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Doctor of Liberal Arts in Architecture

ADAPTIVE REUSE OF THE URBAN BUILT ENVIRONMENT AND DESIGN INTERVENTION STRATEGIES

“Adaptive reuse of buildings bypasses the wasteful process of demolition and reconstruction. This environmental benefit, combined with the energy savings, carbon emissions reduction, and the social and economic advantages of recycling a valued heritage building, make reuse an essential component of sustainable development.”

--Department of the Environment and Heritage, 2004

Preface

This study was conducted during my time as a doctoral student at the Breuer-Marcell Doctoral School of Architecture. Extensive investigation and data collection from a range of institutions, architects, scholars, and professionals were required to conduct this work. Throughout the writing of this dissertation, I have received a great deal of support and assistance.

I acknowledge the generous financial support from the Stipendium Hungaricum scholarship and the China Scholarship Council.

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A special thanks to Prof. Tie Wang of the Central Academy of Fine Arts for making it possible for me to study at this university and giving me great encouragement. In addition, many thanks to all of the members of staff at Pécs University-Faculty of Engineering and Information Technology for instilling in me a passion for learning and their kind support.

Further, I am grateful to my working partners, Wang Yuntong, Liu Yan, and Wang Zhi, for their trust and dedication in helping me to complete outstanding design projects during my doctoral studies. Also, I would like to thank all of my friends and colleagues from China, Hungary, and outside for their time, advice, and moral support.

Last but not least, I would also like to thank my parents and family members for encouraging and supporting me and for their selfless love whenever I needed them.

LIU Shasha

Abstract

According to the World Cities Report 2020, global urbanization will continue to grow over the next ten years. At the same time, large cities are beginning to counter urbanization because of the continuous development of traffic conditions, the Internet, and other information technologies, which have created conditions for the migration and flow of population. The same thing is happening in the big eastern cities in China. On the one hand, the city needs to continue to expand; on the other hand, the original urban center is declining at the start. These pose severe challenges to Chinese cities regarding housing, infrastructure, and basic services. Today, numerous cities worldwide are attempting to transform into sustainable urban development to deal with urbanization, re-urbanization, and climate change.

In this article, the term “adaptive reuse” is used as a research object to look for intervention methods to improve the built environment with unique social values and spatial characteristics. Firstly, The theoretical development process of adaptive reuse is chronologically organized. The built environment is divided into three categories: heritage buildings, existing buildings, and urban regeneration, to formulate the theoretical construction of adaptive reuse independently for each type. Second, we integrate prior researchers’ classifications of the built environment and intervention strategies with prominent cases of adaptive reuse in Europe and China. As a result, the three intervention strategies of this study and their respective designed intervention methods are outlined. In addition, each technique is followed by a matching practical case.

This work is composed of two sections: Part I is focused on the dissertation. Part II is devoted to two practical cases in Qingdao, Chain. Among them, Case 2 is my master plan.

PART I CONTAINS THE FOLLOWING SIX CHAPTERS:

Chapter 1 introduction: Why choose this topic?

The article begins by providing context for the study by discussing urbanization, sustainable urban renewal, and the difficulties associated with built environment regeneration in Chinese cities. The following section discusses the study’s keywords and research methodology.

Chapter 2: Where does “adaptive reuse” come from?

The chapters are arranged chronologically, beginning with the genesis of the fundamental theories of adaptive reuse. It is divided into five sections, starting with an overview of pre-19th century building reuse. Second, adaptive reuse was facilitated by the emergence of the restoration and anti-restoration debates in the nineteenth century. Further, Alois Riegl and Boito’s research around the turn of the twentieth century lay the precedent for its theory. Then, in the mid-twentieth century, an international charter formalized this concept. Finally, in the second half of the twentieth century, the term’s theoretical discussion and practical application became generalized.

Chapter 3: What is “adaptive reuse”?

It is a Theoretical study of adaptive reuse in the built environment. The theoretical framework for adaptive reuse in the built environment is provided via the perspective of three distinct built environments: heritage buildings, stock buildings, and urban renewal. Due to the wide range of contents covered in the urban renewal section will be divided into five categories: residential, historic areas, industrial buildings, urban parks, and user-led renewal projects.

Chapter 4: How be good with adaptive reuse for built environments?

Before engaging in adaptive reuse for the built environment, it is critical with a respectful attitude to understand the built environment’s history and context. And it understands the challenges that will be faced during project implementation.

Chapter 5: How to do with adaptive reuse?

It discusses strategies for adaptive reuse intervention in the built environment. Three viewpoints will be used to interpret architectural design intervention strategies: architectural form, architectural expression, and aesthetic fundamentals. Architectural form is classified into six categories based on the built environment’s host structure, and each category introduces a way of design intervention and is accompanied by practical examples. Architectural expression and aesthetic fundamentals are discussed from three distinct approaches, each with a case study to support them.

Chapter 6: Conclusion

PART II CONTAINS TWO PRACTICAL CASES:

Project 1: Renewal of Sifang road’s historical & cultural district in Qingdao.

Location: Qingdao, Shibei District, China
Architect: BDP Shanghai
Client: Qingdao Municipal Bureau of Urban Resources Planning
Intervention strategies: Recombination, insertion, Link, bridge, weaving, Place maker

Project 2: The Interior Design Of A Private School For The Affiliated Middle School Of Central Minzu University In Qingdao

Location: Qingdao, Chengyang District, China
Architect: TYDI Qingdao
Principal In Charge: LIU Sha Sha
Client: Qingdao Dongtou Cultural Industry Co., Ltd
Intervention strategies: New interior, insertion, installation

Keywords: *adaptive reuse, built environment, design intervention, historic district, urban regeneration, existing building, strategy*

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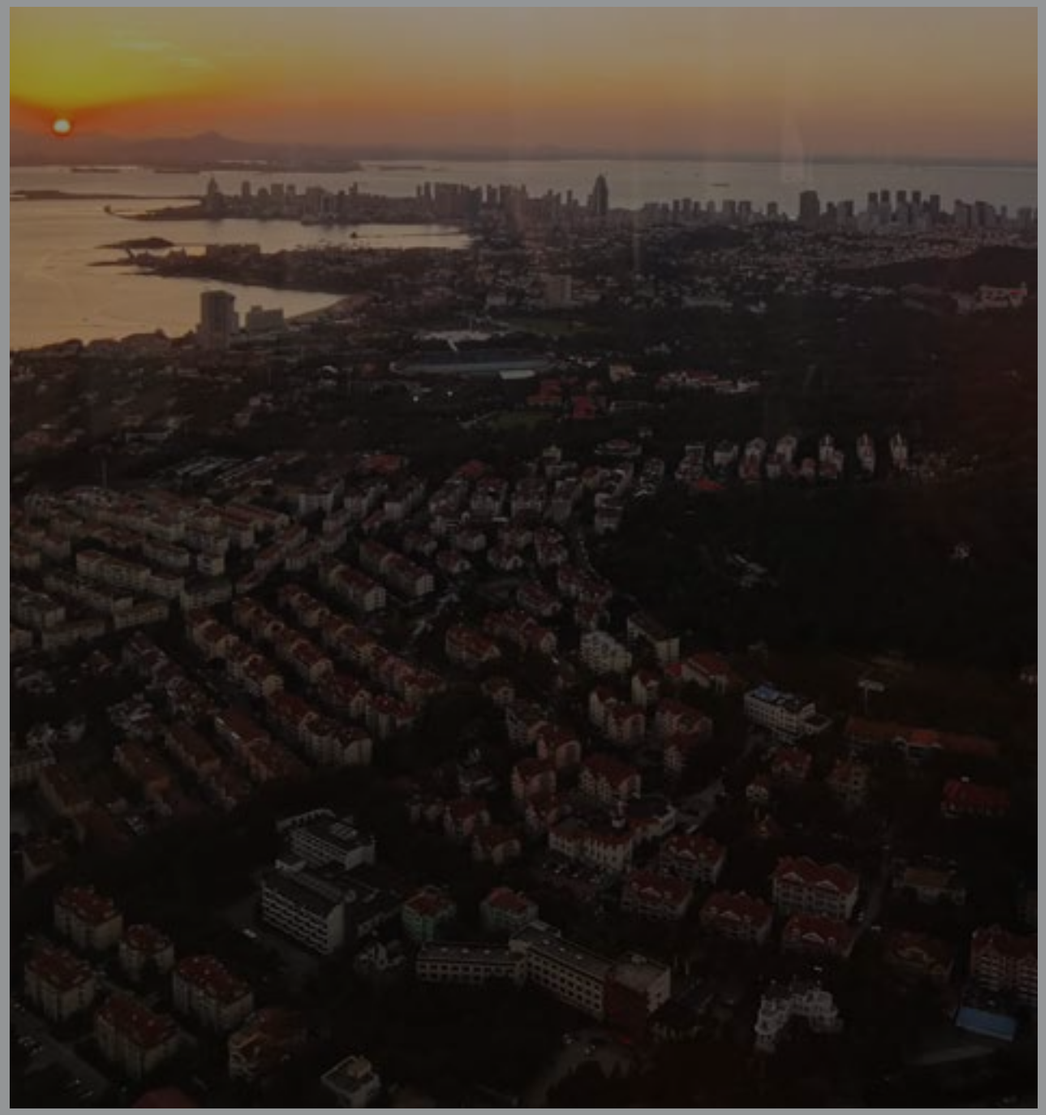
PART I



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CHAPTER

Introduction

01. Qingdao New Town and Old Town, photo by the author

1.1 URBANIZATION AND SUSTAINABILITY

The World Cities Report 2020 predicts that the world's urban population will continue to grow over the next decade, reaching 60.4 % by 2030, up from 56.2 % currently. Urban areas account for over 60% of global GDP, approximately 70% of global carbon emissions, and more than 60% of resource utilization[1]. Simultaneously, the global population will continue to expand, reaching 8.5 billion in 2030 and 9.7 billion in 2050.[2] Urban areas are predicted to absorb nearly all of the world's future population expansion (United Nations, 2018). Urbanization and population growth will unavoidably increase resource use, compounding the escalating climate crisis.

The Intergovernmental Panel on Climate Change (IPCC) states that reducing global warming to 1.5 °C would require a "rapid and far-reaching" transformation of buildings, transportation, and cities. Global net anthropogenic CO2 emissions must be decreased by approximately 45 percent below 2010 levels by 2030, and "net-zero" emissions must be attained by approximately 2050. This requires cities worldwide to transition into low-carbon, sustainable cities. For this purpose, the UN member states unanimously adopted the 2030 Agenda for Sustainable Development in 2015, which includes Goal 11, which calls to "Make cities and human settlements inclusive, safe, resilient and sustainable."

Sustainable urbanization is the totality of a city's economic, environmental, social, and intangible conditions. These are conditions that can improve residents' quality of life in meaningful, visible, and concrete ways. For instance, cities such as Manchester and Essen were industrial powerhouses. These

01. The value of sustainable urbanization. source: The World Cities Report 2020
02. World population size and annual growth rate: 1950-2020 estimates and variables in the projection interval of 95% are projected in 2020-2100, Source: The World Cities Report 2020

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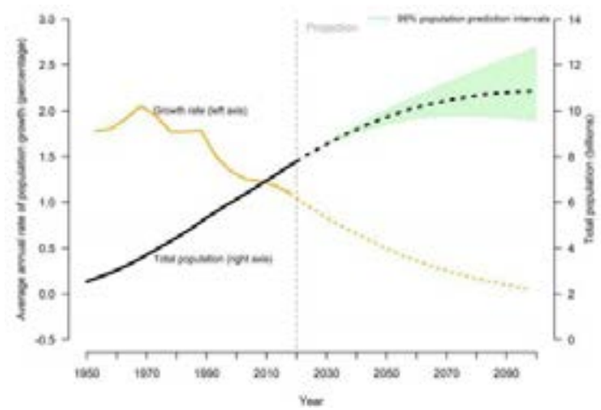

02

once-dominant industrial cities have regressed to secondary status, trailing the financial capitals of New York and London in terms of economic possibilities. Several cities, especially former manufacturing centers that inherited the heritage of unused warehouses, factories, and industrial infrastructure, have sought to revitalize their economies and reposition themselves as "culture capitals."

1.2 URBANIZATION AND URBAN TRANSFORMATION IN CHINA

Cities are becoming increasingly vital in human life, and economic development as the globe enters the urban age. China's urbanization will also continue to grow. According to data from China's Seventh Census, the population in cities and towns will exceed 900 million in 2020, accounting for 63.89 %; the population in villages will exceed 500 million, accounting for 36.11 %. China's resident population is predicted to urbanize at 70% by 2030. Simultaneously, the continuing growth of transportation infrastructure, the Internet, and other technologies have created population migration and mobility conditions. The trend and scale of population mobility have continued to expand. The shrinking space-time distances between cities bring them closer together and increase their effect on one another while likewise intensifying inter-city competition and the need for sustainable urban economic growth. Additionally, in the face of global warming, China's primary strategy for reducing emissions is to be green and switch to renewables cities. Social changes domestically and overseas have caused the development of China's cities to start a new phase. They changed from the crude model of rapid growth in the past to a new model that is better suited to the specific needs of each city.

China's Urban Transformation

China announced the National New Urbanization Plan (2014-2020) in 2014, promoting the development of green cities, smart cities, and humanistic cities as a new urbanization trend. The term "green city" refers to the comprehensive integration of ecological civilization into urban development and the establishment of environmentally friendly production, lifestyle, and consumption patterns, such as green buildings, new energy, and energy-efficient renovation of existing structures. The term "smart city" refers to the innovative use of information technology and its close integration with the city's economic and social development. On the other hand, the humanistic city seeks to discover the city's historical and cultural resources, strengthen cultural inheritance and innovation, place a premium on protecting historical and cultural heritage during the transformation of older cities, and promote

the integration of functional enhancement and cultural heritage protection. The adoption of this plan heralds the beginning of China's urbanization's quick transition to a more qualitative and distinctive form to create livable and sustainable cities. This is accompanied by the implementation of legislation governing urban renewal and the transformation of historic cities.

Urban Renewal

Urban renewal is the required and planned modification of areas of a city that are no longer appropriate for urban social life in modern times. The concept was initially developed in 1958 with the primary objective of increasing land usage in metropolitan areas and promoting redevelopment with the goal of improving the external physical environment. After 1990, as the concept of sustainable development gained traction, urban regeneration became more concerned with the human and ecological environment, social fairness, and community development on a sustainable basis. The meaning of urban renewal has changed even more. It now includes the construction of a complete redevelopment that is economically, socially, and environmentally sound.

In the process of urban development, the modernization of the city and the preservation of the historical and cultural city have often created a fierce conflict between them. For example, in 1925, Corbusier proposed a plan for the central district of Paris, suggesting demolishing those buildings that, in his opinion, had little value for preservation and making room for modern buildings. How to deal with the protection and rational reuse of the built environment in the context of sustainable urban renewal is a problem that cities the world over must address. It is a particularly pressing issue for China at the moment. Urban planning with a greater focus on conserving and utilizing existing structures is a more recent trend strongly related to the contentious transition in urban development from urban renewal to conservation in the early 1970s. These efforts aimed to save, create a city image, and improve infrastructure in regeneration regions; they targeted historic town centers and 19th-century residential districts around the city center. As urban renewal spread to towns, industrial and traffic wastelands, large housing complexes, and, beginning in the early 1990s, even old military facilities, conversion was incorporated into broader urban planning schemes based on economic and ecological considerations. De-urbanization has recently shown another significant shift: conversion cycles have finally caught up with short lifecycles. People have grown to appreciate the benefits of temporary usage when used with a long-

01. The table is China's significant national policies on urban renewal,after 2014. Author's drawing is based on Xu Zhenqiang et al. "On the Current Situation, Problems and Countermeasures of Urban Renewal Development in China

01 Table

TIME	NAME OF THE REGULATION	KEYWORDS	ISSUED BY
2014.03	National new urbanization plan (2014-2020)	Heritage conservation, renovation of old buildings, improvement of human living environment	Central government
2015.12	The 2015 central urban work conference	Renovation of old buildings, improvement of building standards, green development of cities	Central government
2016.02	Several suggestions on deepening the construction of new type of urbanization	Renovation of old buildings, urban greening, improving urban functions, improving public services	State council
2016.11	Guiding opinions on deepening the redevelopment of low-effective land in cities and towns (for trial implementation)	Market-based operation of old urban areas renovated and transformed by old houses	Ministry of land and resources
2019.03	The 2019 government work report	Renovation of old buildings, upgrading of cities/buildings/ infrastructure, the	State council
2019.04	Notice on the renovation of old communities in 2019	Renovation of old buildings, financial assistance	Housing and urban-rural ministry of construction
2019.09	Measures for the management of special funds for urban security housing projects of the central financial	Old housing renovation, upgrading infrastructure, special fund management, building energy-saving renovation	Ministry of finance, ministry of housing and urban-rural development
2019.12	Communique of the 2019 central economic work conference	Renovation of stock housing, renovation of old buildings	Central government
2020.07	The general office of the state council's guiding opinions on comprehensively promoting the renovation of older urban areas	Old city transformation, policy establishment, institutional framework	Central government
2020.8	Notice of the general office of the ministry of housing and urban-rural development on effectively strengthening historical and cultural protection in urban renewal and renovation and resolutely stopping destructive acts	Assessment and demonstration of renovation projects and heritage protection	Ministry of housing and urban-rural development
2020.1	Proposal of the central committee of the communist party of china on formulating the fourteenth five-year plan for national economic and social development and the visionary goals for 2035	People as the core, ecological restoration, heritage preservation, old city renovation, community building, shaping urban landscape, and enhancing resilience	Central government
2021.03	2021 Government work report	Improve the quality of urban development, renovate old cities, and improve the level of public services	Central government

term strategy. The European research project “Urban Catalyst” shows that this is a global problem. It looks at the connection between planning goals and temporary cultural activities in urban redevelopment, like the planned use of Berlin’s Palace of the Republic.

China’s Recent Urban Renewal Policies

As China’s phase of large-scale construction and fast urbanization has mostly ended, the country’s urban growth has entered a phase of building stock renewal. The primary significance of urban renewal is that it is an effective means of achieving the optimal allocation of urban space resources, raising people’s living standards, realizing the value of land, and promoting capital and resource circulation in urban growth[3].

Since the “National New Urbanization Plan (2014-2020)” in 2014, urban development policy documents promoting urban renewal have been produced. The following table compiles urban renewal-related policy documents from recent years to illustrate how urban renewal has evolved in China. As can be seen from the chart, “old buildings renovation” appears most frequently, and policy development is generally mature and sound. Guidelines for the market-oriented operation of urban renewal projects, special money management techniques to incentivize developers, and appropriate institutional structures and evaluation procedures for conservation projects are all included in the initial planning papers. Then, in 2020, the “Proposal for the 14th Five-Year Plan and Visionary Goals for 2035” recommended creating a new municipality centered on people. It promotes historical and cultural preservation, affects the urban landscape, supports the renovation of older urban districts and community development, increases cities’ resilience to disasters, and builds resilient cities. When viewed through the lens of a policy document, China’s urban regeneration progresses from exterior environmental improvement to sustainable and complete improvement.

1.3 DEFINITION OF THE KEYWORDS

Built environment

The term “built environment” refers to places and spaces that have been constructed or transformed by humans and serve as the environment for human activities. It encompasses a range of scales, from buildings and parks to neighborhoods and cities, and frequently includes supporting infrastructure, such as transportation systems.[4]

Throughout this dissertation, the term “built environment” refers to historic structures, existing structures, and traditional neighborhoods located in the city’s downtown that represent a particular historical period’s traditional style and local folklore features. It is characterized by its singular social and cultural significance in contemporary urban evolution and provides the city with its landscape value and local texture. Furthermore, existing structures or neighborhoods that have a significant impact on the lives of urban dwellers serve as a reflection of their collective memory. In other words, the constructed environment discussed in this article is considered to be part of the “urban heritage.” This phrase comes from the European Union research report Nº 16 (2004), Sustainable Development of Urban Historical Areas through Active Integration Within Towns—SUIT.

Urban heritage comprises three main categories:
1. Monumental heritage of exceptional cultural value;
2. Non-exceptional heritage elements but present in a coherent way with a relative abundance;
3. New urban elements to be considered (for instance): The urban built form; The open space: streets, public open spaces; Urban infrastructures: material networks and equipment [5].

Adaptive reuse

Adaptive reuse has been a popular word in architecture, heritage preservation, urban planning, and engineering in recent years[6], [7]. The terms “adaptability” and “reuse” are synonymous. “Adaptability” is defined by the Cambridge Dictionary as “the capacity or desire to alter to adapt to changing circumstances,” whereas “reuse” can be understood literally as the act of reusing.

Adaptive reuse is more widely defined as the act of repurposing an existing structure or the process of transforming an economically, culturally, and socially viable built environment into a new use. It copes with future changes with minimum demolition, cost, and waste and maximum robustness, variability, and efficiency. It has the potential to accommodate change throughout time[8], thus fundamentally extending the life of the structure and enhancing its resilience[9]. Adaptive reuse, on the other hand, is not about perpetuating a current use of a place by upgrading or restoring it to a specific period but about defining new uses and adapting them to the original space or context while keeping and appreciating its value and significance. This strategy, particularly applied to architectural environments associated with cultural heritage, emphasizes maximal preservation and little change. Additionally, in practice, adaptive reuse is a complex operation and decision-making process

10]–[15].

Design Intervention

The Cambridge Dictionary defines intervention as “the action of becoming intentional involved in a difficult situation to improve it or prevent it from getting worse.” Building design means adapting a known system to get at least the intended result.

In architectural design, there is always a risk of failure alongside the certainty of success, which is inherent in the design of customized, historical, highly visible, and long-lasting constructions, both visually and functionally. When we work with built environments, while little can be done to change the past, designers may certainly mediate the integration of new buildings into existing ones[16]. This is a type of mediation that we might refer to as “design intervention.”

The design intervention presented in this article is an approach to the built environment design that was derived from an analysis of a large number of practice cases and related literature. And the subsequent phase is separated into three subject categories: architectural form, architectural expression, and aesthetics, each of which incorporates a variety of distinct tactics.
However, it is important to be reminded that within architecture and planning, the elements and outcomes of design can be difficult to conceptualize and manage. The problem lies not simply in the range of stakeholders differentially interpreting the functionality and aesthetics of a building but also in the effect of structures’ scaling up from the site through the precinct to the metropolitan level[16].

1.4 METHODOLOGY

Literature review

To review relevant domestic and international literature and pay attention to the latest research findings. We analyzed the relevant literature from domestic and international sources to understand the theories related to adaptive reuse development and to define adaptive reuse from different research perspectives.

Empirical research

Using study time in Europe, I visited outstanding adaptive reuse instances around the continent. I synthesized adaptive reuse experiences and models in the built environment through data collection and site visits. Through experience working in a design company, involvement in various projects, and research and field examination of the existing environment in Qingdao, China’s Sifang Area, and the Shanghai Road historic district, it is possible to obtain an in-depth study of particular cases.

Historical research

The relevant literature is reviewed, as is the development history of relevant adaptive reuse participation practices in China and abroad and the theoretical development trends and related applications.

Methods of summarization and induction

To provide an analytical framework, conduct a systematic analysis of well-known design cases and research findings, characterize the intervention characteristics of adaptive reuse in the built environment, and generate pertinent design solutions.

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CHAPTER

Adaptive Reuse's Historical Background And Theoretical Foundations

ADAPTIVE REUSE has emerged as a new term or discipline in recent years, having been widely applied in existing environments such as heritage conservation, urban building stock sustainability, urban renewal, and urban community resilience. Along with these areas associated with the architectural discipline, it has been applied to economics, specifically the circular economy. The growing emphasis on adaptive reuse is strongly intertwined with contemporary demands for social and economic development that are both sustainable and equitable. Additionally, architects, scholars, governments, and stakeholders are increasingly incorporating adaptive use into practical projects in response to urban issues such as climate change, population growth, cultural loss, and resource scarcity.

2.1 REUSE BEFORE THE 19TH CENTURY

Adaptive reuse of buildings is not a new phenomenon in contemporary culture, particularly in the case of structurally sound or iconic monuments, whose life cycle and meaning outlast the planning of their users. Thus, recycling or giving new functions to things so that they can fit into new political, economic, and cultural situations is a way to do this. In the East, the Forbidden City, a royal palace built in 1420 during the Ming Dynasty, is an example of recycling. After the Qing Dynasty unified China in 1644, the palace was not abandoned or destroyed, as it had been in the past when China changed dynasties but was restored and reused. One of the primary reasons it could be recycled and reused was because the Qing dynasty was better adapted to Chinese culture and solidified the rationality of its rule. In the West, Michelangelo designed the 16th-century Catholic Church of Santa Maria Degli Angeli e Degli Martiri in Rome in 1561. He used the ruins of the ancient baths in the church's design. While this project deviated from the preservation spirit, it was groundbreaking in terms of architectural intervention into an existing structure[6]. Several expropriated religious structures were converted to residential, industrial, or

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military use during the French Revolution. In 1790, the French government established a special commission to safeguard the country's architectural heritage, the French Commission for Historical Monuments (Commission des monuments historiques), which in 1840 published the first list of 934 historical monuments. To this day, French historic buildings and sites carry the MH[1]logo. While the Eastern and Western approaches to adaptive reuse are different, they both exemplify the notion of adaptive reuse. This is demonstrated in three ways: first, by extending the life of the building; second, by preserving the historic structure intact through reuse; and third, by adapting the building to a new context. However, the primary motivation for reuse was functional and financial in nature[17] and had nothing to do with architectural heritage preservation. Instead of that, reusing buildings in their historical context was a spontaneous and pragmatic act[7].

2.2 LAID THE GROUNDWORK FOR THE DEVELOPMENT OF ADAPTIVE REUSE

The best of all ways of preserving a building is to find a use for it, and then to satisfy so well the needs dictated by that use that there will never be any further need to make any further changes in the building.

— Eugène Emmanuel Viollet-le-Duc

RESTORATION

In the 18th century, monuments began to receive attention thanks to the archaeological discoveries of Ostia, Pompeii, and Herculaneum; the subsequent travels promoted pioneering publications on the subject. Italy, especially Rome and the area around it, and France became essential places to develop architectural heritage conservation because they were interested in the systematic excavation of monuments.[6]

Following the October Revolution of 1837, the French Commission for Historic Monuments was split up to create a separate commission in charge of historical monuments. The Inspector-General position was created to oversee the damaged historical monuments on the national monuments list and initiate their restoration[18]. In the 19th century, Eugène Emmanuel Viollet-le-Duc was the first Chief Inspector of the Commission of Historic Monuments. In February 1840, Viollet-le-Duc was appointed to restore the Abbey of La Madeleine at Vézelay2. He was then commissioned to restore similar structures in Paris (1844–1864) and Carcassonne (1853). These initiatives became critical fulcrums in the debate over monument restoration.

1.HM is an abbreviation for Monument Historique, which means designation for national heritage sites in France.
2. Abbey of La Madeleine at Vézelay is a Benedictine and Cluniac monastery in Vézelay in the east-central French department of Yonne. It was constructed between 1120 and 1150.

Eugène Emmanuel Viollet-le-Duc

John Ruskin

William Morris

Viollet-le-Duc developed his own restoration theory through the restoration of various styles of historic structures. For instance, he argues that reconstructing Gothic vaults in the early Romanesque style lends the entire structure an aesthetic cohesion[6]. Additionally, he suggests that interventions are frequently large-scale when dealing with "restoration" tasks. In some cases, interventions included the addition of entirely new components to the building, even if these new components were styled in the same manner as the original[7]. His views on the use of historic buildings, as expressed in his writings and works, are as follows:

"The best of all ways of preserving a building is to find a use for it, and then to satisfy so well the needs dictated by that use that there will never be any further need to make any further changes in the building. . . . In such circumstances, the best thing to do is to try to put oneself in the place of the original architect and try to imagine what he would do if he returned to earth and was handed the same kind of programs as have been given to us. Now, this sort of proceeding requires that the restorer is in possession of all the same resources as the original master – and that he proceeds as the original master did." (1990 [1854], pp. 222–223)

ANTI-RESTORATION

Numerous proponents of the Viollet-le-Duc theory advocate for "stylized restoration." They believe that restoring this nature perpetuates its monumental function in society and distinguishes between "dead" and "living" historic sites. Another way to say the type of restoration is based on the style of the person who does it. Although Viollet-le-concept Duc's restoration was recognized in France and accepted by numerous institutions throughout Europe and the United States, it sparked a debate over restoration principles. Critics of Viollet-le-Duc and stylized restoration organized an anti-restoration movement, including John Ruskin, one of the earliest advocates in England.

In his 1849 book The Seven Lamps of Architecture, Ruskin unequivocally stated that restoration means the destruction a structure can sustain: destruction devoid of reality. he argued that "We have no right to touch them." Rather than that, he advises, "... neither have repairs nor have ruins ... Let them take the greatest possible care of all they have got, and when care will preserve it no longer, let it perish inch by inch."[19] Ruskin established the concept of preservation with these expressive words. They eventually evolved into the modern conservation movement's foundation[6].

In 1877, William Morris, a student of John Ruskin, founded the Society for the

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Preservation of Ancient Monuments (SPAB). He regarded historic architecture as the product of an artist working within a particular historical context. Time contributes to the historical beauty of architecture, and thus, signs of time are an integral part of historic architecture. As a result, these structures should be preserved rather than destroyed or restored. Furthermore, the Society condemns stylistic restoration, as stated in their manifesto document: “to put Protection in place of Restoration, to stave off decay by daily care, to prop a perilous wall or mend a leaky roof by such means as are obviously meant for support or covering, and show no pretense of other art, and otherwise to resist all tampering with either the fabric or ornament of the building as it stands.”[6]

CONTEMPORARY RESEARCHERS EVALUATE RESTORATION AND ANTI-RESTORATION

The stylized restoration and anti-restoration movements maintained opposed positions into the early twentieth century. According to contemporary scholars, the debate between the two perspectives is centered on the authenticity of historical heritage. For instance, Liliane Wong describes Morris’s idea of “a work of heritage included additions and alterations that, undisturbed, represented an authenticity of material” in her book, Adaptive Reuse: Extending the Lives of Buildings. And she argues that the manifesto of his association establishes authenticity as a value and extends it to a broad range of existing environments, including anything considered artistic, scenic, historical, antique, or substantial. Sally Stone also speaks in her book. At the heart of the Viollet-le-Duc, Ruskin, or Morris debate is a difference in opinion over how to define authenticity[20].

01. Alois Riegl (lift) and Camillo Boito (Right)

2.3 REUSE THEORY PROTOTYPE ESTABLISHED

THEORY: ALOIS RIEGL ‘S CLASSIFICATION OF HERITAGE VALUES

At the turn of the century, Alois Riegl, an Austrian art historian, wrote an article in 1903 called “The Modern Cult of Monuments: Its Essence and Development.” In the article, he talked about different types of values for monuments. He grouped values into two systems: one for “commemorative values,” which included chronological, historical, and intentional monumental values. The other is “present-day values,” which have: use and artistic value (novelty and relative artistic value).[7]

He made a comparison between restoration and anti-restoration. The former is the recovery of decay and debris into an entire building by stylized restoration. The latter is preserving a sense of architectural age, preserved with minimal intervention. Although Riegl understands both perspectives, as shown by the following description, he tends to support adaptive reuse or reparative approaches.

Material life is a prerequisite for psychic existence and indeed is more important because there is no psychic life without a physiological basis. It follows then that an old building still in use must be maintained in such a condition that it can accommodate people without endangering life or health – any hole or leak must be repaired immediately. In general, we may state that use-value is indifferent to the treatment of a monument so long as the monument’s existence is not affected and no concessions whatsoever are made to age value. Only in cases where use-value is fraught with newness-value must consideration of age-value be even more tightly restricted. [As such,] practical considerations allow age-value only in a few exceptional cases.

PRACTICE: CAMILLO BOITO DISTINGUISHES TYPES OF RESTORATION

Simultaneously, while Riegl’s approach to monument restoration and adaptation was theoretical, Camillo Boito (1836–1914)， the Italian architect， published an article comparing Voillet-le-Duc’s and Ruskin’s ideas in terms of practical application. He criticized both approaches, saying that the Voillet-le-Duc approach diluted the historic site’s authenticity and that Ruskin’s

approach was impractical in advocating its constant disrepair to preserve its age-old value. To balance these two arguments, Boito proposes that the restoration method used on any given project should be determined by the unique circumstances surrounding the building or monument in question. He distinguished three distinct approaches to restoration: ‘archaeological restoration’ for antique monuments, ‘picturesque restoration’ for medieval monuments, and ‘architectural restoration’ for Renaissance and other
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monuments[21]. Additionally, he pioneered the use of eight principles in practice by the architect or restorer to differentiate between the original structure and subsequent changes.

Meanwhile, there is a requirement for public documentation of each phase of development in order to differentiate between the old and new. Furthermore, Boito suggested that these principles be applied following the specific nature of the project. His theories have served as a critical foundation for contemporary interventions.

In this period, other scholars had corresponding ideas, and the Italian civil engineer and urban researcher Gustavo Giovannoni extended Boito’s scientific approach to restoration (also known as archaeological restoration) to all historic buildings, not just monuments. In particular, he highlighted the previously underestimated ‘secondary architecture’ that contributed to the overall historic environment in historic city centers and towns. Georg Dehio, then known as “the founder of German architectural conservation,” declared: “We protect monuments not because we think they are beautiful, but because they are part of our national life. “ During the same period, Austrian architect Adolf Loos noted in a 1907 article that “heritage was conceived as extending from the monument to the historical area, from the important natural features to the entire landscape.”

In the early 20th century, the theories of Riegl, Boito, and others contributed to the development of heritage conservation methods. To this day, the theoretical system that has been developed during this period still provides the fundamental guiding principles for international conservation regulations. During this development, its theories have been expanded so that today’s adaptive reuse is based on them.

2.4 THE INTERNATIONAL CHARTER ESTABLISHES THE CONCEPT OF ADAPTIVE REUSE

THE ATHENS CHARTER OF 1931

Although the concept of “heritage” began to gain importance in the 19th century, and many countries introduced appropriate protection legislation, there was still no widespread international cooperation. It was not until after the First World War that a large number of monuments in Europe were destroyed in a devastating manner that prompted practical cooperation between countries. The post-war peace negotiations led to the establishment of an international conservation cooperation organization, The International Museums Office, in 1926 and the staging of an international conference in Athens, Greece, in 1931, with representatives from 23 countries in attendance. The conference resulted in the Athens Charter, the first international policy for modern conservation. [22]The charter included seven resolutions. The main elements were: professional knowledge of restoration and historic preservation, requiring the cooperation of national and international legislative advisory groups; the preservation of historical heritage and its surroundings; and the use of modern techniques and materials for restoration.

Numerous scholars have emphasized the critical importance of the Athens Charter’s 1931 version to the formation of modern architectural heritage conservation. It influenced adaptive reuse development, and some of the Charter provisions created the concept of adaptive reuse[6]. For example, the Conference recommended that “ The occupation of buildings, which ensures the continuity of their life, should be maintained but that they should be used for a purpose which respects their historic or artistic character. “ (From Section I. DOCTRINES. GENERAL PRINCIPLES) [23]. This demonstrated the importance of continuity and purpose in the reuse of historical buildings. Additionally, the chapter thoroughly discussed the intervention of modern technologies and materials. These discussions established the framework for the use of design interventions as a strategy for protecting architectural heritage and the use of design interventions as a prominent indication of adaptive reuse practice. As demonstrated in the subsequent sections:

The experts heard various communications concerning modern materials for the consolidation of ancient monuments. They approved the judicious use of all the resources at the disposal of modern techniques, especially reinforced

concrete. They specified that this work of consolidation should, whenever possible, be concealed in order that the aspect and character of the restored monument be preserved[23]. (From Section III. AESTHETIC ENHANCEMENT OF ANCIENT MONUMENTS)

In the case of ruins, strict conservation is necessary, and steps should be taken to reinstate any original fragments that may be recovered (anastylosis) whenever possible; the new materials used for this purpose should be recognizable in all cases.[23] (From Section VI. THE TECHNIQUE OF CONSERVATION)

THE ATHENS CHARTER OF 1933

Le Corbusier

In 1933, the Fourth International Conference of Modern Architecture (CIAM), Le Corbusier was an important member, was also held in Athens, focusing not on the conservation of monuments but modern urban planning. The concept of the "functional city" was the conference's theme. Urban planning aimed to address the four main functional activities of living, working, recreation, and transportation. The Charter summarizes the modernist concept of urban planning, which is to establish a rational and rigorous planning system to improve cities' safety, health, efficiency, and quality of life. However, some historic urban structures are considered unsafe and unhealthy slums as described in the article, "architectural assets that must be protected, whether found in isolated buildings or urban aggregations. They will be protected if they are the expression of a former culture. They will be protected if they express a former culture …," with the proviso, however, that such protection should not entail the perpetuation of slum conditions around monuments, which are recognized as "…regrettable but inevitable."[24]

Although the preservation of monuments was also emphasized, the existing structures around them were considered to be inevitably demolished by creating open squares or parks for their perimeter to enhance urban livability. However, when the built environment around the heritage was seen as an obstacle to modern development and only the key historical monuments were preserved, it was just a monument detached from its historical and spatial context. [6], [25]

The 1931 and 1933 Athens Charters focused on different issues. The former was concerned with the preservation and restoration of historic buildings and the conservation of the region surrounding the site, where new materials and technologies might be employed but had to be recognizable. The latter concentrated on contemporary urban planning difficulties, whereas the subject of heritage preservation centered on urban concerns. It mentioned that

new construction in historic districts is opposed to recreating old structures. That would obliterate evidence of the actual past and call for the demolition of the physical environment surrounding monuments to make space for urban services. While both have different viewpoints on preserving the surroundings of heritage buildings, they both emphasize the importance of protecting and expanding the boundaries of existing heritage, particularly in terms of style and authenticity.[6], [22]

THE THEORY OF RESTORATION AND THE VENICE CHARTER

Cesare Brandi

The city's destruction by the Second World War questioned and tested the above viewpoint position. In this particular case, full reconstruction and restoration were acceptable, as in the case of Warsaw, which was completely restored in appearance to its pre-war condition. The plight of historic cities obliterated by war has fostered new international cooperation in the preservation of monuments and heritage and has provided a fulcrum for discussions on authenticity[6], [7]. The League of Nations, founded after World War I, became part of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) in 1945. The International Office of Museums became the International Council of Museums (ICOM) in 1946. In 1956, the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) was established at a UNESCO conference as "an intergovernmental center for the study and improvement of restoration methods." The organization held its second meeting in 1964 and adopted the famous Venice Charter, and the following year established the International Council on Monuments and Sites or ICOMOS.

Cesare Brandi, an Italian historian and restoration theorist, had the most influence on the Venice Charter. He founded the Italian Central Institute of Restoration and, in his 1963 book Theory of Restoration, defined restoration as " by restoration is any intervention aimed at restoring to efficiency a product of human activity." [26]any type of intervention, physical or natural. Additionally, he classified restoration into two categories: a restoration relating to industrial artifacts and a restoration relating to works of art. For the former, the restoration objective would be to re-establish the product's functionality. For the latter, "restoration constitutes the methodological moment of recognition of the work of art in its physical consistency and the twofold historical-aesthetic polarity, given its transmission to posterity." [26] Within his definition, functional structures such as warehouses or abandoned factories that were not regarded as "works of art" were regarded as " common objects." In this light, re-establishing their functional properties could be seen

as a way to bring them back to life, and adaptive reuse could play a role in this process.[6]

Additionally, Brandi clarifies the importance of the creative process in the work of art. He emphasizes the importance of absolute respect for the new artistic reality if the object of conservation has been destroyed, altered, added to, or deformed, creating a new artistic unity, becoming another work of art. For example, the significance of ruin is related to its current state of destruction, and if the ruin absorbs another work of art, then this later formed work of art has significance[26]. Jukka Jokilehto wrote The History of Architectural Conservation and was a former special advisor to the Director-General of ICCROM. He considered Brandy's theories an essential reference for modern restoration and conservation. His views have profoundly influenced international policy and the development of the principles of UNESCO's mandate[18].

While the Athens Charters of 1931 and 1933 pioneered the concept of historic heritage conservation, it was the Venice Charter of 1964 that established the proper universal conservation standard recognized by the international community. It is undoubtedly one of the essential documents in heritage conservation, recognizing ancient monuments as humanity's "common heritage" and emphasizing the importance of their preservation and unwavering transmission of their message. The Charter consists of six topics: defining historical sites, the purpose of monument conservation, the objectives of restoration practices, the conservation of historic sites, excavation, and documentation. It broadens the scope of the term "historic site" with a definition that includes individual works and entire environments of historical significance.[27] Moreover, The Charter makes a clear distinction between conservation, which aims at routine maintenance, and restoration, which is "a professional work whose purpose is to preserve and present the aesthetic and historical value of monuments. The Venice Charter makes a clear distinction between conservation, which aims at routine maintenance, and restoration, "a professional work whose purpose is to preserve and present the aesthetic and historical value of monuments. And in the third section establishes some basic principles of restoration by prohibiting the "construction, demolition or modification" of all or part of a monument[6], [7], [27].

The approval of the Venice Charter was a turning point in the international development of conservation policy, paving the way for the subsequent creation of other critical international conservation principles. ICOMOS pioneered adaptive use (adaption) with the 1981 acceptance of the Burra Charter in Australia, which minimally interferes with the original structure

during restoration and provides the building with a compatible function or use.[28]

2.5 ADAPTIVE REUSE MODERN CONCEPT FORMATION

Due to the destruction of the war, society gradually became aware of the architectural value of different historical periods and the interest in conserving different types of buildings. Consequently, in the 1970s, "adaptive reuse" was established as a theoretical discipline in architecture.[7] The term "heritage" has grown beyond its original meaning of monuments to encompass architectural complexes, urban landscapes, historic districts, cultural landscapes, twentieth-century modern architectural heritage, industrial legacy, vernacular architecture, and intangible cultural heritage. The broadening of the meaning of heritage has resulted in the emergence of other associated restoration terms, along with adjustments in the definitions of linked terms as the scope of heritage protection has grown. Consequently, many synonymous phrases have amassed various definitions as a result of varying temporal contexts and technical advancements. They are frequently used interchangeably with "adaptive reuse" but have significantly distinct meanings.[6], [7], [29] For instance, "adaptation," "alteration," "transformation," "conversion," "renovation," "revitalization," "restoration," "refurbishment," or "modification." The 1964 Venice Charter states that "the conservation of monuments is always facilitated by making use of them for some socially useful purpose" (Article 5)[27] can be considered as a basis for adaptive reuse, and the following definitions have expanded its scope. Rodolfo Machado published a seminal article in 1976: "Architecture as Palimpsest," which describes early reusable materials used for writing, such as parchment. Machado uses "palimpsest" as a metaphor for the adaptive reuse of architecture, which he describes as follows.

"the remodeled architectural work itself, since it can be seen as a text of a special kind that is characterized by the juxtaposition and co-presence of other texts. If an original building is considered as a first discourse that conditions future formal discourses to be inscribed upon it, then remodeling can be conceived of as rewriting."

Machado used the term "remodeling" to refer to reusing the original structure in this instance. He compared architectural reuse to the superimposition of words over the original literary material. In other words, superimpositions on the original structure, with newly added elements requiring adaptation to

the existing structural context by coexistence and juxtaposition. In today's context, the phrase "remodeling" could relate to "adaptive reuse."[7]

PRACTICAL APPLICATION AND THEORY DEVELOPMENT

In the second half of the twentieth century, for example, some renowned architects began to work on ancient structures in terms of practice. For instance, in Italy, Carlo Scarpa's (1906–1978) renovation of the Castelvecchio Museum converted a medieval castle used for fortifications into a museum. The Storhamar Barn (Storhamarlven), created by Norwegian architect Sverre Fehn (1924–2009), contrasts the medieval site's stone with concrete, wood, and glass. The proposal incorporates contemporary elements while protecting old relics and giving space for additional archaeological excavations. Additionally, Brazilian architect Lina Bo Bardi's (1914–1992) 1982 adaptation of the SESC Pompeia converted industrial history into a public place for entertainment and education, revitalizing the neighborhood. Obviously, from these examples, the typology of heritage conservation has evolved toward new uses and diversification. From the first medieval castles to ruins and modern industrial structures, adaptive reuse has allowed us to see their historical story.

On the theoretical front, Architectural Review produced a special issue titled "New Uses for Old Buildings" in May 1972. Cantacuzino, a pioneering researcher on adaptive reuse in the 1970s, edited the 1975 book "New Uses for Old Buildings" based on this particular issue. As a result, seminars on these subjects were held in 1977 in Glasgow and Washington, D.C. On the other hand, Philippe Robert (1989) describes seven distinct forms of physical interventions in historic buildings using examples from both past and contemporary practice in Adaptations: New uses for Old Buildings. Highfield's 1987 book, The Rehabilitation and Re-use of Old Buildings discusses retrofitted buildings,

Carlo Scarpa
Castelvecchio Museum
1959 -1973
A medieval castle

Sverre Fehn
Hedmark Museum
1967–2005
Old relics
giving space for additional archaeological excavations.

Lina Bo Bardi
SESC Pompeia Factory
1977 – 1986
Industrial Factory
a public place for entertainment and education
archaeological excavations.

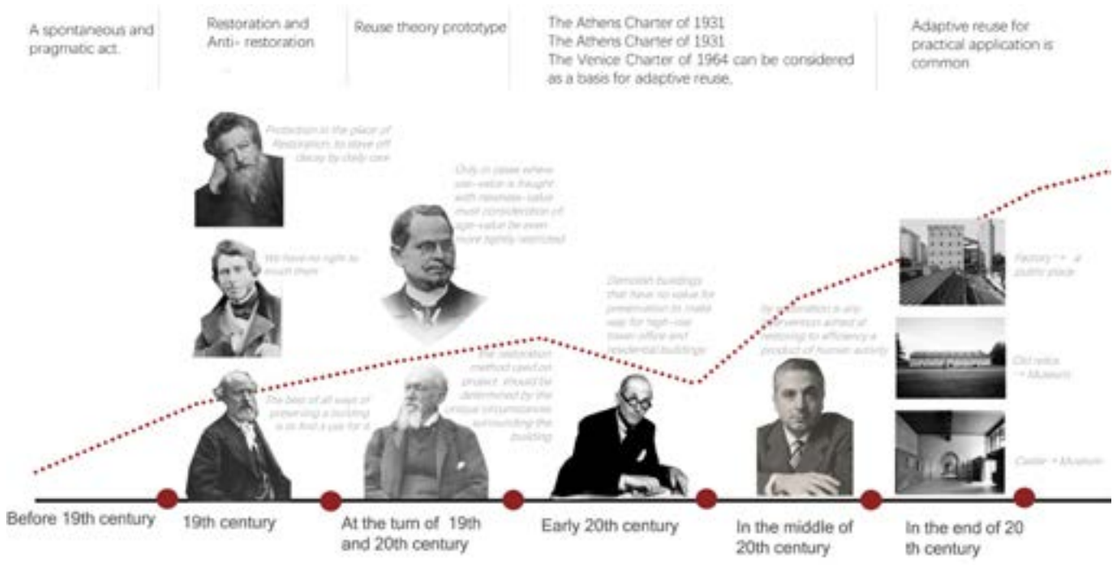
"the remodeled architectural work itself, since it can be seen as a text of a special kind that is characterized by the juxtaposition and co-presence of other texts. If an original building is considered as a first discourse that conditions future formal discourses to be inscribed upon it, then remodeling can be conceived of as rewriting."

— *MACHADO*

emphasizing technical performance characteristics such as fire resistance, thermal performance, and acoustic features.

Rapid urbanization and resource overexploitation, combined with climate change, have increased awareness of the critical nature of environmental preservation across all industries. The World Conservation Organization initially coined the phrase "sustainable development" in 1980, and cities worldwide attempted to seek ways to alter urban sustainability. As a result of this increased concern for the environment, adaptive reuse became a topic of discussion in various architectural disciplines during the 1960s and 1970s (Cantell, 2005). Simultaneously, culture has been recognized as a critical resource for achieving sustainable urban development and driving urban growth. Heritage buildings are a region's cultural, social, and economic assets, visually expressing the city's cultural richness and inclusivity. The conservation and reuse of historic structures have been recognized as a crucial topic in creating sustainable cities. Adaptive reuse has become a term used both in practice and in theory.[10], [14], [30], [31] Even though Machado called "adaptive reuse" a "superficial and empty label" in 1976,[7] modern scholars and architects still use the term. It is now used in architecture, interior design, preservation, urban planning, engineering, and other fields related to these things.

01. The timeline of adaptive reuse's historical background and theoretical foundations



03

CHAPTER

ADAPTIVE REUSE AS A NEW APPROACH TO THE BUILT ENVIRONMENT

01

02

01. Peter Zumthor,Source: https://www.archute.com
02. Sustainability relating to old buildings, Source: The World Cities Report 2020

3.1 INTRODUCTION

Adaptive reuse of buildings connects significant urban issues such as circular economy, building environmental effect, sustainable urban development, and culture shaping cities. It is intrinsically complex and requires interdisciplinary thinking in the context of urbanization. [10], [32]–[34] When its significance is increasingly recognized, the analysis of adaptive reuse has been defined variously by different researchers due to their research viewpoints, historical and cultural settings, and research methodologies. This section defines the term “adaptive reuse” from different perspectives based on the literature, publications, government policies, and international regulations of the past 30 years (1992-2022). It is separated into three sections to define the definition of adaptive reuse in contemporary society: historic building conservation, stock building, and urban renewal. Because the urban renewal part contains various types of construction and renovation, the module will be categorized into five categories.

Adaptive reuse has been introduced in Chapter 2 as a result of heritage restoration and conservation. Nowadays, this word is widely acknowledged by the international community in heritage building conservation, as demonstrated above by its practical and theoretical outcomes. Additionally, due to the war and energy crisis, environmental concerns, urbanization, population movements, and technological advancements of the 20th century. Two types of reusable built environments have formed in cities: non-heritage abandoned structures and older districts no longer fit for modern urban living. In modern architectural parlance, the former was also referred to as stock buildings. The latter is an area of a city that usually has historic buildings, stock buildings, and older buildings that need to be repaired or restored, which is called urban renewal.

Stock building were produced as a result of changes in economic and industrial activity, demographic changes, increased management and maintenance costs, and so forth, mainly because existing functions are no longer applicable to new social and economic forms, and new functions have

> *“When “in-situ preservation” is not a possibility, “adaptive reuse” will be used*
>
> Kirsten Velthuis & Dirk H. R. Spennemann

not been identified. In the beginning, the owners of these buildings favored using adaptive reuse on modern stock buildings to save money and time. In contrast, urban regeneration is redeveloping existing districts or facilities in a city. Adaptive reuse has developed into a strategy for revitalizing urban areas to minimize social, economic, and environmental consequences. For example, in the United States, Los Angeles officially enacted an adaptive reuse policy in 1999 to revitalize the city's architectural and cultural resources and promote the creation of living and working communities.

3.2 ADAPTIVE REUSE FOR HERITAGE BUILDING

The emphasis placed on historical conservation appears to have increased in recent years, and numerous successful cases of heritage buildings being given new life have occurred throughout the world. For instance, the Kolumba Art Museum in Cologne, designed in 2007 by Peter Zumthor, kept the contrasting relationship between old and contemporary, both inside and outside the building. The project preserves the historic site's archaeological value. It shows it to the public while also providing the place with a new use and value, allowing it to continue to thrive. For historic preservation purposes, a tangible, three-dimensional place endowed with meaning by the public can serve as physical evidence for presenting and explaining the vanishing past to current and future generations. When "in situ preservation" is not possible, "adaptive reuse" will be used.[30] Zumthor's design is an excellent depiction of this concept.

DEFINITION OF ADAPTIVE REUSE FOR HISTORIC BUILDINGS

The ICOMOS New Zealand Charter 2010 defines adaption as "the process(es) of modifying a place for a compatible use while retaining its cultural heritage value. Adaptation processes include alteration and addition". The Burra Charter 2013 ICOMOS further elaborates on this definition: the adaption of heritage sites needs to be compatible with existing and proposed functions. Minimizing the impact on the site's cultural value and involving significant components or structural modifications must be set up as an alternative. This process of giving new functions to heritage sites while preserving their heritage values is often referred to as adaptive reuse.[28] More specifically, it gives a building a new presence and function when it is no longer in use or is unsuitable for its original function . In other words, the exploitation of obsolete historical buildings' additional use and durability potential. It encompasses

more than just architectural restoration and is often combined with historic preservation. Adaptive reuse is the process or act by which a historic building conveys features of historical, cultural, and architectural value while gaining the potential for compatible use through restoration, alteration, and addition. The concept is not limited by the past use of the building but respects the history and the original structure when inserting new interventions or reusing. Successful adaptive reuse is one that respects the existing building and its environmental context, adding a modern requirement and an appropriate future to the historic building. Although scholars have defined adaptive reuse from different perspectives, they generally agree that it can transform historic buildings into a usable state and provide social and economic value by revitalizing historic landmarks rather than heritage and cultural symbols.

Adaptive use can transform a heritage building into an accessible and usable place and provide additional benefits to revitalize an area sustainably. Adaptive reuse, when applied to heritage buildings, preserves the achievements, skills, and dedication of the building and its original builders and its social, cultural, and historical values.[35] Adaptive reuse is advocated as a sustainable strategy for heritage conservation [36][[12]. As the boundaries of heritage are expanding, they are no longer limited to the heritage that is only historically significant. Many cities have begun to realize that the reuse of heritage buildings is an important part of any redevelopment plan.[37] Changes in function often result in structural or internal modifications to historic buildings, and there is a sometimes contradictory and sometimes complementary relationship between new uses and conservation. Adaptive reuse of heritage buildings is, therefore, a process of change, and always caution in the process. It is intrinsically complex and requires a certain amount of creativity and invention, not only from the architects involved in finding new functions for old buildings but also from the heritage managers, policymakers, the general public, and other stakeholders involved in the adaptive reuse process.

THE CORE OF ADAPTIVE REUSE FOR HISTORIC BUILDINGS

In terms of heritage building conservation, adaptive reuse, which is based on the principle of conservation, is a strategic instrument. Repair and maintenance interventions are frequently utilized, and new functions must be tailored to the historic fabric. The most preserved historic buildings and those with the highest conservation quality are frequently those that are still in use, demonstrating the critical nature of use. Many historical structures still standing today owe their existence to the new roles assigned to them on occasion, and some of the most famous structures in architectural history have been modified for usage. For example, Forbidden City in Beijing was used as an imperial palace during the Ming and Qing dynasties, and after it was transformed into the Palace Museum, which is still being maintained and updated. The Hagia Sophia in Istanbul was converted into a mosque with the addition of Islamic minarets at the corners, and Quranic quotations replaced the original angelic statues on the interior walls. The Louvre, the world-famous art palace, was initially built as a fortification of Paris in the Middle Ages, then used as an archive in the 13th century, and transformed into a luxurious royal palace by King Charles V in the 14th century. At the end of the 20th century, the famous architect I.M. Pei expanded the Louvre again, bringing the historic building to life again with a modern and innovative approach.

3.3 ADAPTIVE REUSE FOR BUILDING STOCK

REDUCE THE NEGATIVE ENVIRONMENTAL IMPACT OF BUILDINGS

Construction, transportation, and industry are all known to be significant contributors to greenhouse gas emissions. In 2008, the UK's Empty Homes Agency conducted research comparing CO2 emissions from new buildings with renovations of existing buildings. When all carbon dioxide consumed during the construction process was considered, the study determined that new energy-efficient buildings will recover the carbon consumed during construction after 35 to 50 years of energy-efficient operation. Existing buildings have already consumed all of their energy, and even the most energy-efficient new buildings will not be able to offset their consumption within a few years. Therefore, the urgent need to reduce carbon emissions worldwide makes the reuse of buildings an urgent priority.[29], [38]

The Organization for Economic Co-operation and Development also points out that the lifespan of buildings is unique compared to other industrial products. Low turnover rates indicate that newly constructed buildings have a limited environmental impact. Therefore, the existing building stock must be viewed as an untapped asset with potential for environmental improvement. Therefore, to improve the sustainability of the construction industry, it is necessary to shift the mindset from the traditional view of the building process as linear (e.g., built with virgin materials and ending with demolition) to a circular mindset (e.g., closing the loop of material flows).[38]As Lina, a renowned Brazilian architect, put it, "Adaptive reuse frequently reduces the negative impact of construction on the environment and the depletion of non-renewable resources; it also maintains the place memory and identity."[39]

SUSTAINABILITY

Today, adaptive reuse is more broadly described as the act of putting a building to new use or a process of developing a structurally sound old building into an economically viable further use. However, in the process or method of adaptive reuse, the existing use of space is not perpetuated by upgrading or restoring it to a specific period. Instead, it defines new uses and adapts them to the original space while preserving and respecting its value and meaning, an approach that promotes maximum preservation and minimal adaptation.

01. Liliane Wong's book and Bie Plevoets and Koenraad Van Cleempoel 's book

Scholars have focused more on adaptive reuse in the sustainability of existing buildings than on the conservation aspects of heritage buildings. Adaptive reuse of buildings is already a growing trend. The importance of this trend is that it is a sustainable strategy that extends the life of existing buildings by reducing materials, transportation, energy consumption, and pollution. [29]Its sustainability is reflected in three aspects, material and resource efficiency improvement (environmental sustainability), cost reduction (economic sustainability), and memory retention (social sustainability)[40].

Multiple studies and analyses agree that adaptive reuse of existing buildings is beneficial to the environment. Compared to reuse, studies of building demolition found significant reductions in energy consumption, carbon dioxide and other greenhouse gas emissions, and material use.[10], [32], [41] The main driver for environmental benefits stems from the environmental impact of the building throughout its life cycle. More specifically, the cumulative energy input required to initially construct the building and the energy consumed during the operation of the building during its use.[42] Environmental concerns have pushed up energy costs, followed by higher costs for construction materials, transportation, and other resources associated with the construction industry. The rising cost of new construction and the cost-effectiveness of adaptive reuse of existing buildings have led more and more practitioners to consider using existing buildings[29]. The environmental and cost-effective features of adaptive reuse coincide with the circular economy advocated in recent years. Adaptive reuse of the existing environment reduces the environmental impact belonging to the circular economy strategy.[34] Both require the transformation of materials into new products by extending their life span and realizing new value through redevelopment and reuse. It is also supported by the projects funded by the EU Horizon 2020 program "Circular models Leveraging Investments in Cultural heritage adaptive reuse" (CLIC) and "Buildings as Material Banks."

DEFINITION AND EMERGING FIELDS

Adaptive reuse consists of the terms "adaptation" and "reuse" and explicitly involves a change in the function of the building and its structural mass. Functional change may imply a radical rebirth, but it may also be a more subtle transformation.[7] Furthermore, the degree of adaptation of the structural body component is undefined; it can be an almost complete change in the structure and appearance of the building or only some minor adjustments to the interior. Because the components of adaptive reuse explicitly encompass the structural body and function of the building, the term allows for the interconnection of the more established disciplines of architecture, interior architecture, preservation, engineering, and planning, making adaptive reuse the most appropriate name for this emerging field discipline.[6], [7]

Liliane Wong also clearly stated that adaptive reuse is an emerging field. However, she does not explicitly define "adaptive reuse." Instead, she provided some terms related to architectural conservation development, such as "conservation, restoration, maintenance, adaptation, addition, alteration, conversion, maintenance, rehabilitation, restoration, etc. She arranged the definitions of these terms chronologically to give us a different perspective on the changing terms. She explained that the interpretation of adaptive reuse is necessarily embedded in the history of heritage conservation. The meaning of these related terms does not depend on a single understanding of the definitions at one point in time. On the contrary, these debates and shifts in the understanding of conservation and preservation gave rise to adaptive reuse as it is today. She explained that the interpretation of adaptive reuse is necessarily embedded in the history of heritage conservation. The meaning of these related terms does not depend on a single understanding of the definitions at one point in time. On the contrary, these debates and transitions in perceptions of conservation and preservation gave rise to present-day adaptive reuse, and they illuminate the roots of adaptive reuse practice. She adds that the 1964 Venice Charter, which set forth the need for "some socially useful purpose" in conserving monuments, can be seen as the basis for adaptive reuse. The 20th century established the practice of adaptive reuse as based on the adaptation of existing built environments to new uses. Today, we are confronted with the potential of adaptive reuse projects in an emerging field.[6]

01

02

01. SESC Pompéia
02. Lina Bo Bardi

THE CORE OF ADAPTIVE REUSE FOR EXISTING BUILDINGS

The core of adaptive reuse of existing buildings is the transformation to extend the life of existing buildings, reactivate their vitality, and promote environmental, economic, social, and cultural benefits. More specifically, through the replacement, improvement, expansion, and continuation of the old building functions, combined with the physical structure of the building interventions, insertions, and installations, to meet the actual needs of the current user. In terms of the environment, it reduces energy consumption and environmental pollution. In terms of the economy, it extends the life of the building, recycles the building, and saves costs. In cultural terms, it preserves human memory and urban character, and in social terms, it promotes the resilience and health of the community. In addition, adaptive reuse has become an emerging field in related architectural disciplines.

> *"Adaptive reuse frequently reduces the negative impact of construction on the environment and the depletion of non-renewable resources; in addition, it maintains the place memory and identity."*
>
> - Lina Bo Bardi

01. Jane Jacobs first introduced the concept of "urban diversity."
02. Italian architect Giancarlo De Carlostarted with an extensive analysis of the existing status quo of the city of Urbino.
03. Aldo Rossi proposed "urban artifacts"
04. Colin Rowe proposed "collage city"

3.4 ADAPTIVE REUSE IN URBAN RENEWAL

THE BACKGROUND FOR URBAN RENEWAL THROUGH THE REUSE OF THE BUILT ENVIRONMENT

In the first half of the 20th century, the urban planning approach was seen as a linear and top-down process. By the late 1960s, many scholars questioned the basic approach to urban planning, and different approaches were proposed to analyze the conditions of existing cities. For example, in 1961, Jane Jacobs's book The Death and Life of Great American Cities first introduced the concept of "urban diversity." That involves the idea that historic buildings and distinctive urban spaces should continue to exist in a certain way and that their livability should be enhanced according to the community's needs.[43] One of the most effective processes to accomplish this is by reusing historic buildings.

In 1964, the Italian architect Giancarlo De Carlo was in charge of the Urban Master Plan for the city of Urbino. The master plan started with an extensive analysis of the existing status quo of the city, which included: urban topography and landscape, various historical levels, socio-economic conditions, traffic, physical conditions, and the architectural quality of the existing buildings. This analysis led Carlo to decide to preserve and reuse the existing buildings to revitalize the city's historic center, with new housing developments on the periphery of the city and integrated into the landscape. His approach was considered a model for historical heritage preservation and urban renewal. Another Italian architect, Aldo Rossi, supported De Carlo's planning philosophy. And he stated in his book The Architecture of the City (1966) that "the dynamic process of the city tends more to evoke than to preserve, and in the process of evolution, monuments are not only preserved but are constantly presented as agents of development" (1982, p. 60 p.). He sought a blend of preservation of the historic environment and urban regeneration to meet modern living standards. He argued that the architectural works that grow over time, the "urban artifacts," defined the unique character of the city and were essential elements of the city, both in terms of their individuality and their sense of place, evoking memories of historical events and associations with the urban culture[44].

In 1978, Colin Rowe published his book Collage City and proposed the "collage city" model. He also believes that the city's development is a continuous process and that the city is formed by the superposition of buildings from

different eras, and he advocates the use of collage design in the city to show the history of a city.[45] In other words, traditional parts and forms are combined and changed according to modern needs. So that tradition and modernity are integrated into one, achieving the purpose of both continuing histories and reflecting contemporary characteristics, which is the borrowing of historical elements under new environmental conditions. To some extent, it preserves the historical environment and considers the need for realistic development.

These theories and approaches, which rejected modernism's technology-only or function-only theories, recognized the process theory of urban development and diversified urban spaces and emphasized that the construction of each historical era showed the course of urban development. Thus, these theories are conceptually instructive for urban renewal and provide theoretical support for reusing historic buildings at the level of urban development processes.

CULTURAL HERITAGE AS A DRIVER FOR URBAN RENEWAL

Urban conservation was finally incorporated into international theoretical literature in 1975, with the Amsterdam Declaration proposing the concept of "integrated conservation." The proclamation emphasizes the significance of heritage conservation for place identity and the utilization of historic buildings for livable cities. The Washington Charter expanded on it in 1987 to highlight the principles of comprehensive conservation. The Charter places a strong emphasis on preserving a historic town's material values, referred to as its "qualities"—in other words, its form, formal appearance, link to its surroundings, and functional character[46]. The 2005 Vienna Memorandum defined "historic urban landscapes" regarding World Heritage and made recommendations on how to adapt to new intervention approaches and urban development in World Heritage locations (UNESCO, 2005). ICOMOS and UNESCO jointly published three theoretical texts on integrated urban conservation in 2011: Recommendation on the Historic Urban Landscape, the Paris Declaration on heritage as a catalyst for development, and The Valletta Principles For The Safeguarding And Management Of Historical Cities, Towns And Urban Areas. Each of the three documents places a more significant emphasis on intangible values, the natural landscape and topography connected with the built environment, sustainable development, and community engagement[47] [48], [49]. Using heritage as a driver for urban regeneration has been a popular approach in the revitalization of historic cities worldwide in recent decades[50].

It is already a well-established fact that cultural heritage plays a critical role in urban regeneration. Urban regeneration is accomplished via the restoration and reuse of historic structures and the preservation and revitalization of intangible cultural assets such as traditions, crafts, and oral histories, and the restoration and improvement of natural environments. Furthermore, adaptive reuse as a tool for enhancing continuity and local identity applies to heritage buildings and a variety of other structures that are not currently considered to have architectural or historical significance but are preserved for social, ecological, or practical reasons. We outline three models of urban regeneration through adaptive reuse that contribute to the sustainability of cities in the following sections.

ADAPTIVE REUSE AS SUSTAINABLE TOOL FOR IN URBAN RENEWAL

In 1987, the World Commission on Environment and Development (WCED) defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their needs." This term covers many fields, such as the environment, society, the economy, culture, and others. Sustainable development is often thought of as a way to use resources to ensure fairness for future generations, protect the natural environment, minimize the use of non-renewable resources, keep communities and individuals healthy, and meet basic human needs. The idea of adaptive reuse, which makes sense in terms of practical results and conservation values, backs the reuse of buildings as a strategy for sustainable urban development. It extends the useful life of buildings, avoids demolition waste, reduces material, transportation, energy, and pollution, encourages the reuse of implicit energy, and provides significant social and economic benefits to society[29]. Many government agencies also consider adaptive reuse a vital policy for sustainable urban development planning. For example, the Australian Environment and Heritage Agency published "Adaptive Reuse: Preserving Our Past, Building Our Future" in 2004, which talked about how adaptive reuse of buildings could be good for both the environment and the economy without tearing down and rebuilding. This environmental benefit makes reuse a critical component of sustainable development[51]. The other example is that the United States' state planning bureaus came up with Adaptive Reuse Manuals, rules, and guidelines for urban development tools that come with incentives.

THREE ADAPTIVE REUSE PATTERNS IN URBAN RENEWAL

In the 1980s, redevelopment of brownfields, former industrial districts, historic central urban areas, and the reuse of specific monuments became popular urban development strategies throughout Europe and North America. Urban planners and city dwellers alike aim to create environmentally sustainable and thriving cities in the modern day. Due to its abundance of innovation and creativity, historic buildings and existing structures are critical resources for the urban environment's future sustainable growth. Adaptive reuse can assist communities, governments, and developers in reducing the environmental, social, and economic costs of continuous urban development and expansion, providing resource efficiency and usable space within an area, and revitalizing the region [37], [52]. During urban regeneration, adaptive reuse manifests itself in three different patterns rather frequently.

The first, adaptive reuse of existing buildings in a region, is utilized to alter and adapt existing buildings' functions and improve their physical conditions to promote regional sustainability. It is typically composed of three distinct sorts of complexes: residential complexes, historic districts, and industrial buildings.

In the second, heritage assets are converted into urban parks or cultural tourism destinations to reestablish their local value and improve the area's livability and exploitability.

The third, user-led adaptive reuse, such as an artist-led art park, is a critical component of the urban spiritual form as part of the urban development or renewal process. It reflects the city's cultural features and social character on a cultural level.

These three approaches apply to five distinct built environments: residence, historic districts and industrial buildings, city parks, and user-led areas. We will discuss each of these categories separately in the following sections to help you understand how different types of adaptive reuse contribute to urban sustainability and quality of life in urban regeneration.

RESIDENCE

There have been two forms of adaptive reuse of existing buildings in the residential category: the rezoning of brownfield sites in cities to create new residential areas and the transformation of decaying or obsolete residential building areas[7]. The subject of this paper combines the second form and,

therefore, focuses on the renewal of residential buildings. When deteriorating urban settlements' streets and public spaces are revived and regenerated, it improves the neighborhood's quality of life and fosters social cohesiveness. One such example is the redevelopment of the Bijlmermeer area in southeast Amsterdam.

It was a vast modern residential complex developed between 1966 and 1975 that consisted of 31 practically identical residential structures. The functional homogeneity and remoteness of the area lead to a lack of social monitoring. Additionally, parks, garages, and enclosed passageways devolved into hotbeds of crime and devastation. These led to many apartments being left vacant and other buildings and apartments being occupied and sublet without permission, which exacerbated the area's decay (Crimson, 1997; Wassenberg, 2010, 2013). In 1986, Rem Koolhaas (OMA) was invited to draw up a redevelopment plan for Bijlmermeer. He argued that the area's problems were not caused by the type of residential area but by the negligence of the original planning concept. Instead of opting for demolition, he focused on the quality of the original planning model, restoring and improving the public functions near the central traffic line, weaving open spaces with new functions such as sports fields, open-air theaters, beaches, and gardens, and parking. The renewal of Bijlmermeer took a total of 20 years. The last neighborhood to be renovated was Kleiburg, a historically protected neighborhood in the area. Apart from the regeneration of large modernist decaying neighborhoods through regional rezoning, adaptive reuse might include residential area regeneration or the renovation of individual apartment buildings. For instance, Anne Lakaton and Jean-Philippe Vassar, the 2021 Pulitzer Prize winners, have made significant contributions to this discipline. They refuse to take on design planning projects requiring the demolition of social housing, preferring to design from the inside out, putting a premium on the occupants' well-being.

They transformed 530 units within three buildings at Grand Parc in Bordeaux, France, in 2017. They increased the dwellings' practicality and performance techniques. Still, more importantly, they introduced spacious and flexible rooms to each unit and did not expel occupants during construction, thereby assisting residents in maintaining rent stability. They are committed to residential renovation projects that extend the life of what is currently there. They satisfy users with enhancements and extensions at a minimal cost. As Vassar puts it, "Good architecture is a space where something special happens; you want to smile, just because you are there. It is also a relationship with the city, with what you see, and a place where you are happy, where people feel well and comfortable—a space that gives emotions and pleasures."[53] They have completed numerous similar projects, including a low-rise residence with 59 apartments in Moulouse. France (2015) and several adjacent mid-rise

buildings with 96 apartments in Chalons-sur-Saône, France (2016), as well as work they are currently undertaking, such as a residential renovation project converting a hospital in Paris, France, into 138 mid-rise apartments; and a mid-rise building with 80 apartments in Aix-en-Provence, France.

There are also remarkable examples of old residential neighborhoods being transformed into comfortable family housing in Bruges, Copenhagen, and Bologna and locations like London and Rotterdam, where former shipyards have been converted into residential zones. Whether in modern settlements or historic residential neighborhoods, revitalization projects are important because they improve people's lives and may also help the region's economy by bringing in businesses that work with them. Consequently, the community can continue to function healthily.

01. In 1986, Rem Koolhaas (OMA) was draw up a redevelopment plan for Bijlmermeer.
02. Figure 01Fig Transformation of G, H, I Buildings, Grand Parc, 530 Units, photo courtesy of Philippe Ruault

01 Aerial view of Bijlmermeer anno 1971

Bijlmermeer before renovation (buildings in grey are retained; buildings in red are demolished)

Bijlmermeer after renovation (buildings in grey are retained; buildings in green are new constructions)

02

HISTORIC DISTRICT

Historic districts constitute an important part of urban space and are essential carriers of urban history and cultural heritage. Adaptive reuse is increasingly advocated as an effective approach to regenerating historic urban districts: providing social, economic, and environmental benefits while preserving them[12]. Specifically, adapting the historic district to modern cities' environmental and amenity infrastructure conditions by partially adapting the neighborhood's businesses, transportation planning, and some architectural interventions. Preserve the historical and cultural characteristics of the area, both in terms of intrinsic customs and cultural heritage and external architectural values. Improve the suitability of people within the neighborhood community, thereby generating economic and social benefits for the local community.[54]

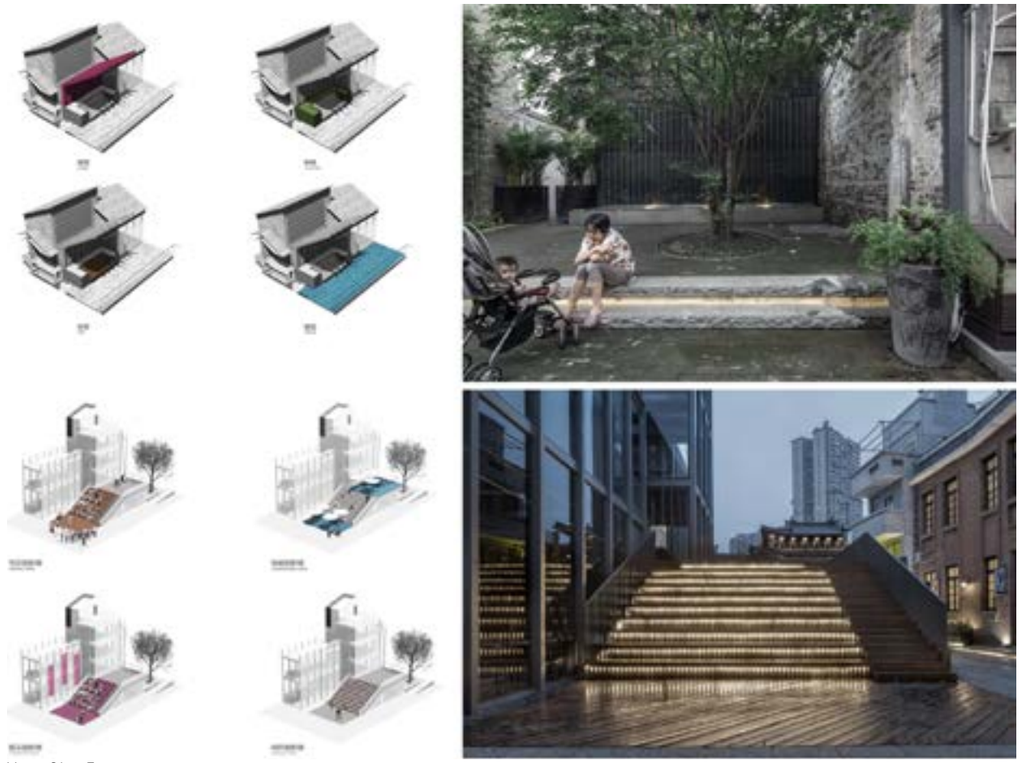
Grainger Town is the historic heart of Newcastle-upon-Tyne, a city in northeast England. The builder Richard Grainger built this classical-style quarter between 1824 and 1841. It consists of three main city streets that form a hierarchy. Gray Street is the grandest, followed by Granger Street, and Clayton Street is relatively plain, with most of the buildings on the street being four-storeis buildings with vertical windows, dormers and towers. Among them, Granger Market and Theatre Royal are the most important heritage named protected buildings in the district. As the commercial center of Newcastle moved north in the 1970s, the area began to decline. The early 1990s, Granger town went on a path of revival and revitalization.

The process of revitalizing the Granger town project has gone through a series of stages, and its origins are based on conservation. Initially, it was primarily a partnership between government and English Heritage, with input from private sector groups driven by the Department for Education and the Confederation of British Industry (CBI). The aim was to market Newcastle as an investment location and develop a 'conservation-based strategy,' essentially a planning framework for the area's regeneration. In order to mobilize additional partners and attract additional funding, the second study of Grainger Town was undertaken in 1996, "The Grainger Town Regeneration Strategy" (EDAW, 1996). The report spawned the creation of an "independent" body for the Grainger Town project, the Grainger Town Partnership (GTP), which was formed as a corporation with a multidisciplinary team of people and a board of directors comprised of municipal units, major funders, and other stakeholders in the area. There are also group forums representing residents, business, arts and culture, and urban design issues (although not specifically conservation.) The GTP has been in effect for six years (beginning in 1997/98) and is intended

to provide significant capital resources to help achieve the goals of this revitalization strategy. Still, the responsibility for planning and development control remains with the municipal unit[55]. To date, evidence from the Grainger Town project shows that most of the performance indicators have been achieved and exceeded. It has become a model for the regeneration of historic districts in English regions, where the combination of conservation and regeneration has led to creative and dynamic solutions (English Heritage, 1998)

The building in Grainger Town in UK

Another case study comes from the renovation of Yong Qing Fang, a historical and cultural preservation district in Guangzhou, China. Inside the neighborhood are historical buildings such as the Republican mansion, Bruce Lee's ancestral home, and Luang Xing Tang, and traditional residential houses, which have a strong Lingnan flavor and Xi Guan cultural characteristics and are rich in historical and cultural resources. However, by the early 21st century, Guangzhou's urban center shifted eastward, and the Yong Qing Fang neighborhood gradually fell into disrepair with old building structures. Many of them have been severely damaged; poor environmental conditions such as lighting, ventilation and sanitation, and fire-fighting system; serious cases of unauthorized construction and additions; and a lack of public space. In 2016, the Guangzhou Municipal Government introduced the Build-Operate-Transfer



Yong Qing Fang

([3]BOT) model to promote the renovation of the neighborhood, and Vanke, China's largest real estate developer, was awarded the construction and operation rights. The neighborhood is based on the premise that the original outline of the buildings and streets remain unchanged, with architectural interventions, landscape enhancement, and more public space for the original residents to move around. The Yong Qing Fang old city renovation project avoids the mass relocation of the original residents and the waste of site resources. The new activity space facilities were built by effectively using the

demolition waste from the site, such as tiles, bricks, hemp stones, and wood, to create new public spaces. After a series of renovations, Yong Qing Fang has successfully become a vibrant urban historic district, attracting tourists from all over the world to visit[56].

Over the last 30-40 years, conservation and regeneration have often been seen as largely complementary processes. Historic buildings, for example, have helped in many regeneration projects by adding to the quality of the project and the location's uniqueness. These factors are becoming increasingly important in a period when 'culturally-led regeneration' is becoming fashionable. Correspondingly, conservation agencies have generally

3: BOT is essentially a form of infrastructure investment, construction and operation, premised on an agreement between the government and a private organization, whereby the government issues a concession to the private organization, allowing it to raise funds to build a certain infrastructure and manage and operate the facility and its corresponding products and services for a certain period of time. The government may impose restrictions on the quantity and price of public goods or services provided by the agency, but guarantees private capital the opportunity to make a profit.

embraced the economic and social role of the historic environment, which is a significant departure from the relatively narrow cultural role that conservation once assumed[55]. Indeed, the preservation sector has become a catalyst for a “preservation-led revitalization” or “revitalization through preservation” agenda in many places.

Additionally, adaptive reuse for tourism purposes is common in many parts of the world. However, this has been a controversial topic so far. For example, changes in functional use for tourism and the addition of modern cultural elements can change the traditional cultural landscape and livability of heritage sites, forcing communities to move away from their original inhabitants.

INDUSTRIAL BUILDINGS BLOCK

Since the 1980s, many cities in Europe and the United States have been limiting the industrialization of their cities. The closure or departure of the industry caused economic and social crises, especially for cities that developed as a result of industry. Their urban structures and infrastructures were formed to serve their industries, and the relocation of industries inevitably necessitated a redefinition of the urban layout. For example, Manchester, the world capital of the cotton industry, which pioneered the industrial revolution, has successfully achieved the preservation and economic revitalization of its industrial neighborhoods with a mixed-use approach in the context of industrial decline. The regenerated Manchester became the model of urban redevelopment, with urban fashion and entertainment and a concentration of influential orchestras, theaters, museums, and other cultural and entertainment facilities in the northwest of England, full of culture[57].

Eindhoven in the Netherlands was the birthplace of Philips, and the city grew rapidly as the company’s industry expanded. It was responsible for much of the region’s employment and industrial infrastructure. Also, it built many buildings related to public life, such as housing, leisure, sports and culture, education, and healthcare. When Philips gradually withdrew from the city and moved its activities to low-wage countries, the city had to come up with a strategy on how to regenerate itself economically, socially, and architecturally. This region’s growing high-tech industries created opportunities for economic revival at the start of the 1990s. The city also worked to attract creative industries to the area (Aussems & Horsten, 2018). Strijp-S is one of Philips’s largest and most important former industrial areas. It has been transformed into a lively and attractive urban neighborhood through its regeneration.

As a distinct type of industrial heritage[58], Port Heritage is defined by its

distinctive position, frequently entwined with canal activity, and inextricably related to the city core. Since the 1960s, the treatment of this particular urban region has been a source of contention. For instance, Brisbane’s Wool-store Precinct is a case study in repurposing industrial heritage to promote the area’s regeneration. The Wool-store Precinct, located along the Brisbane River and close to the city center, was closed in the 1980s as the economy faltered and firms relocated, leaving many abandoned and deserted manufacturing buildings that are gradually decaying. To alleviate population pressure and housing demand in the city center and revitalize the area’s development, the authorities began an overall renewal of the old industrial area in 1992. The process was implemented strictly according to the urban renewal plan in a phased and focused manner. After 30 years of redevelopment, the Wool Factory Docklands has become a sustainable living and working environment, a win-win for heritage preservation and urban renewal, and Brisbane’s most famous riverside living and leisure location. The Wool Factory Docklands is now the most popular place to live and work in Brisbane[60].

The critical significance of adaptive reuse in fostering sustainable urban development is now well established, and abandoned industrial sites are already a valuable resource for urban regeneration. These industrial sites have been repurposed through adaptive reuse, whether in the United Kingdom’s Manchester, the Netherlands’ Eindhoven, or Australia’s Woolen Mill Docklands. These industrial sites have been transformed into their new urban contexts through adaptive reuse, which involves altering, upgrading, and reusing the structures’ obsolete functions[29].

01. Manchester became the model of urban redevelopment
02. Strijp-S has been transformed into urban neighborhood

01

02

CITY PARKS

Urban parks have become an integral aspect of city life, and the demand for green, open public places has grown increasingly apparent. Due to the advancement of industrialization and urbanization and the increasing density of urban dwellers over the last several decades, open outdoor public space has become an attractive location to live for a wide variety of people. However, as urban area becomes scarcer, how to develop public green space has become one that cities must address. Historic ruins, former industrial sites, waterfronts, roofs, and obsolete (transportation) infrastructure such as railway tracks or roads become viable locations in this setting.

Castlefield Urban Heritage Park was established in 1982 as the United Kingdom's first urban heritage park. It is located within Manchester's Inner City Conservation Area. The conservation area is the terminus of the Bridgewater Canal, the world's first industrial canal built in 1764, a Roman castle built in 79 AD, the world's oldest canal warehouse built in 1779, and the railroad development that resulted in cast-iron bridges, brick bridges, viaducts, and canal systems. In light of the city's industrial downturn, it has successfully conserved and regenerated the industrial district through a mixed-use concept. The history park's prominent features include dilapidated elevated rails, rusty iron bridges, and massive warehouses[61].

The other extraterrestrial case is the New York High Line Park, which began as a train freight line connecting the Meatpacking District to the Port of Hudson at Thirty-fourth Street in 1930. It stayed abandoned for 30 years and was on the verge of being demolished when it was closed in 1980. The Friends of the High Line proposed reviving the High Line by "greening" it, which would entail using local New York plants to irrigate the abandoned lines. Each case involved preserving and repurposing the most stunning buildings and structures for new uses or as a landmark inside the park. While these artifacts may not have been deemed historic or architecturally significant before the renovation process, they frequently become heritage items and a feature that supports local identity following reuse[62].

The project was completed in three phases. The designers cleverly mixed plants and construction materials, varying the proportions of the setting to accommodate wild vegetation, artificially cultivated plant growth, private recreation, and public use. It keeps the elevated railroad's harsh, wild character while creating a popular new park in the city.

High Line Park has made a significant contribution to Manhattan's West Side regeneration, establishing a new local emblem, drawing a large number of

residents and visitors, and encouraging private investment. It has created a beautiful aerial pathway on Manhattan's West Side, where buildings are dense and green space is scarce, improved the ecological environment, and provided a unique space for citizens to exercise and socialize. Moreover, it has also boosted the surrounding economic development and increased the resident population by 60%. The High Line Park has become a global model for reusing abandoned urban infrastructure. Its transformation has significantly impacted the city's vitality and quality of life, leading to healthy urban growth[62].
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Castlefield Urban Heritage Park and the high line parrk

Castlefield Urban Heritage Park

The high line park

USER-LED PROJECTS

User-led projects are often initiated by the “creative class” - such as artists or young professionals working in the creative industries - and have repeatedly acted as pioneering projects in the urbanization process. However, the success of these projects can threaten their survival; this is the case with the Tacheles Art Museum. The area around the Tacheles in Mitte went through a process of gentrification. In 1999 the plot of land on which the Tacheles is located came under the ownership of a project developer. By then, the Tacheles had become one of Berlin’s most important centers of alternative culture; its international appeal - making Berlin a major European creative city - helped the city government recognize its importance.

The same happened in the 798 Art District in Beijing, China, a radio joint equipment factory built with German aid. after 2000, some of the premises were left unused and rented out to the public due to the industrial transformation. Because of its open space, convenient transportation to the city, low rents, and large space, many artists were attracted to rent the space and make their renovations. Gradually, it has formed a multi-cultural area integrating galleries, art studios, cultural companies, and fashion stores. With multiple art exhibitions opening every day on average, 798 Art District has become a typical representative of the vitality and influence of China’s cultural and creative industry gathering areas. However, artists have also begun to flee the area, gradually pushing up rents and commercialization.

Tacheles Art Museum in Berlin and 798 Art District in Beijing

Tacheles Art Museum

798 Art District

THE CORE OF ADAPTIVE REUSE FOR URBAN RENEWAL

In conclusion, when adaptive use is used for urban renewal, it is a way to plan for the city that needs a broader range of policy tools to make it happen. The fundamental goal of adaptive reuse is to maximize the physical and social resources inherent in the historic built environment. Although several approaches to adaptive reuse and preservation policies, some common principles can be found. The first principle is that adaptive reuse should preserve the integrity of existing structures and their surroundings when revitalizing a neighborhood while demanding as little intervention as possible when new uses are required. Second, adaptive reuse should protect the symbolic importance of historic structures and promote community participation. Finally, adaptable uses should be given more attention to help the local economy and make the area more livable.

Nowadays, numerous historic cities and areas worldwide rely primarily on their cultural heritage as a catalyst for urban renewal. By reusing the historic built environment, urban regeneration accomplishes economic and cultural goals by preserving local identity and increasing public welfare. However, like in the abovementioned example, the risks of gentrification are ubiquitous. The revitalization of Bijlmermeer’s modernist residential district of Kleiburg, where wealthier inhabitants displaced the poor populace, Similarly, the building of urban parks, such as New York’s High Line Park, may increase the area’s property values.

04

CHAPTER

THE PRE-THINKING AND CHALLENGES

4.1 OVERVIEW

Since the 1970s, when adaptive reuse became a critical component of the existing building and architectural conservation, a number of scholars have created different strategies for design interventions. The primary focus is on two aspects: physical interventions on the primary structure, such as those proposed by Brooker and Stone (2004) for the interior of the building: intervention, insertion, and installation, and by Jäger (2010) for the exterior of the building: addition, transformation, and conversion. Another strategy is to use contrast and analogy to define the aesthetic link between the old and the new, as Crimson and Breitling(2007) do with correlation, unity, junction, and delineation.

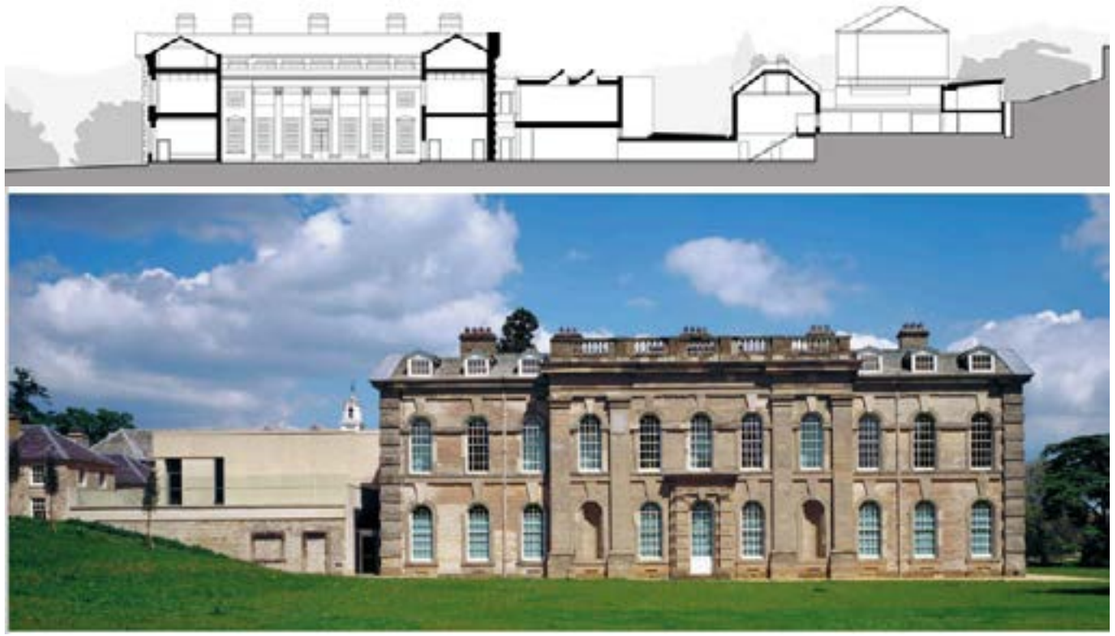
Developing effective and practical design methods for built environments is significantly more challenging than it is for new buildings, which must contend with the uncertainty of existing structures and balance the perspectives of a wide number of participants. While this article discusses several design strategies, architects should be aware of the importance of maintaining a consistent approach when reusing existing buildings to avoid a large number of bespoke situations from leading to a variety of disconnected, individual solutions 60].

4.2 UNDERSTANDING GOOD DESIGN FOR ADAPTIVE REUSE

The historic built environment is frequently made up of accretions, eclectic styles, mixed and matched materials, varying rooflines, and irregular forms that form a wonderful and harmonious whole that has been softened by the passage of time[66]. Understanding, respect, good manners, and skill are required to introduce good design into a historical setting.

Good design is perceived rather than defined. While architectural quality is subjective, the origins of good design are deep, complex, and subtle, especially when related to the historic environment. There is no “one-size-fits-all” solution, and prescribing a formula is risky and presumptuous. However， influential and well-known ingredients feed dynamic, contextual, and ultimately successful projects when they are led by a person who knows how to use them.

RESPECT HISTORY WITH GOOD MANNERS



Compton Verney and its section, source: Stanton Williams

The fabric of historic built environments is visually appealing, but it also contains information about how people lived, worked, and valued; it also has an incredible capacity to evoke memories. The relationship between a single building and the city, town, or village in which it is located is equally important. Giving old spaces new life can give a place a sense of rootedness and continuity while also reviving economic and community well-being. The form of any new design, whether it is a change or addition, should complement and empathize with the existing structure. As the architect, Teresa Borsuk, said:' The key to any alteration or redevelopment is understanding the building's historical evolution, from how it works now, its development through time, right back to its original core. Only then can you appreciate and capture its historical significance.'

Roger Hunt and Iain Boyd, who wrote the book NEW DESIGN FOR OLD BUILDINGS, point out that" 'well-mannered' is the description best suited to a new design that succeeds in a historical context. The new structures do not compete unduly with the old buildings in form or position, but equally do not ape the original or pretend to be historic; instead, they fulfill modern needs in a contemporary style." For instance, in England, the Compton Verney Art Gallery

The Investcorp Building and its section layout, source: ArchDaily

was renovated in 2004 and completed in 2007. A new education center and offices were constructed within restored historic outbuildings, which are connected to the historic building via a new underground walkway[66].

'Well-mannered' opposite is 'rude. A controversial case is the Investcorp Building for St Antony's College, Oxford, designed by Zaha Hadid Architects and completed in 2015. While the design is brilliant, innovative, and uses modern materials, the junctions with the older buildings appear ill-considered and ignore their forms.

VALUING CHANGE AND ADDITIONS AND LONG-TERM THINKING

The addition of new design elements is frequently viewed as an additive process. In reality, it is also subtractive, as it is unavoidable that some existing features are impacted. Good design will not throw away vintage fabric for no reason. They are acutely aware of loss and change, but this does not imply that all historic fabric is infallibly sacred. Change and additions in historic structures can be defined in various ways. Excellent examples do not always have to say their uniqueness. Rather than that, they engage with and form a relationship with the existing structure, form, and materials – one that may not be immediately apparent.

Since we live in a time of rapid change, the renewal of systems or components invariably results in attempts to modify the changes, resulting in further loss of structure and character. Without considering the efficacy of long-term interventions, the principle of adaptive reuse is violated, non-sustainable, and cannot be empathized with historical structures.

REGENERATION OF PLACE BY DESIGN

Retaining buildings in their surroundings adds to the character of an area and help us learn about the building's construction and how it was made and used. It has been

proven that regenerating places are in decline through conservation and good new design work. It helps the economy of the area and the character and quality of the local environment. Even small projects have a benefit.
Good design in the historic environment involves maintaining interest, scale, and a relationship with the buildings at its heart, while the spaces between and around the buildings provide their setting. The materials employed in these spaces often reflect the local vernacular and reveal patterns of wear and age while, below the surface, there may be a rich layer of archaeology.

DESIGNING TO PRESERVE MATERIALS AND SKILLS

In many cases, design innovation is critical for historic building conservation due to the engineering solutions it can provide, frequently in conjunction with new materials and technology. Using these methods retains the building's integrity and preserves as much historic fabric as possible while maintaining an honest approach that is easily readable in the future. When craftsmanship is combined with high-quality, carefully selected materials, the building takes on a life of its own. When this is combined with good design, it is possible to embrace the here and now and establish a dialogue with the existing building and its context that stretches back in time.

DISTINCTIVE STYLES

There is a danger in simply copying ideas from one project to the next. In reality, each scheme is unique and necessitates a customized solution that respects and responds to the unique characteristics of the site and building. There are no shortcuts to making a great design; physically researching each structure generates an essential understanding of its construction, materials, and flavors and an awareness that those charged with its care will be judged similarly by future generations.

4.3 BEGINNING AND CHALLENGES OF REUSE

Working with existing building fabric presents the technical design and detailing challenges that are not present in entirely new construction. Before design can begin, the existing conditions must be assessed, field-measured, and documented in a preliminary manner. If no drawings are available, an exploratory investigation and material testing should be carried out.
Early identification of building and planning code constraints is critical; timely correction of existing deficiencies can result in a well-integrated design strategy for the new intervention. Following the establishment of preliminary design concepts, additional field investigations are required to verify initial assumptions and to prepare a set of existing-conditions documents that will be used to determine how new construction will interact with existing.

In addition to the architectural studies outlined above, the design team should conduct a number of engineering analyses of the existing structure, similar to those conducted during a historic building restoration. The condition of any remaining original elements, including the energy efficiency of any portions of the existing envelope that will be retained, should be assessed. Moreover, some technical challenges are related to designing projects[67].

1. Cleaning an existing building is not always easy, and overcleaning flat surfaces can remove the patina of time.
2. Concerns about shoring, underpinning and strengthening existing structural elements.
3. For most mixed-use projects, foundation work will be required. This work is complex, risky, and should be approached with caution.
4. Old masonry walls can be severely weathered, uneven, and out of plumb, making alignment with new walls nearly impossible.

Only a few of the technical challenges have been mentioned above, but clearly, they differ from the issues faced by designers of new buildings. For example, finding a place to layout the crane and constructing it in dense urban settings provides additional challenges. Furthermore, a design must gain approval from various stakeholders. Approvals for alterations to existing buildings can be more cumbersome. Typically, stakeholders include the following: the owner/developer, the architect (including the entire design team), the local planning department, the special regional commissions, the local building department, and special interest advocates. Often, the desires of these various stakeholders collide[67]–[69]. To balance all of these difficulties, We require more patience and temperance.

05
CHAPTER

INTERVENTION STRATEGIES OF ADAPTIVE REUSE

5.1 OVERVIEW

The emphasis must be on a well-considered and well-executed response for a design to succeed. Creating good architecture in a historic environment is not restricted to traditional details or materials; it requires form, geometry, texture, and color to find a solution and then stitch these elements into the historic fabric. Its design concept is informed by the existing structure, its condition, and the project’s overall objectives. Because the choice of a design strategy will affect the next steps in the design process, it is important to talk about the different options with everyone involved early on[66], [70].

When deciding between different design concepts, aentral question is the extent and degree of interventions and alterations they entail. The options range from routine maintenance to deliberate alteration and extension and the option to demolish and replace the existing structure. The more extensive the changes, the higher the cost—and vice versa. A particular design strategy is chosen less frequently than one might expect based on a conscious analysis of the condition and pattern of damage. As a result, it is essential to consider the long-term consequences of a particular design strategy from the start.

The strategy employed within the adaptation can be classified into three distinct categories: the form of transformation, aesthetic fundamentals, and architectural expression. Of course, there are exceptions to this, but this general taxonomy is a fairly good guide to adaptive reuse strategies. The groupings are based on the principles of building design.

5.2 INTERVENTION TYPES

This chapter discusses intervention approaches for adaptive reuse of existing constructions from an architectural form perspective. A number of scholars have proposed a variety of intervention methods; in order to facilitate understanding of these methods, a summary diagram of the precedents' intervention strategies for existing buildings is shown in Table 2, along with a textual explanation for each method.

The intervention methods of Adaptive reuse architecture are classified according to the features of the existing structure. This classification is partly based on the work of Edward T. White, who wrote "Path Portal Place." His book proposed a simple diagram for interpreting feasible interventions and specific conditions for buildings and sites[71]. In addition, this table was organized and compiled based on Park and Dafna Fisher's study of the diagram[72], [73]. Furthermore, the author graphically illustrates the indoor intervention strategies that Brooker suggested in his book and shows them in the table below[20].

The table 2 intervention categories were utilized in this work: Knuckle, Gate, Wall, Corner, Bridge, Transition, Boundary, Marriage, Umbrella, Roof, Parasite, Hat, Divider, Skin, Glue, Feature, Infill, Underground, Alignment, Dis-alignment, New Interior, insertion, installation and so on. The table below contains all of the necessary diagrams for all precedents.

Table 2 Relevant intervention approaches for adaptive reuse of existing constructions diagrams， by author

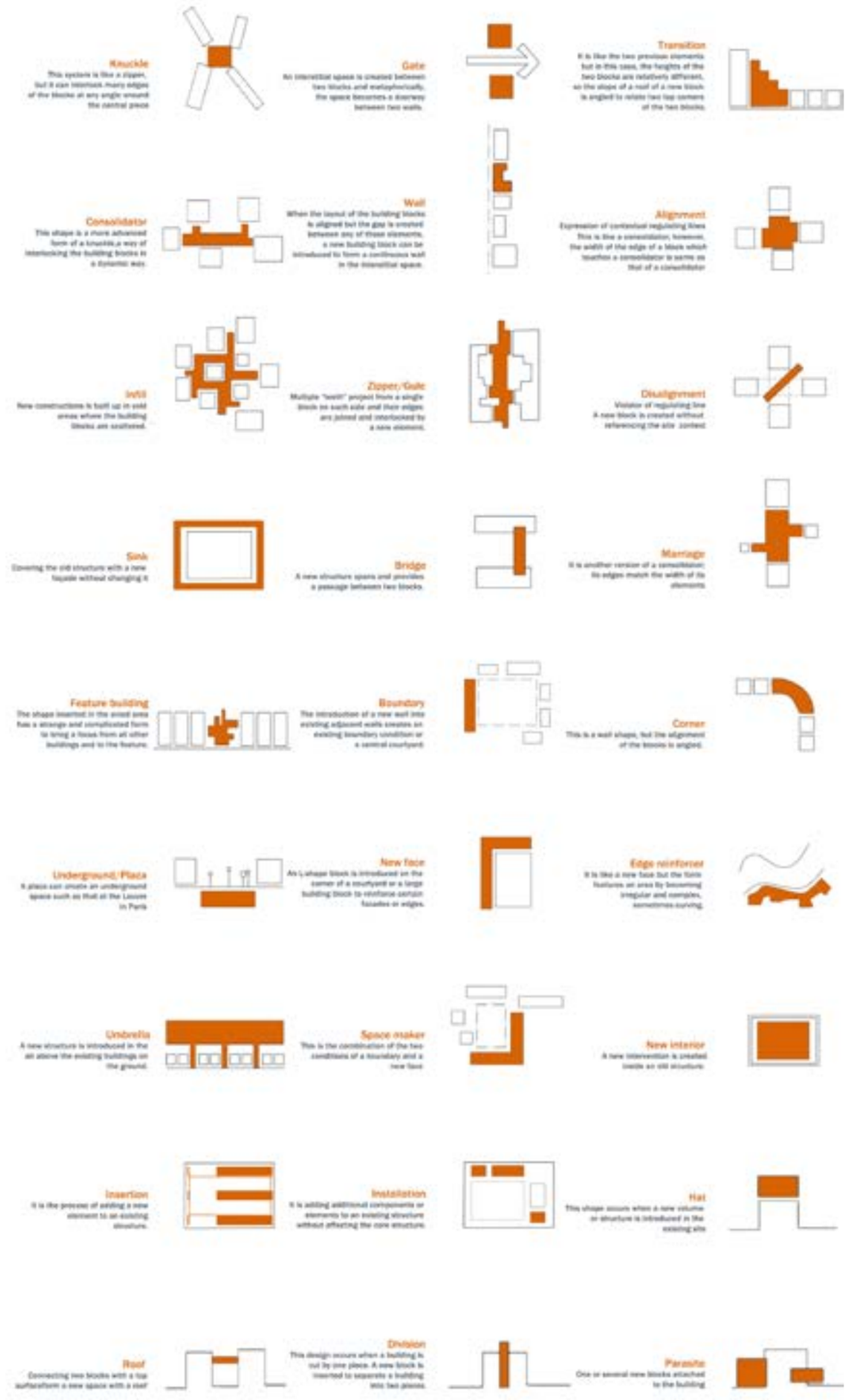


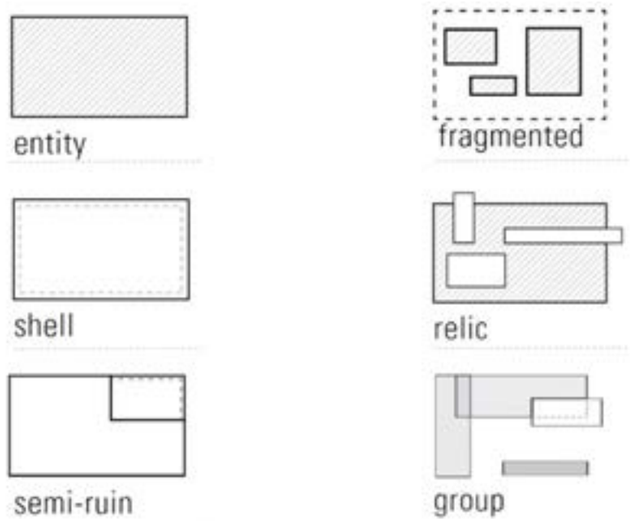
Table 2

5.3 FORM OF EXISTING BUILDING

In the context of architecture, form refers to both internal structure and external outline and the principle that gives unity to the whole[74]. It often includes a sense of three-dimensional mass or volume. In other words, the fundamental aspect of form that determines its appearance is the configuration or relative arrangement of the lines or contours that define a form. Many variations of a form can be generated from the existing fabric by manipulating, adding, or subtracting elements.

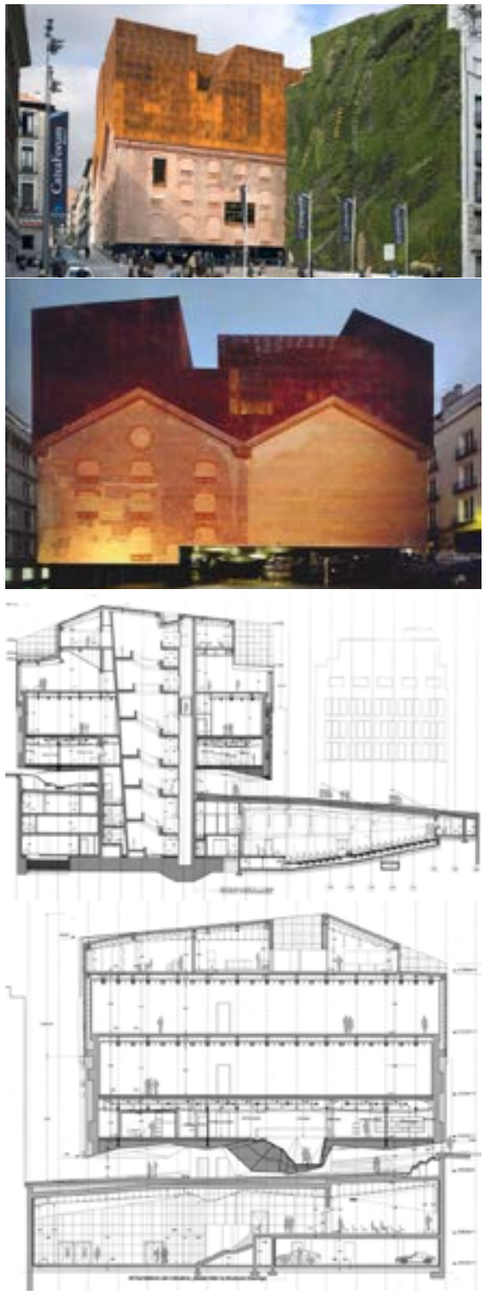
In the built environment, a host building is a structure that receives a new use for a defined or undefined period. The reuse of an existing structure for a new purpose requires a similar adaptation to an imperfect host structure. Host buildings can be classed according to their many states of being, with each category exhibiting comparable physical characteristics[75]. These characteristics, in turn, frequently dictate the type of design involvement necessary in a reuse application. Host structure is the new building form's physical foundation and defines its shape.

The purpose of this phase is to establish the concept of the host structure as an entity and understand how alterations and interventions can be made in support of its new form. According to Liliane Wong's book The Adaptive Reuse Extending the Lives of Buildings, the host building is classified into six types.



01

01. Host structure types, resource: The Adaptive Reuse Extending the Lives of Buildings
02. The Caixa Forum museum and its section



02

ENTIRE

The most frequently used host structure is an existing, entire, and undamaged structure suitable for conversion to a new purpose. In this case, design interventions might take place on both the exterior and interior of the structure. Conversions of entire buildings include anything from renovations to subtractions and additions. We can intervene with several design strategies for an entire existing structure as follows.

Superposition

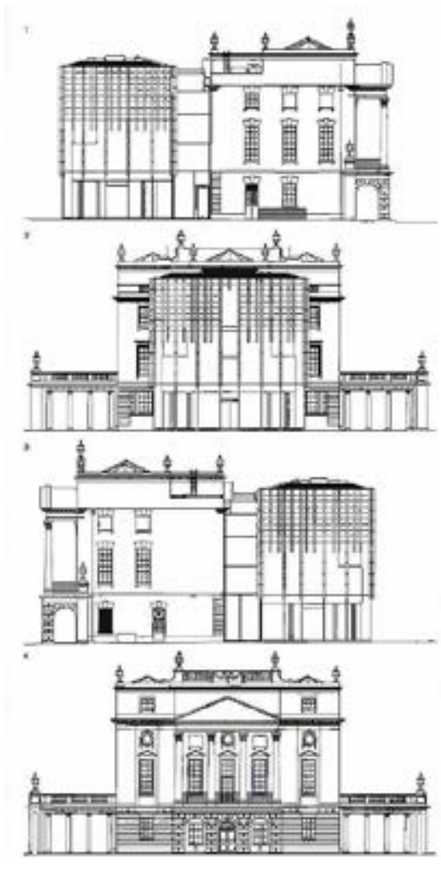
Vertical and horizontal overlays of space are frequently used to convert and expand older structures into multi-story or multi-volume configurations. Vertical upward superposition or downward superposition depends on the functional requirement. Horizontal superposition is used to add separate functional space to the existing space's general plan. This method corresponds to the Table 2 intervention method for Hat, Underground.

Caixa Forum museum in Madrid is an extraordinary example of superposition. It was transformed from a former power plant. The structure is much more significant due to the addition of two basement levels and two extra stories above the original brick shell. The upper expansion derives its sculptural influences from the surrounding urban roofscape and fits snugly over the existing roof undulations. Because only the shell of the previous power plant was classified as a historic resource, the architects demolished the structure's base. An extension of the new plaza was formed by lifting the building's brick bulk above the sloping ground plane. Additionally, by removing the base, entrances and exits might be situated in accordance with the surrounding area's circulation pattern rather than conforming to the power plant's elevations. As the entire mass is supported by inner columns set back from the facade, the glass base adds to the visual tension. [76]

The Elbphilharmonie, source: https://divisare.com

The Elbphilharmonie on the Kaispeicher in the heart of Hamburg's HafenCity is another example. It has now become a new social, cultural, and everyday life hub not just for the inhabitants of Hamburg, but also for visitors from all over the world.

The Kaispeicher remained in use as a storehouse until the turn of the century. This robust and substantial structure will now serve a new purpose. The new structure was extruded from the shape of the Kaispeicher. While rising above the older building's brick block with the same ground plan, the top and bottom of the new structure are fundamentally different from the warehouse below: the broad, undulating shape of the roof rises to a total height of 110 m at the Kaispitze (the tip of the peninsula), sloping down to the eastern end, where the roof is 30 m lower. The bottom of the new structure is a dynamic animated plaza on top of the warehouse, split into zones defined by vast vaulting varying from flat to quite steep. An arch built into the sidewall provides views of the sky as well as breathtaking, theatrical vistas across the Elberiver River and downtown Hamburg. Views of the foyers on various levels are provided via deep recesses built into the building above the plaza.[77]



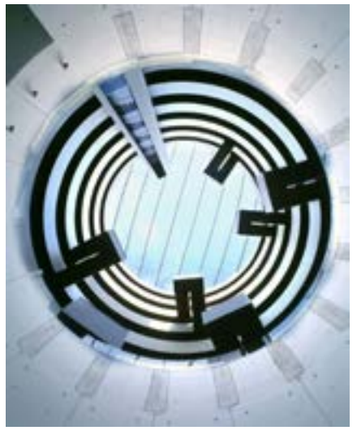
Juxtapositions

Used in the historic environment, well-executed juxtaposition allows the old to remain clearly readable against the new, creating visual separation from distinct material and design differences. There is inherent integration and sympathy despite these set boundaries: the two structures function together as a new and successful entity[66].

The Holburne Museum successfully used the technique of juxtaposition. The scheme saw the creation of a new, self-contained design alongside the sensitive conversion of a Grade I listed building in Bath, England. A glass expansion juxtaposes a historic structure, adding 800 square meters of gallery space. This juxtaposition is very stunning. Additionally, it enhances the tourist experience by installing a lift that makes the museum fully accessible to all and a garden café that views the grounds.

The proposal reconnects the old Sydney gardens with the city by recreating the distinct axis between Great Pulteney Street on one end and the gardens on the other. The project greatly strengthens the museum's community engagement and serves as a catalyst for regeneration in this part of Bath and Somerset.[78]

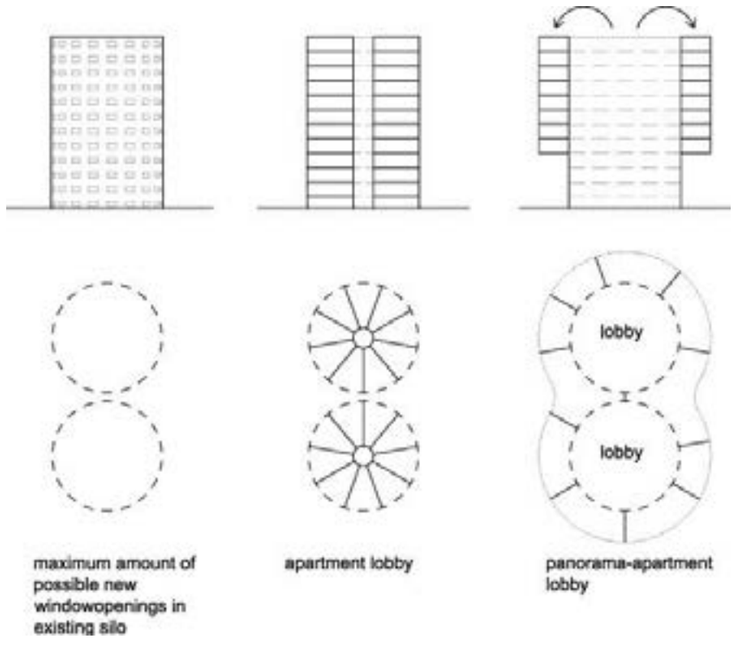
The Holburne Museum and it elevation,Source https://archello.com



Wrapping

When the new structure's space capacity exceeds the existing space capacity of the old building, the base conditions are limited, and the old building lacks numerous remodeling opportunities, "wrapping" unavoidably occurs. The old structure will be partially or totally incorporated into the new structure, becoming a part of it. The new building's appearance will take precedence following the renewal, while the old structure can retain its original form. The conversion of Copenhagen's Gemini Residence is an excellent example. These are the most sought-after flats that have been converted into warehouses and blend a modern lifestyle with a hint of heritage. Due to the limited and intricate opening possibilities in the concrete rings, the apartment floors are hanging on the exterior of the silos.[79] This results in two large atria while still providing for maximum views and plan flexibility in each space.

Gemini Residence , Source: https://archello.com



SHELL: INTERIOR CONVERSION

"A host structure as only the interior of an entire building differs dramatically from the whole building host," Liliane Wong explains. In this case, adaptive reuse comprises an intervention into a host building that engages with every part of the building except the building envelope. The host building just works as a shell to hold new and different activities. This sort of host structure is often, though not solely, a historic building with a specified protected exterior. An interior conversion doesn't change the outside of the house, but it can change the structure inside.

Graeme Brooker and Sally Stone grouped their interior reuse strategies into three distinct categories for the adaptation: New interior[1], insertion, and installation. This phase organizes the architectural strategies for the shell as the host structure into these three groups. Adaptive reuse is a widely used approach in interior design and is characterized differently. However, this general taxonomy is a pretty good guide to remodeling strategies.

New interior (Intervention)

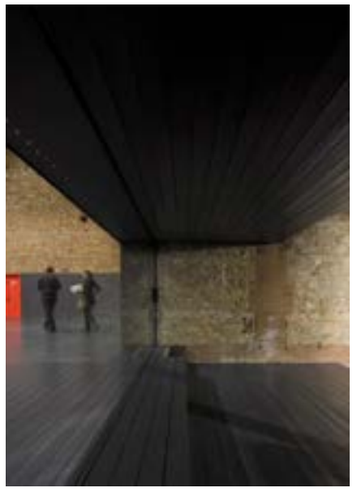
The new interior is a highly integrated strategy. The new elements will significantly modify the existing ones to lose their original integrity. The old structure undergoes significant modifications to the point that it is no longer self-contained. The existing structure and the new extensions are seamlessly combined. When a building is already in terrible condition or needs a lot of work to fit its new purpose, this strategy is often used.

For almost 85 years, the Cineteca Matadero was used as an abattoir and livestock market, but it has since been rebuilt to include two movie screens, a film studio, an archive, and a terrace for outdoor screenings. With the tectonic history of brick land and the historic slaughterhouse's powerful rhetoric in the background, the intervention has solved the huge spam demanded by the program by depending on these unrepeatable walls of solid brick and lime mortar. The horizontal construction was addressed with reinforced concrete slabs, which, when combined with the existing brick walls, provide a complete set of vertical load-bearing walls, dispersing efforts through ample textile walls.

1: To avoid confusion, we use the phrase "new interior" instead of "intervention," which is the original word in Brooker's book.

The Film Archive Area is encased in a permeable basket, enormous and walking, that filters light and functions as a lamp, a colossal figure of a modest orange hose crocheted infinity. Black baskets define film rooms. The lighted orange background in the main room causes the basket to float until the film begins, at which point the background fades away, leaving only a bright black surface. In the little projection room, a basket-banked trough of very dark on black space fleet nearly black wood dazzles the eye only when a window is opened.[80]

Indoor design in Cinema center in matadero, source https://www.archilovers.com





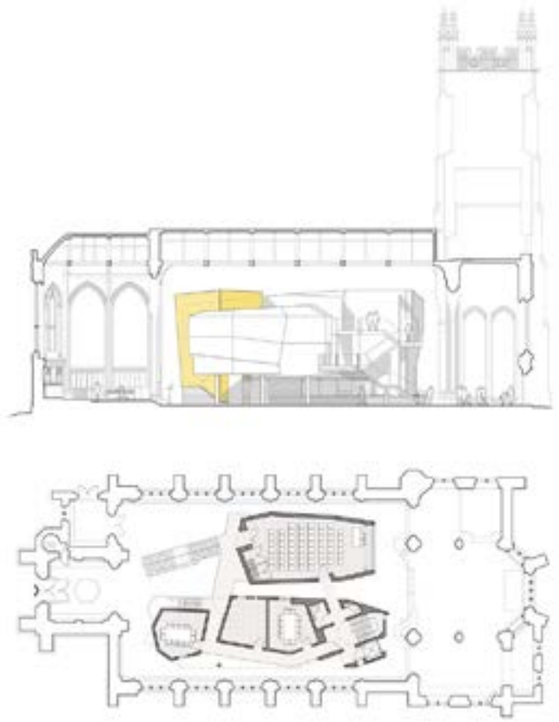

Insertion

Insertion is the process of adding a new element to an existing structure. A new, independent element that is well fitted to the existing envelope. The element is made to fit and is placed inside the boundaries of the existing building. This strategy generally does not significantly affect the current structure and typically results in a clear distinction between the original structure and the new insertion[6].

All Souls is an immense church capable of holding a congregation of 800 and, at 16 meters wide, has the largest single-span nave of any parish church in England. It asked to convert into a community center. The adaptation of a religious building can pose delicate questions. The architect or designer has to signal to the new users while respecting the original building. A church is often a dominant building in an area and frequently has a dramatic or symbolic interior. The approach that OMI took to the church's conversion was very definitely one of generating variation and difference. They chose not only to contrast the language of the new elements of the community center but also to break the ordering geometry of the interior subtly.

OMI continued this streetscape into the building by constructing a series of pods or small structures that actively celebrate the continuation of the road through the front door and into the nave. Major historic repair works were carried out to the church, including replacing the Westmoreland slate roofs, brickwork and stone repair, and replacing most of the leaded glass windows to the nave. The insertion has been pulled back from the carefully conserved fabric of the building. It has established a new relationship between the structure and visitors [81].

The architects have created a free-standing insertion that deliberately contrasts with the original building. The language of the new elements is uncompromisingly contemporary. Although the position of these structures is somewhat reminiscent of the previous organization, it reflects the relationship with the street and, therefore, the population who live immediately around the building.



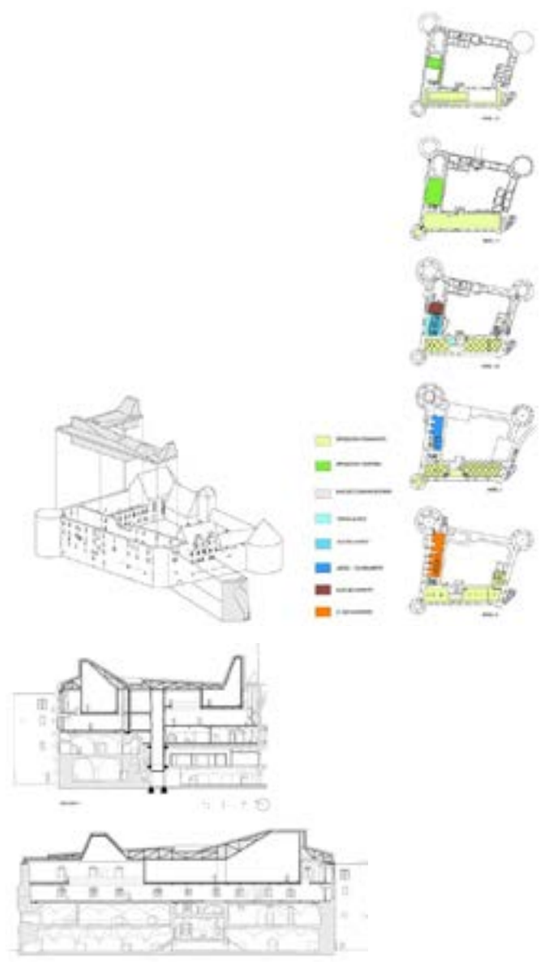
All Soulsin England, Source: https://www.omiarchitects.com

installation

Installation is adding additional components or elements to an existing structure without affecting the core structure. The old and new structures coexist in their own right. The new pieces are contained within the old structure's bounds. It enables the new elements to be removed and the building restored to its former condition in the future. This strategy is often used in historic buildings where a lot of care has been taken to preserve them. In the specific case of the Selexyz Dominicanen bookshop, it used the earliest Gothic church in the Netherlands, with a pure and strong space with fragments of significant frescos on the major vaults and one wall.

The new structure was installed in the church without contact but folded along the row of columns, with a series of steps within and cantilevered floors. All technical installations, storage, and restrooms are concealed beneath the choir in an extension of an existing basement. The lighting is integrated into the "bookcase." Consequently, the bookstores serve as a medium for an experience of exploring while also immersing oneself in the breathtaking space of this magnificent church on all levels.[82]

Selexyz Dominicanen bookshop, Source: https://archello.com/



INCOMPLETE HOST BUILDINGS: THE SEMI-RUIN HOST

They are not complete and are missing either structural or infrastructure features. Within this framework, design interventions include internal insertions and additions. The objective of such extensions is twofold: first, to restore the existing wrecked structure to its original state, and second, if desired, to expand the extent and capability of the host structure in its new usage.

Weavings

While insertions are conceivable in circumstances where the space is clearly defined, many buildings lack this flexibility, necessitating the integration of new work into and around the existing fabric[66]. In this situation, the extension is new construction constrained by the host's load-bearing capacity to carry greater weight directly or to act as a support for a new attachment. The link between the modifications and the original structure dictates whether an adaptive reuse approach is used for maintenance or as art[6]. The Moritzburg Museum in Halle, Germany, is an example of a conversion from a semi-ruined roofless castle to a folding structural platform with the addition of a new roof and upper stories.

A new roof, conceived as a large folded platform that rises and breaks to allow natural light to enter, will support the new exhibition areas. As a result of this operation, the ancient ruin's floor has been completely freed, creating a unique space suitable for various exhibitions. Two new vertical communication cores will be constructed to complement this design. The first is in the north wing and is used to connect the levels that must communicate. The second is a new, contemporary tower, 25 meters high, which replaces the bastion and provides access to the new exhibition areas, highlighting the city's distant views. [83]

Roof structure into the Moritzburg Castle, Halle.
Sources: https://www.archdaily.com

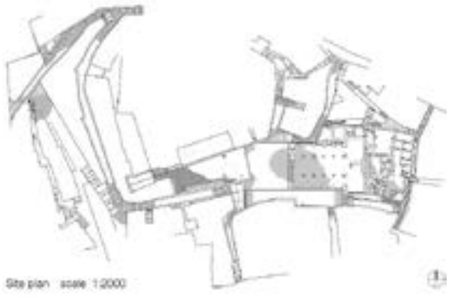
FRAGMENTED HOST

When the host building is characterized by an extent of incompleteness rendering it uninhabitable, adaptive reuse becomes an act of invention. These hosts come in a variety of shapes and sizes, ranging from a part of a building to its infrastructure, façade, or structure. It is charged to add to such fragments in order to achieve a new state of completion. The inclusion must be justified by the fragment's relevance, which includes historical significance and economic considerations. Therefore, this phase provides two cases that represent the different architectural forms and the adaptive reuse of the cultural and economic perspectives, respectively.

Placemaking

The term "placemaking" is frequently used in a variety of fields and has a variety of definitions based on how each discipline views it. Placemaking is defined in this paper as the process of building an environment that reflects the spirit of the location. To represent the spirit of place in an environment, it is necessary to first distill the environment's features first, then design and integrate nodes, pathways, and areas, and finally design the environment's boundaries. The objective of placemaking is to provide people with a feeling of orientation and identification[84].

Reusing historic fragments introduces a new level of complexity. The significance of such remnants necessitates an adaptive strategy that can be either inspired by history or succumb to false historicism. Recognizing and acknowledging history in the manifestation of a building's new design are critical components of successful fragment reuse. The term "placemaking" is appropriate for this purpose.



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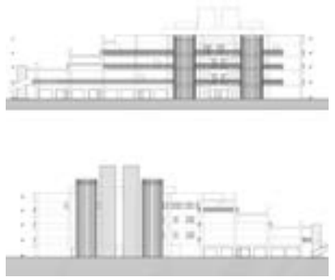
The conversion of the earthquake-devastated Chiesa Madre in Salemi, Italy, are an example of the fragmented host that have historical significance. It into a new urban plaza is governed by the 17th-century church, which dictates the addition of a new floor, circulation, structural improvements, and new lighting. It was not rebuilt, however. Its ruins have been restored minimally and integrated into the public open space, creating a new focal point for urban life. The additions, some of which incorporate original materials and 17th-century techniques, are centered on the architectural ruin itself. The raised platform of the cathedral has been covered with white stone from the nearby town of Trapani. Stone blocks show where the old columns used to be, some of which have been re-erected. The ruined walls of the apse now define one end of the square, much like a stage set. Narrow lanes cut through the dense urban fabric, leading to additional squares and courtyards filled with new shops and amenities.

01. Álvaro Siza Vieira, Oporto Urban Renewal in Salemi, Renewal of an urban ensemble from the early Middle Ages
02. An abandoned concrete structure was the point of departure for Studio Piva's Le Terrazze Hotel in Treviso. Sources, https://www.archdaily.com



02

Consolidator

Consolidator: This approach is a more complex version of the joint between different blocks, and it is a customizable way of interlocking the construction parts. The under case gives us a good example[72].

The abandoned concrete skeletons in Carità de Villorba, Italy, are examples of structure reuse; their significance is primarily due to their potential as structural resources. Because structures account for a sizable portion of a construction budget, their reuse as structural support for a multifunctional building makes economic sense. The case consolidates the new fabric for the old. It was a good way to show that an old structure can be used in completely new. The objective was to create a multifunctional structure that combined living spaces and common areas into a hotel, a cultural event auditorium, a wellness center, a restaurant, a business and commercial area, and a residence with various house typologies.[85]

RELIC HOST STRUCTURE

It is simply a relic of the past. It is not transformed but rather catalyzes new construction. Its significance is in recalling memory: an event, history, a period.

Glue/Zipper

Multiple fabrics of a single construction are interlocked on each side, and their edges, or they are joined together by a new element.

The wall relic and Madonna statue in the church are a case in point, which inspired Peter Zumthor to design the architecture for the new Kolumba Museum in Cologne, Germany. The spirit of these relics pervades the detailing of the new building, guiding a spatial experience that very much recalls the old one. Zumthor's design rises delicately from the ruins of a late-Gothic church, preserving the site's history and essence. He has used a grey brick to integrate the site's destroyed fragments. The grey brick facade incorporates remnants of the church facade to create a new face for the contemporary museum. The brickwork is articulated with perforations, enabling diffused light to fill specific areas of the museum. The "mottled light" shifts and plays across the ruins as the seasons change, creating an ever-changing peaceful environment.

The museum is comprised of sixteen distinct exhibition rooms that are organized on the building's three levels. The lower level has been preserved as an archaeological site, with a pathway leading to the museum's exhibit areas on the upper levels. The winding passage minimizes visitor impact on the archaeological site. Additionally, the building's heart contains a secret garden courtyard – a tranquil and secluded spot for reflection.[86]

01

01. Kolumba Museum in Cologne, Source: https://www.archute.com/
02. Long Museum West Bund in Shanghai , Source: https://www.archdaily.com/

Another example is the Long Museum West Bund in Shanghai, China, where a 110-meter-long coal hopper unloading bridge. This site of which was used as the wharf for coal transportation. Before the design, a two-story underground parking structure had been completed. This space has been transformed into the heart of a new contemporary art museum. The museum's design was inspired by the original relic, which featured concrete cantilevered vault umbrella structures.

The new design has a cantilever structure with a "vault-umbrella" and independent walls, while the shear walls have an open plan and are immersed in the existing basement to be concreted with the original framework structure. The first underground floor of the original parking structure has been transformed into an exhibition space. While the overground space highlights the multiple orientations created by the "vault-umbrella" structure's relative connection in various directions; additionally, the electrical and mechanical systems have been integrated into the "vault-umbrella" structure. In the overground space enclosed by the "vault-umbrella," the walls and ceiling are finished in as-cast concrete, creating an illusion of a subtle geometrical separating line.[85]

02

Zsolnay Quarter Transformation process
Source: https://www.mcxvi.hu/en/portfolio/zsolnay-kulturalis-negyed/

GROUP HOSTS

A host structure is not always restricted to a single structure. The reuse of multiple buildings as hosts results in a massive scale of adaptive reuse. Group hosts are classified according to whether they are components of a single complex or stand-alone structures within a larger metropolitan setting[6]. As a single complex, the goal is often to keep a historical event, community, or point in time alive, like at UNESCO-protected historic sites.

Using more than one building as a host structure presents several challenges: the condition of the individual structures, their physical relationship, their individual historical significance, and their collective relationships. These conditions necessitate a single adaptive strategy that gives each structure a new and unique identity. This type of host, even more than the others, needs to be looked at on a case-by-case basis because of all the different things that could happen.

Infill and Bridge

When it comes to “infill,” a new structure is constructed in vacant areas where building pieces are strewn about. They usually include this text’s suggested further interventions, such as zipper and consolidator. “bridge” is In between two blocks, a new building spans and offers passage[72].

The conversion of the Zsolnay porcelain factory in Pécs, Hungary, is such a case where the preservation of the heritage of the Zsolnay family has resulted in the complex’s conversion into a Cultural Quarter. Zsolnay Quarter includes unique exhibitions presenting the Zsolnay heritage. Along with conserving the past, exhibiting the present and presenting contemporary art will play a significant role.

The multiple functions of the Zsolnay quarter can be based on the diversity imagined in it. During the planning process, the quarter was divided into four separate yet related subunits: Artisan’s quarter: The Zsolnay family and factory history, Café, event halls, Handicrafts Street, and Art Auxiliary Affaires were located here. Creation District: Art exhibitions, seminars, youth activities, rehearsals, and event spaces were created by remodeling the former pyroxenite facility and its environs. Family and Children Quarter: The Bóbita Puppet Theater in the Green House will be the heart of the new neighborhood. Exhibits, family playgrounds, and an open-air stage will make visitors’ stay delightful. University District: The buildings of the Zsolnay Cultural Quarter, separated by Route 6, are occupied by the PTE Faculty of Arts institutes.[87]

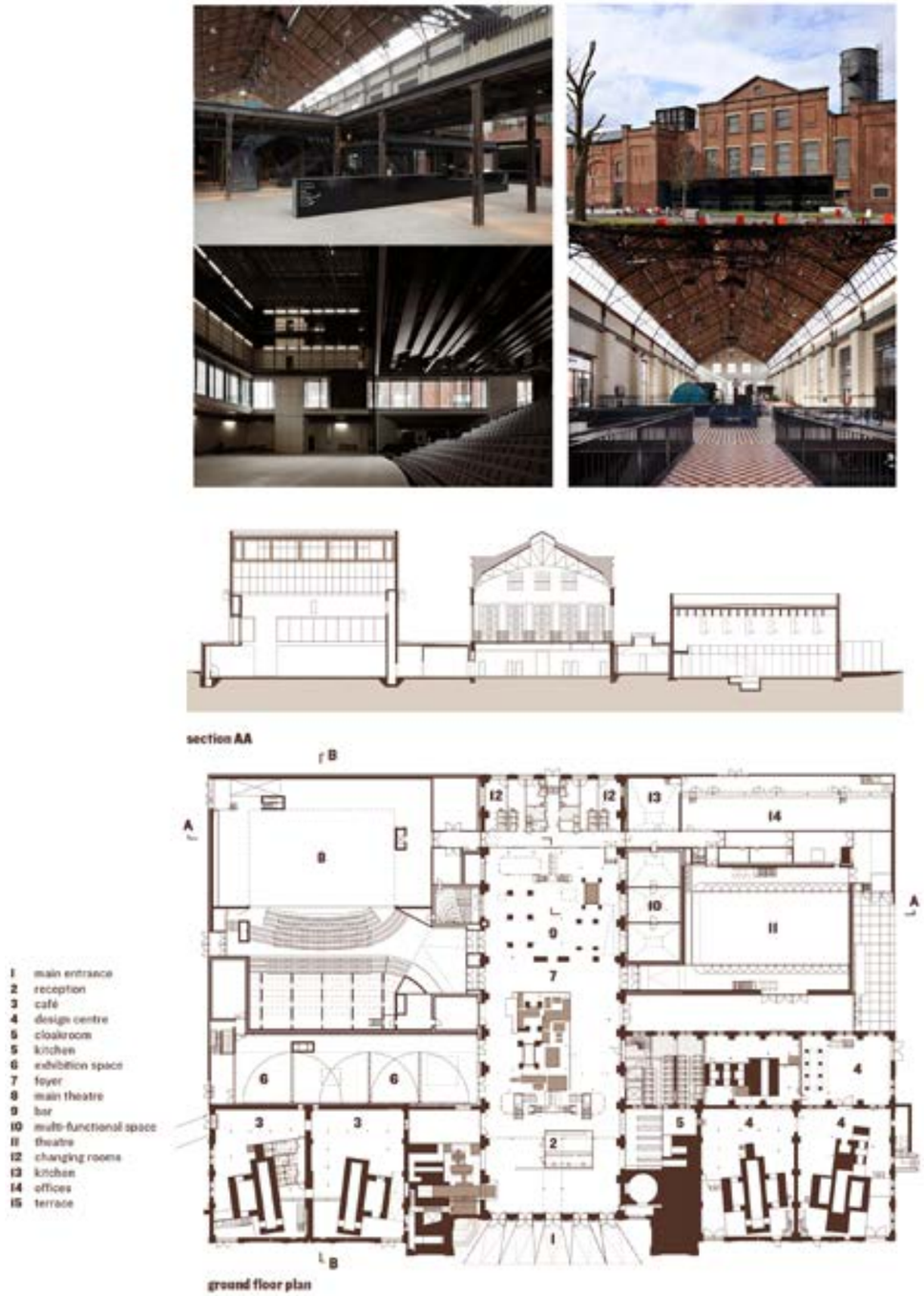
Parasite

In the same way, as the parasitic relationship in nature is based on the host-parasite relationship, the parasitic architecture symbolizes the relationship between an existing building and a new extension, adaptive reuse, superstructure, or installation[88].

C-Mine is a regional cultural center in the Belgian town of Genk. The project, which was completed in 2010, repurposes the former coalmining complex's powerhouse buildings to create a pair of multipurpose auditoria of different sizes, meeting rooms, and places for flexible cultural programming and space for technical support and administration.[89]

The master plan's formal figure-field relationships are transformed into something richer in space. The remaining and repaired portion of the building will house a design center, a café, a celebration hall, and a tourist infrastructure for mining heritage experiences. The armpits of the previous T-shaped structure are being transformed into a new theatre hall, a smaller music room, multiple exhibition spaces, and facility functions (including offices). The new component integrates seamlessly into the current complex's functional and formal logic[90].

A massive new, durable black steel box marks the relocated entry, which is positioned on the ground floor within the former machine hall, and from which the entire complex is entered. This quite dark and foreboding bottom level, littered with the detritus of the previous occupation, includes all the required equipment for cultural production. The architects enhanced the clutter with specific interventions that house the offices, café, galleries, staircases, and entrance to the new auditorium.



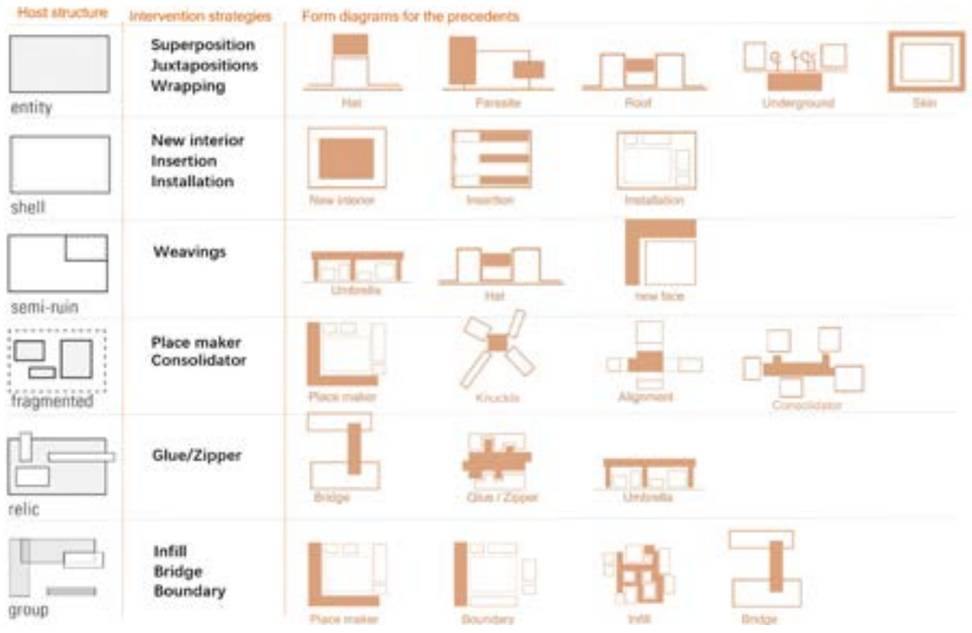
C-Mine Cultural Centre master plan and pthots, Source: https://divisare.com/

THE CONCLUSION OF THIS PHASE

Forms also have relational properties that govern the pattern and composition of elements: Position- The location of a form relative to its environment or the visual field within which it is seen. Orientation- The direction of a form relative to the ground plane, the compass points, other forms, or the person viewing the form. Visual Inertia- The degree of concentration and stability of a form. The visual inertia of a form depends on its geometry and orientation relative to the ground plane, the pull of gravity, and our line of sight. In reality, all of these properties of form are affected by the conditions under which we view them.
An existing building is a complicated frame structure in the built environment that receives a new purpose. In this phase, we offered six types, and they each have their own physical characteristics. These criteria influence the design involvement required in the adaptive reuse process. It is the new building's physical foundation and defines its form.

The authors of the preceding work provide relevant adaptive reuse intervention strategies for each of the six types and practical examples to support each strategy. The authors assemble the relationship between the host structure and its intervention strategies and the prior researchers' intervention approaches in the figure below. There is a substantial connection between the two methods, and the previous researcher's study of building form supports this paper's building form methods for adaptive reuse.

The relationship between host structure, intervention in this paper, and the precedents form diagrams



The following diagrams on the page 95-95 compile the intervention strategies and the research cases in this dissertation leading to the following six adaptive reuse intervention strategies in building form.

Existing buildings that are structurally intact and in the process of being adapted to new uses typically retain the completion of the structure because this type of building is predominantly a conservation type of building. It is mainly in the form of additions to the main structure, which serve to integrate old and new activities or to act as a carrier for new functions, that the intervention takes place. The paper provides three intervention strategies: superposition, juxtaposition, and wrapping.

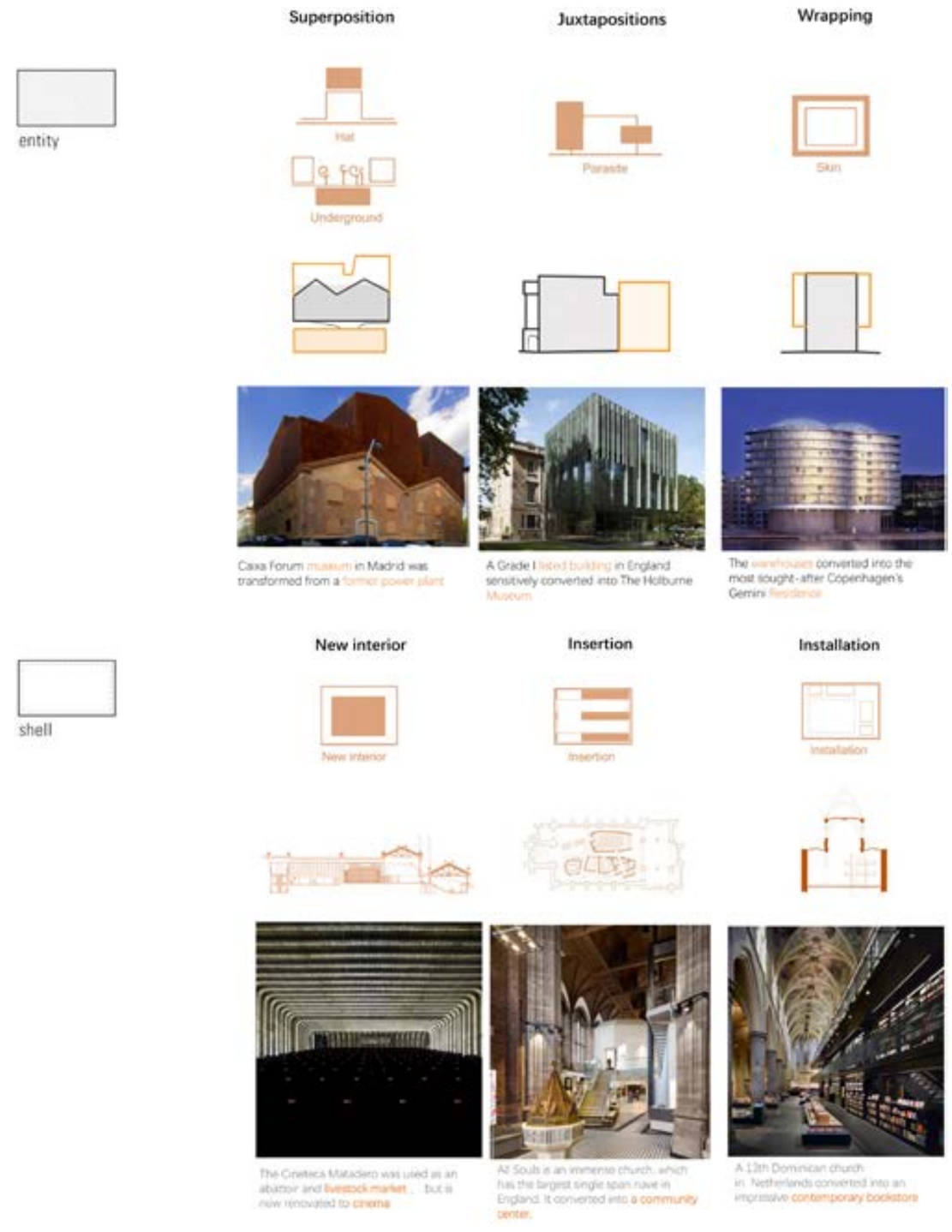
Structures that are highly available on the outside but are obsolete or ruined on the inside are called "shell." This form of intervention is typically targeted at the interior spaces of a building's structure. The new functions introduced into the interior of the building must be compatible with the structural and cultural context of the existing structure to maximize the usage of the current structure. In the case of preserved buildings, they are designed to be as flexible as feasible in terms of composition, décor, and furniture. The following adaptive reuse strategies are mentioned in the text: new interior, insertion, and installation.

Buildings that have been partially damaged but are still structurally sound for the most part. Typically, interventions are aimed at repairing historically significant structures. The new features must complement the building's historical and cultural character, and balancing new technologies and materials with the existing structure is also critical. Due to the fact that this type of intervention approach must be tailored to the specific damaged structures, this study will focus on the most common top structure damage and the strategy employed to repair it: a weaving of the old and the new.

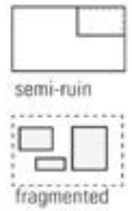
The structure of the building is largely damaged, and although it is in a state of disintegration, the general structure of the building can still be seen. In this case, adaptive reuse becomes an act of invention. This form of reuse is frequently justified by two factors: first, it is a historically significant conservation structure. Second, for economic reasons, abandoned, unfinished constructions are repurposed. At this point in the paper, we explain how to intervene with each of the two contributing elements. Placemaking is an effective method of preserving a site's historical and cultural significance, and economic reasons can affect consolidation decisions.

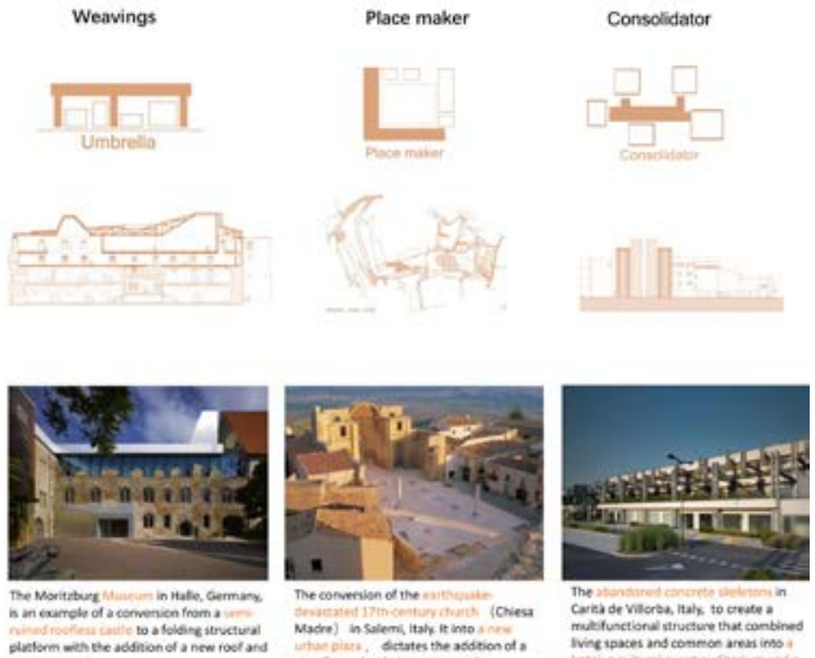
A relic of the past recalls the significance of an event, a history, a period of time through adaptive reuse. In the urban context, there are numerous ways of reuse for this category. We may broadly divide it into two primary types, one as part of an urban park and the other as a building that can be renovated for public access. This research focuses on the second kind, Glue, and zipper, as creative and effective means of design intervention.

A group is a collection of structures, the most common of which is a city's industrial park. It is a resource that can be redeveloped in contemporary urban development. Due to the fact that they are a synthesis of numerous types of structures, their intervention methods frequently coexist in a variety of ways. Combining "infill" with "bridges" is a widespread intervention technique, which involves filling in gaps with new functional buildings, linking the various functional blocks via bridges, and eventually constructing new forms. Extending the space to alter the spatial pattern by parasitizing the main building is another appealing technique of adaptive reuse intervention.



The intervention strategies and the research cases in this capter,Source by author

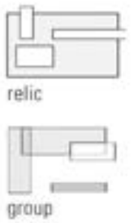


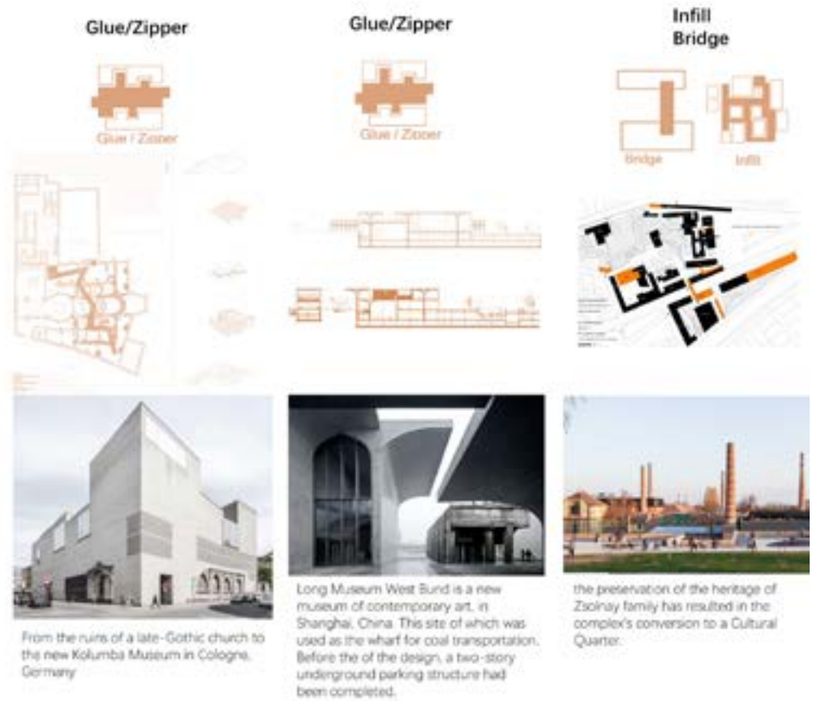


The Moritzburg Museum in Halle, Germany, is an example of a conversion from a semi-ruined roofless castle to a folding structural platform with the addition of a new roof and upper stories.

The conversion of the earthquake-devastated 17th-century church (Chiesa Madre) in Salemi, Italy. It into a new urban plaza , dictates the addition of a new floor, circulation, structural improvements, and new lighting.

The abandoned concrete skeletons in Carità de Villorba, Italy. to create a multifunctional structure that combined living spaces and common areas into a hotel, a cultural event auditorium and a residence.





From the ruins of a late-Gothic church to the new Kolumba Museum in Cologne, Germany

Long Museum West Bund is a new museum of contemporary art, in Shanghai, China. This site of which was used as the wharf for coal transportation. Before the of the design, a two-story underground parking structure had been completed.

the preservation of the heritage of Zsolnay family has resulted in the complex's conversion to a Cultural Quarter.

5.3 ARCHITECTURAL EXPRESSION

The topic of how new additions relate to or distinguish themselves from existing structures is critical. Hierarchies are established here: whether the new design is submissive to the existing structure or stands out through noticeable design or material selection. Relevant design expression issues include how the new interacts with the old, whether interventions are visible or not, and, perhaps most importantly for the public, whether the design is bold and striking or reserved and restrained. There are numerous possibilities, ranging from integrative conformity to defiant contrast.

THE CORRESPONDENCE OF HOST STRUCTURE AND NEW ADDITION

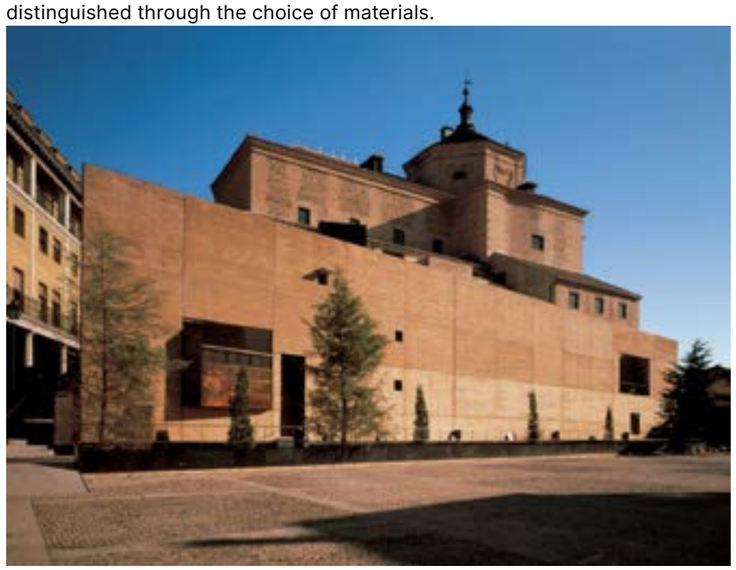
The continuance of existing forms and architectural means is a straightforward solution to harmonize the new with the host structure. When the same or comparable structures, materials, colors, and shapes are utilized for new buildings and additions corresponding to the original's fundamental volume and roof form, the outcome will be harmonious and likely to be a touch dull in its appearance.

Architects frequently aim to maintain the fundamental structure, concepts, and proportions of existing construction. The new design differentiates itself from the current structure through subtle distinction rather than stark contrast. The new feature is integrated into the existing structure by carefully selecting materials and artwork. These slight differences between the original and the new building provide room for expression. However， Harmonisation is the art of drawing a correspondence between new and old in design - between the modern and the historic. Where the new corresponds entirely with the old, it communicates a false impression of history and a lack of design initiative. Toledo's Cultural Center is an excellent example of how buildings may express their correspondence.

The old church of San Marco, which used to be a monastery on the highest point of Toledo, was left empty for a long time. It now stands in the middle of the city's historic center. It was designed by an architect named Ignacio Mendaro Corsini, and it has seminar rooms and a civic archive. The church itself has been turned into a cultural center.

From a distance, the ten-meter-high walls enclosing the archives lend the church the appearance of a fortified structure. The closed concrete facade

has a warm golden coloration that matches the surrounding urban fabric. The complex has a towering, wide entrance. Excavations from Roman and medieval times are visible through the concrete floor slab. From the gallery floors, visitors can see into the reading room below. The high area is lit by ceiling lights and small holes, creating a magical, almost monastic ambiance. The concrete structure's steel shuttering was kept in place to make window surrounds. The new architecture has been carefully integrated with simple, restrained means into the existing fabric. Old and new are never the less distinguished through the choice of materials.



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01. Toledo's Cultural Cente
02. Santa Marta University complex, Source: http://www.michelemascalzoni.it/

02

MULTI-LEVEL PRESERVATION

Since the 1964 publication of the Venice Charter, which made the potential for historical discoveries a central theme, dissection and fragmentation of a building into individual elements has become a critical method of incorporating history into a design. Frequently, architectural designs begin with a physical dissection of an existing structure. It is not unusual to discover remnants of previous decorative walls, painted timber paneling, and roller patterns. The popularity of resurrecting such traces to bring attention to space is positively unexpected. However, in most cases, these traces serve only as an eye-catcher. They express a limited message, primarily because no indication of the fragment's meaning is provided.

Massimo Carmassi, an architect from Italy, is a master at creating enticing juxtapositions of broken fragments, delicate artistic surfaces, and deftly designed new elements from an incoherent collection of remaining fragments. He took part in the Santa Marta University complex (a former bakery) is an excellent example of this, as it is located within a former military base that was originally used to store bread, wheat, and other food rations. Following recent conversions by Verona University, the Santa Marta complex now houses the faculties of Economics and Law. The restoration project is organized around a distributive method for repurposing the multiple rooms with minimal modifications to their spatial and material structure.

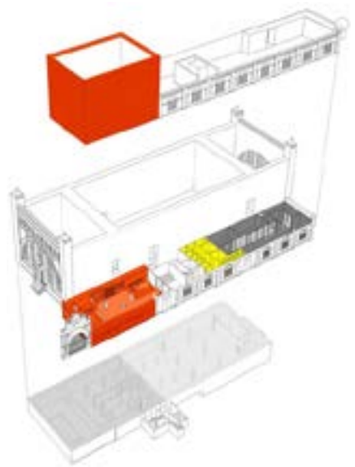
The primary goal of such fragmentary approaches is not to explain historical relationships but to inspire wonder at the building's surprises and the historical distance between the finished product of "today" and the broken fragments of "the past." This historical gap is only discernible if both "now" and "the past" are present in every direction. This illustrative impact becomes more apparent as the distinction between new and old becomes more pronounced. By itself, the complexity of a historic structure, its materials, surfaces, and colors generates significant fascination. This means that such illustrative solutions are impossible without considerable visual information[91].

THE CONTRAST OF OLD AND NEW

In an architect's work, the contrast between modern and ancient is crucial. This is the point at which the attempt at integration or the relationship's balance is evaluated. One should keep in mind that the overall design will be more persuasive if the fundamental philosophy underpinning the fusion of new and old is also obvious. In practically all designs created within the context of existing buildings, contrast serves as the major visual characterizing of the bipolarity of new and old and a division of the past and the present. Due to the Building Protection Ordinance's restrictions, numerous aspects of older buildings cannot be renovated. The advent of the new part is certain to cause conflict with the existing one. It is not easy to strike a sensible balance between old and new, and hence its design must be carefully considered and articulated[67].

A new art museum in Malmö, Sweden's southernmost city, is an excellent example of the contrast between old and new. It is a modern and contemporary art museum in Malmö that is built in a former electrical plant.

The architects chose to create a new extension - a modern addition to the historic structure. And infuse the interior with a completely new spatial organization. The new addition is distinguished by a perforated orange-red exterior that connects to the existing building's brick architecture. The façade is totally glass on the street level, allowing sunshine to stream through the perforated surfaces. Two new staircases on the interior will allow guests to traverse in a circle between the turbine hall's high chambers and the higher exhibition halls. The turbine hall is divided into three sections and offers a pedagogical workshop in addition to the exhibition halls. The structure combines the past with the present and contrasts the old and the new.



Art museum in Malmö, Sweden

5.4 AESTHETIC FUNDAMENTALS OF ADAPTIVE REUSE

The strategic classification of architectural aesthetics comes from Johann Jessen and Jochem Schneider's article "Conversions – the new normal." This phase further expands on this classification and provides practical case support for each strategy. However, it is necessary to emphasize that one cannot establish design approaches or aesthetic concepts for specific building tasks that prescribe a dependency between new function and design philosophy. Hybrid forms and combinations are the norms in today's architectural practice of converting old buildings into new uses[92].

As the field of adaptive reuse is redefined and expanded. Traditional design principles are being questioned in light of the inherent dissonance between the old space and its new use. Along with the conventional rule that "form follows function," when a new function is subjugated to "the giftedness of the space," another traditional rule is reversed: the rule that "form follows form." It has become apparent that not one motto has a formulaic meaning and has been replaced by an approach targeted to the particular object. Architects increasingly view adaptive reuse of existing structures as an aesthetic challenge and a noticeable task. This is the case reflects a shift in the profession's perception of itself and explains why this area has grown in importance for practice. New construction is still the most rewarding discipline because it allows for more creative space design.

HOLISTIC EXPRESSION AND SEEKING INSPIRATION IN THE ORIGINAL

Much adaptive reuse begins with the goal of preserving and reusing existing structures. Aesthetically, a visual reference to the original's historical image is critical. In conservation-minded conversions, the design idea is to emphasize authenticity and formal preservation of the "Old in its entirety." This approach prioritizes identifying a new use similar to the original intent or structure. For example, ancient fortifications became military museums, lavish palaces became art museums, and industrial parks within cities became open creative industries. These ideas can also be a jumping-off point for more restoration-oriented conceptual and design approaches. They prioritize a historical ambiance over a pure desire for authenticity。

When The historical image of the building is seen as an important cultural icon, all structural interventions are subjected to the imperative of keeping

changes to a minimum and practicing the utmost restraint. Once the existing structure serves as a traditional historical image, it's more interesting to look for true historicity than to try to be true to the past. On the other hand, in art, the aesthetic emphasis is placed on the original, or more precisely, on what remains of the original. The opposite to this ideal is the strategy of the controlled decay of buildings or monuments. This strategy is employed when the chances are low that an important monument can be preserved in the long term. Like this case, the Völklinger Hütte, a former iron, and steelworks designated a world heritage site, has been exposed for some years to continual erosion[93].

The aesthetic conceptions created explicitly in relation to the original are diverse and contradictory. They range from simply formal modifications to the existing fabric to presenting the appearance of historicity. All of them, however, have the aesthetic concept of an image of the original, which determines the conversion's formal expression to be the entirety of that is material and spirit of the old building

01. Völklinger Hütte, source:https://voelklinger-huette.org/
02. Documentation Centre in the Reichs Party Congress Complex in Nuremberg

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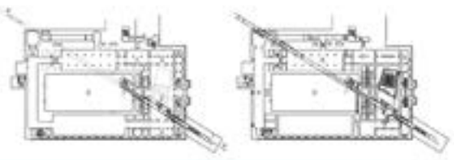


02

PRESERVATION OF THE SCENE AND SPIRIT OF THE PLACE

The second aesthetic design strategy is based on the principle that old and new coexist in a transformed structure, where different historical layers are brought into dialogue. The concept of the homogeneous whole is replaced by a two-or multi-layered model in which space is formed of diverse fragments that form a new whole only through their interaction. Both the old and the new are normally handled equally; both receive the same serious intervention. A distance is generated, a difference-based distance rather than a dissonant-based distance. A spatial tension between the many temporal and iconic layers develops, which is discovered and treated as a design concept[94].

These descriptions are intended to highlight distinctions that are not intended to redesign the existing object radically. On the contrary, the old structure is viewed as a medium for reimagining. This attitude is collage-based, juxtaposing various separate set pieces that typically exist in the same setting. Considerable weight is placed on components and materials in this differentiation. Today, architects use this method to make changes to their buildings in most cases. It doesn't matter how big or small the changes are.

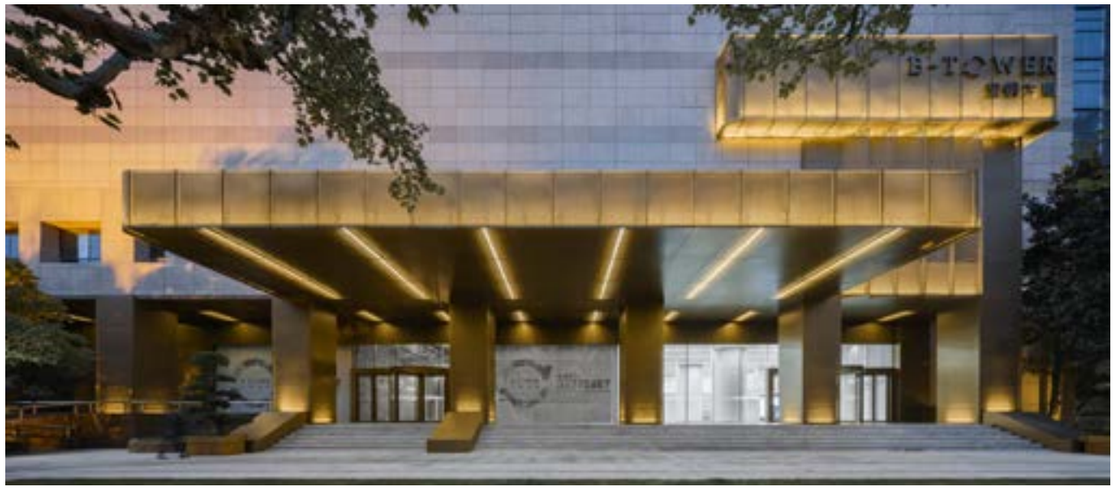
The documentation Centre in the Reichs Party Congress Complex in Nuremberg is a noticeable example of this strategy in action. The theme of disruption, dissection, and laying bare pervades indoor and outdoor spaces, conveying the architecture's sense of critical distance and deconstruction. The architect employs unpolished, almost harsh, details. The original brickwork is left exposed. All internal fittings are made of steel, and as much of the spatial enclosure as possible is glazed. The contrast between diverse layers, the structural difference, is particularly stark.

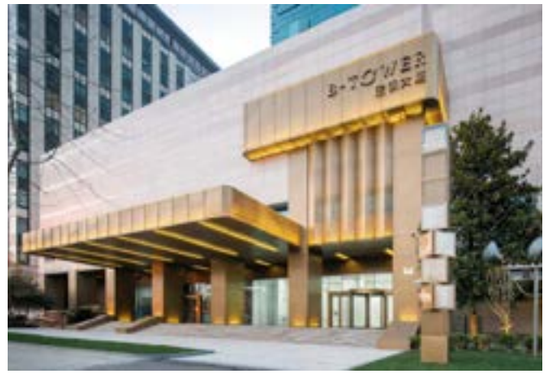
HOST STRUCTURE(EXISTING FABRIC)AS MATERIAL FOR THE “NEW ENTITY.”

The decisions to preserve existing structures for new projects are increasingly driven by pragmatic reasons, such as economic or zoning restrictions. This has resulted in a third essential design attitude: the view of existing structures as freely available and interchangeable “building materials” that may be used directly to manufacture a “new entity.” In general, the existing fabric can be manipulated and interpreted freely; there are no limiting guidelines or laws in place, and there is no “demand for authenticity.” The transition between the old structure and the new addition is perfectly smooth. There is no gap between the old and new buildings. The old is no longer used to showcase the new; similarly, the new is not used to showcase the historical value of the old but rather as an instance of “merging.” This assembly-type is neither clearly old nor clearly new; rather, it encompasses both without making either category or layer discernible. The goal is to look for a way to think about design coherence beyond old and new ideas.

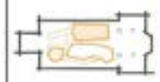
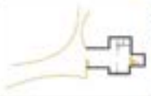
With today’s emphasis on sustainable urban development, using existing structures as base materials has become increasingly common throughout the world. The renovation of Shanghai’s Baosteel Building is an excellent example. It is located on Pudian Road, No.370. It has stood there for 20 years, having been founded in 1998. With time, the previous modern office tower has become increasingly dim. The architects covered the building with perforated panels on some elevations that face the urban space. In the sunlight, the new material will gleam. When the structure is lighted at night, the entire structure will be illuminated. The new façade will give the structure a more youthful appearance and increase the amount of natural light entering the structure. The previously gray public space has been given a fresh look when it comes to interior design.[95]The podium facade is the pink granite material, the main facade of the office tower is mirror green curtain wall which remains the style of 1998.

The renovation of Shanghai’s Baosteel Building , Source https://www.archdaily.cn/





The table 3 , intervention strategies,Source by author

Selected cases by Architectural Form						Architectural expression			Aesthetic fundamentals of adaptive reuse		
Host structure	**Now**	**Former**	**Intervention**	**Diagram**(orange is new,grey is old)	Photo	**The correspondence of host structure and new addition**	**Multi-level preservation**	**The contrast of host structure and new addition**	**Holistic expression and Seeking inspiration in the original**	**Preservation of the scene and spirit of the place**	**Host structure as material for the "new building"**
entity	Caixa Forum museum in Madrid	A former power plant	Superposition					√	√		
entity	The Elbphilharmonie	A storehouse	Superposition					√			√
entity	The Holburne Museum in England	A Grade I listed building	Juxtapositions					√		√	
entity	Copenhagen's Gemini Residence	The warehouses	Wrapping			√			√		√
shell	The Cineteca Matadero cinema	An abattoir and livestock market.	New interior				√				√
shell	An immense church, which has the largest single span nave in England	A community center.	Insertion				√		√		
shell	A 13th Dominican church in Netherlands	Contemporary bookstore	Installation				√		√		√
semi-ruin	The Moritzburg Museum in Halle, Germany	A semi-ruined roofless castle	Weavings					√	√		
fragmented	A new urban plaza in Salemi, Italy.	The conversion of the earthquake-devastated 17th-century church (Chiesa Madre)	Place maker			√				√	
fragmented	Combined living spaces and a hotel, a cultural event auditorium and a residence in Carità de Villorba, Italy	The abandoned concrete skeletons	Consolidator			√					√
relic	Kolumba Museum in Cologne, Germany	The ruins of a late-Gothic church	Glue/Zipper			√	√			√	
relic	Long contemporary ar Museum, in Shanghai, China.	The wharf for coal transportation	Glue/Zipper			√	√		√		
group	Zsolnay Cultural Quarter in Hungary	The preservation of the heritage of Zsolnay family	Infill Bridge			√		√	√		

5.5 THE CONCLUSION OF THIS CHAPTER

This chapter provides an overview of the adaptive reuse strategy for the built environment. The approaches for adaptive reuse creation based on the existing environment are developed on three levels: spatial form, architectural expression, and aesthetic foundation. These three levels comprise the primary body of the design intervention strategy system discussed in this paper.

The three do not exist in isolation but are inextricably linked. According to the table below, adaptive reuse occurs in monolithic buildings with a complete structure whose architectural expression on the exterior tends to be “the contrast of the host structure and the new addition.” Fragmentation or clusters of buildings tend to have an architectural expression of “the correspondence of host structure and new addition.” Due to the internal environment’s stability and controllability, this type is more likely to exhibit a “multi-level preservation” expression. Furthermore, in the process of adaptive reuse of the built environment, “holistic expression and seeking inspiration in the original” and “host structure as material for the new building” as the aesthetic foundation are more accessible to apply in practice than “preservation of the scene and spirit of the place.”

The table 3 summarizes the system of intervention strategies provided in this chapter.

06

CHAPTER

CONCLUSION

CONCLUSION

Climate change has become the most pressing global issue of the 21st century. Asia, the region with the fastest rate of urban population expansion in the previous 20 years, has tremendous economic, social, and environmental difficulties due to increasing urbanization. The urban appearance has undergone radical changes since China's reform and opening up. Particularly since the 1990s, with the rapid development of Chinese cities and large-scale urban renewal, a large number of historical buildings and traditional neighborhoods have been torn down, resulting in serious "constructive" destruction of historical urban features. How could the sharp contradiction between conservation and development be reconciled in seeking sustainable urban development? Adaptive reuse of the built environment has developed as a balancing mechanism in the face of this challenge. In recent years, China has begun to address this issue with legislation and regulations. There have also been theoretical studies from many viewpoints and effective social impact cases, but there are no guiding principles for designers and no developed research on design intervention strategies. Therefore, the author believes that it is necessary to study and explore the application of adaptive reuse strategies in the built environment. From a microscopic perspective, it's critical to offer relevant workers practical expertise to avoid unnecessary issues in practice; from a macro perspective, the conflict between conservation and development in the urban development process can be better resolved.

The urban built environment refers to the human-made environment that provides human activity settings, including homes, buildings, zoning, streets, sidewalks, open spaces, etc. Historic structures, stock buildings, and old city neighborhoods and blocks are essential components of the historic urban fabric. These three integrate multiple values of cultural and emotional, social and environmental, and economic dimensions and are material carriers of urban history and culture. Adaptive reuse is reusing existing materials to preserve and develop the built environment. It is required to first understand the term's historical evolution and roots in order to comprehend this act.

Before the 19th century, several political and religious structures were utilized to meet the ruling class's interests and economic considerations. The reuse of buildings during this period was spontaneous and unconscious and had nothing to do with architectural conservation. By the 19th century, with the rise of archaeology, many people became interested in monuments. There was a restoration debate between Le-Duc and Ruskin. The former claimed stylistic restoration, which restored the heritage and found a use for it; the latter claimed anti-restoration, which argued that people who should be

present had no right to touch or preserve them in their current state. Even though the two views are very different, later academics say they both deal with the same essential question: how to define authenticity.

By the turn of the 20th century, the conservation of historic structures had garnered widespread discussion and attention as a result of the devastation caused by war. On the theoretical side, Alois Riegel, an Austrian historian, distinguished the various types of heritage values. On the practical side, Camillo Boito, an Italian architect, distinguished three different approaches to restoration and eight guiding principles to help architects distinguish between original structures and subsequent modifications in their practical work. Following that, the Athens Charter of 1931 and the Athens Charter of 1933 were adopted, which profoundly affected the conservation of the built heritage and its surroundings, despite their distinct objectives. Finally, the Venice Charter established the framework for adaptive reuse, resulting in the modern definition of this term. By the late 20 th century, adaptive reuse had become a field of study in the architectural discipline due to its theory and practice development.

Today, building vibrant, green, and resilient cities is possible by putting them on a sustainable development path. Adaptive reuse of the built environment is a critical strategy for achieving sustainable urban development because it contributes to cultural continuity, economic development, and the resolution of numerous social and environmental issues. It is also a strategy that maintains a balance between conservation and development. It applies to the conservation of historic buildings and the renovation of stock buildings and older urban areas. These three types of adaptive reuse for built environments address a different inner core, and defining them helps us focus on the things we can change when we work with different types of built environments.

When adaptive reuse is applied to historic buildings, its theoretical foundation is first and foremost conservation, followed by the search for functions that are suited to the structure, transforming it into a usable space that serves the public interest. It is tasked with the responsibility of transferring urban heritage and architectural art to future generations.

The adaptive reuse of existing architectural stock is theoretically aimed at the goal of extending its useful life through new functions that address contemporary needs. It enables recycling to provide environmental, economic, social, and cultural benefits in accordance with the requirements of sustainable urban development.

When adaptive reuse is applied to urban renewal, it is essentially an important tool for urban planning and requires the support of relevant government policies. It encompasses both of the above, with various approaches summarized here in three common threads. The first one is that adaptive reuse should preserve the integrity of existing structures and their surroundings when revitalizing a neighborhood while demanding as little intervention as possible when new uses are required. Second, adaptive reuse should protect the symbolic importance of historic structures and promote community participation. Finally, adaptable uses should be given more attention to help the local economy and make the area more livable.

Before beginning design work for the built environment, it is critical to understand and respect the historical context of the buildings in a suitable manner. Allowing regeneration or extending its life is a central objective of design interventions, and any additions or alterations should be based on a complete and long-term consideration. The implementation process must preserve its materials and techniques and distinguish between old and new levels for future generations to recognize it. Simultaneously, extensive preliminary research and studies are necessary due to the increased expenses and technical obstacles that ensure the project's success throughout execution.

To effectively assist the practice of reuse of the built environment, the author summarizes and concludes the adaptive reuse methods of the built environment on three levels: spatial form, Architectural expression, and aesthetic fundamentals, which comprise the main body of this article's design intervention strategy system. The architectural form is classified into six categories: "entity," "Shell," "The Semi-Ruin," "Fragmented," "Relic," and "Group." They are based on their current original structures, which we refer to as host structures in the study.

Existing buildings that are structurally intact and in the process of being adapted to new uses typically retain the completion of the structure because this type of building is predominantly a conservation type of building. It is mainly in the form of additions to the main structure, which serve to integrate old and new activities or to act as a carrier for new functions, that the intervention takes place. The paper provides three intervention strategies: superposition, juxtaposition, and wrapping.

Structures that are highly available on the outside but are obsolete or ruined on the inside are called "shell." This form of intervention is typically targeted at the interior spaces of a building's structure. The new functions introduced into the interior of the building must be compatible with the structural and

cultural context of the existing structure to maximize the usage of the current structure. In the case of preserved buildings, they are designed to be as flexible as feasible in terms of composition, décor, and furniture. The following adaptive reuse strategies are mentioned in the text: new interior, insertion, and installation.

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The structure of the building is largely damaged, and although it is in a state of disintegration, the general structure of the building can still be seen. In this case, adaptive reuse becomes an act of invention. This form of reuse is frequently justified by two factors: first, it is a historically significant conservation structure. Second, for economic reasons, abandoned, unfinished constructions are repurposed. At this point in the paper, we explain how to intervene with each of the two contributing elements. Placemaking is an effective method of preserving a site's historical and cultural significance, and economic reasons can affect consolidation decisions.

A relic of the past recalls the significance of an event, a history, a period of time through adaptive reuse. In the urban context, there are numerous ways of reuse for this category. We may broadly divide it into two primary types, one as part of an urban park and the other as a building that can be renovated for public access. This research focuses on the second kind, Glue, and zipper, as creative and effective means of design intervention.

A group is a collection of structures, the most common of which is a city's industrial park. It is a resource that can be redeveloped in contemporary urban development. Due to the fact that they are a synthesis of numerous types of structures, their intervention methods frequently coexist in a variety of ways. Combining "infill" with "bridges" is a widespread intervention technique, which involves filling in gaps with new functional buildings, linking the various functional blocks via bridges, and eventually constructing new forms. Extending the space to alter the spatial pattern by parasitizing the main building is another appealing technique of adaptive reuse intervention.

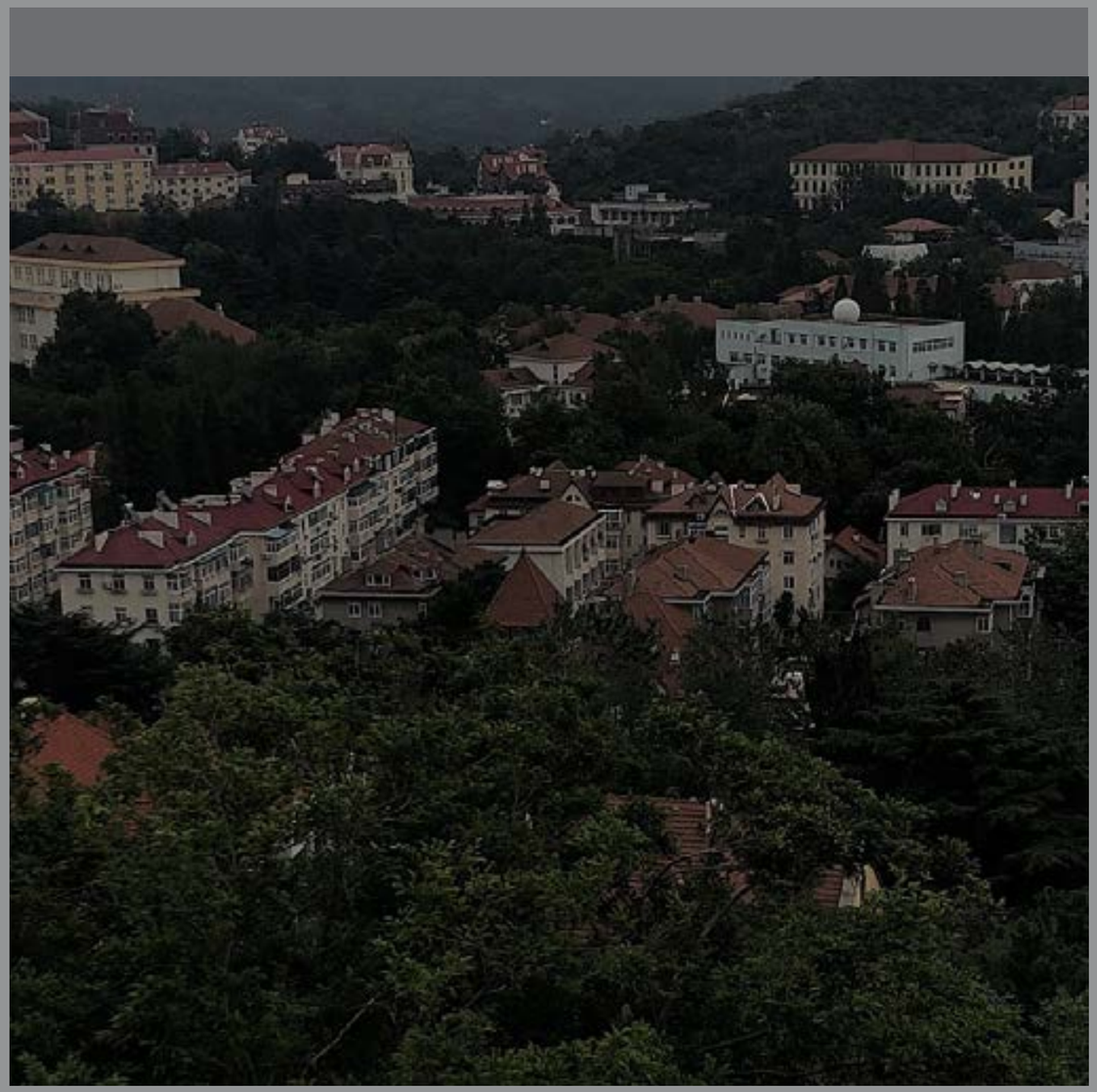
Second, the architectural expression is the most intuitive reflection of the building's external appearance and an important carrier of the building's readability and historical and cultural style. The integration of old and new, multi-level preservation, and the contrast of old and new are all possible strategies of building expression, and each of these three strategies has distinct characteristics and is applicable to distinct objects. Additionally, aesthetic fundamentals must be met regardless of the architectural form or expression used to handle existing structures and new functions. The following strategies can be used to establish aesthetic foundations: first, a holistic expression that draws inspiration from the original structure; second, the preservation of the scene and spirit of the place; and third, the use of the original host structure as a material for the new structure.

The three do not exist in isolation but are inextricably linked. According to the table below, adaptive reuse occurs in monolithic buildings with a complete structure whose architectural expression on the exterior tends to be "the contrast of the host structure and the new addition." Fragmentation or clusters of buildings tend to have an architectural expression of "the correspondence of host structure and new addition." Due to the internal environment's stability and controllability, this type is more likely to exhibit a "multi-level preservation" expression. Furthermore, in the process of adaptive reuse of the built environment, "holistic expression and seeking inspiration in the original" and "host structure as material for the new building" as the aesthetic foundation are more accessible to apply in practice than "preservation of the scene and spirit of the place.

While the strategies outlined above can contribute to optimizing the built environment, there is no "one-size-fits-all" solution, and prescribing a formula is equally dangerous and presumptuous. Each design intervention method has its own adaptations and characteristics, and they can be used independently or in combination on a project. Different strategies should be chosen based on the existing building's location and context, function and type, and value, customs, and traditions.

PART II

01



PROJECT 1 RENEWAL OF SIFANG ROAD HISTORICAL & CULTURAL DISTRICT IN QINGDAO

Location: Qingdao, Shibei District,China

Architect: BDP Shanghai

Client: Qingdao Municipal Bureau of Urban Resources Planning

Intervention strategies: Insertion, Link, bridge, weaving, Place maker

1.1 THE BACKGROUND OF THE PROJECT

The Overview of Qingdao

Qingdao is located in Shandong Province in the eastern part of China, on the west coast of the Yellow Sea in the Pacific Ocean, across the sea from Korea and Japan. It is now an important central city along the coast of China, a coastal resort tourist city, an international port city, and a national historical and cultural city. The city consists of seven districts and three cities, with a total area of 11,293 square kilometers. Among them, 5,226 square kilometers are in the urban area (Shi Nan, Shi Bei, Li Cang, Lao Shan, Qingdao West Coast New Area, Cheng Yang, and Jimo) and 6,067 square kilometers in Jiao Zhou, Ping Du, and Lai Xi. 2021 7th National Census shows that the resident population of Qingdao is 1,071,700. In the 2019-2020 Global Urban Competitiveness Report released by the Chinese Academy of Social Sciences (CASS) and UN-Habitat, Qingdao was ranked among the top 200 cities in the world in terms of urban economic competitiveness, ranking 76th and 144th in terms of sustainable urban competitiveness. Qingdao is ranked 76th in economic competitiveness and 144th in terms of sustainable competitiveness[96].

02

01. Old town in Qingdao
02. The location of Qingdao

THE URBAN HISTORY OF QINGDAO

Qingdao's urban development dates back to the late 19th century when the Qing government decided to fortify Jiao'ao in 1891, and the city was established. In November 1897, Germany occupied Jiao'ao and signed the Treaty of Lease of Jiao'ao and its surrounding areas for 99 years, building a free port and the Shandong Railway. On October 12, 1899, Kaiser Wilhelm II decreed that the newly built city in the leased area would be the capital of the leased area, named "Tsingtau"; Qingdao was officially born as a city. In 1900, the Governorate of Jiaozhou prepared the first city plan in the history of Qingdao, the "Qingdao City Plan." The Jiao'ao government demolished the former Chinese villages and built a modern port city in the German-style according to the city plan, setting the modern Qingdao's urban pattern and architectural style. Due to the port and railroad construction, the railroad was laid deep into the hinterland of the Shandong Peninsula, thus making Qingdao the hub of German-Japanese commerce in China, which evolved from a remote fishing village to a commercial city during the German lease period[97].

After the outbreak of World War I, Japan replaced Germany in 1914 to occupy Jiao'ao, carry out military colonization, and build many spinning factories in Sifang and Cangkou. Chinese merchants also created Huaxin Yarn Factory.

Japanese-style residential areas were built on the north side of Dabao Island and Tatau Road, with stores on the first floor and residences on the second floor along the street. At the same time, Chinese-style patio courtyards were built on the north side of Taisi Town and the south side of Dabao Island, and simple labor dormitories were constructed in the industrial area. On December 10, 1922, China took back Jiao'ao, and its administrative area was the same as that of the German Jiao'ao Concession. In 1929, the Nanjing Nationalist Government took over the commercial port of Jiao'ao and established Qingdao Special City in July of the same year, which was renamed Qingdao City in 1930. In January 1938, the Japanese invaded Qingdao again. In September 1945, the Kuomintang government took over Qingdao, which remained a unique city. In June 1949, after the liberation of Qingdao, it became a city under the jurisdiction of Shandong province.

01. Qingdao during the German occupation in 1912
02. The conceptual map of Qingdao during the Japanese period
03. Map of changes in Qingdao city boundaries from 1899 to the present

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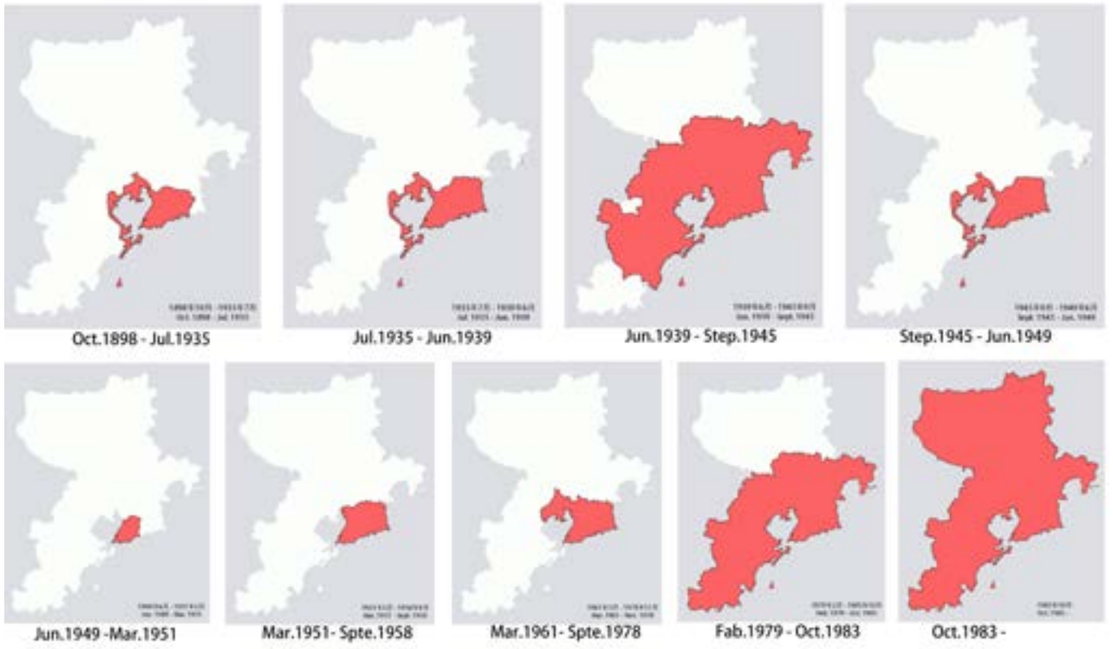

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03

HISTORICAL & CULTURAL DISTRICT IN QINGDAO

In terms of Qingdao's urban development history, the four stages it went through were first. The initial completion of urban planning and construction during the German occupation period and the formation of a trade center; secondly, the transformation of industrial development during the Japanese drama period; then, the focus on public construction during the National Government period and finally, the beginning of modern urban construction

01

during the People's Republic of China.

In July 2021, Qingdao released the "Qingdao Historical and Cultural City Protection Plan (2020-2035)". It aims to protect the cultural heritage of Qingdao in various historical periods, inherit and continue the spatial pattern and characteristics of the city, and improve the quality of the urban living environment by shaping the historical and cultural atmosphere of the city. The plan defines the scope of protection of the historical city center of Qingdao and the key historic and cultural districts to be protected. The protection content has also been expanded from the protection of independent historical streets and buildings to a more comprehensive urban fabric and the relationship with the natural landscape environment[98]. The document identifies 15 significant protected historic districts Figure 0 1(p118), including the following:

1, Zhongshan Road Historic and Cultural District
2, Guantao Road Historic and Cultural District
3, Shanghai Road - Wuding Road Historic and Cultural District
4,Yushan Historic and Cultural District
5, Guanhai Mountain Historic and Cultural District
6, Signal Mountain Historic and Cultural District
7, Guanxiang Mountain Historic and Cultural District
8, Huangtai Road Historic and Cultural District
9, Wudi Road Historic and Cultural District
10, Sifang Road Historic and Cultural District
11, Yangxin Road Historic and Cultural District
12, Changshan Road Historic and Cultural District
13, Bagan Mountain Historic and Cultural District
14,Badaguan-Huiquanjiao-Taipingjiao Historic and Cultural District
15, Olympic Sailing Center Historic and Cultural District

Among them, 1 to 12 are all traditional residential-type historic districts, with historically protected structures and traditional residential-type structures on the lots. They formed a community scale, preserving a specific street texture, reflecting the local folklore characteristics of a particular historical stage, and defining the urban district's unique appearance.

This study presents the application of adaptive reuse projects in Qingdao, taking the renewal of the Sifang Road historical and cultural district as examples. The following figure shows the location of this area.

01. 15 significant protected historic districts in Qingdao
02. The location of Sifang Road historical district

1.2 SIFANG ROAD HISTORIC DISTRICT

SITE ANALYSIS

The core protection area of the Sifang Road Historical and Cultural District covers a total area of 42.1 hectares. It protects ten cultural relics protection units, six historic buildings, and 217 traditional-style buildings in this district; it protects 15 roads with a checkerboard pattern; it protects the unique courtyard buildings. The project presented here, a part of the district, is shown below phpots.

The Sifang Road neighborhood is located in the only historical and cultural memory district in Qingdao, with well-maintained overall architectural features, a clear road network, and a strong sense of street sequence in the area. There are many landmarks within a 500-meter walking distance, and the accessibility by car is relatively good. At the same time, the base also faces many difficulties, such as the lack of parking space, the homogeneous checkerboard pattern, and the lack of open square space.

Sifang road architectural features in today

HISTORICAL BACKGROUND

Chinese business history: The Living area of Chinese merchants has deep historical memories

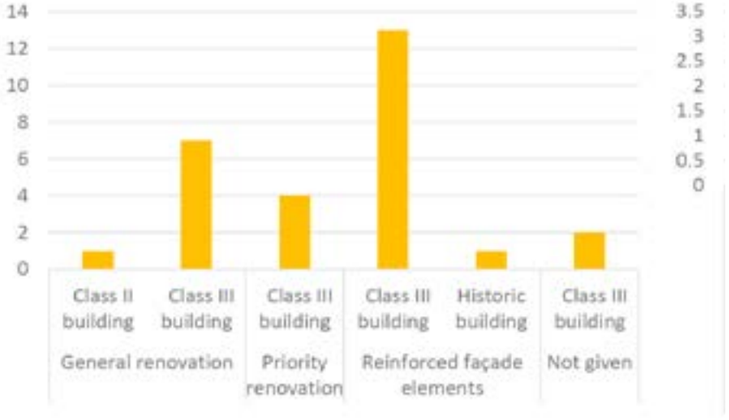
Beginning in the winter of 1900, the Chinese community on Dabao island built a n e w Chinatown. Due to colonial aggression, lack of capital, and backward technology, most Chinese businesspeople relied on foreign powers to make a living by taking other resources. The Chinese merchants who lived in jiao zhou bay became the earliest commercial operators in Qingdao during the German occupation period(1898-1914). In the later period, the development of the bank’s capital entered a prosperous period. The massive wealth focus and explosive expansion of the Chinese area began. In the first 50 years of the 20th century, the history of local business communities from different regions was made by Chinese business communities. As a core business circle with a history of 100 years, the area of Dabao island cannot be separated from the most concentrated Qingdao Chinese time-honored brands[99]. The 1950s history of trade development has given Sifang Street its traditional open square and pleasantly sized pedestrian environment, as shown below diagram02.

FROM THE RISE OF LIYUAN TO ITS DECAY, IT IS ROUGHLY DIVIDED INTO THE FOLLOWING SIX STAGES

- City establishment. The Navy Office of the Qing Dynasty was established in Qingdao, and Qingdao was officially established as a city
- LI yuan Formation: During the German occupation of Qingdao, the first houses with both commercial and residential uses were built, which became Li-yuan.
- Development period: The German planned to expand the Chinese district, and the construction of the Li-yuan was at its peak. A large number of residences in the form of Li-yuans appear as two-storey structures, with commercial on the second floor and residential on the second.
- Golden age :As many as 706 Li-yuans have been built.
- Stagnation: Uildings fall into decay
- Decay: The government begins to intervene to preserve them

BUILDING QUALITY EVALUATION

Conservation level and Suggested strategy



1 | 3
2 | 4

01. The evolution of Sifang Street is depicted in this timeline.
02. Spatial relationship of Sifang street
03. Protected building plan
04. Conservation level and Suggested strategy

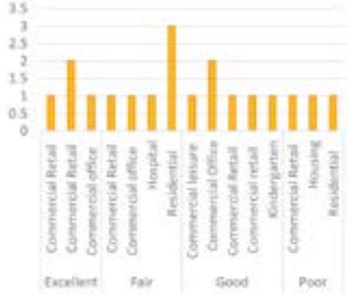
Table 3 Statistical table of architectural features, conservation levels and intervention strategies for conservation categories

Number	Period	Conservation level	Area/	Characteristic elements on the facade	Suggested strategy
1	1898-1914	Class III	106	Traditional yellow walls with white special window frames	Reinforced façade elements
2	1898-1914	Class III	620.7	Traditional yellow walls with white window frames and arched doorways	Reinforced façade elements
3	1898-1914	Class III	187	Traditional yellow walls with white window frames	General renovation
4	1898-1914	Class III	319.1	Traditional yellow walls with white window frames	General renovation
5	1898-1914	Class III	96	Traditional yellow walls with white window frames	General renovation
6	1898-1914	Class III	218.2	Traditional yellow walls with white window frames and arched doorways	Reinforced façade elements
7	1898-1914	Class III	283.5	Traditional yellow walls with white window frames	General renovation
8	1914-1922	Class III	324.3	Traditional yellow walls with white window frames	General renovation
9	1898-1914	Class III	305.8	Traditional yellow walls with white window frames	Priority renovation
10a	1929-1937	Class III	190.6	Traditional yellow walls with white window frames	Reinforced façade elements
10b	1898-1914	Class III	159.8	Traditional yellow walls with white window frames, Featured Parapet	Reinforced façade elements
11	1914-1922	Class III	294.6	Traditional yellow walls with white window frames and arched doorways	Reinforced façade elements
12	1898-1914	Class III	88.5	Traditional yellow walls with white window frames,rock footing	General renovation
13	1898-1914	Class III	162.9	Traditional yellow walls with white arched window	Reinforced façade elements
14	1898-1914	Class III	14.6	Red brick with white window and Featured Parapet	Reinforced façade elements
15	1929-1927	Class III	211.3	Red brick with white window and Featured Eaves	Reinforced façade elements
16	1898-1914	Class III	292	Featured Eaves	Reinforced façade elements
17	1898-1914	Class III	373.8	White cement plastering	Priority renovation
18	1898-1914	Class III	105.1	Yellow walls	Priority renovation
19	1914-1922	Class III	272	Gray walls	Priority renovation
20	1898-1914	Class III	130	Modern materials and special balcony railings	Reinforced façade elements
21	1898-1914	Class III	386.5	Gray walls and Featured Parapet	Reinforced façade elements
22		Class III			
23		Class III			
24	1898-1914	Class III	499.8	Gray walls, arched doorways	Reinforced façade elements
25	1929-1937	Class III	289.6	Traditional yellow walls	General renovation
26	1929-1937	Class II	566.8	Gray walls	General renovation
27	1937-1945	Historic	145.3	Gray walls and yellow walls	Reinforced façade elements
27	1937-1945	Historic	145.3	Gray walls and yellow walls	Reinforced façade elements

Existing building quality and function

Number	Existing Function	The current frequency of use	Area/	The existing quality of façade
1	Commercial Retail	Medium	103.5	Fair
2	Residential	High	208.4	Fair
3	Commercial Office	Low	1416.9	Good
4	Commercial Retail	Medium	1573.9	Good
5	Commercial leisure	Low	1967.4	Good
6	Commercial office	High	208.2	Fair
7	Commercial office	Medium	1540.2	Excellent
8	Commercial retail	High	2146.8	Good
9	Commercial Retail	High	741.7	Excellent
10	Commercial Office	High	678.6	Good
11	Housing	Unknown	561.5	Poor
12	Commercial Retail	High	396.1	Excellent
13	Commercial Retail	High	208.7	Excellent
14	Residential	Medium	355.8	Poor
15	Hospital	High	760.9	Fair
16	Kindergarten	High	579.5	Good
17	Residential	High	1161.8	Fair
18	Commercial Retail	High	69.2	Poor
19	Residential	Medium	783.6	Fair

01. non-conservation buildings plan
02. Statistical table of functions and frequency of use of non-conservation buildings
03. Statistical table of Existing building quality and function



1.3 DESIGN STRATEGIES OF URBAN REGENERATION IN THE SIFANG STREET BLOCK

FROM THE PERSPECTIVE OF URBAN RENEWAL, THE DESIGNER PROPOSES THE FOLLOWING FOUR STRATEGIES.

1, Create multiple types of dynamic public nodes to attract more users. The linear park links the north and south streets, while pocket parks and an inner courtyard add to the street's liveliness. For example, Jiaozhou road is a public vitality center to pull the vitality of the whole area.

2, The creative industry drives the development of the block and forms a well-matched mixed block. The area is divided into different functional zoning: The south area is mainly occupied by the creative office, and a residence mainly occupies the north with sufficient commercial supporting facilities. The leading industry is creative industries, and the functional groups each have a distinct theme but merge.

3, Create a walking-friendly neighborhood to improve street comfort and experience. Traffic organizations define the grade of roads and establish time-division restrictions based on the notion of "Super Blocks." For example, To create a pedestrian priority zone with a slow-walking block and a walkway that connects landmark buildings to public space.

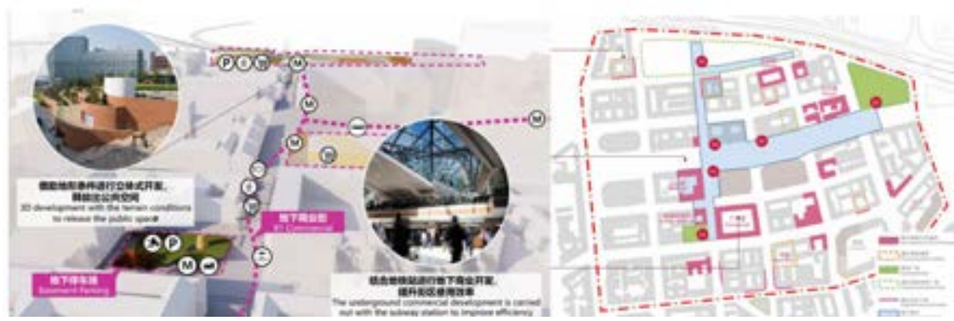
4, Above ground and underground compound development maximize block value. Firstly, the public space is released by three-dimensional development with the help of topographic conditions. Second, underground commercial development combined with subway stations to enhance the efficiency of block use.

multiple types of dynamic public nodes

The creative industry

walking-friendly neighborhood

Above ground and underground compound development



1.4 DESIGN INTERVENTION STRATEGIES

The Sifang neighborhood uses four design elements - a linear park, four thematic streets, several cultural landmarks, and industrial clusters - to renew the overall environment of the district. They are used on different roads to connect and interact with each other through these four elements. Multiple adaptive reuse intervention strategies are used. The relationship between design elements, zones, and intervention strategies can be found in the table below.

The site layout

Table 5 Intervention strategies of the project

Graphic	Design elements	Areas	Adaptive reuse's intervention
	A linear park	Jiaozhou road	Link Bridge
	Four theme streets	Boshan Road Haipo Road Zhifu Road Yizhou Road	Space maker Weaving
	Multiple cultural landmarks	Jiaozhou Road - Boshan Road Node Jiaozhou Road - Zhifu Road Node Sifang Road - Yizhou Road Node	Insertion Parasite Weaving
	An area of industrial clusters	Civic Park(car parking) Living & Recreation Centre Urban Vitality Corridor Industrial Creative Centre	Zipper/Glue

LINK- A LINEAR PARK

Jiaozhou Road is transformed into a linear park with three themes, linking the north and south areas. The three themes are interpenetrated through the design concept. The first step is to separate the traffic and pedestrian flow. Then, the park is set up with different entrances and distributed at essential nodes. Finally, the building facades along the street are remodeled, and landscape elements are incorporated.

Link- a linear park

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SPACE MAKER AND WEAVING-FOUR THEME STREETS

Compared with the other two streets, the overall height difference between Haipo Road and Boshan Road is relatively large, and the setting of the landscape can make pedestrians feel rich in the walking process. Three modes can be planned according to the different functional needs of the neighborhood: daily mode can take into account car traffic, festival market mode, and pedestrian mode. The streets, buildings, people, and landscapes are integrated with the neighborhood through a series of facilities such as mobile flower boxes, seats, and outcrops to build different functional scenes.

Yi Zhou Road's overall height difference is not significant. For the main car road, we use big leaf maidenhair as street trees in the plant design process, four seasons evergreen, rain gardens also on the car and pedestrian space to divide, safe and at the same time enrich the road landscape.

Zhifu Road's overall height difference is relatively smooth and will introduce catering enterprises to move in. The gentle site also provides conditions for catering out.

01. Boshan street
02. Haipo street
03. Zhifu street
04. Yizhou street
05. Four theme streets plan
06. Three modes: daily mode, festival market mode, and pedestrian mode

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MULTIPLE CULTURAL LANDMARKS

INTERVENTION STRATEGIES FOR JIAOZHOU ROAD - BOSHAN ROAD NODE

Link

The number of party walls that divide this block makes it difficult to create a single experience, so it was chosen to enhance the existing small-scale connection in the center and generate a node point by creating a glazed courtyard condition that projects past the roofline.

Insertion

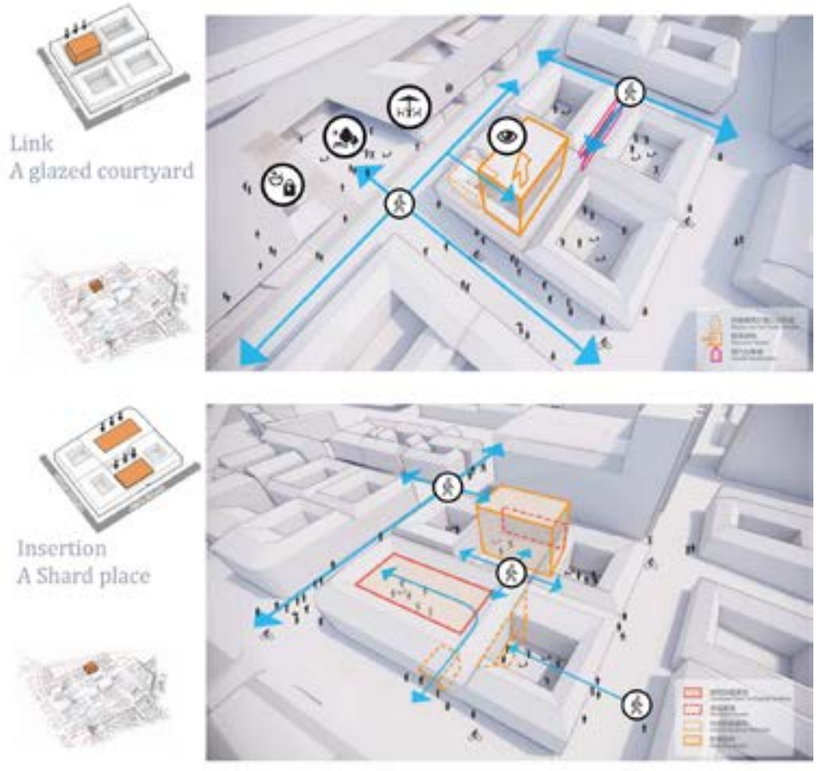
Another block has a number of divisions, increasing the difficulty of creating a cohesive experience. One of the main interventions is to internalize the courtyard in the most significant building, with a minimal glazed roof. The most important intervention is to rebuild a carefully selected building, creating a new shared heart space that connects to the other structures within the block, announcing it by extending beyond the retained facade line.

Bridge

The block to the northwest corner would ordinarily not enjoy a significant connection to the rest of the scheme. But by connecting the park edge directly into the block and opening up the internal space to generate a more public courtyard with a modern canopy. This design embodies the themes of exploration and discovery within the project.

Place maker

The framework of this block and consistent frontage provide an excellent opportunity to enhance the center of the block. By surgically removing the internal building and updating the west frontage with an internal courtyard, the space becomes a vital F&B node with good permeability to the wider region.



Intervention strategies

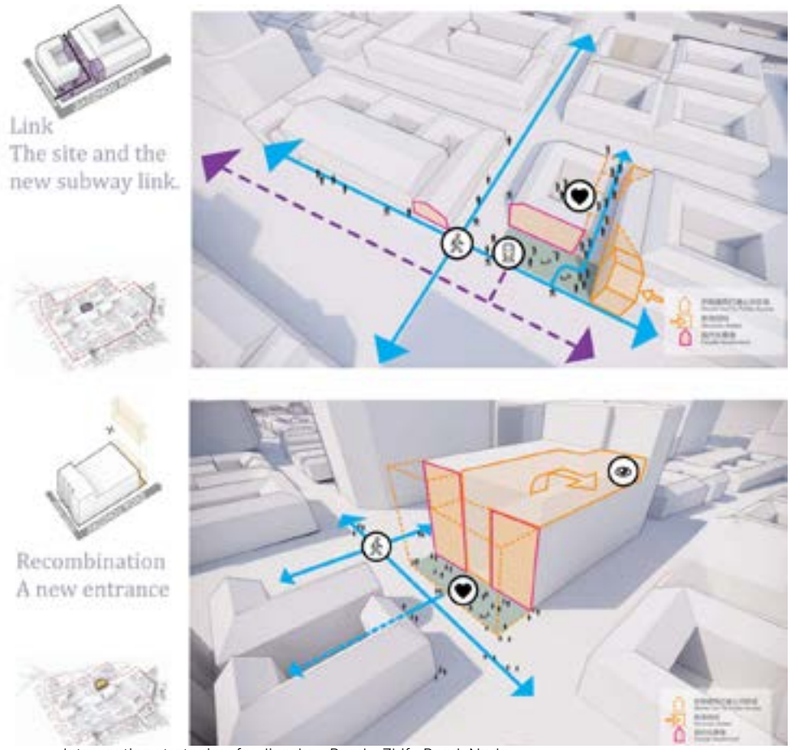
INTERVENTION STRATEGIES FOR JIAOZHOU ROAD - ZHIFU ROAD NODE

Link

The metro connection provides a significant axis for movement through the entire site. This block has been articulated to make it as permeable as possible. They were cutting through the whole block to engage two streets together. The exposed facades would be treated in a clean, modern manner to reflect the centrality of the plot and the new Metro Connection.

Recombination

One of the boldest movements within the north blocks is to cut back a commercial building. This way creates several new experiences and conditions. Firstly it opens the courtyard to the center, providing a new entrance to the block. Enclosing the roof reintroduces the area lost by cutting and a new viewing platform. Cutting the block back connects to the main pedestrianized street, and the new facade directly engages the historical block to the East



Intervention strategies for Jiaozhou Road - Zhifu Road Node

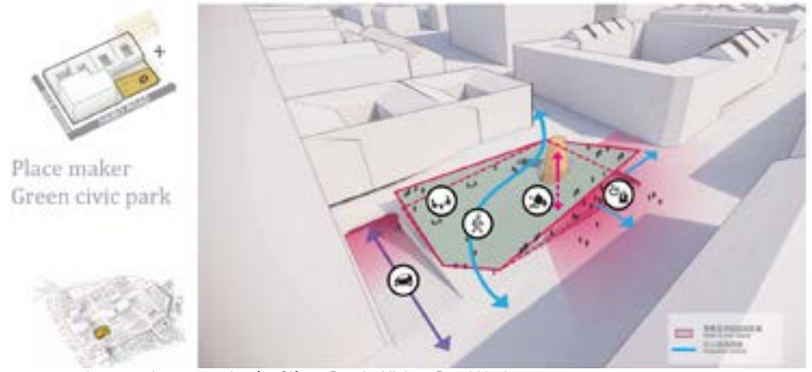
INTERVENTION STRATEGIES FOR SIFANG ROAD - YIZHOU ROAD NODE

Place maker

Reinventing open spaces for new public use is also an integral point of the study. This “Pavillion” creates a new green civic park with connections back to the north. It provides a community, basement car park, and small retail offering under the roof canopy. The roof also creates a theater to watch movies.

AN AREA OF INDUSTRIAL CLUSTERS

Regenerating the Northmost Car Park would enhance the overall area extensively and provide an anchor point to the social offering. An inviting new civic green space, 20,000sqm vehicle parking, and a modest retail offering respond to the street edge and mask the elevated highway.



Intervention strategies for Sifang Road - Yizhou Road Node

An area of industrial clusters

MASTERPLAN (PROJECT 2) THE INTERIOR DESIGN OF A PRIVATE SCHOOL FOR THE AFFILIATED MIDDLE SCHOOL OF CENTRAL MINZU UNIVERSITY IN QINGDAO

Location: Qingdao, Chengyang District,China

Architect: TYDI Qingdao

Principal In Charge: LIU Sha Sha

Client: Qingdao Dongtou Cultural Industry Co., Ltd

Intervention strategies: New interior, insertion, installation

2.1 THE BACKGROUND OF THE PROJECT

Chengyang District is located north of Qingdao City (Figure 0 18 lift), covering 553.2 square kilometers and eight subdistricts as of 2020. This project is being built in Jihongtan(Figure 0 18 Right), a subdistrict of Chengyang District. The CRRC Qingdao Sifang Locomotive & Rolling Stock Co., Ltd. (hence referred to as CRRC Sifang), which was initially located in Qingdao's Sifang District, was progressively transferred to this area in 2006 with consent from the Chinese Ministry of Railways. The precursor of CRRC Sifang was the Shandong Railway's Sifang General Repair Works, which was constructed during the German occupation of Qingdao. After it began operations in 1903, it was responsible for all repair work and rolling equipment on the Jiaoji Railway. All locomotive components built by the company were imported directly from Germany.

It survived the war with Japan, the civil strife, and the famine, but it remained resilient. Today, CRRC Sifang is one of China's largest railroad rolling stock equipment manufacturers, with 66% of China's high-speed trains departing from Echinohontan. Due to the factory's vast and complicated industrial chain, over 120 industries that provide core support have begun to settle in Jihongtan, with the local support rate of products reaching around 40% and the level of industrial agglomeration ranking first in China[100]. China's first national technological innovation center, the "National High-Speed Train

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Technology Innovation Center," was created in Qingdao on September 5, 2016. It is a global and professional innovation platform that the government has developed for research institutes, universities, businesses, and other stakeholders. Its primary mission is to conduct research and development and apply cutting-edge and essential standard technology to the high-speed train industry[101].

However, regional urban planning has received scant attention despite the significant growth of the rail industry in the area over the last decade. Many of the temporary manufacturing facilities were misordered, with substandard livability and immature adjacent residential circumstances. Taking advantage of the National Technology Innovation Center's establishment, the Chengyang government formally presented the concept of "Highspeed Train Town," centered in Jihongtan District, as a driver for economic development and industrial restructuring in the region. Qingdao Motor Town Investment Group Co. was created on March 31, 2017, as a Chengyang District-based state-owned investment firm.[102] The company has developed an urban renewal strategy for the Jihongtan neighborhood (Innovation Center). The Qingdao World High-Speed Train Town Comprehensive Plan has already been announced to transform the area into a national high-speed train technology innovation center with global significance. The objective is to integrate industry and city to create a pleasant, trendy, elegant, world-class train town. The plan forecasts that the region's urban resident population will reach 300,000 in the long run. It is a new, technologically advanced, intelligent, ecologically sound, and sustainable metropolis built on a new model of train transit[103].

01. the location of Chengyang district, Source: Sasaki
02. Jihongtan district, Source: Sasaki
03. The CRRC Qingdao Sifang Locomotive & Rolling Stock Co., Ltd
04. Personal rapid transit
05. The public transportation system

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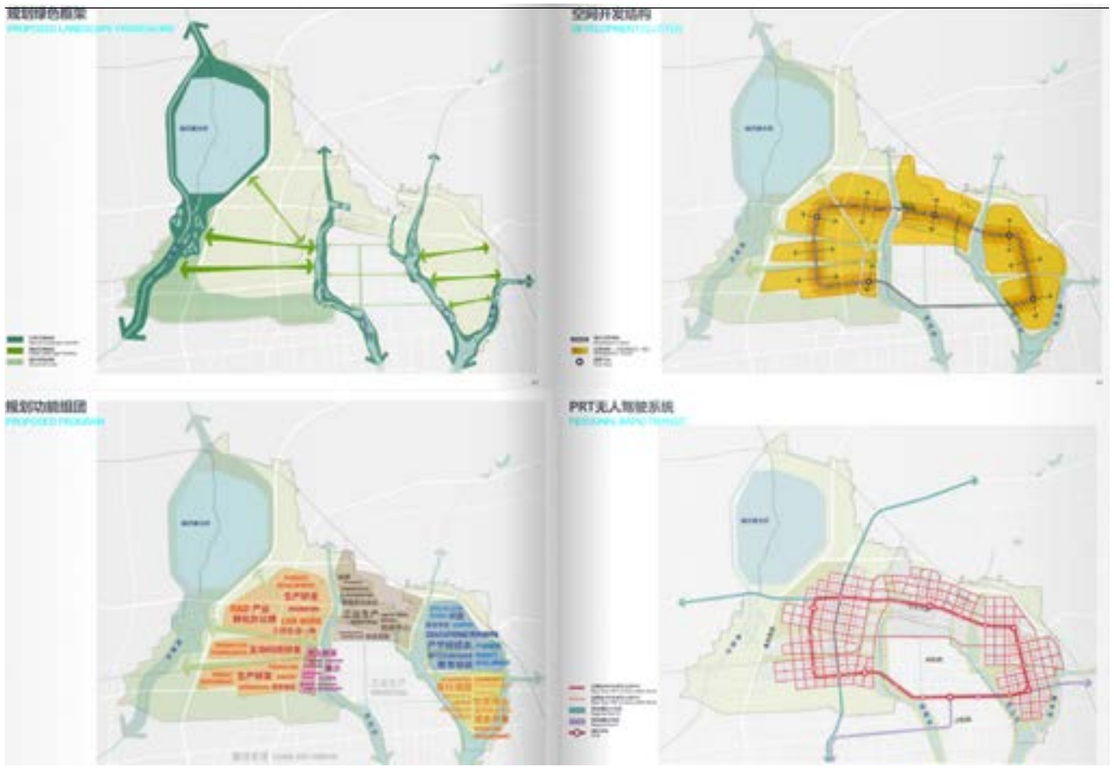

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Its regional renewal strategy is centered on the following four points:

1, building a green framework, making the three rivers into natural landscape corridors with multiple planned landscape corridors.

2, the spatial structure of industrial clustering is defined by the major urban axis and several associated nodes.

3. Following the existing regional functional layout, mixed and infilled functional blocks are added to complete the city's functional plan.

4. The public transportation system is comprised of an urban ring road and a PRT system.

"The general framework of the site is formed under the principle of ecological planning. It unifies the fundamental urban functions and industrial developments. The city and developments have the opportunity to grow harmoniously together. With its rich natural resources, the study area can be transformed into a sustainable city focusing on the high-speed rail industry. New R&D core area developments will serve as the identity of the region. The National High-Speed Rail R & R & D Hub strives to lead alternative transportation technology globally."

— *SASAKI*

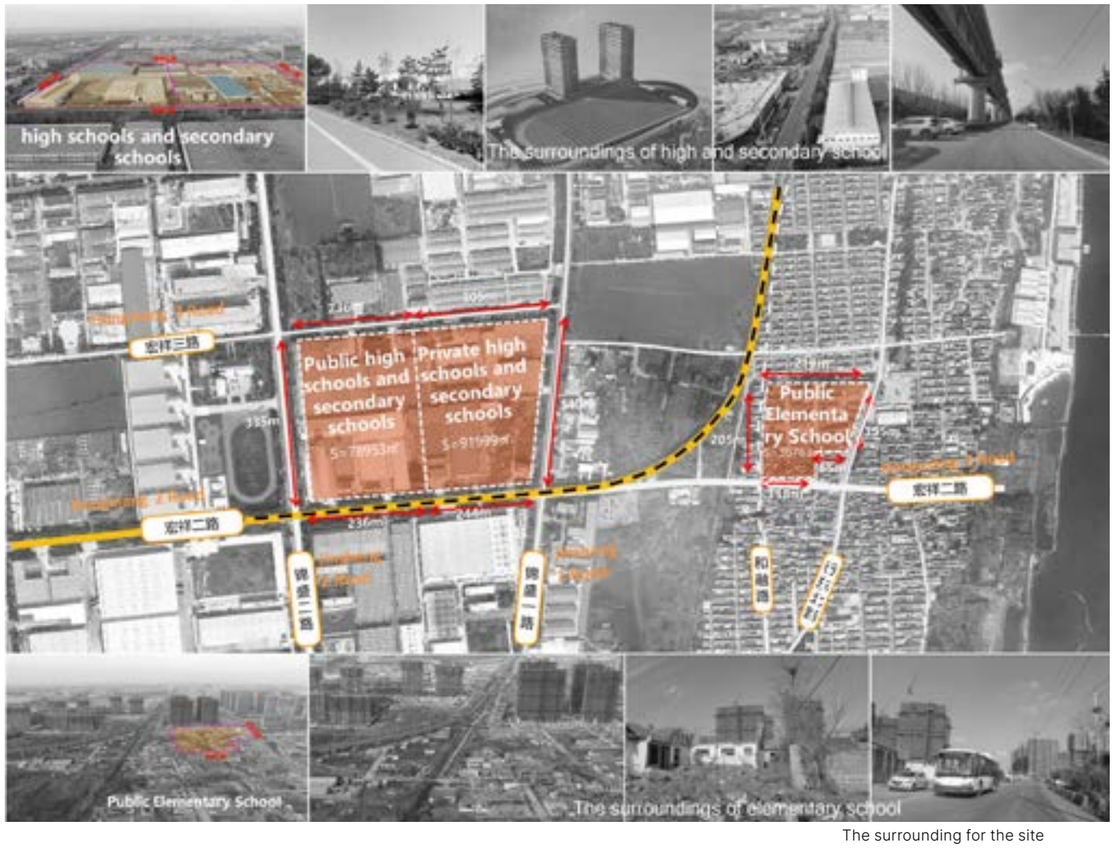
2.2 THE CONSTRUCTION SITE

At the end of 2018, Qingdao Chengyang District Management Committee and Central Minzu University signed a contract to build the Qingdao School of the Affiliated High School of the Central Minzu University in Chengyang District. Qingdao Dongtou Cultural Industry Co., Ltd is responsible for the investment. Qingdao School has an entire planning site of 205,334,000 square meters. The school is divided into full-time public schools and private schools. It will add 7,500 new quality education seats in this area, including 1,620 for elementary school, 3,000 for public junior high school and high school, 1,800 for private high school, and 1,080 for the international section of private school. High and junior high schools are located east of Jinsheng 2nd Road and north of Hongxiang 2nd Road. It surrounds mainly by factories and belonging to an urban brownfield. The elementary school is located west of Lao Dong Road and north of Hongxiang 2nd Road, surrounded by residential areas.

01. The images 01 illustrate these urban renewal planning strategies. Source:Sasaka
02. Relationship between the building site and the surrounding properties

02

As visible in the image below, the construction site of the private high school is an industrial brownfield surrounded by other industrial plants and virtually no linked housing facilities. The school is indicated on the map by the marker. The regeneration area brings excellent educational resources and satisfies the demands of the area's existing people. It is also hoped that the site will attract residential developers and quality enterprises in order to contribute to the area's regeneration. The region intends to build an ecological campus as its heart, one to meet the demand for the use of the school's educational environment and the other to contribute to the improvement of the urban environment.



The surrounding for the site

2.3 BUILDING DESIGN

The building area of the senior high school and junior high school is 168,985.2 m², and the total building area is 206,762.64 m². The construction economic and technical indicators Show in the following chart. The campus is divided into three main groups: Private school, Shared area, and public school. The author is responsible for the interior design of the private school.

Construction economic and technical indicators				
Project areas			Amount	Unit
Land area			168985.2	㎡
Total construction area			206762.64	㎡
Above-Ground floor area			173172.15	㎡
Above-ground construction	Public part ground floor area		89417.38	㎡
	Public part	Teaching area	41290.12	㎡
		Living area	32137.1	㎡
	Shared Area	**Library and Theater**	5269.36	㎡
		Sports center	10720.8	㎡
	The private part of ground floor area		80051.9	㎡
	Private part	**Teaching area**	44626.89	㎡
		Living area	35425.01	㎡
Underground construction area			33590.49	㎡
Underground construction	Public part underground floor area		18593.84	㎡
	Public part	North zone	13808.6	㎡
		South zone	4785.24	㎡
	Private part underground floor area		14996.65	㎡
plot ratio			1	-
Building density			36.80%	-
Green ratio			30.11%	-
Total Parking			492	Cars
Parking	Public part		287	Cars
	Private part		205	Cars

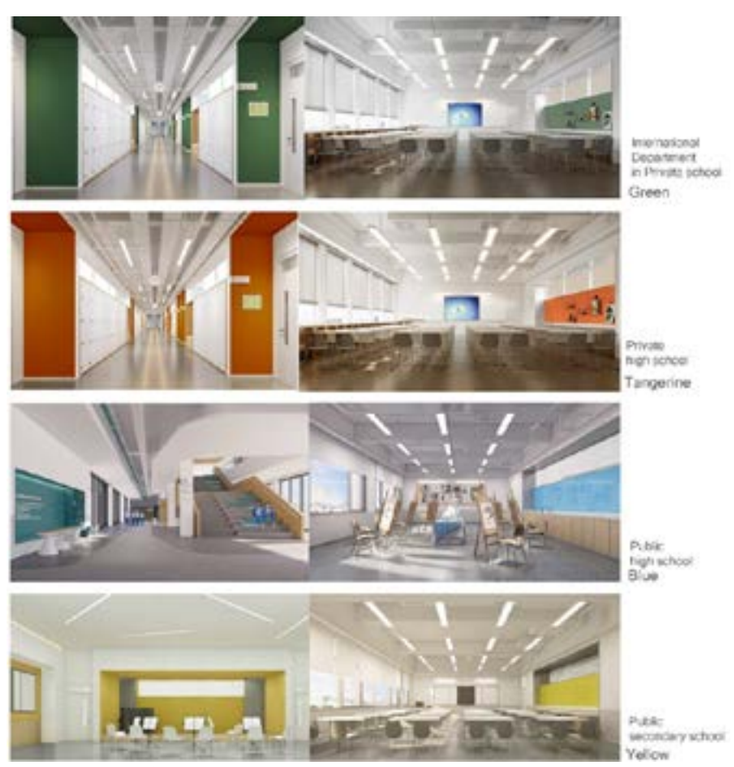
Table 6 Construction economic and technical indicators

Site plan and building design

The buildings are arranged in a central symmetrical form to accommodate the coexistence of public and private campuses. In the middle is the shared area, which functions as a library and lecture hall, and a sports center, with two buildings. The two sides are the campus area, where the public campus contains three buildings: the junior high school building, the senior high school building, and the student dormitory; the private campus contains three buildings: the senior high school building, the international department building, and the student dormitory. The exterior of the building is based on the façade features of other high schools affiliated with the Nationalities University, and the use of red brick material is retained to continue its consistent campus culture.

2.4 THE OVERALL CONCEPT OF INTERIOR DESIGN FOR SCHOOL

There are eight buildings on the whole campus, and the building area is about 200,000 square meters. Four of the buildings are very similar in appearance. To give each building a recognizable character, the interior design of the entire campus uses color to distinguish the different teaching areas. The junior high school of the public school is colored yellow with a youthful and energetic atmosphere, while the senior high school is colored blue with stable and soft color. In the private area, the International Division uses a green color that represents nature and peace; the Upper School adopts an orange-red color that is taken from the exterior of the building. The figure below shows the spatial scheme of the different academic buildings in adopting different colors.



The color scheme of teaching building

THE OVERALL INTERIOR DESIGN PRINCIPLES OF THE CAMPUS ALSO INCLUDE.

1, the principle of safety, that is, the decorative materials comply with national standards. All use environmentally friendly materials, and the process should be delicate, durable, easy to maintain and take care of, and the interface to avoid sharp-edged shapes.

2. The principle of signage orientation, the shape, and color of the signage system should reflect the overall cognition of the campus, coordinate with the overall image of the campus, unify with the architectural style of the campus, and create an orientation system with regional cultural characteristics. The signage system should reflect the overall perception of the campus, coordinate with the overall image of the campus, harmonize with the architectural style of the campus, and create an orientation system with regional cultural characteristics.

3, the principle of applicability and comfort, that is, the overall shape, color, texture of materials, and the external heat (moisture) environment should be considered through the human body organs (eyes, ears, skin, etc.) to the sense of touch, vision, hearing perception.

4. The principle of innovation, the overall interior design should be future-oriented and breakthrough, but also respect the traditional culture of the school, absorb the traditional cultural concepts of the school, supplemented by modern means, to create a new campus with characteristics.

5. The principle of culture and artistry is to have the school's cultural continuity but not to be old-fashioned. The campus environment is artistic and has its cultural temperament so that students can develop their aesthetics in this creative atmosphere.

6. The design must respect the overall planning and spatial characteristics and work in close contact and coordination with construction units, architects, and equipment engineers during the design process. The design must respect the master plan and the characteristics of the space.

> *Since I was responsible for the interior design of the private international and high school buildings and the library and lecture hall building, this paper focuses on these three buildings. The general design principles are only used as background information and will not be explained too much in this phase.*"

2.5 THE BUILDING OF LIBRARY AND UDITORIUM

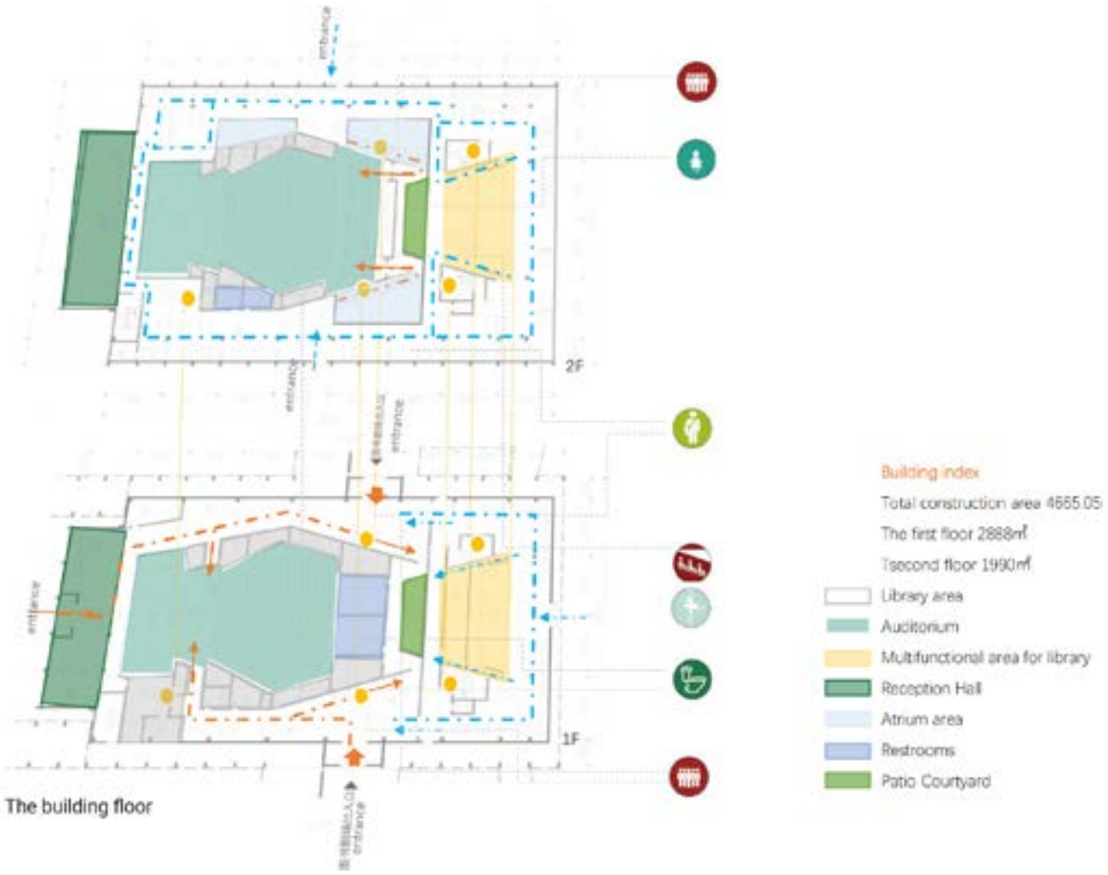
THE BUILDING INFORMATION

The building of the Library and auditorium is located on the central axis of the campus (Figure 0 1) facing the main entrance of the campus, and is the most featured building on the campus. The building design puts the functional modules of the library and auditorium together. The auditorium appears as a block with a red brick facade inserted into the library block with a glass curtain wall (Figure 0 22).In the interior, the two functions are intertwined and independent, sharing the public transportation space; the red brick and the glass curtain, both materials, echo each other as wall finishes in the additional space.

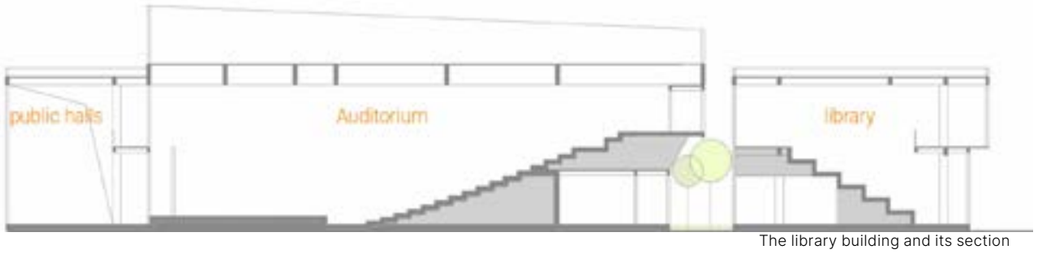
01

02

01. The location of the building of the library and auditorium
02. The middle building is the library

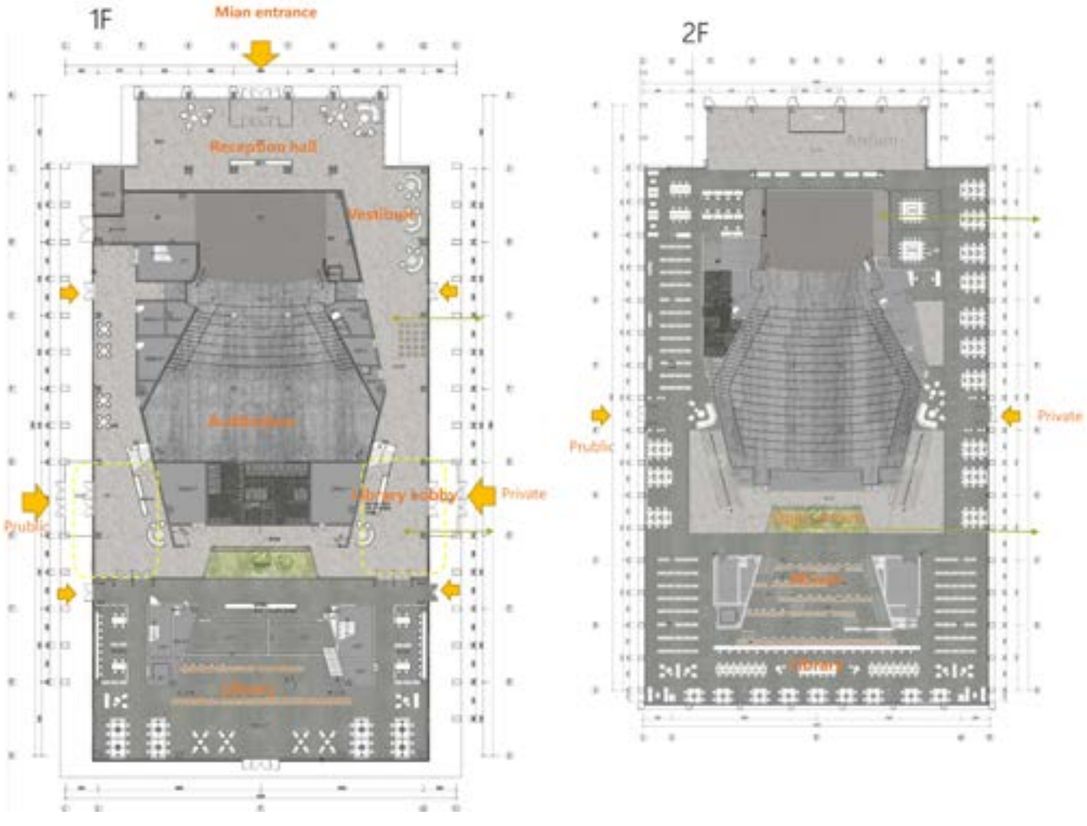


The building floor

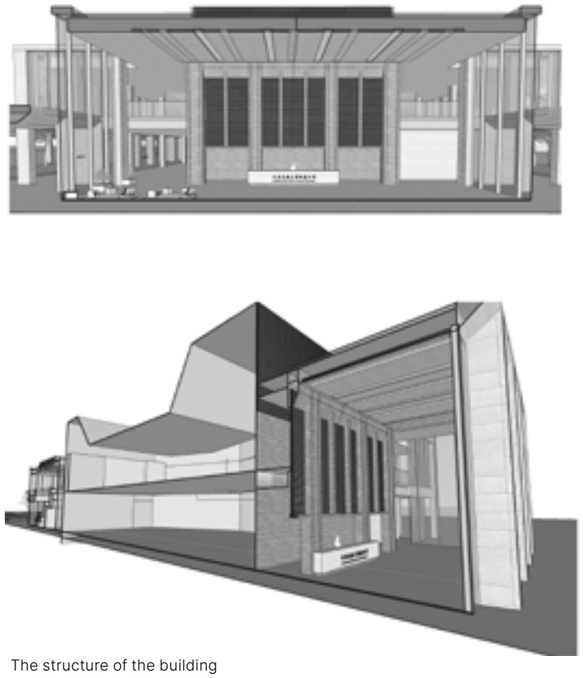


The library building and its section

THE BUILDING PLAN below shows that the building consists of three main functions, public halls, a library, and an auditorium. The building consists of two floors, with separate entrances for the two campuses, a library vestibule, and main access. The architects designed a two-story corridor on both sides of the building to connect the campuses. We will start with the public lobby.



The building floors plan



The structure of the building

PUBLIC HALLS

Public Hall are located on the first floor of the building and consist of three parts. Firstly, the reception hall is located at the top of the building, a 9m high space with about 200 square meters. It is a 9-meter high space with approximately 200 square meters. It is mainly composed of a reception desk, a waiting area, and a display area to meet the functional needs of school communication activities, new students' admission, and the opening of the lecture hall to the public. Secondly, from the 1st-floor plan, the central position is the front Vestibule of the lecture hall entrance, connecting the main and secondary entrances and the front and back spaces of the building, facilitating the evacuation of people. Finally, there is the vestibule near the library entrance, where the library registration office is located. This space retains the exterior features of the building in terms of wall finishes. It extends the red brick material and building structure as design elements and materials to the interior space.

The reception hall

The Vestibule of the lecture hall and library hall

AUDITORIUM

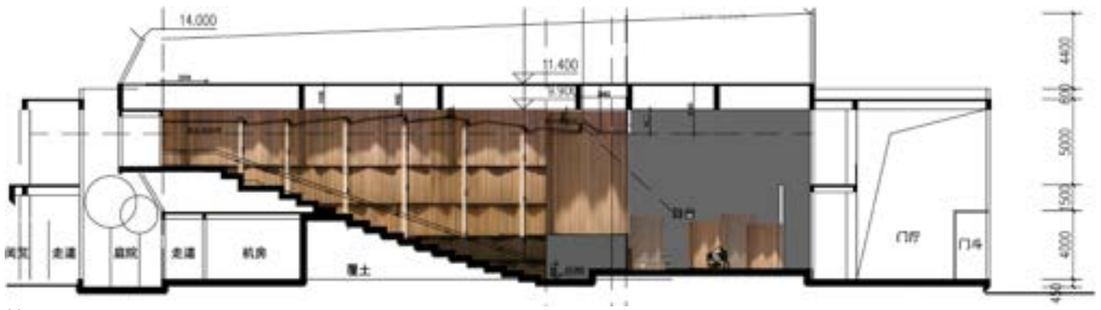
Overall

As we can see on the building plan above the Figure of the building floors plan on page 147, the lecture hall is located in the center of the whole building, with four entrances and exits, as marked on the plan above. A staircase has been removed from the library lobby to connect the waiting lobby to the rear entrance of the lecture hall. The lecture hall will be open to the community and undertaking important events on campus. Therefore, the whole space is designed in accordance with the technical standards of the theater.

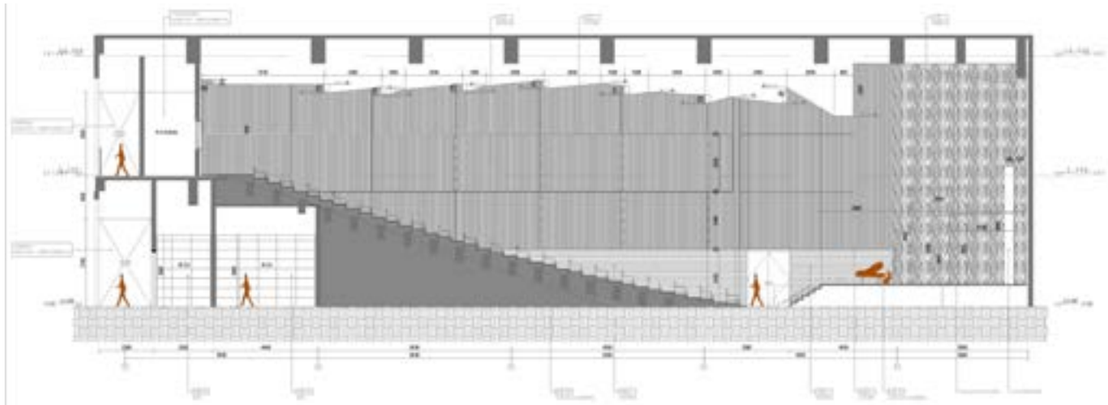
The auditorium's purpose is to host important school events while also accommodating the multipurpose usage of singing and dancing activities. The auditorium's audience hall comprises an uneven hexagonal plane and has a capacity of 560 seats. It is 26m wide at its widest point, while the back wall is 22m from the curtain line. Its stage is divided into the main and side stages; the stage's opening measures 13.6 meters wide, 8 meters high, and 8 meters deep.

01. The lecture's section
02. The construction drawing for the sidewall

01



02



Acoustical aspects of design

Three acoustical design concepts are available for performing arts buildings: 1) based on natural sound, 2) based on electro-acoustics, and 3) combining natural sound and electro-acoustics. Each technique is appropriate to the performing arts building's various functions. The auditorium's primary purpose is to host significant school events such as graduation ceremonies, opening ceremonies, etc. As a result, the optimal method for utilizing natural sound.

Audience Hall

Audience hall interior design should take both acoustic and visual considerations into account. It is related to the sound volume in the hall, the uniformity of the sound field, the excellent quality, and the presence of acoustic faults. The auditorium's aesthetic appearance is determined by the auditorium's plan, elevation, and section design.

Following examination, the unequal hexagonal plan design was chosen. There are two explanations for this.

1) the structure is simple. The majority of the audience has a good perspective and is within the human voice range.
2) the theater's capacity is limited; the audience hall span is limited to 22m, and the side walls can give a strong and broad lateral early reflection of sound.

The auditorium's ceiling is folded in shape and supports the theater's primary functions, including speaker bridges, surface light bridges, and acoustic requirements. By adjusting the dip angle of the ceiling, you can create a front ceiling for the front of the audience that provides a beneficial early reflection of sound. Its rear ceiling elevation is limited to three meters, which prevents the emergence of long-delayed reflection of sound.

Micro-perforated acoustic panels are installed on the theater's rear wall. The rear wall of the hall can be treated acoustically in three primary ways:
1) acoustic absorption treatment;
2) acoustic diffusion treatment;
3) back seat sound reinforcement via rear tilt;
We picked the first option for this theater, constructing a composite acoustic structure on the rear wall.

Ornamental wood is used on both sides of the stage entrance. This method serves two purposes: it creates a decorative and aesthetic appearance while minimizing low-frequency absorption. The sound can be reflected and directed toward the audience, providing an incredible amount of early reflected sound to those in the front and center areas. On the other hand, the side walls have a slightly curved shape with hardwood micro-perforated acoustic panels on top and black on the bottom. It is better for acoustic resonance and lends the room an atmosphere of elegance.

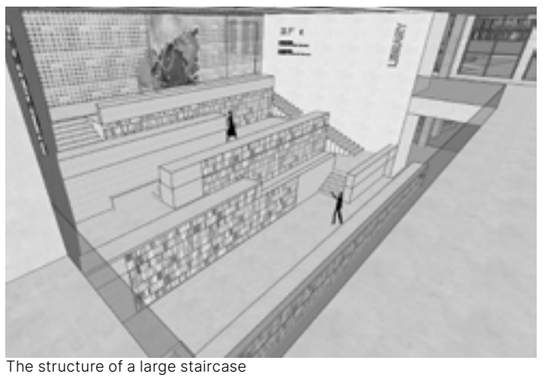
The Perspective of Auditorium

THE LIBRARY

With the advent of the data age, the library space has not only been designed for patrons to check out but has also begun to transform into a place for a variety of social activities. The core function of the library has gradually shifted from being primarily a place for reading to being primarily a place for storage and learning, and communication, becoming a major place for constructive pedagogy outside of the classroom, where students take advantage of the library's public service attributes and will also work and study in the library as a team. Therefore, the library design pays more attention to planning the space for learning and communication.

Form

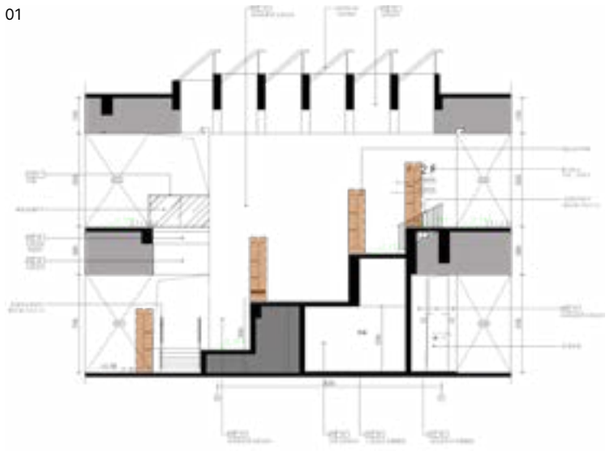
The library has two floors, with two main entrances on the first floor connecting the library lobby. The layout is U-shaped, with a spacious open area for the stairs surrounding the U-shaped room. The staircase's bottom level contains a bookstore and a library management office. This spatial configuration enriches the room and adds interest. Students can look for their favorite books on the staircase's shelves and read them while seated at the bar. The skylight at the top brings natural daylight into the building, animating and enticing it with constant changes in light and shade. The space's comfort and richness will increase the number of student visits.



The structure of a large staircase

The library's second floor is accessible through a large staircase, and there are two entrances on the second floor connecting the public campus and the private campus buildings. There are ample study areas and two separate discussion rooms on the 2nd floor. The library is digitally managed, so there is an intelligent book manager and electronic access for self-service access and borrowing and the traditional shelves. The second floor of the library has a perfect view through the glass wall of the building, and sufficient natural light diffracts into the depths of the library and leads the reader's perspective to the distant landscape.

01



01. The construction drawing for the large staircase
02. Front view of the ground floor of the library
03. the perspective of the ground floor of the library

Materials

The library's interior design adheres to green design principles. The library makes the best possible use of the building's original structure by relying on modest wall cleaning and signage system decorations. The ceiling is finished with an aluminum mesh that is easy to remove and maintain, flexible, and long-lasting. The objective of reusing the original structure and easy-to-maintain materials is to minimize the usage of new resources and decrease the construction process's environmental impact. Additionally, the providers of the aluminum mesh for the floor and ceiling were picked from the neighboring area, which reduced CO2 emissions generated during the transit process. All of this is consistent with the idea of adaptive reuse design.

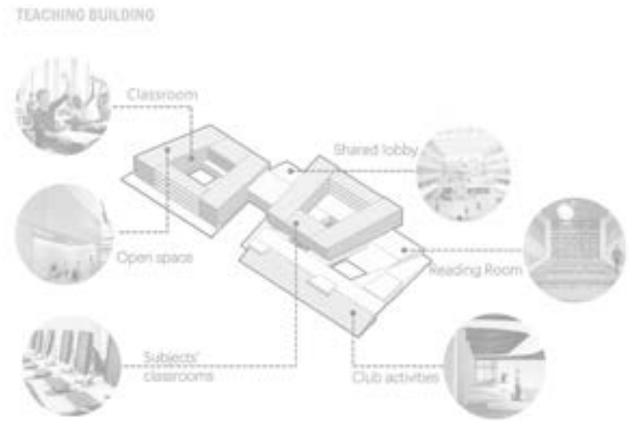
03

02

The perspective of the first floor of the library

2.6 THE TEACHING BUILDING

The facade of teaching building



The dagram of the two teaching building

BUILDING INFORMATION

The facade of the Teaching building adopts the classic three-stage composition of academy architecture. The red face tiles are chosen to echo the red-brick architectural tradition of the campus of Minzu University and coordinate with the campus's primary color. At the same time, the design incorporates modern architectural design language and uses light gray metal louvers to create a rhythmic façade effect. The overall image of the building is dignified and elegant without losing the modern atmosphere.

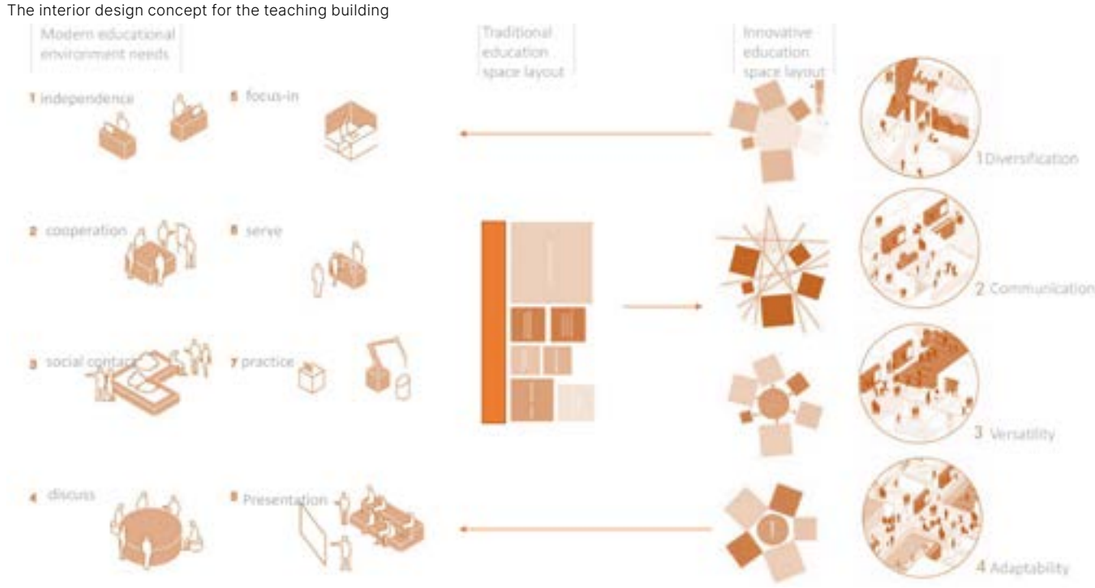
THE DESIGN CONCEPT OF THE TEACHING BUILDING

In the 1950s, psychologist J. Piaget proposed the constructivist theory of education (Constructivism), the core of which emphasizes student-centeredness, encourages students' active exploration of knowledge, and seeks to develop their thinking skills through cooperation, communication, and discussion among students. It points the way to contemporary diversified teaching and learning. The spatial design of the teaching building follows this philosophy.

Learning is acquiring knowledge through collaboration and communication among students in a specific context. The "context" is not only a psychological intention but also a physical environment and even a cultural atmosphere. The ultimate goal of all scenarios is to create a sense of belonging and enthusiasm for the place where students learn. We hope that the Four Teachings will become a diverse interactive place for classroom teaching, communication, and group learning and will be integrated into students' and teachers' daily campus life space.

The design concept for this educational space is shown in the graphic at the bottom. The design of the space is inspired by the needs of a modern educational environment, creating a space that is diverse, communicative, versatile, and adaptable to the needs of the students and teachers in the space.

The interior design concept for the teaching building

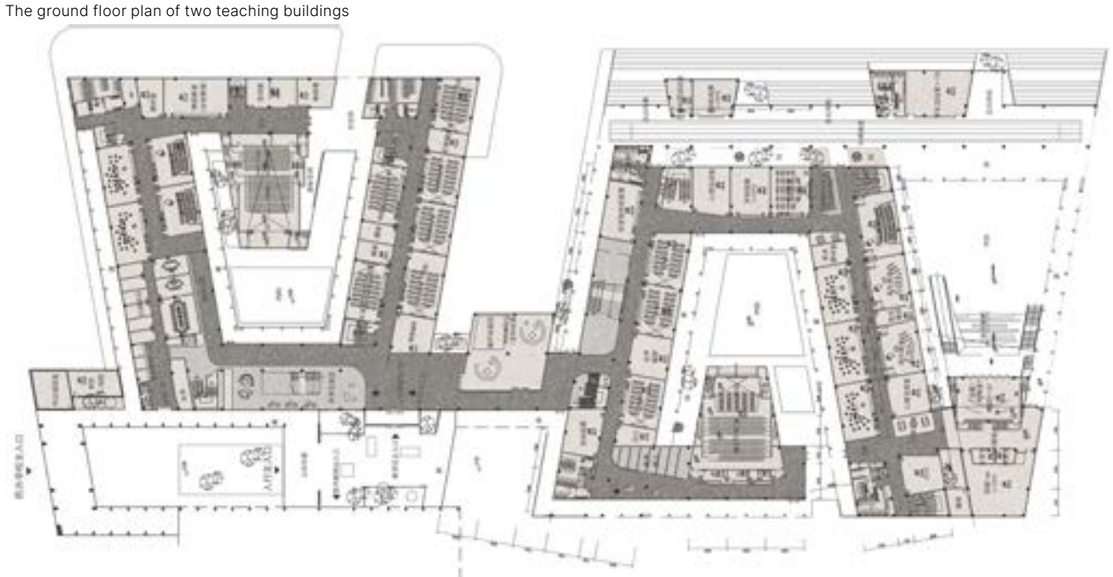


INTERIOR DESIGN FOR TEACHING BUILDING IN PRICATE PART

In the organization of spatial flow lines, the accessibility and convenience of two teaching buildings are considered. As a result, a shared space connects two buildings on the ground floor. Each of the two buildings has several independent entrances, which are located facing the campus road, the inner side of the campus, and the sports field to realize the diversion of people. An interconnecting corridor is set up on the second floor of the building and the library. The corridor is connected to the library lobby, which greatly enhances the traffic convenience between the two buildings and facilitates the daily life of teachers and students

The ground floor plan below, a dark gray Vinyl Flooring is used as the flooring material for the traffic spaces of the two buildings, and a lighter gray is used for the staying spaces.

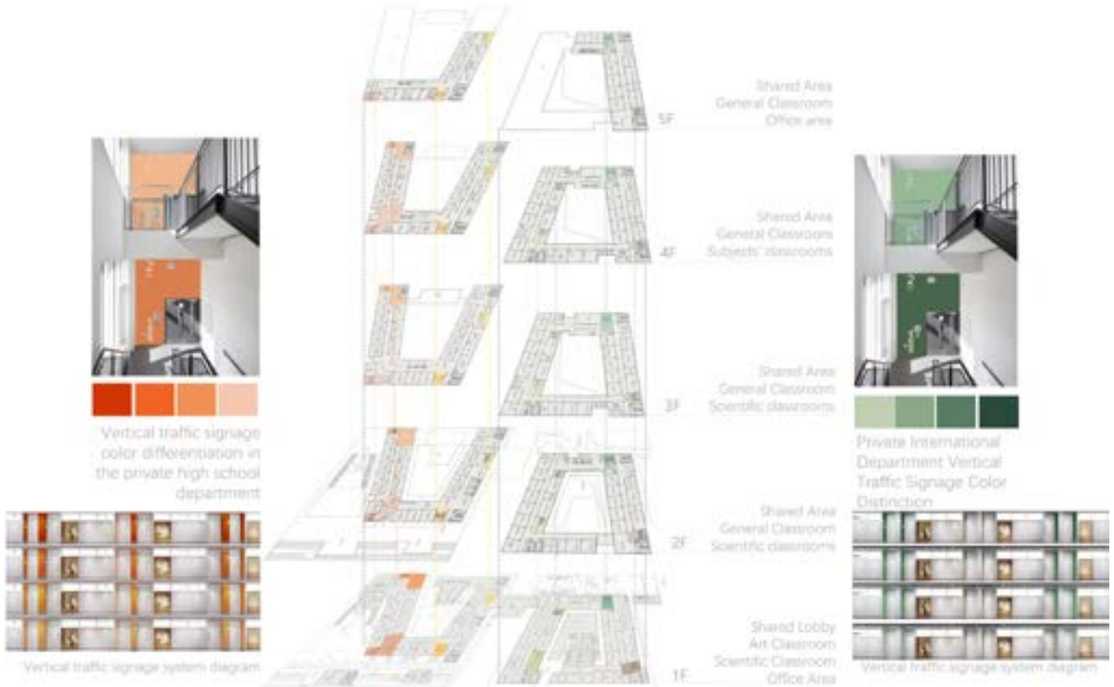
The ground floor plan of two teaching buildings



Two teaching buildings are made up of 5-story single structures united on the ground floor and share STEAM classrooms. The International Department building employs green as the building's logo color, whereas the Private High School Department uses orange as its brand color. The different colors are not only used as symbols to identify the different teaching areas, but more interestingly, they exist as the most important decorative element of the space. Combining their logo colors with the diverse graphic composition design makes the space vibrant and energetic.

The picture below combines the plan and color scheme of the two buildings together. The orange color comes from the material of the building facade; the green color is taken from the plantings in the green campus.

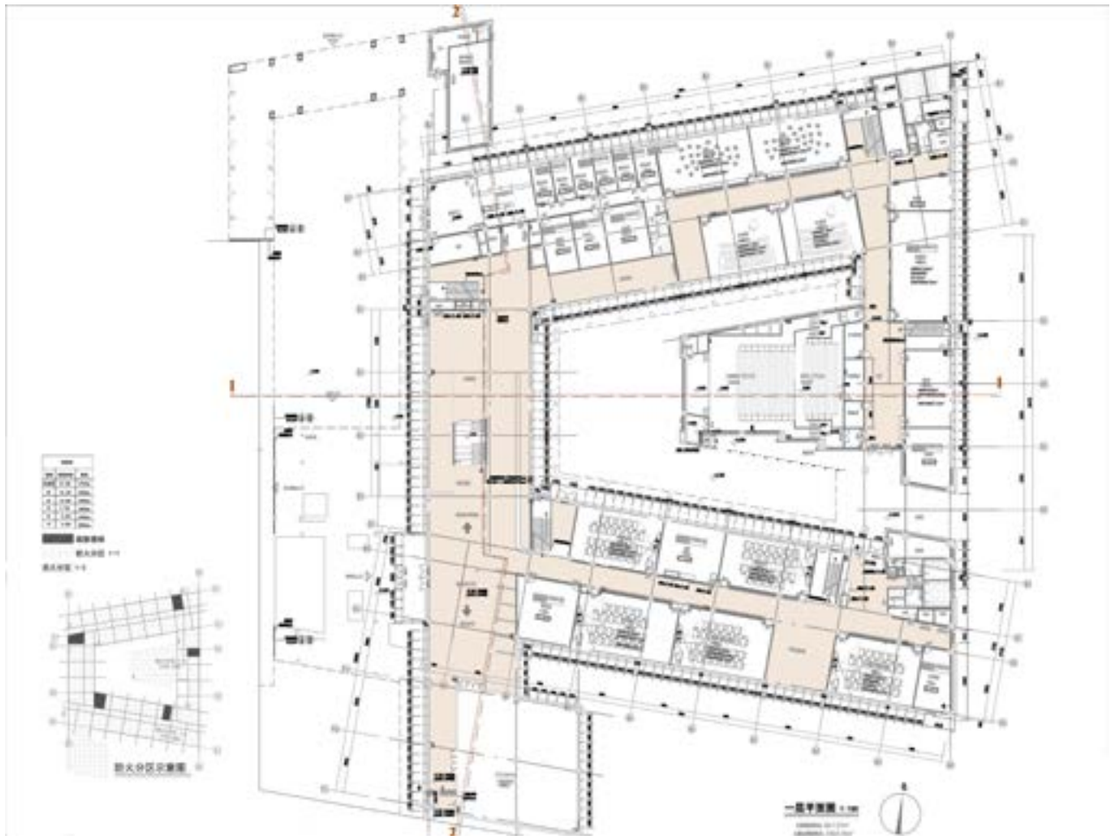
Functional unit of the teaching building



THE TEACHING BUILDING OF INTERNATIONAL HIGH SCHOOL

The total construction area of the international department building is 21,900 square meters. The first floor is arranged with the entrance foyer, gatekeeper and fire control room, school history display area, reception desk, rest area, and other display and reception function spaces. The student service space is mainly located on the second and third floors of the building, and the third floor is mainly for student association services. The second to fifth floors are also equipped with standard classrooms and step classrooms to meet different teaching needs. In addition, there is a stepped display platform from the second to the third floor, which provides a place for students' and teachers' educational seminars and exchanges and enhances the space's diversity and interest.

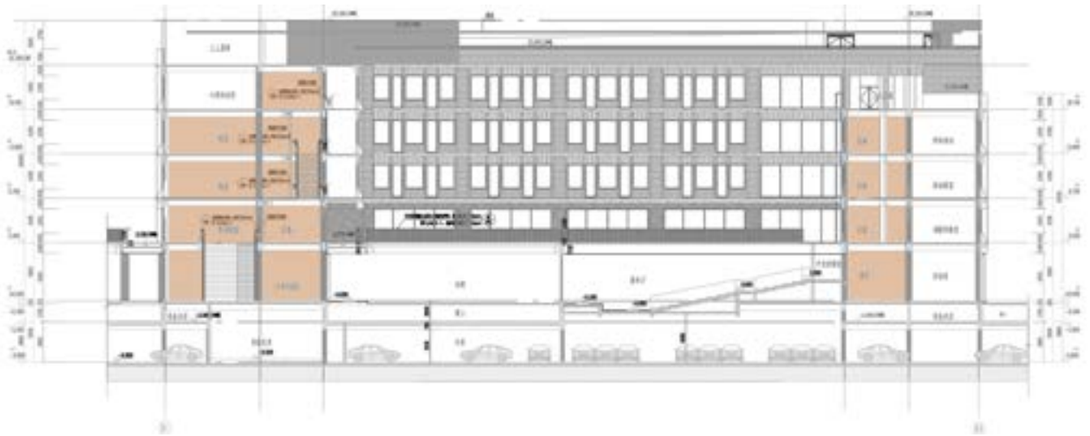
01



01. The layout of ground floor in international high school
02. The section-1-1 for the building of international high school
03. The section-2-12for the building of international high school

Section 1 and Section 2 of the diagram below show that the building has an abundance of public areas. These areas will be transformed into shared zones with different furniture and teaching aids to create diversity, variability, and adaptability in the space. This design will allow students to communicate with each other whenever and wherever they want.

02

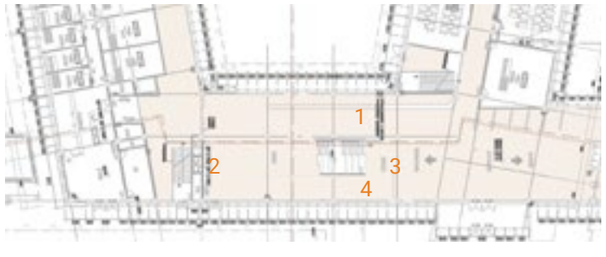


03

The lobby of the first floor of the International High School building is furnished with tables and chairs in different combinations to facilitate discussion and communication between teachers and students. A display area was also designed to allow the school to organize different educational activities and to allow students to display their work and assignments. The hall area is nearly 500 square meters, and the interior elevation is basically a glass curtain wall. Therefore, perforated sound-absorbing gypsum board and micro-perforated wood veneer aluminum square are used as ceiling materials to reduce the noise in the space. The most surface is finished with white interior paint, but the staircase is finished with a unique wood fireproof board. This design treatment gives the room a visual memory point and enriches the space level.

1 | 3
2 | 4

01. The view-1 of groundfloor in international departmnet
02. The view-2 of groundfloor in international departmnet
03. The view3 of groundfloor in international departmnet
04. The view-4 of groundfloor in international departmnet



The big staircase on the ground floor connects to the public space on the first floor in the figure below. The public space on the first floor is smaller than the public space on the ground floor. Acoustical materials at the ceiling have been reduced and replaced by the original roof surface of the building. The walls are still mainly painted, and the building's logo color is used as the color composition for decorating the space.

01. The view-1 of first floor in international departmnet
02. The view-2 of first floor in international departmnet
03. The view3 of first floor in international departmnet

1 | 2
3

Reporting Room in International school

Retracted the front seats in Reporting Room

ACADEMIC LECTURE HALL

The International Department's academic lecture hall continues the green color scheme throughout the furniture. The folded ceiling is made of GRG reinforced acoustic panels. The side walls use integrated perforated acoustic panels installed directly on the original structural walls, which are easy to remove and replace for maintenance and high flexibility.

In addition, in this lecture hall, the front seats can be retracted in the lower part of the rear section, which provides a viable line for providing different educational activities.

The section of Reporting Room in International school

CLASSROOMS AND CORRIDORS

The ceilings and walls of classrooms and corridors were also designed to minimize the use of new materials. Instead, the cost was invested in the students' functional appliances and teaching equipment. For example, student lockers in the corridors, the workstations inside the classrooms, and the cork boards behind the classrooms.

01. Corridor of the International Department Building
02. Classroom of the International Department Building
03. The elevation of corridor in the International Department Building

01

03

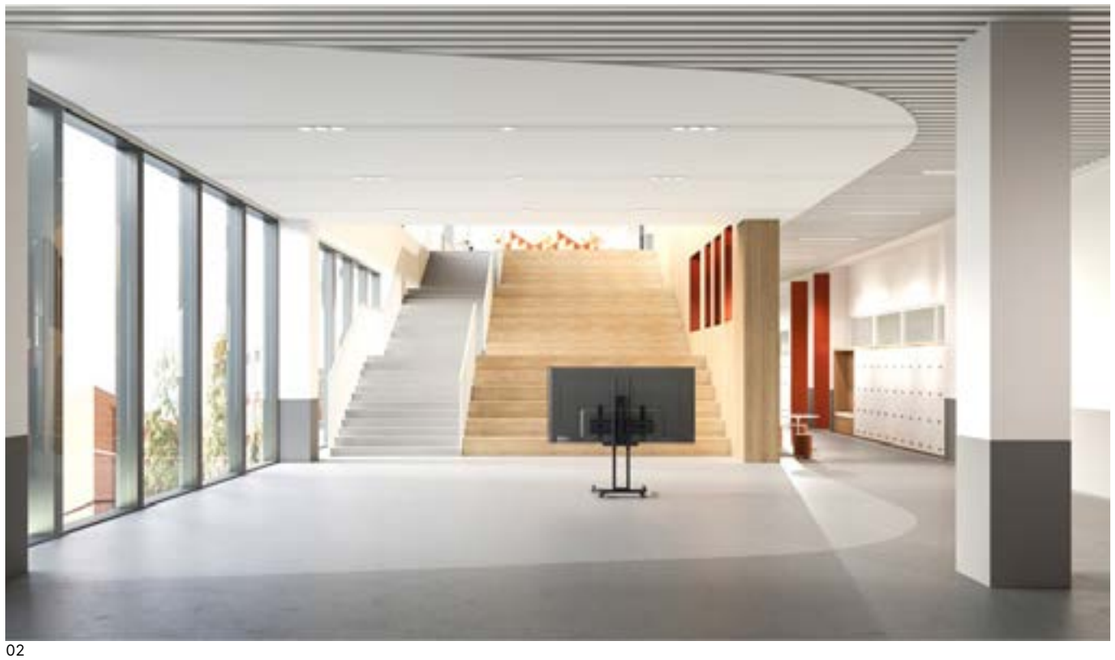
02

THE TEACHING BUILDING OF PRIVATE HIGH SCHOOL

The private high school department has 22,000 square meters in size. The functional rooms are organized in the same way that the international high school department is. The major color scheme is orange.The ceiling is mainly made of gypsum board and an aluminum grille. The walls are primarily painted with the building's logo color as the decorative color of the space. We created an open presentation room and a space for students to stay according to the structure of the area.

01

01. **The ground floor plan of private high school**
02. **The view-1 of groundfloor in private high school**
03. **The view-2 of groundfloor in private high school**



02

03

01

02

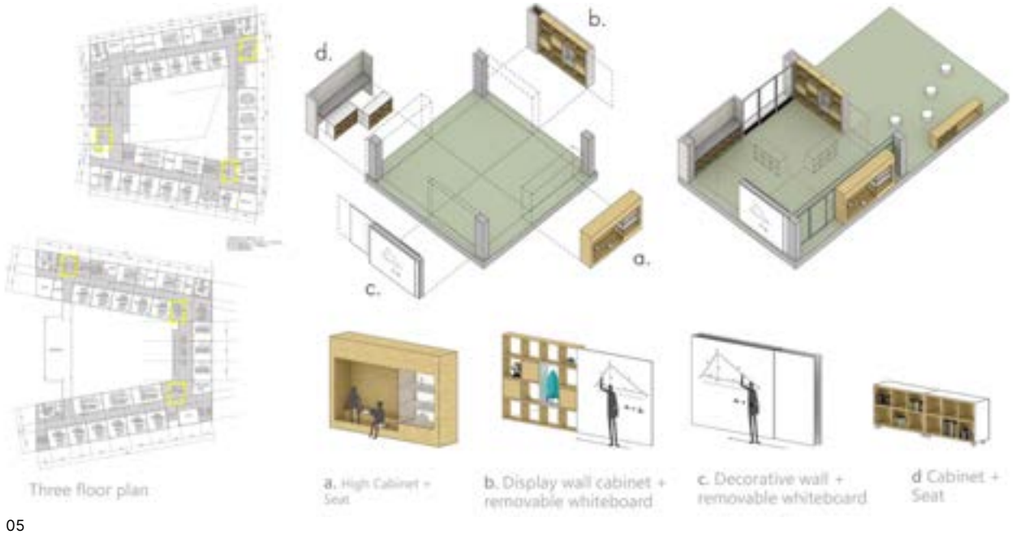
03

01. The public areas on the frist floor
02. Communication space on the frist floor
03. Communication space on the ground floor
04. The combination of A+B modules
05. the four different modules of ABCD

MODULARITY

The building has a number of small rooms with similar spaces. A modular treatment has been used in these spaces. Here the four different modules of ABCD are designed. They can be flexibly combined according to the functional needs of different areas. It can be an open public space or a semi-closed group discussion space. The combination of A+B modules is shown in Figure 4 below.

04 b. wall cabinet + removable whiteboard a. Cabinet + Seat

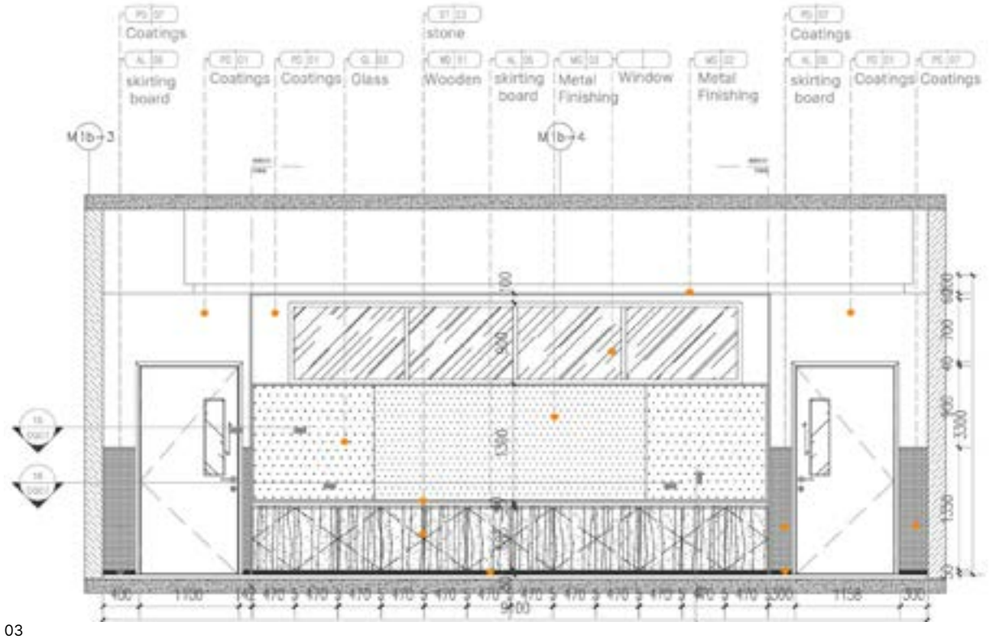


05

01. The blackboard view of the classroom in the private high school
02. The back view of classroom in the private high school
03. Construction drawing of classroom side wall
04. The corridor of the private high school

01

02



03

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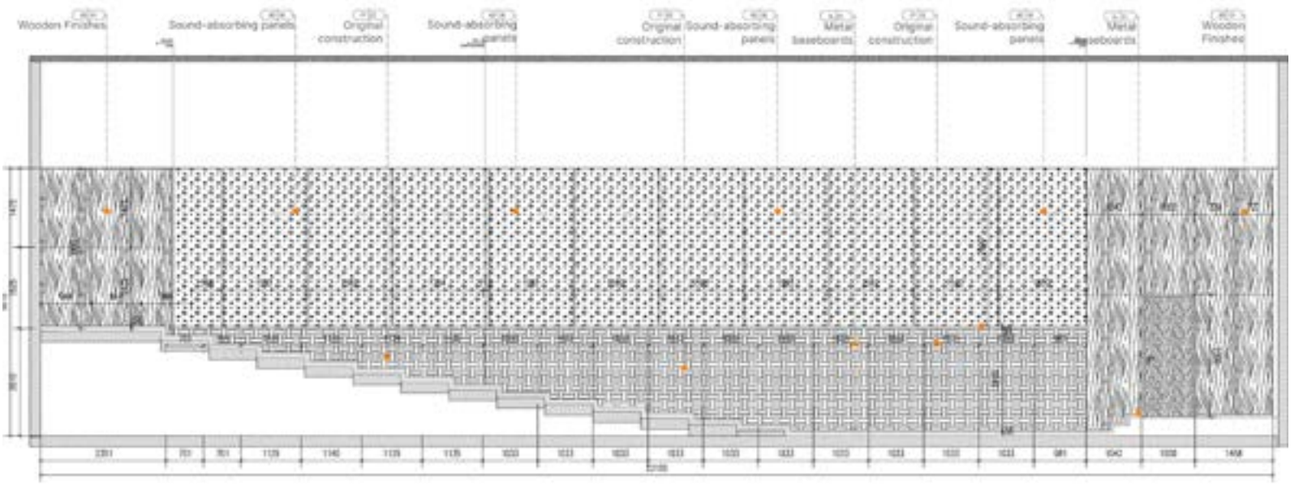


01. In front of the lecture hall in the private high school
02. The section of the lecture hall
03. Construction drawing of the side wall for the lecture hall

The lecture hall in private high school

The lecture hall of a private high school was designed with furnishings that matched the color of the building's emblem. To prevent the sound of the lecture hall from disturbing the surrounding environment and prevent outside noise from entering the room and interfering with the lecture hall's regular operation. As a result, the room is primarily designed around the sound insulation treatment while selecting materials.

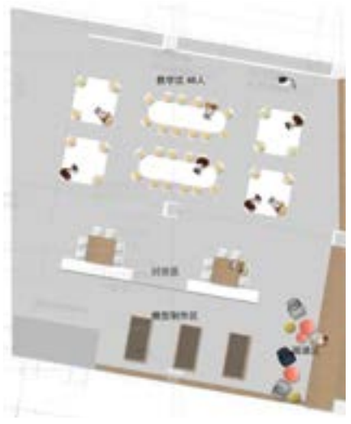
A strip shape and incorporated track lights divide the ceiling into equal proportions. The lecture hall's back wall is a horizontal installation of striped ornamental panels measuring 2.4 meters in length to replicate wood veneer. Above 1.4 meters, the two side walls are constructed of sound-absorbing wood and inlaid with light strips; below 1.4 meters, they are made of composite materials. The hollow behind the side walls is left with a 250 mm depth to absorb sound at middle and high frequencies and prevent fluttering echoes. The floor and wall skirts have virtually no acoustic absorption properties. Indoor seats made of soft materials significantly impact indoor sound absorption; according to standards, seats must have a medium frequency sound absorption of 0.3-—0.4m2 soft seats.

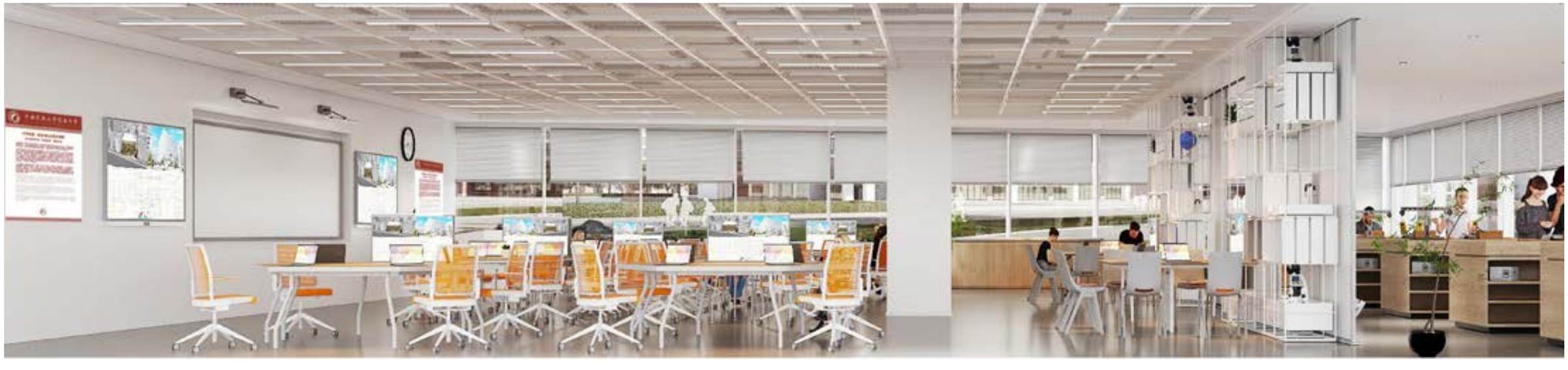
The stage floor is made of overhead solid wood, which absorbs a small amount of low-frequency sound; the stage portion of the ceiling is made of paper-faced gypsum board solid paste mineral wool acoustic panels, which prevents the stage between the ceiling and floor from fluttering echoing; the stage wall is made of 25mm thick fireproof soft package material, with a cavity of 250mm, which absorbs high-frequency sound, controls reverberation time, and prevents

STEAM classroom

STEAM education is an interdisciplinary practical activity that combines science, technology, engineering, the arts, and mathematics. STEAM education aims to foster students' problem-solving mindsets, complex cognitive thinking, and emotional thinking while also emphasizing students' interdisciplinary integration, interpersonal teamwork, and social survival skills.

Unlike traditional classrooms with rows of desks and chairs + aisles, STEAM classrooms' functional space planning incorporates various features. It is separated into many functional spaces, including a classroom, an operating area, a conversation and learning area, and an exhibition area. The primary distinction between STEAM classroom furniture and standard classroom furniture is that STEAM classroom furniture must enable an integrated, multidisciplinary approach to learning. Flexible classroom designs are required to accommodate a variety of subject teachers and student workshops.

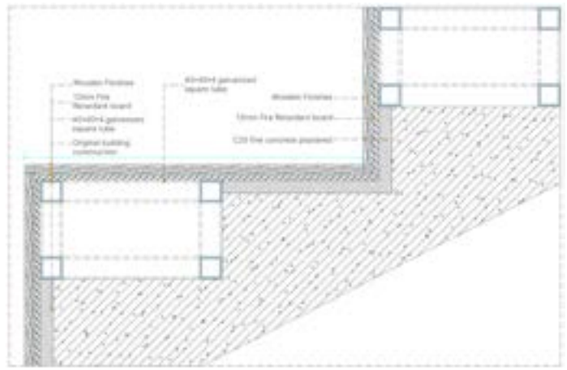




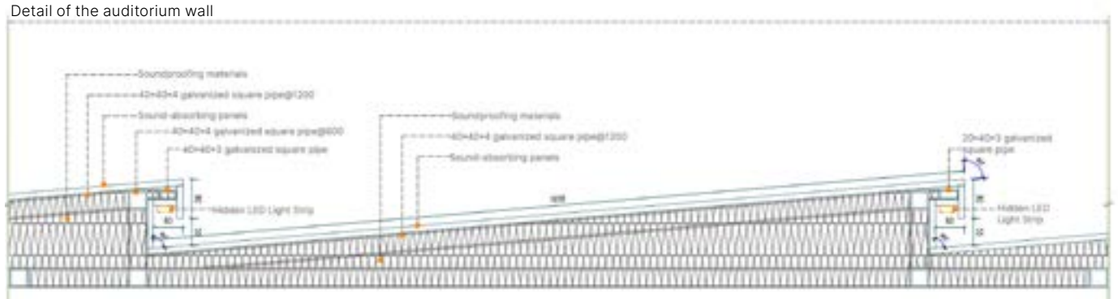
Other spaces and details

The two educational buildings have many additional functional rooms, along with the sections depicted above. The art and calligraphy classrooms, which share a decorative plan with standard classrooms, will not be covered in detail here. The music classroom is decorated with sound-absorbing materials to minimize its impact on other functional rooms, and it has a more calm and atmospheric tone than the other rooms. The dance classroom is topped with a sloping roof, natural light is introduced, and lighter materials are chosen to make the space vibrant. The design of the laboratory space mainly serves the requirements of the experimental equipment.

Detail of large staircase in public space



Detail of the auditorium wall



The music room

The laboratory

Other functional rooms

The dance room

2.7 SUMMARY OF CASES

PROJECT 1

The “Liyuan” buildings are an essential part of the urban fabric of Qingdao’s old city, and they can best reflect the city’s commonplace life. They carry not only the historical and cultural information of the city’s past, but more importantly, they serve as the memory of the city and give the locals a sense of identity and belonging to the city. The Four Square Street Historic Preservation Area preserves the integrity of the “Liyuan,” a unique residential building in Qingdao.

After evaluating the buildings, the designers have adopted an adaptive reuse approach to renew the area. The premise is to maximize the preservation of the district’s historical and cultural facilities by finding new adaptive functions. A series of intervention strategies allow the old buildings to take on a new life, thus upgrading the district sustainably. Through an in-depth survey and study of the protected area, the project proposes a design strategy from two perspectives: the urban renewal perspective and the other being the specific interventions for the existing environment.

From the perspective of urban renewal, four points are proposed:

1. Create multiple types of public dynamic nodal places.
2. Develop creative industries to promote the neighborhood as a sustainable mixed neighborhood.
3. Improve the comfort and experience of the streets to create pedestrian-friendly pedestrian neighborhoods.
4. Maximize the district’s value through a combination of above- and underground development.

The specific interventions for this existing environment begin with creating a linear park to connect the north and south. Secondly, the planning of four main streets to stimulate street commerce and drive connectivity throughout the area. And then, the renovation of nodal buildings at road crossings makes them public service buildings that identify the site. Finally, industrial clustering will drive the vitality of the area.

The renewal project of the Sifang Historic District has already been implemented in Qingdao, and each building or area will have a different design company to provide specific solutions according to this plan. Due to the large number of stakeholders involved, the complexity of the transformation of the buildings, and the coordination of various units during the implementation process, the final presentation of the area is unknown and still faces many risks. As the author mentioned above, “adaptive use is used for urban renewal. The core is a way of city planning that needs a wider range of policy tools to make it happen. “

PROJECT 2 -MASTER PALN

Urban restoration is critical for modernizing urban government systems and enhancing people’s quality of life. China’s urbanization has evolved gradually away from incremental expansion and toward stock renewal. Chengyang Jihongtan district has used the advent of high-tech industries to revitalize inefficient land, convert land uses, and enhance the industrial structure. It will make city operations more efficient, improve space quality, and make living and ecological environments better.

The school’s building site is an industrial brownfield, and the area surrounding it is densely populated with temporary industrial plants. The regional government invested in superb educational resources in the hope of establishing a new urban environment centered on an ecological campus. The area’s regeneration strategy is built around the “campus-city” relationship. By considering the campus and the city as a single organism, a holistic regeneration process is applied to improve the area’s quality and foster synergistic development of the campus-industry-city triangle. These also fit with the adaptive reuse development goal.

Although the structure is new, the designers used a majority of adaptive reuse concepts in designing the school’s interior. Along with intervention tactics for insertion and installation, the designers incorporated the building’s original structure into the design to limit the use of new materials. Additionally, because most of the neighboring industries are associated with high-speed rail, there are relatively more metal and composite material manufacturers. Most of the interior decoration materials were supplied by these adjacent companies. On the one hand, local materials are used to help the development of local industries. On the other hand, carbon emissions are reduced during transportation to reduce the impact on the environment.

CONCLUSION SENTENCES

PART 1

Adaptive reuse for historic structures is based on conservation first, then finding uses for the property that serves the public interest, which means transferring urban legacy and architectural art to future generations is its obligation.

The core of adaptive reuse for building stock is to extend the useful life of existing architectural assets by adding new uses that meet contemporary needs.

Adaptive reuse of urban renewal is essentially an important tool for urban planning and requires the support of relevant government policies. Adaptable reuse should be given more attention to help the local economy and make the area more livable.

It is important to understand and respect the historical context of the buildings in question. Allowing regeneration or extending its life is a central objective of design interventions. The implementation process must preserve its materials and techniques, as well as distinguish between old and new levels. Simultaneously, extensive research and studies are necessary.

Adaptive reuse occurs in monolithic buildings with a complete structure whose architectural expression on the exterior tends to be “the contrast of the host structure and the new addition.” Fragmentation or clusters of buildings tend to have an architectural expression of “the correspondence of host structure and new addition.” Due to the internal environment’s stability and controllability, this type is more likely to exhibit a “multi-level preservation” expression.

In the process of adaptive reuse of the built environment, “holistic expression and seeking inspiration in the original” and “host structure as material for the new building” as the aesthetic foundation are more accessible to apply in practice than “preservation of the scene and spirit of the place.

PART 2

The area’s regeneration strategy identifies appropriate new uses for the district’s historic and cultural structures while maximizing their preservation. Subsequently, through a variety of intervention strategies, these historic structures can be repurposed, providing for a sustainable upgrade of the area.

The local government invests in high-quality educational resources to revitalize industrial brownfields. The “campus-city” relationship is one of the design principles of the renewal. This helps the growth of the campus-industry-city together.

To minimize the use of new materials, the original construction structure of the school is used as the interior material. Additionally, materials produced by local are used to aid in the growth of local companies and to lessen the transportation process’s carbon imprint.

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