Adaptive (Re)purpose of Industrial Heritage Buildings in Massachusetts A Modular Strategy for Building a Community

Riya D. Premani

University of Massachusetts Amherst

Follow this and additional works at: https://scholarworks.umass.edu/masters_theses_2

Part of the Architectural History and Criticism Commons, Historic Preservation and Conservation Commons, Interior Architecture Commons, and the Other Architecture Commons

Recommended Citation
https://doi.org/10.7275/35406540 https://scholarworks.umass.edu/masters_theses_2/1290

This Open Access Thesis is brought to you for free and open access by the Dissertations and Theses at ScholarWorks@UMass Amherst. It has been accepted for inclusion in Masters Theses by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.
Adaptive (Re)purpose of Industrial Heritage Buildings in Massachusetts

A Modular Strategy for Building a Community

A Thesis Presented

by

RIYA D. PREMANI

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF ARCHITECTURE

May 2023

Department of Architecture
Adaptive (Re)purpose of Industrial Heritage Buildings in Massachusetts

A Modular Strategy for Building a Community

A Thesis Presented

by

RIYA D PREMANI

Approved as to style and content by:

____________________

Professor Ray K. Mann

____________________

Stephen Schreiber, Chair

Department of Architecture
ACKNOWLEDGEMENTS

I want to thank my parents for believing in me and being a constant source of encouragement. I want to thank my sister Vrutika, my brother Dhruv, for encouraging me every day to do my best. I want to thank Professor Carey Clouse for showing me the positive outcomes with each draft. I want to thank my Thesis Chair Professor Ray K Mann to guide me with design development and believing in me that I can do it.
ABSTRACT

ADAPTIVE (RE)PURPOSE OF INDUSTRIAL HERITAGE BUILDINGS IN MASSACHUSETTS

A MODULAR STRATEGY FOR BUILDING A COMMUNITY

2023

RIYA D PREMANI, B.ID, CEPT University

M. Arch., UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Professor Ray K Mann

A significant portion of a building’s carbon emission comes from the materials used to construct it, primarily through fabrication and assembly. According to the World Green Building Council, this is called embodied carbon, and it makes up to 49% of the total emissions from global construction. Thus, new energy-efficient buildings can take from 10-80 years of time to offset just the carbon used in construction. Combined with such amounts of construction and demolition waste, new construction can be viewed as a wasteful or even destructive practice. Adaptive reuse presents a promising alternative method for creating new space, without the emissions and waste that would be generated by building something new.

This thesis identifies challenges in the adaptability of existing buildings and provides instances which show why reuse and mixed-use spaces are significant. A literature review will be used to provide the concepts and strategies of sustainability.
Case studies will help identify the real world issues and how they are addressed in different ways to show various functional spaces. Adaptive reuse is also being explored as a means to fulfill the socio-cultural, economic and environmental sustainability goals while keeping the character of the city intact.

Keywords: Adaptive Reuse, Cultural heritage, Sustainability, Industrial heritage, Mill Buildings
# TABLE OF CONTENTS

ACKNOWLEDGMENTS........................................................................................................ iv

ABSTRACT............................................................................................................................ v

LIST OF TABLES.................................................................................................................... ix

LIST OF FIGURES.................................................................................................................. x

CHAPTER

1. Adaptive Re-use as an idea..........................................................1
   1.1 Introduction ..............................................................................1
   1.2 Historic Preservation and Adaptive Re-use .........................6
   1.3 Adaptive Reuse and Sustainability.........................................7
       1.3.1 What is Social Sustainability? .........................................9
       1.3.2 Design to Re-use ...........................................................9

2. Analysis.........................................................................................11
   2.1 Precedent Analysis .............................................................11
   2.2 Re-use of Mill Buildings .....................................................17

3. Industrial Mill Heritage ...............................................................20
   3.1 Industrial Mill Buildings .....................................................20
   3.2 Importance of preserving the mill buildings ......................21

4. Design .........................................................................................22
   4.1 Adaptive Reuse Design Development .................................22
       4.1.1 History of Easthampton .............................................22
       4.1.2 Site Context .............................................................23
4.2 Design Process ........................................................................................................25
5. Conclusion and Limitation .....................................................................................32
6. Image Citations ......................................................................................................33
BIBLIOGRAPHY .........................................................................................................35
LIST OF TABLES

1. Methodology for research..............................................................17
2. Sustainable Development..............................................................19
LIST OF FIGURES

1. The Dovecote Studio by Haworth Tompkins, England (Vile, 2009) ...........22
2. National Gallery Singapore by Studio Milou (National Gallery Singapore) ......23
3. The Emperor Hotel, Qianmen (Leijonhufvud, 2013) .............................24
4. The Union, Boston, MA (Stone, 1976) ............................................25
5. 100 Shawmut, Boston (AZA, 2019) .................................................27
7. Strelein Warehouse, Front Façade (Mackenzie, 2010) ............................29
8. Residence in a Warehouse (Splinter Society Architecture) .......................30
9. Timber Framed House (Velde, 2016) .................................................30
10. Site Map, Easthampton, MA ............................................................34
11. Site Plan ..........................................................................................35
12. Design Process through the grid ........................................................36
13. Generative models ...........................................................................36
14. Generative models ...........................................................................36
15. Generative models ...........................................................................36
16. Layouts with 1BR, 2BR and 3BR apartments for the housing scheme .......37
17. First Floor Plan .................................................................................37
18. Second Floor Plan .............................................................................38
19. Third Floor Plan ...............................................................................38
20. Fourth floor plan ...............................................................................39
21. View of the Housing Scheme ..........................................................40
22. View Showing the double volume display area ...................................40
23. View of the display area…………………………………………………………..41
24. View of the office spaces………………………………………………………41
25. Exploded View…………………………………………………………………42
CHAPTER 1
Adaptive Re-use as an idea

1.1 Introduction

Urban landscapes have witnessed tremendous change in the twentieth century, and in the twenty-first century, development has sped up, endangering historic landscapes. To address the extraordinary urban population growth and new economic opportunities, many metropolitan regions are under pressure to develop. The most prominent architectural movement of the modern era, modernism, rejected conventional building and planning techniques by using designs and a material palette that frequently contrasted with the neighborhood's historic surroundings. Too often, city leaders build new landmarks in response to financial challenges, hiring renowned architects to produce thought-provoking structures that demand individual attention while obstructing classic civic symbols like city halls and cathedrals.

The term "adaptive reuse" refers to initiatives that give an old structure a new purpose, such as converting an abandoned warehouse into a retail store or a former school into social housing. Repurposing a current structure makes excellent use of the energy embedded within the materials, all of which had to be obtained, produced, and transported to the site in a labor-intensive manner.

Considering exclusions such as medical buildings and religious monuments, the COVID-19 pandemic has demonstrated that multi-use buildings are better for the neighborhood and the environment than those with single purposes. During the epidemic, hotels served as temporary hospitals and student accommodation, sporting events served as food pantries, healthcare facilities, and polling places, and retail outlets served as distribution hubs.
Many European cities and towns have succeeded in accepting growth and change while preserving their unique architectural histories, establishing these sites as cultural assets with significant artistic value today. Through well-established adaptation mechanisms, living species must also balance conflicting assertions of stability and change. Recent developments in urban philosophy urge the purposeful application of comparable adaptable strategies to preserve a balance between necessary change and the preservation of the built environment's historic identity.

Rome is the best illustration of how many different sorts of change—both adaptive and potentially disastrous—have occurred in the city over the course of its millennia-long history. After fifty years or more of design deviating from accepted practice and prioritizing contrast with the environment above formal continuity, historic centers are facing a new challenge. The idea of adaptation puts forth a cutting-edge strategy for urban conservation that gives long-term historic character preservation top priority while allowing for necessary growth and change.

Architects and developers may address the underperformance of existing buildings to convert single-use areas into multi-functional environments as they re-examine the roles and functions of the buildings in response to social, economic, and climatic volatility. By layering new uses, restricted types of single-purpose places like malls and corporate office buildings could improve accessibility, vibrancy, and resilience in modern urban settings.

Cities in transition will change as the effects of climate change become more apparent in order to adapt to new environmental problems. These locations could undergo aesthetic or functional changes, becoming radically different from how they used to be.
A significant amount of the carbon emissions produced by a building are attributable to the extraction, manufacturing, and fabrication of materials, as well as to transport, assembly and end-of-life procedures. Embodied carbon is anticipated to make up 49% of worldwide new construction carbon footprint between now and 2050, according to Architecture2030, an organization focusing on climate change and the built environment, a new, energy-efficient structure can "pay back" the carbon load resulting from its construction over a period of 10 to 80 years (Architecture2030).

But there are issues with new development that go beyond carbon emissions. Construction and demolition debris makes up 26% of the non-industrial trash produced in the US, according to a recent report by the Environmental Protection Agency (Environmental Protection Agency, 2022). Reusing existing structures can significantly cut down on emissions, waste generated during construction and demolition, and associated costs.

It is not a new phenomenon, and it probably has been a practice since the idea of making space first emerged, to adapt an existing structure for new uses. For instance, during the Renaissance period, classical monuments were renovated, and during the French Revolution, religious structures were transformed for industrial or military purposes (Plevoets, & Van Cleempoel, , 2013). These interventions offer the first examples of the utility and efficiency applied to even significant public structures, despite the fact that they were made pragmatically and maybe without any purpose of cultural preservation. While many adaptive reuse projects may have just been functional, there was still a strong emphasis on historic preservation.
In the late 19th century, older structures were modified even by architects. According to French architect Eugene Emmanuel Viollet-le-Duc (1990), better way for preservation of a building is to find a function that can adapt to the building and that way it will not require further changes in the existing structure.

Adaptive reuse has the ability to yield a wide range of financial and social advantages. If the facility is in good structural shape and is simple to modify for its new program, there are cost advantages. These benefits include the potential for lower site acquisition costs, lower building costs, and quicker construction times, depending on the size of the project undertaken. The ability to purchase a property with an existing building is a determining element in the viability of redevelopment, since it is more affordable to purchase an existing building with relevant infrastructure than it is to find unoccupied ground and begin from scratch. In order to address the economic problem of energy use, adaptive reuse has emerged as a compelling development option.

Urban sites that are demolished to make way for new construction effectively lose all of their value as assets and all of the prior investments made there are wasted. Economic growth does not occur by chance; development takes place when there is a perceived demand for space. For instance, the value of undeveloped land depends on the size of the market. On the other hand, underutilization and excess capacity reduce the value of land. Older buildings are sometimes an untapped resource that can be used to house and expand start-up and small businesses because they are less expensive per square foot than new projects.

Additionally, adaptive reuse provides societal advantages such as regenerating an area and offering a connection to the past. Retaining existing structures can strengthen the
texture and character of a community rather than trying to remedy an issue by eliminating buildings. Adaptive reuse's tangible revival can benefit an urban community, and it is frequently used as a motivation to upgrade neighboring buildings. The urbanist Jane Jacobs recognized that cities require old buildings so urgently that it's probably impossible for vibrant streets and districts to develop without them. She noted that “I don't mean old buildings that are museum pieces or in fantastic, expensive states of rehabilitation when I say old structures; rather, I mean a lot of simple, commonplace, low-value old buildings, some of which are in disrepair” (Jacobs, 1961, 187).

Building preservation also produces a variety of difficulties. The first is the idea of unceasing development, or perpetual progress. The value of what currently exists is diminished by the notion that anything new is more excellent by nature. As seen by the large number of deserted places, planners have long viewed old structures as an economic impediment. They have historically viewed these buildings as being, or out of date if they are used for anything other than what they were intended. To enhance their image, cities have also destroyed places to make room for new construction. Municipalities are neglecting their historical foundations as they build their contemporary identities (Table 1).
1.2 **Historic Preservation and Adaptive Reuse**

The area of historic restoration advertises itself as sustainable. Adaptive reuse of old structures is now frequently seen as a form of sustainable development. Sustainability in preservation, like architecture in general, is too often centred around environmental considerations such as material conservation, energy conservation, and water conservation. Two more aspects of sustainability are recognized by most definitions: economics and culture. The Brundtland Report (1987) envisioned sustainability as a comprehensive system of interconnected ecological, economical, and sociological linkages, which is rarely considered in the preservation area. The preservation industry should participate in the full range of sustainable solutions, especially economic and social issues, for various reasons, according to this article (Al-Athel, et al, 1987). It then revisits one of the most well-known case studies in the curriculum of historic restoration in the United States—Faneuil Boston's Hall Marketplace—to see how far sustainability was approached as a series of interrelated interactions. Finally, it recommends that by connecting various existing concepts, discoveries, and approaches pioneered by Randall Mason, Setha Low, and others, restoration could be made more sustainable (Donofrio 2012).
1.3 Adaptive Reuse and Sustainability

As ranked by the United Nations Environment Program (Worldwatch Institute, 2008), the United States, Australia, and Canada emit the highest amount of carbon dioxide per capita from buildings. According to Yudelson (2010), 75% of all buildings will be built or renovated by 2040. As a result of the fact that nearly five million existing buildings in the US and Canada are ripe for retrofitting into energy-efficient structures in the next five years, he predicted that the pace of building energy retrofits and green upgrades would accelerate dramatically (ibid).

Adaptive reuse plays an important role in reducing emissions from the built environment. Additionally, reusing materials and assemblies salvaged from adaptively repurposed buildings and other buildings can contribute to sustainability. In recent decades, proven design solutions have evolved into a wide range of principles, strategies, approaches, and solutions. Buildings undergo a lot of changes; it is important to know the process that they have been through in order to declare them sustainable. Fournier and Zimnicki (2004) supported this in their guidelines, which specified to provide some information for adaptive reuse of buildings that show consistency with goals and objectives of historic preservation and design sustainability. These guidelines are integrated into concepts of sustainable development in the adaptive reuse of historic buildings to preserve the cultural heritage as well as enhance the built environment.

It is not only important to design the building well, but also to plan carefully and consider its surrounding environment in order to achieve successful adaptive reuse projects (Zushi, 2005). According to Fournier and Zimnicki (2004), the adaptive reuse of historic buildings should also incorporate principles of sustainable design that allow
maximum reuse of the existing building components, restoring passive aspects of the original design and preserving the microclimate created by historic plantings. Aside from examining the potential for adaptive reuse projects in sustainable design, Snyder (2005) incorporates "green design" into structures that previously had a conflict with nature. Additionally, he emphasized that sustainable design and adaptive reuse will play a major role in architecture in the future. Green adaptive reuse, according to Langston, extends the life cycle of a building and reduces its carbon footprint while maintaining its cultural heritage.

A balance must be found between preserving the building's past, ensuring its viability in the present, and ensuring its sustainability in the future. The mere re-use of a building does not suffice if it continues to be energy inefficient and harmful to the environment. According to the U.S. Energy Department, buildings consume 30 percent of our energy and 60 percent of our electricity.

While sustainability has gained popularity in the field of architecture, it has not yet been widely adopted in urban settings despite its benefits to both the occupant and the environment. A more sustainable development pattern involves reusing existing structures. Urban areas have a vast amount of underutilized building stock, while suburban areas continue to build voids to create on speculative grounds. There is a need to develop an approach to redevelopment that incorporates the principles of sustainable design and adaptive reuse. Adaptive reuse is neither about replacing the old with something that is new, but has to do with restoring its void with new or better functionality of the spaces.
The built environment plays a significant role in this discussion, as it consumes 40% of energy supplies and generates a corresponding amount of waste (Sizirici B, et al, 2021). Climate change adaptation is concerned with how humans respond to this challenge and how the effects of a changing climate might be reduced to the greatest extent possible (Burton, 2005). Making greater use of existing infrastructure is one of the most significant contributions that the urban environment can make to adapt to climate change.

A knowledge gap on the influence of the factors of adaptive reuse and its advantages that affect the sustainability of repurposed buildings has been recognized as the research problem. The research hypothesis is that heritage urban sustainability is accomplished by supporting adaptive reuse, which are represented by the building's requirements, the requirements of its surroundings, and the advantages of adaptive reuse.

1.3.1 What is Social Sustainability?
The original concept of sustainable development included a clear statement towards society. (Table 2) However, recently references about sustainability have focused more on environmental challenges or included it in concepts such as development and economic growth (Vallance, Perkins & Dixon 2011).

1.3.2 Design to Re-use
A design approach comes into picture soon after the reuse process has been started. The reuse process starts once the abandoned site is found and explored. To undertake a comprehensive design approach, clarity of specific areas must be considered for planning and design. When architects design a new building on site, they start with a concept to fit the space and surrounding context, whereas when they reuse and adapt, they must start from specific site conditions to fit the scheme accordingly. This process of adaptive reuse within the context of industrial and socio-cultural legacy of cities and their outputs of the urban landscape is a path to bolster the relationship between society and architecture. Adaptive reuse often makes the user experience the innovative design process that was a result of the social practices.
2.1 Precedent Analysis

The example of The Dovecote Studio is about preserving the ruins that one would have thought are too damaged, creatively (Fig 1). The abandoned building was just an empty envelope that was transformed creatively by Studio Haworth Tompkins with cortical steel. It complements the earthen red of the brick but is a completely separate structure within the original shell. It was entirely pre-assembled and placed inside the envelope with the help of a crane. It presently serves as artist accommodation, rehearsal space, and temporary exhibition space in Snape Maltings, Suffolk, a globally famous music venue.

Figure 1 The Dovecote Studio by Haworth Tompkins, England (Vile, 2009)
A gold mesh screen that arcs out over the pavement conceals a transitional gallery between Singapore's previous city hall and courthouse, which was previously unoccupied. Studio Milou supports the canopy from the inside using tree-like steel frames, which have perforations that cast a dappled pattern on the inside. The original characteristics of the buildings were protected as much as possible. The windows and columns that used to be the original exterior facades, now face the gallery. (Fig 2)

![Figure 2 National Gallery Singapore by Studio Milou (National Gallery Singapore)](image)

These transparent extensions to historic buildings transform the architecture by enlarging the area by little or small change to the exteriors. This allows the glazed walls to show the original structure directly. Other than structures, these glass interventions also blend with the sky and bring natural light to the interiors.
The Emperor Hotel in Qianmen was previously a public bath, and the feeling of bathing is still present in the modern hotel. The space is designed by emotions and dreams to create illusions and memories. The hotel is designed keeping in mind the importance of water in the desert city. The entrance is a narrow alley that is of great importance to the northern Chinese architecture and the traditional gray bricks along with the white marble interiors contextualize the space to its location (Fig 3).

Figure 3 The Emperor Hotel, Qianmen (Leijonhufvud, 2013)

While adaptive reuse is becoming more fashionable, there are still plenty of options to transform underutilized structures into new living, leisure, and workspaces. Adaptive reuse expands the creative outreach of the architecture and urban landscape through transformations like a subway station that is transformed into a library, a train
station is transformed into an amphitheater, and a power plant is transformed into a climbing gym.

Reuse is an essential part of the long-term redevelopment of cities. Adaptive reuse schemes, in the best situations, preserve timeless architectural traditions while regenerating spaces for people and enterprises. Furthermore, by reusing and recycling and avoiding demolition, these types of projects can assist lessen the environmental effect of development.

Figure 4 The Union, Boston, MA (Stone, 1976)

The Union is a brand-new affordable housing complex in downtown Boston for low-income, homeless, and formerly homeless people. In order to transform the structure
into affordable housing, St. Francis House and the Catholic Archdiocese of Boston's Planning Office for Urban Affairs (POUA) teamed up to develop this project. Prior to being renovated, the building had recently served as office space. Historic marble fireplaces and inside Corinthian columns were two examples of architecturally noteworthy components that were preserved and restored as part of the project. It was decided to replace the contemporary (about 2000) windows with replicas of the original window framing. The stone facades’ broken and damaged stones were fixed, and the brickwork was repointed.

A significant example of the High Victorian Gothic style in Boston is the Boston Young Men's Christian Union (BYMCU) building (Figure 4). The building's exterior is characterized by its multicolored granite, marble, and brownstone façades, ornately designed entrance, and window surrounds with arches and columns. Local architect Nathanial Bradlee, of Bradlee and Winslow, created the BYMCU in 1875. Originally, it had a retail store on the main floor and offices for the Union, as well as an auditorium, a gym, a library, and social and game rooms, on the upper floors. Three distinct extensions were finished after the building's initial construction.
In order to preserve a famous warehouse in The South End, a designated Boston Landmark District, a new condominium project dubbed (Figure 5) 100 Shawmut in Boston, Massachusetts, blends new construction and adaptive reuse. With a distinct "V" shape at the long leg of the "L," which deviates from the warehouse's strict orthogonal geometry, the L-shaped glass and terracotta addition that sits above the original structure and wraps its eastern side sets it apart from both the original building and the surrounding urban context. Constructing a 13-story, 231,880 square foot residential condominium by fusing a six-story brick warehouse with a modern extension.

With the new building set back from the historic property to emphasize its unique form and profile, the design approach preserves the character of the neighborhood and the original building. The extension above has remarkable geometry and beautiful materials, which further emphasize the difference between old and new.
2.2 Re-use of Mill Buildings

Tiger Senior Housing – Paris, Illinois

- A historic high school in Paris, Illinois, has been converted into 42 low-income senior apartments.
- The facility preserves its original gym and auditorium, which provide activity and gathering places for residents. One of the most difficult problems was installing new insulation on the outer walls.
- The original building structure was a 3-wythe masonry wall with a plaster interior finish, and there was no insulation in the original wall assembly. They had to add insulation on the inside of the facade to meet the energy code and NGBS requirements.

![Image of Tiger Senior Apartments, Illinois](Image)

**Figure 6 Tiger Senior Apartments, Illinois (Jordan, 2022)**

Strelein Warehouse designed by Ian Moore Architects, Surry Hills, Australia

- A consistent re-use led to the latest version of this structure, formerly a grocery warehouse and an artist’s loft.
- Converted to a 1BR House
- To highlight the distinction between new and old, all original elements have been painted white, with all
contemporary interventions painted black.

Figure 7 Strelein Warehouse, Front Façade
(Mackenzie, 2010)

Residence in a Warehouse by Splinter Society Architecture, Hawthorn East, Australia

- Interventions define the residential conversion of this former flower mill.
- Expressive balconies have been hung from the façade
- Cantilevered mass has been added to the roof,
- Views to a nearby canal.
  A sharp contrast in façade material occurs at a break between two halves of the project,
- 19th-century style industrial bricking shifting to 20th century style industrial concrete.
Figure 8 Residence in a Warehouse

Timber house by GAFPA, Gentbrugge, Belgium

- The site was previously occupied by a stonemason. The owner chose to keep the structure in order to reduce cost.
- The two-story residence is constructed within the brick structure.
- The structure installed inside is made out of timber frame.
- Dismantling this roof also produced a sheltered double-height space that allows daylight to reach the new house and provides views of the garden from the upper floor.
- The roof and floor slabs of the adjacent concrete structure were removed to create an open-air space that now contains the walled garden.

Figure 9 Timber Framed House (Velde, 2016)
CHAPTER 3
Industrial Mill Heritage

3.1. Industrial Mill Buildings

Due to their big, open spaces, industrial buildings are particularly well adapted for adaptive reuse. Many industrial structures have architectural value as vernacular remnants of the industrial era, and their associations with notable persons and events may not have as much significance. On the other hand, certain industrial structures were created by well-known early 20th-century architects like Albert Kahn. By the end of the nineteenth century, steel frame buildings had replaced the red brick factories with load-bearing walls. Early in the 20th century, reinforced concrete had become the material of choice, the skeleton was more noticeable on the exterior, and the windows had grown significantly. Heavy industry's fall in the early and middle decades of the 20th century has left a legacy of idle, dormant, and abandoned sites all over the American landscape (Burkhardt, 2017).

According to Adaptive Use: A Survey of the Construction Prices, a research by the Advisory Council on Historic Preservation, there was significant environmental concern during this time, and fuel and material costs were very expensive. Because of the exorbitant costs and related challenges obtaining building permits, adaptive reuse has emerged as a practical substitute for new construction and the eviction of existing structures associated with urban renewal. The early 1960s saw grassroots campaigns to rescue SoHo and Penn Station in New York City, which helped the preservation movement acquire momentum and national attention. Jane Jacobs (1961, 187) wrote the following in The Death and Life of Great American Cities in support of common historic
structures: “Cities need old buildings so badly it is probably impossible for vigorous streets and districts to grow without them.”

3.2 Importance of preserving the mill buildings

A community's historic industrial character must be preserved in order to keep these architectural landmarks. Because industrial methods have changed so drastically over the past century, few locations currently dominate as a result of industry shifting globally. Previously, different regions were influential at different times. From the 1880s, the textile industry was starting its relocation from New England to the South-East. Industrial buildings and complexes have stunning architectural design, both in terms of size and understated ornamentation. They were constructed with production, efficiency, and occasionally staff safety in mind.

The industries designed by Albert Kahn, Walter Gropius, and Frank Lloyd Wright may be the exceptions, but it is the factories built by craftsmen in the nineteenth century that most require preservation and revitalization. Contrary to country residences, palaces, and castles, which early preservationists cherished for its associations with great people, many industrial structures were traditionally overlooked due to their lack of legendary ties and their useful architecture. This is confirmed by the neglect of these factory buildings by the preservation community. Due to their decrepit surroundings, filthy scenery, and "average" architecture, they are frequently disregarded. Such an assumption disregards the intricate architectural details, distinctive features, and distinctive public areas frequently established in industrial complexes.
CHAPTER 4

Design

4.1 Adaptive Reuse Design Development

The research base of adaptive re-use is developed into a mixed-use project. ‘Building 7’ is a one of its kind of housing scheme developed specially keeping in mind the growing art culture and the artist’s community in the mill heritage city of Easthampton, MA.

4.1.1 History of Easthampton

The history of Easthampton’s mill heritage goes back to 1832, when Samuel Williston shifted his business base to the city where he employed people of the town to set up his button factory. This allowed the city to grow through employment and because of the work force, the city started growing prosperously. The Civil War supplies included buttons, cotton production and elastic webbing, which were made at these factories. The mill factories started providing them the supply during WW1. The immigrants from other cities started building housing along the main streets of the town for better connectivity, such as Lovefield and Ferry Streets. The decline of these industries hit when WW2 was over. The factories saw major losses and started declining. The last mill was abandoned in 1995.

To this day, the nearby towns such as Northampton, Springfield, which are major art and educational hubs, housing options and well-known schools, have attracted many new residents to move to Easthampton. As a result, the artist community is growing along with the social housing scene. Gradually, the city is building its effort to provide progressing environments for artists and to cater to this idea, the housing communities are
growing rapidly. To adapt the growing housing schemes, the abandoned mill buildings fit the program. The city has established an ordinance to adapt mixed-use programs in the mill district. Some other important factors of the site, 1 Ferry Street, include its connection to the rail trail, ground transport routes, connectivity to nearby towns, pond culture (Easthampton Reconnaissance Report, 2009).

4.1.2 Site Context

1. Lower mill pond

According to history, the Lower Mill Pond was developed by Samuel Williston. It receives water from the Brickyard Brook watershed and goes into the Manhan River. Easthampton’s pond system was built to provide industrial water power for the factories. The significant water feature on site is adjacent to the building is the narrow canal.

2. Surrounding context
The project is surrounded by mill buildings which are in the process of redevelopment and surrounded by housing communities and has a beautiful view of the Lower Mill Pond, which again has a lot of historic significance when the original building was a flourishing button factory in the 19th century.

Figure 11 Site Plan
4.2 Design Process

The building is divided into three parts which serve a different purpose. The concrete addition is redeveloped as office spaces and conference rooms on different levels. The central part is converted to housing and studio spaces integrated for the artists with various housing requirements. The last volume is developed into a community meeting space to hold a larger number of people for community gatherings. The first level also consists of an art gallery space to promote collaboration amongst artists and exposure in the community. (Figure 12)

The grid produced by the beam structure is shown as polygons, which are further developed as volumes blocks and rearranged as small cuboidal generative models to identify different iterations from the grid. (Figure 13, 14, 15)

Figure 12 Design Process through the grid

Figure 13  Figure 14  Figure 15
The design strategy relies on basic housing layouts, consisting of 1 bedroom apartments, 2 bedrooms – shared apartments, and 3-bedrooms – family apartments, in various volumes. These units are arranged keeping in mind the entrance from the stairwell and the elevator and have enough circulation to provide storage and supply for artists. (Figure 16)

Figure 16 Layouts with 1BR, 2BR and 3BR apartments for the housing scheme

1. First Floor (Figure 17)

Figure 17 First Floor Plan

Program: Public Use – art gallery and entrance dividing office space and housing
2. Second Floor (Figure 18)

![Second Floor Plan]

Figure 18 Second Floor Plan

Program: Office Spaces, Housing, Display area, Open area for co-working spaces, community space

No. of Apartments: 4

1BR: 1

2BR:

3BR: 3

3. Third Floor (Figure 19)

![Third Floor Plan]

Figure 19 Third Floor Plan
Program: Office Spaces, Housing, Display Area

No. of Apartments: 6

1BR: 4
2BR: 2
3BR: 0

4. Fourth floor (Figure 20)

![Fourth floor plan](image)

Figure 20 Fourth floor plan

Program: Office Spaces, Housing

No. of Apartments: 17

1BR: 13
2BR: 4
3BR: 0

The walls facing the central area on the inside have large display spaces to showcase the artist's current work theme. This ensures the use of space in the maximum way and encourages collaboration amongst the community. (Figure 21)
There are various cut-outs in the slab to make it double volume display areas to showcase large installations. The vertical differentiation provides volumetric visualization of the space and encourages different light quality in each space. (Figure 22)

To take these collaborations further, the first level is redeveloped into a large open plan gallery to exhibit the best works. The cut-out from the slab encourages the difference in spatial quality in the gallery spaces. (Figure 23)
The office spaces are divided into three floors to provide privacy as well as spatial void creates a visual difference at each level. These are spaces such that they can overlook below or above for a fascinating view of the grid made by the beam structure resting on the columns. (Figure 24)
The exploded view (Figure 25) further shows the connection between the three parts of the mixed-use development.
CHAPTER 5  
Conclusion and Limitation

5.1 Conclusion and Limitations

The project sums up the importance of adaptive reuse and the strategies used to redevelop an existing structure. However, there are some limitations to the adaptive reuse factors. These challenges are often seen during the design and construction phases of the project.

1. Adapting to building codes: The main challenges of an adaptive reuse project is getting the structure up to the code. The building might be built in various time frames and hence might not be eligible to fit in certain energy or accessibility codes. Hence, further investment is required to get the structural details up to code to bring it up to code.

2. Less flexibility: As much as we want to redevelop and meet programmatic needs along with the aesthetic factor, the built structure sometimes limits the efficiency in the layout.

3. Program and Context: Adaptive reuse factors include the context of the project. The location and the use plays an important role in developing the program and intent of the project.

Further limitations pointed out are that the design project can take up more programs or functions. The space allotted to each program can be diversified. The limitations of the project should not limit designers and architects to pursue an adaptive reuse project. Each building is different and needs different attention in the beginning.
IMAGE CITATIONS

https://www.azacorp.com/portfolio-item/112-shawmut/

https://wjwarchitects.com/work/tiger-senior-apartments/

https://architizer.com/projects/emperor-qianmen-hotel/

https://www.archdaily.com/186556/strelein-warehouse-ian-moore-architects


Residence in a Warehouse. View Photograph.
https://www.splintersociety.com/project/house-in-a-warehouse


https://www.archdaily.com/89980/dovecote-studio-haworth-tompkins
BIBLIOGRAPHY


https://doi.org/10.1108/02632770010315724


https://doi.org/10.5937/a-u0-7938.


http://rave.ohiolink.edu/etdc/view?acc_num=ucin1115644591


http://rave.ohiolink.edu/etdc/view?acc_num=ucin1116013015