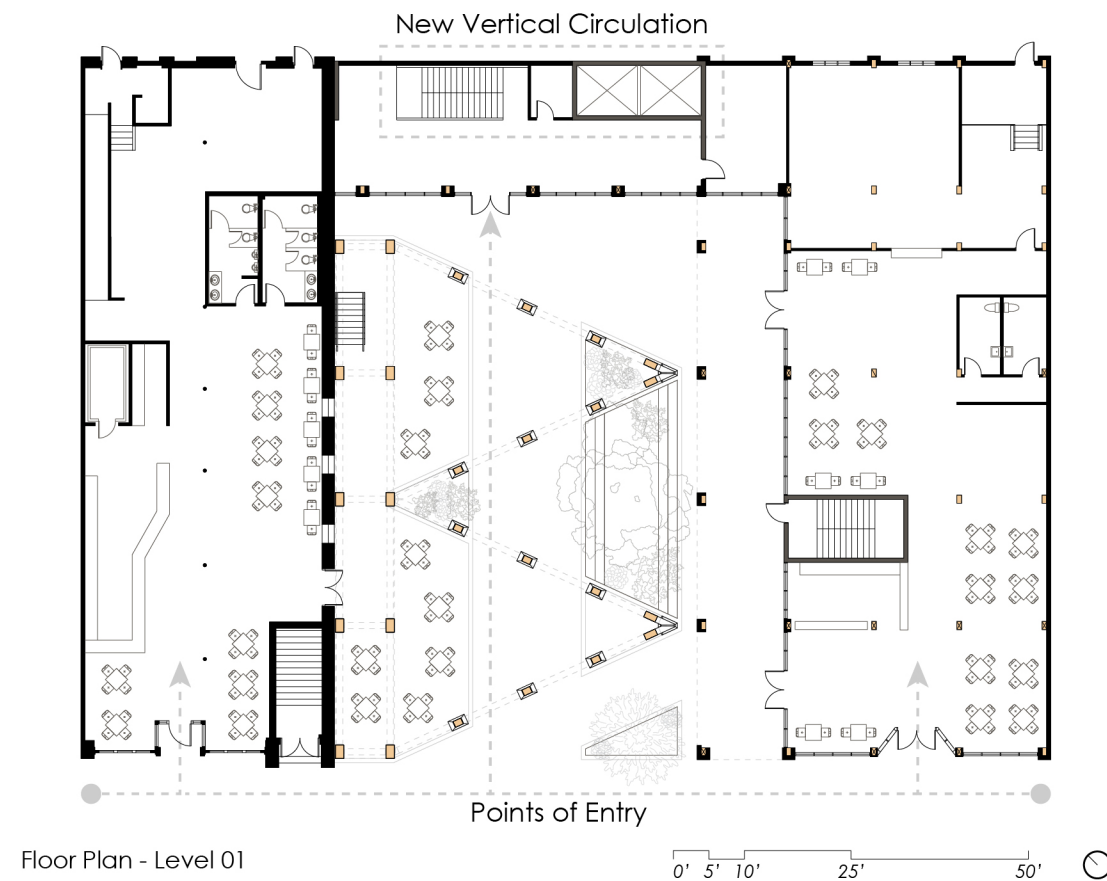
Although this approach does not fully align with the environmental aspirations of the thesis, it highlights the realities of designing mass timber structures within highly seismic regions. Rather than replacing steel and concrete entirely, the proposal suggests that future innovation may lie in refining hybrid systems that maximize the use of timber while strategically utilizing steel and concrete only where necessary.

Final Adaptive Reuse Proposal

The final adaptive reuse strategy is realized through the extension of the Barnes Building rather than through extensive modification of its historic interior. By relocating circulation, accessibility requirements, and many contemporary building services into the adjacent addition, the project preserves the character-defining spaces of the existing structure while substantially improving its long-term usability.

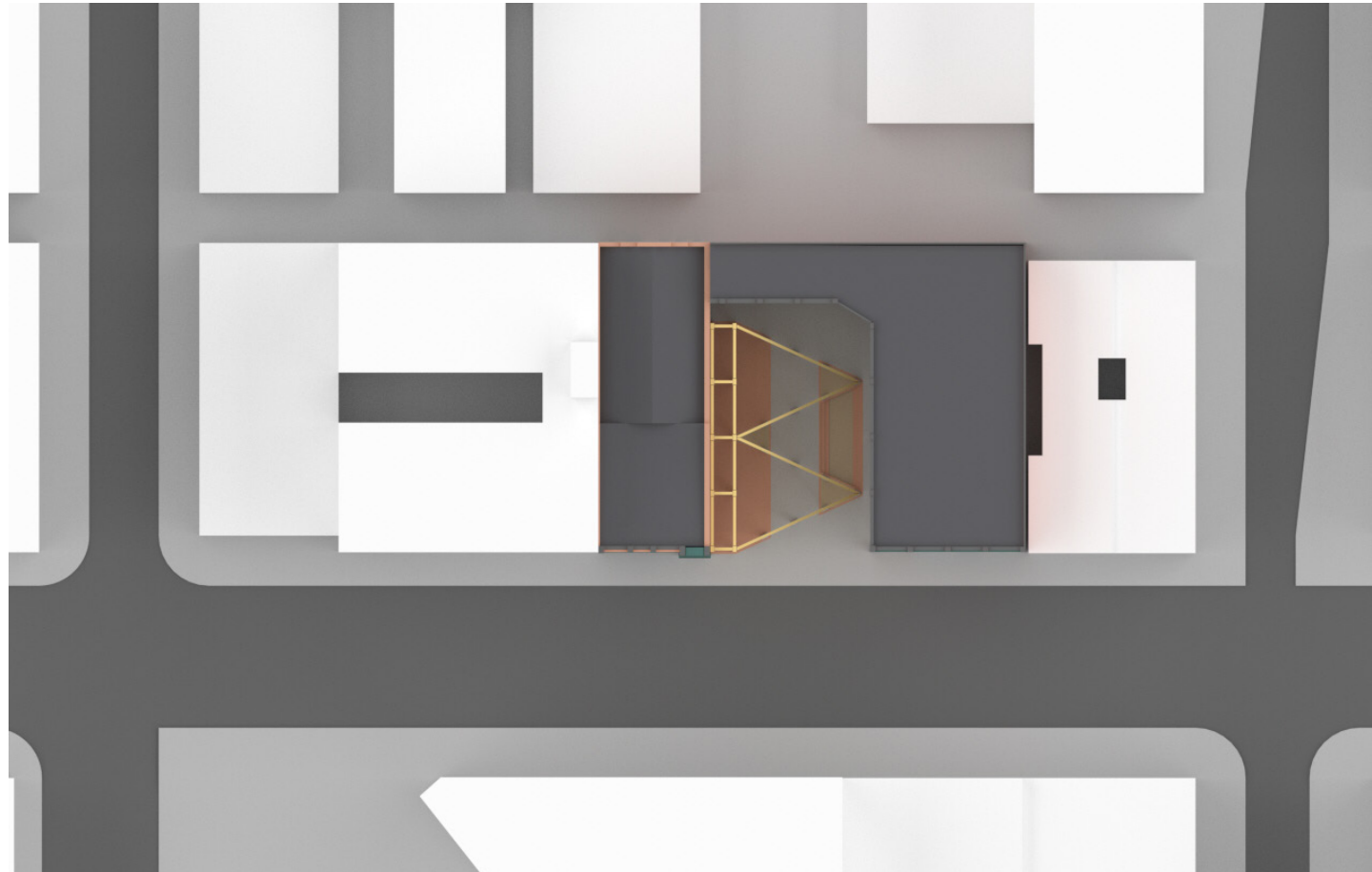
The resulting C-shaped building creates new opportunities for public activity and flexible occupancy. At the ground level, food and beverage spaces, a public pocket park, and tenant lobby areas activate the site and strengthen its relationship to the surrounding neighborhood. The basement level retains the existing bar and music venue while introducing accessible entry and improved life-safety provisions.

Upper floors accommodate a variety of cultural and creative uses, including dance and yoga studios, gallery spaces, recording studios, rehearsal spaces, artist workspaces, and associated offices. Together, these programs build upon Belltown's established identity as a center for music, performance, and artistic production while ensuring that the Barnes Building remains an active participant in the cultural life of the neighborhood. Rather than preserving the building as an artifact of the past, the proposal seeks to position it as a flexible framework capable of supporting future generations of use and adaptation.

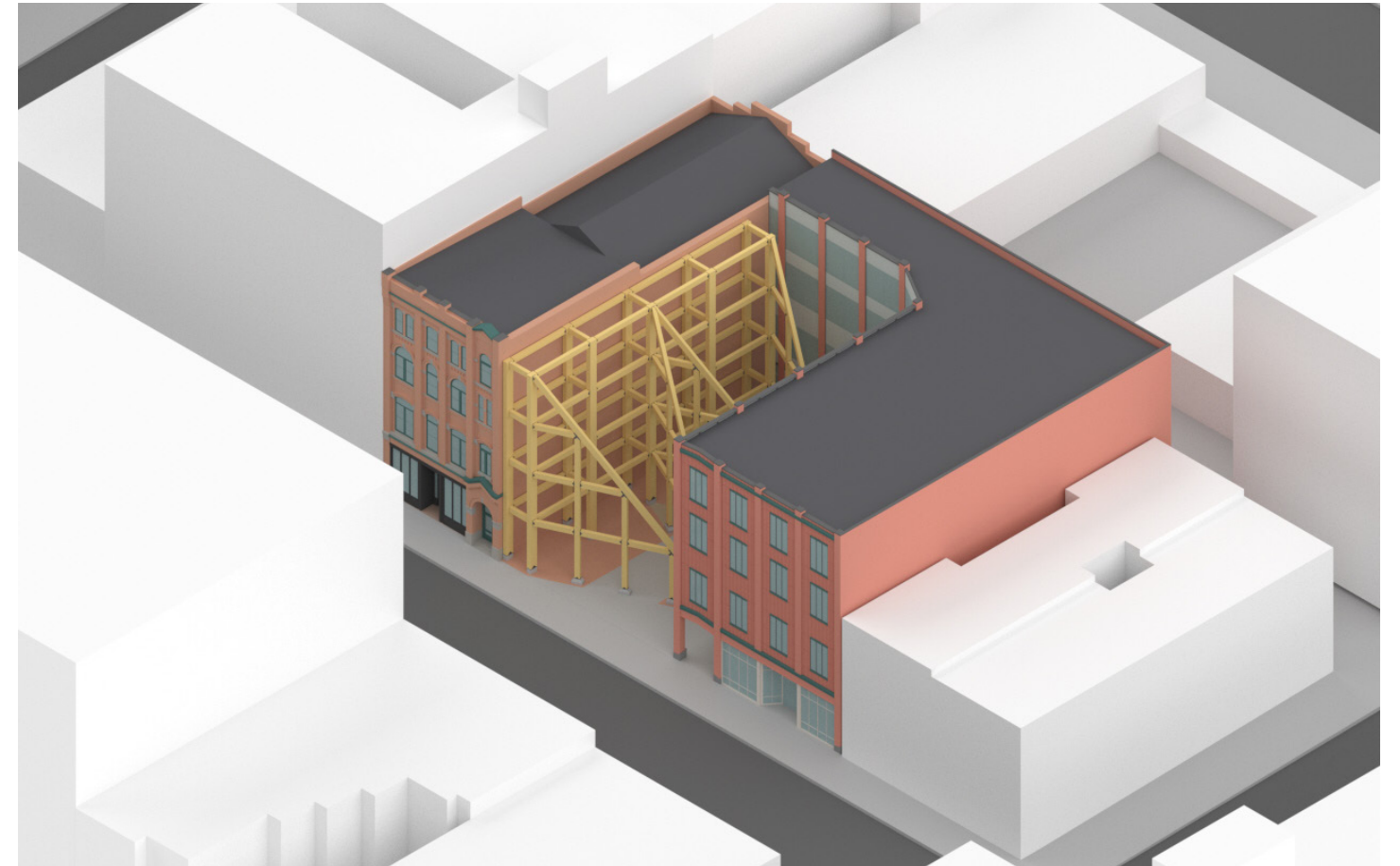


*Fig 90: Primary circulation routes for the final design.
Source: Diagram by author*

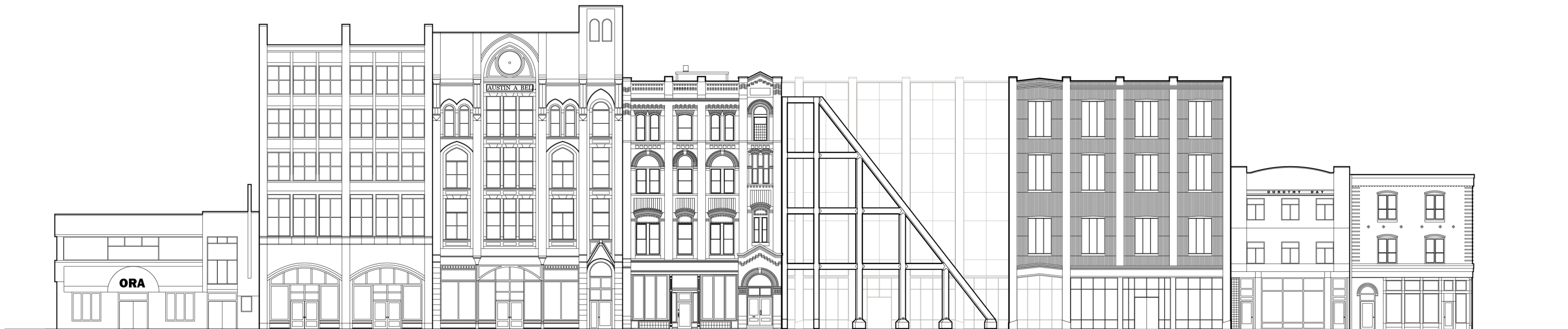
6.6 Design Proposal Documentation



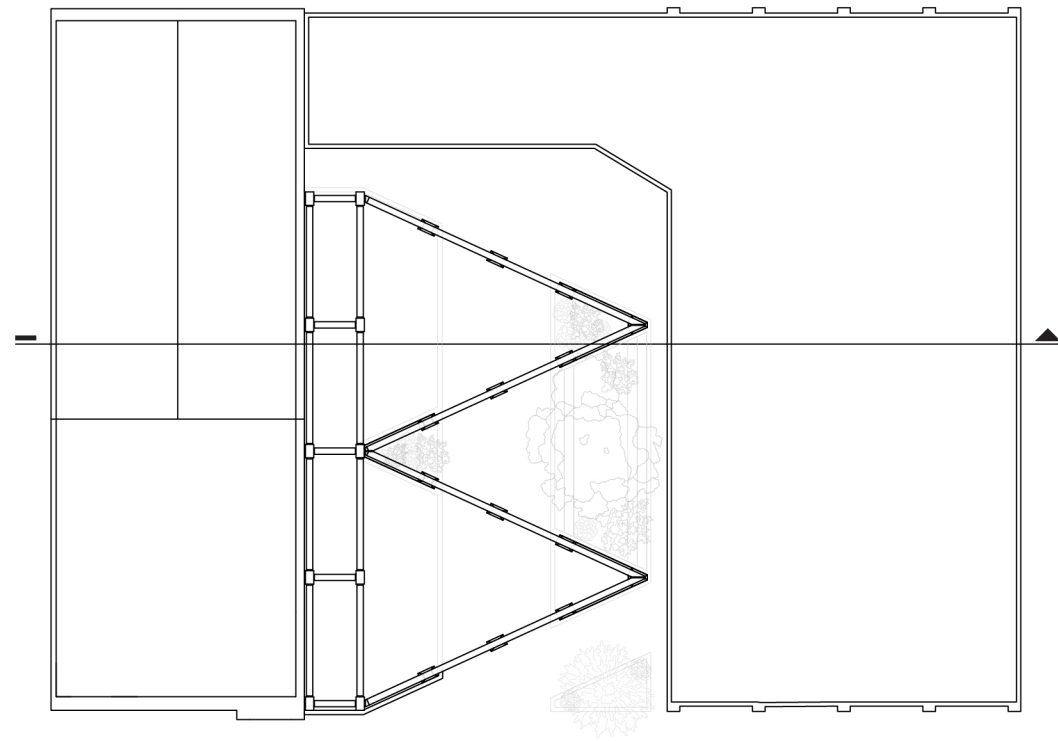
Site Plan



South Axon

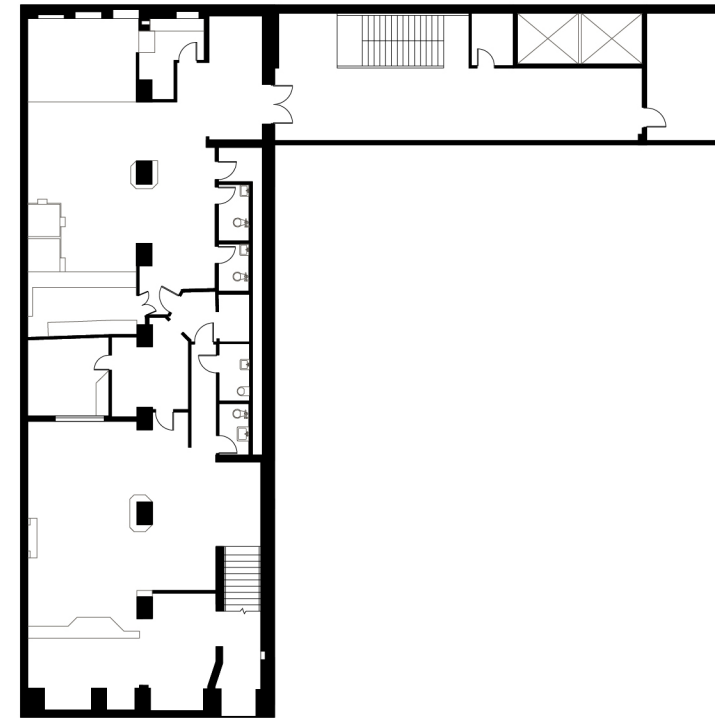


Street elevation along 1st Ave



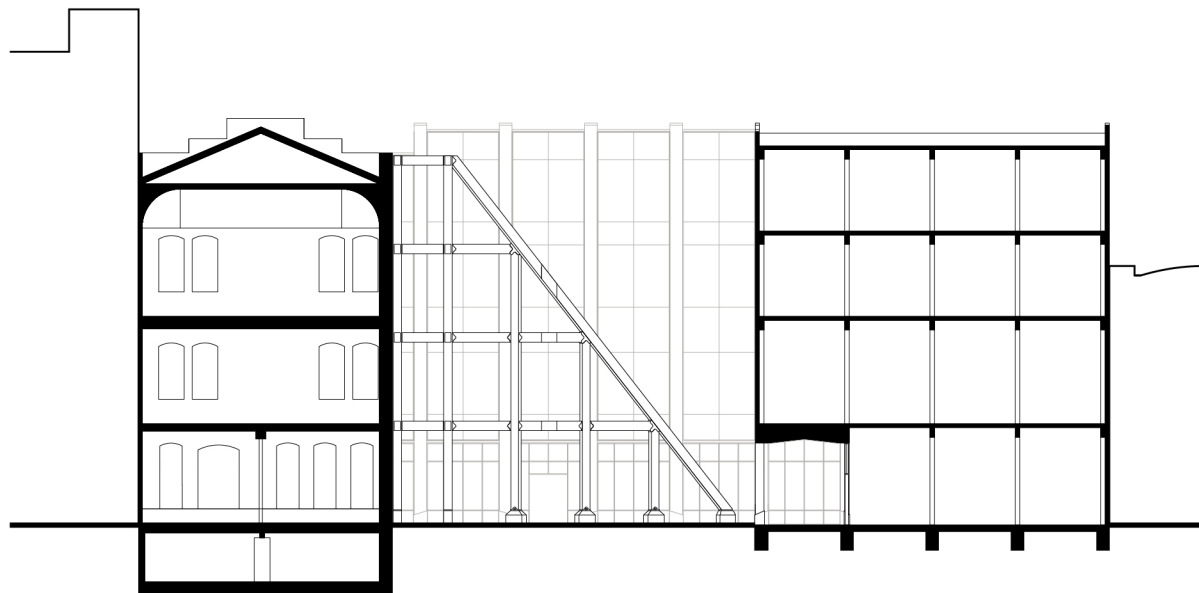
Roof Plan

0' 5' 10' 25' 50' 



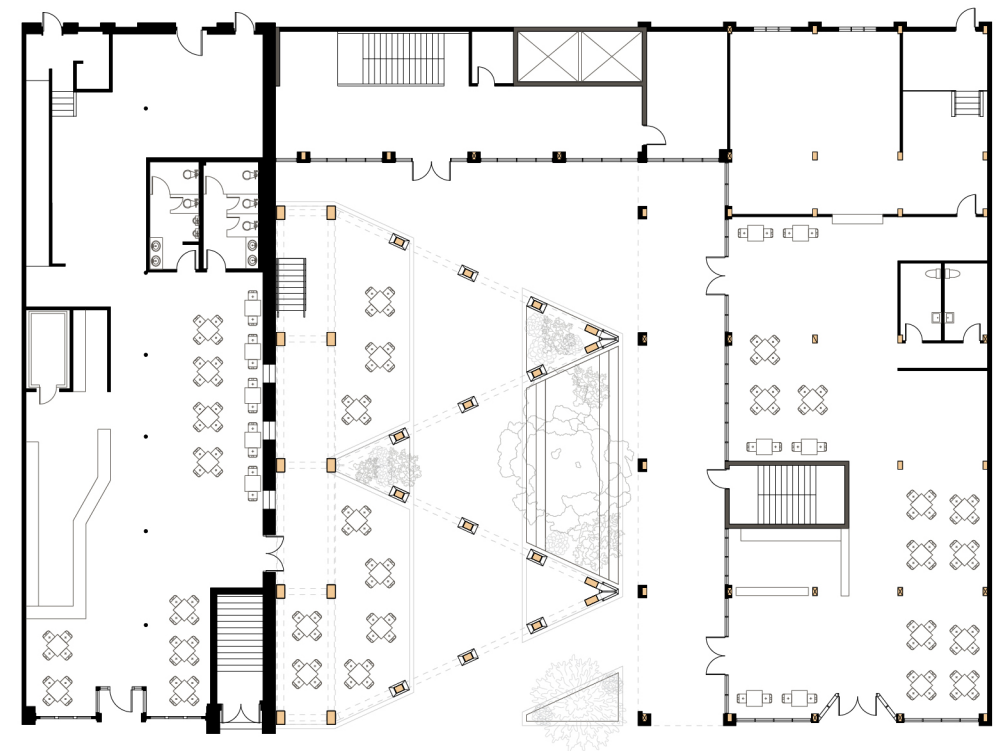
Floor Plan - Basement Level

0' 5' 10' 25' 50' 



Building Section

0' 5' 10' 25' 50'

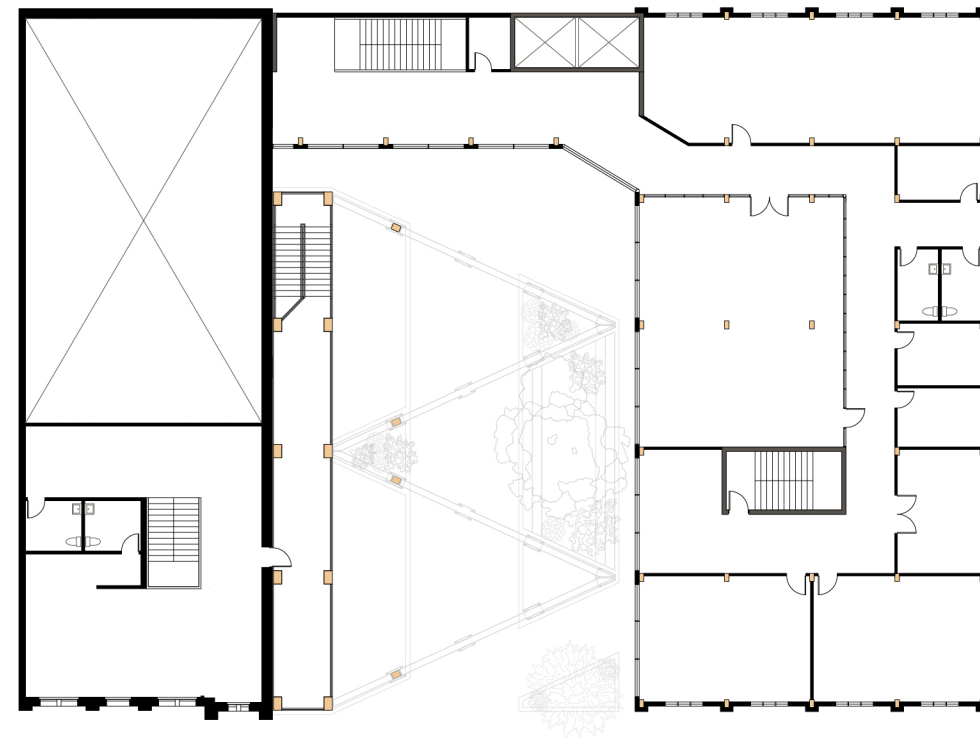
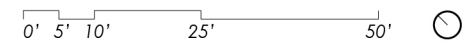


Floor Plan - Level 01

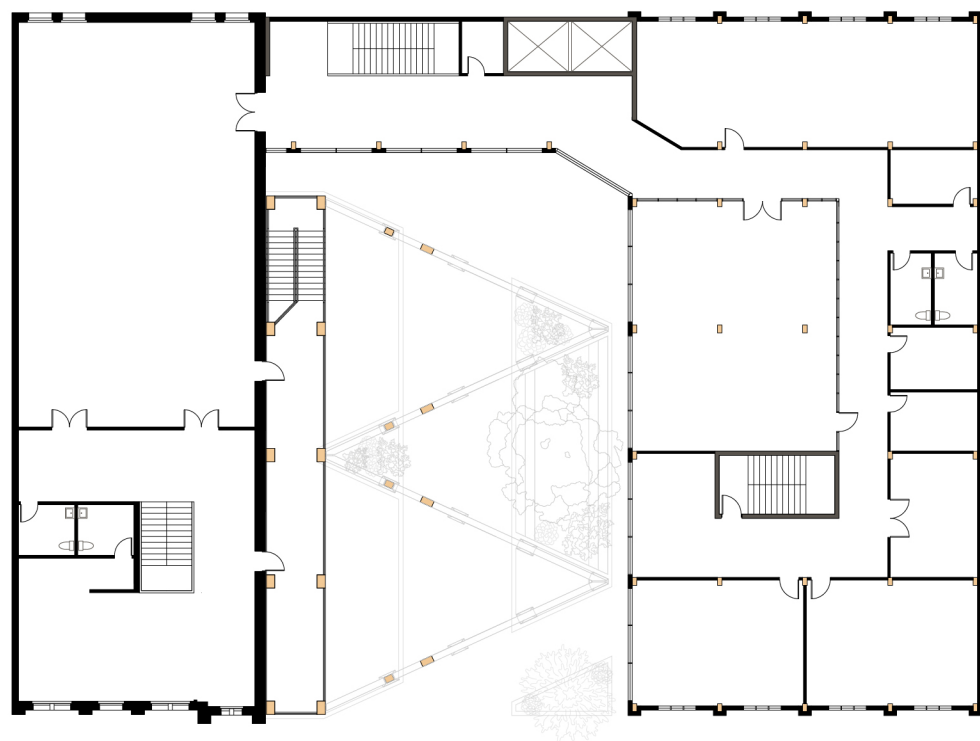
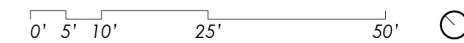
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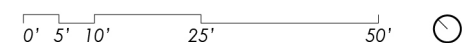
Floor Plan - Level 02



Floor Plan - Level 04

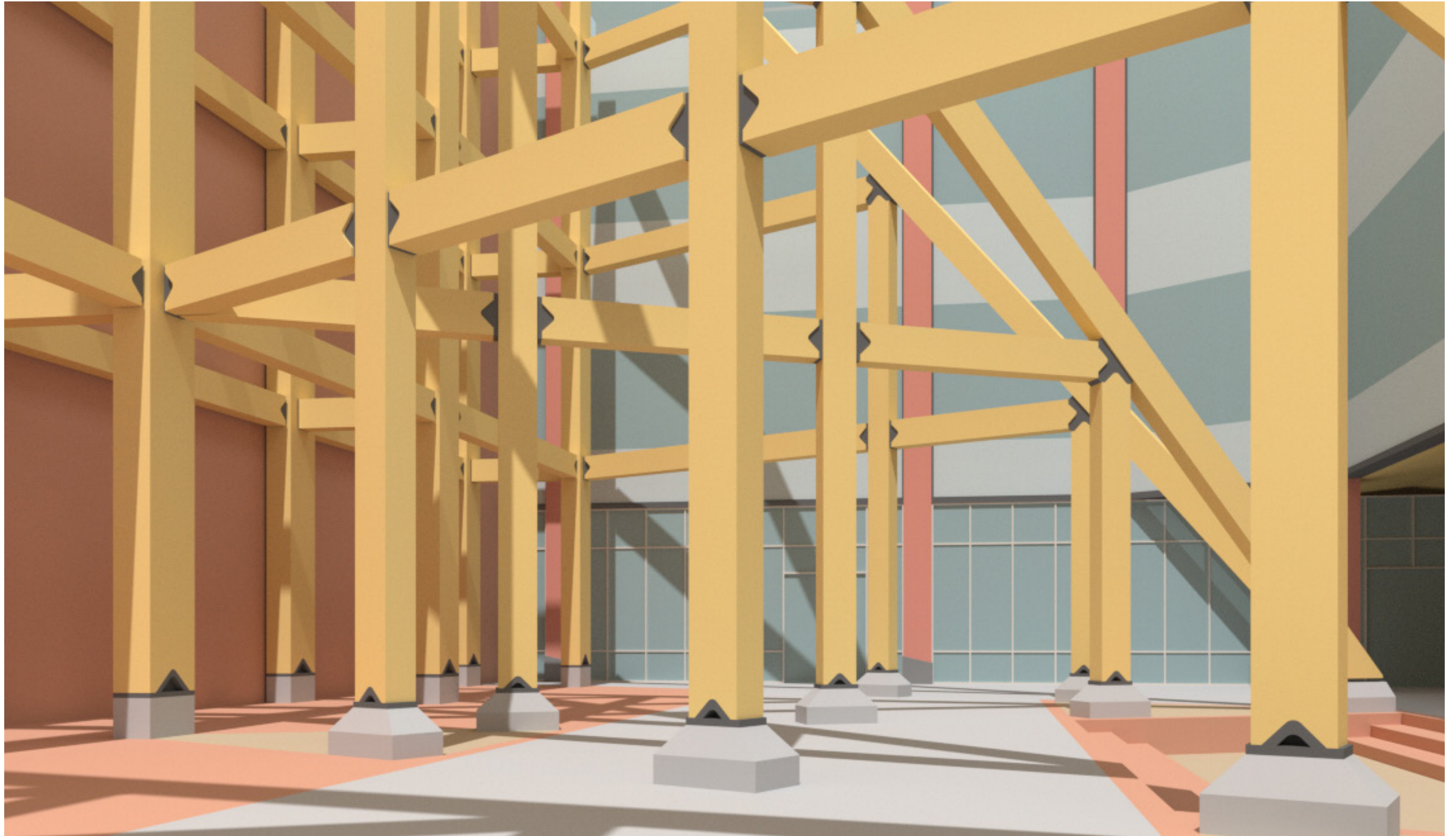


Floor Plan - Level 03





East elevation along 1st Ave



View from within timber buttress pocket park

Discussion and Conclusions

7.1 Reframing the Challenge

This thesis began with a simple observation: unreinforced masonry buildings represent an important part of the architectural, cultural, and environmental fabric of West Coast cities, yet they remain vulnerable to seismic activity, changing economic conditions, and continued development pressure. Traditional approaches to seismic retrofit often address structural concerns independently from questions of preservation, adaptive reuse, and urban growth. As a result, historic buildings are often forced with difficult compromises when making adaptive reuse decisions.

The proposal developed in this thesis suggests an alternative approach. Rather than treating seismic retrofit as an isolated engineering problem, the project investigates how seismic resilience can become an opportunity for architectural transformation, adaptive reuse, and urban activation.

7.2 Evaluation of the Proposal

The project established four primary objectives: sustainability, preservation, cultural continuity, and functionality. A fifth objective, seismic resilience, emerged through the technical requirements of the retrofit itself.

From a preservation perspective, the proposal retains the building's most valuable historic elements, including its landmark-protected masonry facades, heavy timber structure, and significant interior spaces. The intervention focuses on preserving those components that continue to contribute architectural, cultural, and environmental value while selectively modifying areas that limit contemporary use.

From a sustainability perspective, the project prioritizes the retention of existing materials and embodied carbon. Rather than replacing the building, the proposal extends its useful life while introducing mass timber as a renewable structural material capable of supporting future adaptation.

Functionally, the project resolves long-standing circulation and accessibility challenges through the introduction of a new vertical circulation core and expanded floor area. These interventions allow the building to support a broader range of future occupancies while maintaining flexibility over time.

Finally, the project addresses seismic vulnerability through a mass timber buttressing system that strengthens the existing masonry structure while remaining legible as a contemporary intervention.

7.3 The Value of Mass Timber

Mass timber offers several advantages that make it uniquely suited to this proposal. Structurally, its lighter weight reduces seismic forces compared to steel and concrete alternatives. Architecturally, timber introduces warmth, texture, and visible structural expression that complements the material character of existing masonry construction. Environmentally, mass timber represents a renewable and carbon-sequestering resource capable of supporting broader sustainability goals.

Within the context of this thesis, however, the most significant contribution of mass timber is its ability to operate simultaneously as structure and architecture. Unlike many conventional retrofit systems that are concealed within walls or mechanical spaces, the proposed timber intervention remains visible and occupiable. The structural system becomes part of the public experience of the project.

This quality connects contemporary mass timber construction to a longer lineage of Pacific Northwest timber architecture, from the infrastructural logic of the Wilburton Trestle to the exposed structural expression of Winkenwerder Hall and the public connections of Northlake Commons.

7.4 The Retrofit as Urban Space

One of the most significant findings of this thesis emerged during the design process itself. The project began as an investigation into seismic retrofit but gradually expanded into a broader exploration of how historic buildings participate in contemporary urban life.

The introduction of the external timber buttressing system transformed the retrofit from a purely structural intervention into a new form of public engagement. The structure creates circulation paths, gathering spaces, visual identity, and connections between buildings. It supports the historic building physically while simultaneously supporting new forms of social and urban activity.

In this sense, the intervention functions as a gasket between historic and contemporary conditions. It mediates between masonry and timber, preservation and growth, old and new construction, private occupation and public space. The project suggests that the spaces created by retrofit interventions may be just as valuable as the structural improvements themselves.

7.5 Future Research

While the proposal demonstrates the architectural potential of mass timber retrofit strategies, several areas warrant further study. Detailed structural engineering analysis would be required to validate connection design, force transfer, and long-term performance. Questions of ownership, development feasibility, and implementation would also require additional investigation. Future research might explore similar strategies for different URM building types, varying site conditions, or alternative mass timber structural systems.

Additionally, using mass timber as a structural system in a fully exposed condition pushes the need for continued research into how these products may be engineered for long life spans when exposed to the elements.

7.6 Conclusion

This thesis set out to investigate how mass timber could be integrated with an existing unreinforced masonry building to provide seismic retrofit, adaptive reuse, and long-term preservation. Through the design of the Barnes Building proposal, the research demonstrates that these objectives need not be pursued independently.

By combining seismic retrofit, adaptive reuse, urban infill, and public space into a single architectural strategy, the project proposes a new model for engaging historic buildings in growing cities. Rather than isolating preservation from development, the proposal suggests that historic buildings are preserved most successfully when they are integrated into the future growth of the city. In doing so, the project positions mass timber not only as a structural material, but as a catalyst for architectural expression, urban connection, and long-term stewardship of the built environment.

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