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A Study on the Space Reconstitution Reflecting the Characteristics of Adaptive Reuse: Focusing on High-rise Building Regeneration as a Complex Cultural Space

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Abstract In this study, we focused on 'Adaptive Reuse', which has the concepts of space reconstitution and social and cultural regeneration, so that previously constructed highrise buildings can accommodate various changes in modern society, and new spatial design was developed based on the characteristics of adaptive reuse. We sought to present the concept and direction, detailed strategies, and architectural response elements of space reconstitution for the purpose of realizing the typical spatial reorganization required by modern society and seeking directions and methods of space reconstitution that can be applied to future society. The purpose is to do so.

Keywords Remodeling, Space Reconstitution, Adaptive Reuse, High- rise Office Building

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1. Introduction

1.1 Research Objective

As modern society progresses, the number of aged high-rise buildings steadily increases, leading to a growing demand and interest in remodeling from both social and environmental perspectives. Remodeling has traditionally been utilized as a physical means to improve the interior and exterior spaces of buildings and to enhance building systems. However, with recent emerging trends and demands across society, it is increasingly challenging to actively accommodate changes through remodeling, rather than new construction.

Therefore, this study focuses on the concept of 'regenerative architecture' encompassing 'spatial regeneration' and 'socio-cultural regeneration', aiming to propose a restructuring of high-rise building spaces that can accommodate such changes during remodeling of existing high-rise buildings. Social changes in our society are constantly occurring due to factors such as shifts in societal consciousness, advancements in industrial technology, and events like the COVID-19 pandemic. Especially, the pandemic period has highlighted the necessity for restructuring the environments and methods of various facilities such as residential areas, workplaces, and schools to align with societal demands and changes.

Furthermore, lifestyle patterns have also evolved, with a universalization of cultural enjoyment and a diversification of spaces beyond their conventional uses. The emphasis on spaces for exploration and experience is evident in the remodeling of high-rise buildings. Moreover, the accommodation of these changes is closely linked with urban regeneration efforts, actively conducted through regenerative architecture projects such as repurposing vacant facilities to revitalize areas. Additionally, high-rise building facilities, such as office spaces, are increasingly demanded to serve as multifaceted cultural spaces within communities.

Hence, this study aims to explore directions for spatial restructuring reflecting the characteristics of regenerative architecture to respond to social changes when designing high-rise building remodeling projects.

1.2 Scope and Methodology of the Research

In this study, to propose directions for spatial restructuring of high-rise buildings applying the characteristics of regenerative architecture, we first reviewed previous studies to clarify the concept of regenerative architecture and extract its characteristics. Next, based on the identified characteristics of regenerative architecture, we derived directions for spatial restructuring and formulated detailed strategies. We then examined and analyzed the applicability of these strategies through case studies of spatial restructuring. Additionally, we analyzed how new architectural elements respond architecturally to existing built spaces during spatial restructuring of high-rise buildings and proposed architectural elements for spatial restructuring.

Given the broad scope and targets of high-rise building remodeling projects, the scope of spatial restructuring in this study focused on the lower levels of office facilities,

Table 1. Space reconstitution objectives, methods, and directions in highrise building

Division	Contents
Space reconstitution range	Reconstruction of Common Space in Low Floor of High-rise Building Business Facilities
Space reconstitution objectives	Composition of a Complex Cultural Space that Embraces Diversity and Publicity in High-rise Buildings
Space reconstitution methods	Remodeling of High-rise Building with the Characteristics of Regenerative Architecture
Space reconstitution directions	Complex Space, Open Space, Conceptual Space

aiming to create multifaceted cultural spaces with public appeal in high-rise buildings. The scope, objectives, directions, and methods of spatial restructuring were summarized in Table 1 below.

2. Concept and Characteristics of Regenerative Architecture

2.1 Concept of Regenerative Architecture

Regenerative architecture, also known as Adaptive Reuse, refers to the practice of revitalizing existing buildings or structures by preserving their historical essence while incorporating new design elements to repurpose them for contemporary functions and uses.[1)]

According to a blog post from Samsung Blueprint dated November 18, 2016, the concept involves breathing new life into the original or parts of the original structure without compromising its fundamental character. However, the definition of regenerative architecture does not have a clear-cut dictionary or legal definition. Previous studies on regenerative architecture have emphasized the preservation and utilization of the historical significance inherent in old buildings. It is seen as more than just renovation but as a means to revitalize the accumulated history and culture of a building, bridging the gap between the present and the past. In this study, regenerative architecture refers to expanding the concept of remodeling to create spaces capable of accommodating new programs while maintaining the inherent sense of place of existing buildings, interpreted from a humanistic and social perspective in a modern context.

Regenerative architecture goes beyond recycling, incorporating the concept of "upcycling" into the realm of architecture, which entails adding value to existing structures by imbuing them with environmentally friendly design, ideas, and technologies. Rather than demolishing and rebuilding, regenerative architecture seeks alternative utilization methods to imbue buildings with renewed value.[2)]

2.2 Characteristics of Regenerative Architecture

To derive design characteristics of regenerative architecture for the application of spatial restructuring in high-rise buildings, we first summarized the characteristics identified in previous studies. While the design characteristics derived from previous studies vary, there is a common emphasis on the aspects of sense of place and historicity in terms of utilization and preservation of existing buildings. Although there are differences in the characteristics defined for regenerative architecture in each study, common terms such as symbolism, adaptability, complexity, functionality, and various other terms are used across different studies.

The design characteristics of regenerative architecture mentioned in previous studies were recombined into six keywords by integrating words with similarities in meaning, and the contents of the design characteristics of high-rise buildings of re-established regenerative architecture are shown in Table 4.

3. Concept and Direction of Spatial Reorganization

3.1 Concept of Space Reconstitution

Reconstitution, in its literal sense, refers to "restructuring

Table 2. Types of adaptive reuse

Division	Contents
Regeneration of Modern Buildings	Regenerating modern buildings with historical value, such as registered cultural properties, into archives, exhibition halls, etc. through preservation and utilization measures
Regeneration of idle industrial facilities	Rehabilitation of industrial facilities left in physical form due to changes in industrial and economic structures into complex cultural spaces
Road-centric regeneration	Brand waste warehouses, waste facilities, etc. in underdeveloped areas such as industrial areas and regenerate them into commercial spaces, cultural spaces, exhibition spaces, etc

[1)]Sim Ga-in, "A Study on the Design Characteristics of Regenerative Architecture of Complex Cultural Spaces Recycling Industrial Facilities", Korea Space Design Association, 2023

[2)]Sim Ga-in, "A Study on the Design Characteristics of Regenerative Architecture of Complex Cultural Spaces Recycling Industrial Facilities", Korea Space Design Association, 2023

Table 3. Characteristics of adaptive reuse design in previous studies

Researcher	Research Topic	Design Characteristics
Park Sang-kyung (2017)	A Study on the Characteristics of Regenerative Architectural Design as a Commercial Facility in Aged Space	Temporality, materiality symbolism, directional complexity
Park Su-rin (2018)	A Study on the Spatial Characteristics of Complex Cultural Space Using Idle Industrial Facilities	Historicality, place symbolism, artistic diversity, participation utilization, openness
Park Myunghee (2019)	A Study on Architectural Planning and Design Characteristics of Idle Industrial Facilities Renovation	Specificity, variability flexibility, potential relationships
Shin Young-hye (2021)	A Study on the Change Characteristics of Urban Organization in the Semi-Industrial Area of Seongsu-dong	usability, conservation access, aesthetics usability, scalability
Lee Young-joo (2022)	A Study on Design Characteristics and Regenerative Values through Case Analysis of Spatial Upcycling at Home and abroad	Historicality, Efficiency Artistry, Economy Sharing, Sustainability
Sim Ga-in (2023)	A Study on the Design Characteristics of Regenerative Architecture in Complex Cultural Space Using Idle Industrial Facilities	Culturality, relational variability, accessibility historicality, symbolism preservation, harmony transferability, scalability

Table 4. Redefining the characteristics of adaptive reuse design in highrise building

Design Characteristics	Design Characteristics in Previous Studies	Contents
Historical symbolism	Timeline (Park Sang-kyung) Historicity (Park Su-rin, Lee Young-joo, Sim Ga-in) Conservation (Shin Young-hye, Sim Ga-in) Symbolism (Park Sang-kyung, Sim Ga-in)	It constitutes the essence of regenerative architecture, expresses regionality and historicality, and includes symbolic meaning
Functional complexity	Culture (Shimga-in, Park Su-rin) Artistry (Park Soo-rin, Lee Young-joo) Aesthetics (Shin Young-hye) Accessibility (Shin Young-hye, Sim Ga-in)	A space configuration that can perform multiple functions in a high-rise building or accommodate a variety of programs within the space
Continuous relationality	Purpose (Shin Young-hye) Uniqueness (Park Myung-hee) Participation (Park Su-rin) Shared property (Lee Young-joo)	Expressing various program spaces and multipurpose spaces in high-rise buildings, including experience and participation
Reconstructability	Harmoniousness (Sim Ga-in) Relationship (Park Myung-hee, Sim Ga-in) Materiality (Park Sang-kyung) Directivity (Park Sang-kyung)	Expressing the temporal and spatial coexistence of space and the relationship and harmony with existing buildings
Flexibility of space	Efficiency (Lee Young-joo) Utilization (Park Su-rin, Sim Ga-in) Persistence (Lee Young-joo) Flexibility (Park Myung-hee)	Flexible space to respond to changes to express the efficiency and sustainability of high-rise buildings
Potential scalability	Potential (Park Myung-hee) Transference (Sim Ga-in) Openness (Park Su-rin) Economic efficiency (Lee Young-joo)	Express possibilities and potentials for wider utilization through space such as opening and transfer

something that has been previously organized." In architecture, it can be seen as similar in meaning to terms like remodeling or renovation. In this study, the concept of space reconstitution is proposed as a remodeling concept with the meaning of adaptive reuse. Space reconstitution can be defined as a new spatial design method that rebuilds the physical environment through remodeling based on the socio-cultural concept of adaptive reuse, aiming to restore

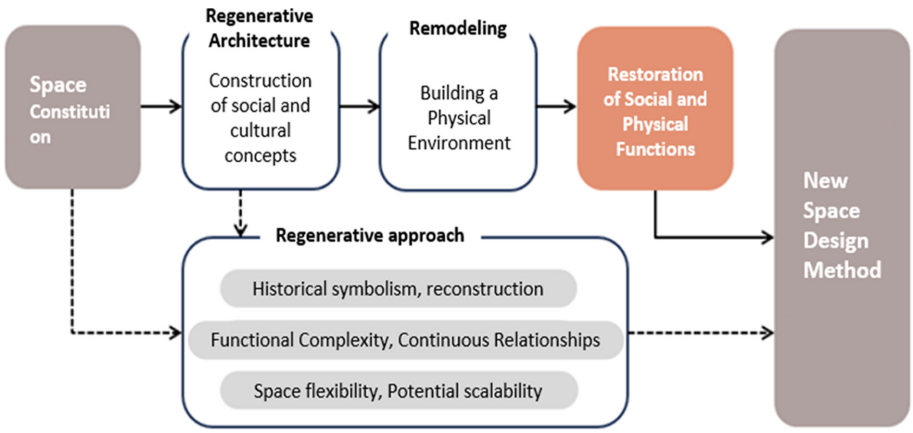


Figure 1. Concept of space reconstitution.

social and physical functions. Through space reconstitution, it can be said that "regenerative actions are involved in spatial restructuring to impart new programs to existing buildings."

3.2 Methods of Space Reconstitution:

In the reconstruction of high-rise building spaces in Seoul, which are required for remodeling, the openness of the use of space is low due to the exclusion of publicity, making it difficult to respond to changes in society and behavior in the context of urban regeneration. In response to this, changes in public and shared spaces are occurring due to spatial restructuring in the low, middle, and upper parts of high-rise buildings.

The method proposed for space reconstitution involves applying the characteristics of regenerative architecture to remodeling. While remodeling encompasses regenerative architecture in a broad sense, the space reconstitution in this study aims for publicly accessible multifunctional spaces, defining remodeling and regenerative architecture as complementary concepts. Therefore, the directionality of space reconstitution is defined by applying the characteristics of regenerative architecture from previous studies. Remodeling and regenerative architecture share common characteristics, particularly in terms of environmental sustainability. However, they can be differentiated primarily by their emphasis on functionality for remodeling and on sense of place for regenerative architecture. In other words, remodeling involves making buildings anew in terms of functionality and aesthetics, enhancing the value of buildings by creating sustainable spaces both internally and externally. On the other hand, regenerative architecture respects the existing sense of place and historicity of the building, constructing multifunctional spaces that accommodate various programs, creating spaces where the contemporary and the historical coexist.

As shown in Table 5, the characteristics of regenerative architecture were defined as six characteristics: historical

Table 5. Characteristics of adaptive reuse design

Characteristic	Contecnts
Historical symbolism	It is an element that constitutes the essence of regenerative architecture by preserving the original form, and it means expressing the historicality of existing buildings and can be used as a symbolic element based on people's memories and experiences.
Reconstructability	It refers to a space composition that provides a new experience through the construction of a modern space in contrast to the space of the past, and refers to an exotic space composition in which modern images and past images coexist.
Functional complexity	It refers to a space configuration in which a space can perform various functions or accommodate various programs within the space, and it can be activated by increasing the user's experience time.
Continuous relationality	It means that spaces of various characteristics are related like one space connected to each other, and it means that space can be used efficiently through visual connection and spatial connection.
Flexibility of space	It refers to the ability of space to adapt to or induce change, and it refers to the ability to form a flexible relationship by breaking boundaries and responding to changes in the environment.
Potential scalability	It is not limited to the physical size of the space, but it refers to the possibility of being used more horizontally and vertically through potential elements, and it also refers to the expansion of the use of space.

Table 6. Characteristics of complex cultural space

Characteristic	Contents
Complexity	The main characteristics of multi-cultural space include various programs such as culture, art, and community
Symbolism	Space that symbolizes the historical and identity of the space and contains cultural characteristics
Experience	A space that arouses and activates interest by providing opportunities for various events and experiences in a complex space
Scalability	Space that includes openness, professionalism, and accessibility and means physical and conceptual expansion
Integration	Convergence space that includes publicity and exchangeability and creates synergy with new types of space configurations
Variability	Flexible space that includes versatility and diversity to respond to objectives and changes

Table 7. Direction of space reconstitution in highrise building

Characteristics of Regenerative Architecture	Characteristics of Complex Cultural Space	Space Reconstruction Direction
Functional complexity Reconstructability	Complexity Integration	Muti space
Flexibility of space Continuous relationality	Variability Scalability	Open space
Historical symbolism Potential scalability	Symbolism Experience	Concept space

symbolism, reconstruction, functional complexity, continuous relationship, space flexibility, and potential scalability.

The characteristics of the complex cultural space were defined as six characteristics: complexity, symbolism, experience, integration, variability, and scalability.

In this study, based on the characteristics of regenerative architecture and the features of multifaceted cultural spaces, the direction of space reconstitution was established. Drawing upon the functional complexity and multiplicity, reconstructability and integration, 'multifunctional spaces' were proposed. Additionally, utilizing spatial flexibility and variability, continuous relationships and expansiveness, ‘open spaces’ were suggested. Lastly, based on historical symbolism and symbolism, potential expansiveness and experiential aspects, ‘conceptual spaces’ were presented as the direction for space reconstitution. The summarized direction of high-rise building spatial restructuring reflecting the characteristics of regenerative architecture and multifaceted cultural spaces is outlined in Table 7.

3.3 Space Reconstruction Direction and Detailed Strategies

The space reconstruction of high-rise buildings comprises complexity, openness, and conceptualized space. Complex space exhibits intricacy through program diversity, reconfiguration of spatial boundaries, and hierarchical eradication. Open space embodies characteristics of variability and continuity through transparent space, void space, and transitional space. Conceptual space entails an expanded spatial concept focused on experiential understanding within the building's context. The three directions for space reconstruction of high-rise buildings are summarized as follows.

3.3.1. Complex space

The multifaceted spaces in high-rise buildings aim for de-territorialization and de-boundarization, striving for flexible spatial configurations that are adaptable and adjustable to meet various requirements, thereby addressing the need for sustainable spatial configurations that can be reconstructed without unnecessary situations. Furthermore, ensuring complexity involves establishing integrated spaces through the flexible relationships among diverse spaces. As strategies for spatial reconstruction to adapt to social changes, the following approaches were proposed: ① Diversification of multifaceted programs and ② Integration of spaces through the reconfiguration of spatial hierarchies.

3.3.2. Open space

The open spaces in high-rise buildings aim to expand the concept of open spaces, wherein open spaces do not merely signify empty areas but rather undergo changes in the concept of shared spaces through transitions or expansions. Particularly, as office buildings become taller,

Table 8. Direction of space reconstitution (Multi Space).

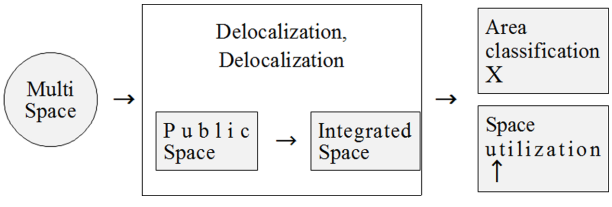


Table 9. Direction of space reconstitution (Open Space).

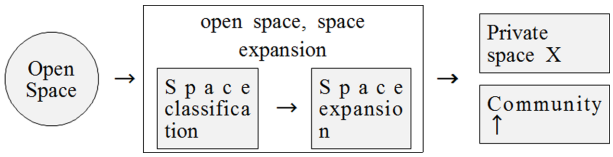
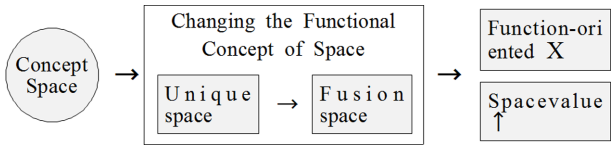


Table 10. Direction of space reconstitution (Concept Space)



the lower floors emerge as crucial junctions where public and private realms intersect, underscoring the importance of transitional spaces that serve as buffers between public and private areas. In this study, strategies for configuring open spaces in the lower floors of office facilities include: ① Configuring the lower floors as transitional spaces and ② Establishing openness and connectivity to ensure the configuration of the lower floors.

3.3.3. Conceptual space

Conceptual spaces in high-rise buildings aim to achieve functional conceptual changes within spaces, with convergence being a crucial element in expanding the concept of spaces. In modern times, the relationship between space and function has become more fluid. For instance, a café may also serve as a library, and vice versa. Spaces are evolving from being dedicated to a single function to encompassing various spaces reflecting lifestyles and preferences. While traditional spaces have been subdivided and evolved, they have encountered limitations due to their enclosed characteristics. However, with the contemporary paradigm of convergence, spaces are transforming into mutually complementary spaces that fill in each other's deficiencies. Conceptual spaces go beyond physical spaces to denote expanded spaces where various values coexist. For space reconstruction, strategies for configuring conceptual spaces include: ① Space branding centered around experiences and ② Creating hybrid spaces as detailed directions.

The direction and detailed strategies of the above high-rise building space reconstruction are the basis for the complex cultural space reconstruction design applying the characteristics of regenerative architecture, and are summarized as shown in Table 11.

4. Case Analysis by Space Reconstruction Direction

4.1. Case Studies on the Space Reconstruction of High-rise Buildings

The purpose of this study was to examine how the characteristics of the space reconstruction of high-rise buildings defined above were applied and to analyze the applicability of the space reconstruction in the actual design. The four selected cases were reconstructed through remodeling since 2018, targeting office buildings located in each region of Seoul. The Seoul office building of the Korea Exchange is characterized by an integrated complex space composition of several programs, and the Shinyoung Securities office building is a corporate office and consists of a complex space and a conceptual space centered on cultural space. Maru360 is an example of constructing an open space based on the community while reorganizing business facilities into a start-up support center, and Samil Building is a symbol of Korea's first high-rise office building and is a case reconstructed into a conceptual space based on the location and historical value of the building.

4.1.1. Seoul headquarters of the Korea Exchange reconstructed as a complex space

'Complexity' and 'Integration' are the central elements of space reconstruction, serving as foundational concepts that accommodate diversity and ensure spatial sustainability. These concepts are well exemplified in the case of the remodeling project of the main building of the Korea Exchange headquarters in Seoul. The objective of the remodeling project was to create an open space conducive to communication. The existing first-floor space of the

Table 11. Detailed strategy of space reconstitution in highrise building

Direction	Detailed strategy	Contents
Multi Space	Diversification of programs	Diversify programs for public use and develop sustainable content.
	Hierarchy of spaces	It removes the hierarchy of spaces and constructs a flexible space by resetting the hierarchy of spaces.
Open Space	Transition space configuration	It constructs a transition space for accessibility, openness, and connectivity.
	Openness and connectivity	The space is composed in three dimensions to secure openness and connection.
Concep	Space Branding	It constitutes a space where experience and experience-oriented culture and architecture are fused.
	Creation of Convergence Space	Spaces of various personalities are fused to form a space of a new trend.

Table 12. Case analysis for space reconstitution

Case	Year of completion	Location	Space Reconstruction Direction
Korea Exchange	2021	Yeouido-dong, Yeongdeungpo-gu	Multi Space
Shinyoung Securities	2018	Yeouido-dong, Yeongdeungpo-gu	Multi · Concept Space
Maru 360	2021	Yeoksam-dong, Gangnam-gu	Open Space
Samil Building	2020	Gwancheol-dong, Jongno-gu	Concept Space

headquarters was fragmented due to the underground parking ramp, and it was cluttered with office facilities lacking adequate lighting and ventilation, along with a disjointed information library and café area. To reconstruct the space, the underground parking ramp was removed, and a new floor was added to ensure spatial continuity. Walls were demolished, and boundaries were broken down to reconfigure the space into an integrated and adaptable multifaceted cultural space. Through the integrated platform X-Platform, spaces and facilities were seamlessly interconnected, allowing for the integration of diverse functions such as a library lounge, café, and smart offices.

The integrated platform, X-Platform, was designed to balance the spatial reconstruction in response to the symmetrical spatial structure of the main building, where four cores are symmetrically positioned in the north, south, east, and west directions. The café lounge located by the southern windows breaks down boundaries to emphasize communication and is configured to allow ample daylight to flow into the interior. The open library, accessible to everyone, features a free-flowing spatial structure with flexible boundaries and is visually connected to its surroundings.

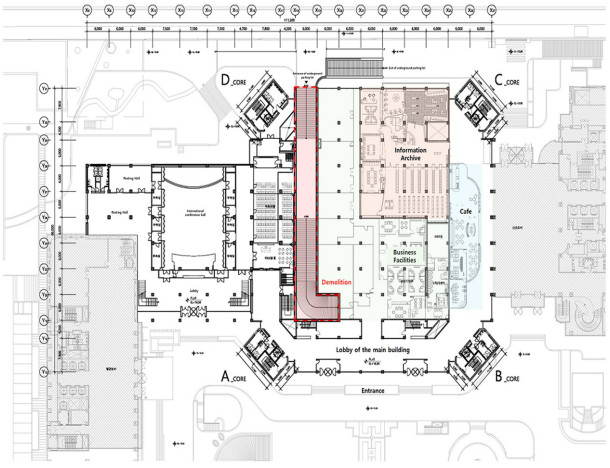


Figure 2. Existing spatial structure of Korea Exchange (Before)

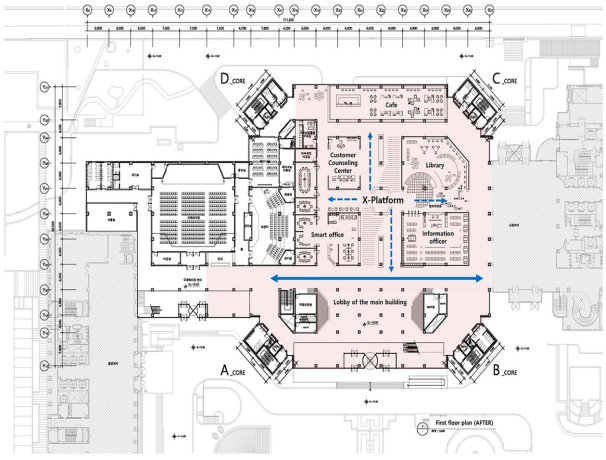


Figure 3. Space complexization of Korea Exchange (After).



Integrated Platform Cafe lounge Library

Figure 4. Various spaces of Korea Exchange.

4.1.2. Shinyoung Securities' office building reconstructed into a conceptual space and complex space

The ground-floor space reconstruction project of Shin Young Securities, located in Yeouido, demonstrates a case of reconfiguring the building into "conceptual" and "composite" spaces. The conceptual space is a fusion of

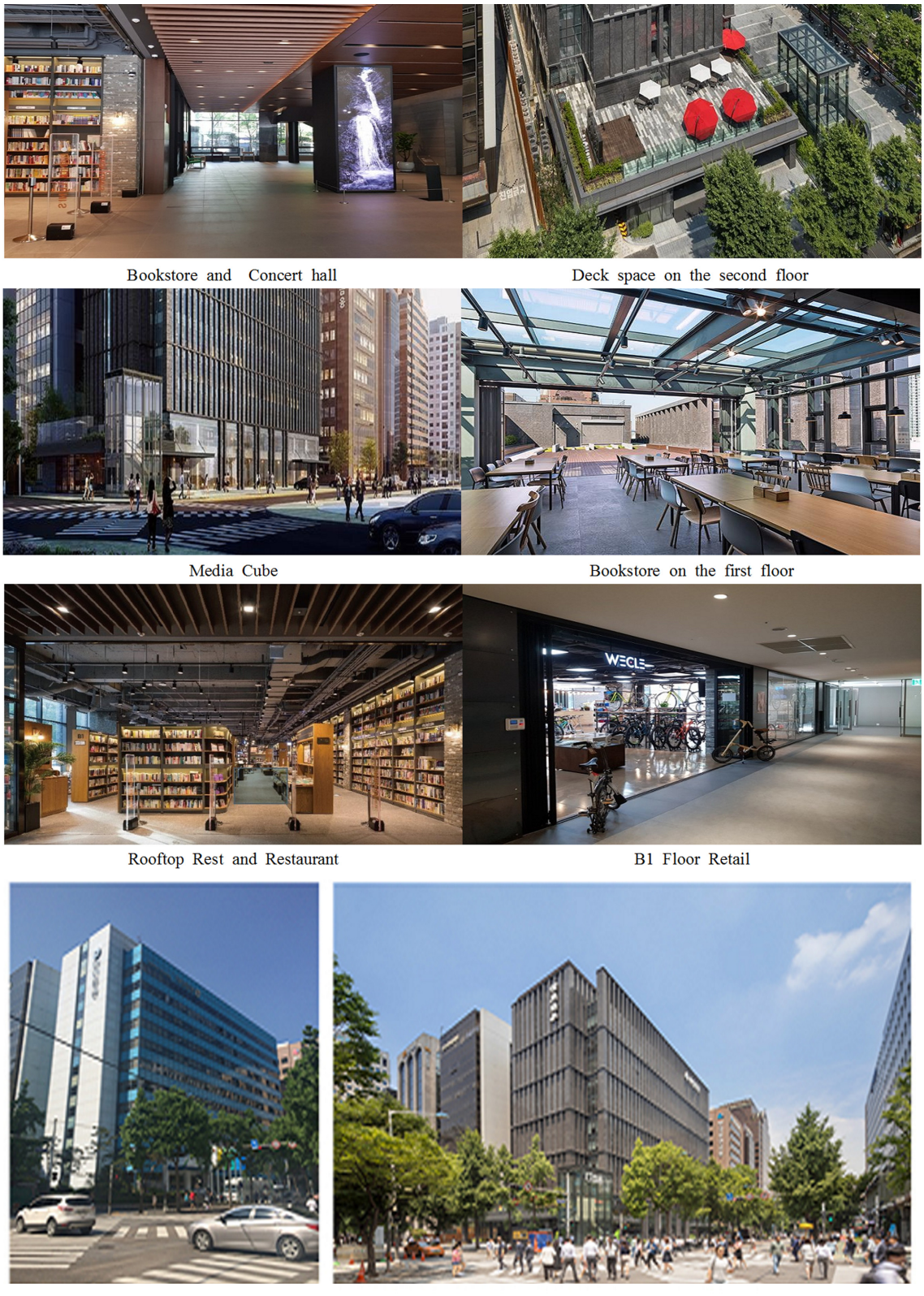


Figure 5. Various spaces of Shinyoung Securities Office.

various contents, allowing for prolonged user experiences. During the overall remodeling process, Shin Young Securities transformed the lower floors (from basement 1 to the 2nd floor) into a composite cultural space. The majority of the lobby on the 1st floor is occupied by a bookstore and a performance hall, hosting cultural events such as Shin Young Culture Classes that introduce classical music and art. Various spatial elements, such as the media cube connecting the basement 1 floor and the podium deck, the restaurant linked with the rooftop lounge, and the retail shop on the basement 1 floor, were incorporated to encourage user experiences and participation. This project forms a new composite cultural space in Yeouido, combining offices and culture.

4.1.3. Maru 360 Building Reorganized as Open Space

The terms "expandability" and "versatility" are expressed in the vocabulary of open spaces. Open spaces do not simply refer to empty spaces. Through the expansion of space and the connection of transitional spaces between spaces, community activation can be expected. The expandability and versatility of open spaces are well demonstrated in the case of the Maru360 Building space reconstruction project shown in Figure 6. The Maru360 Building

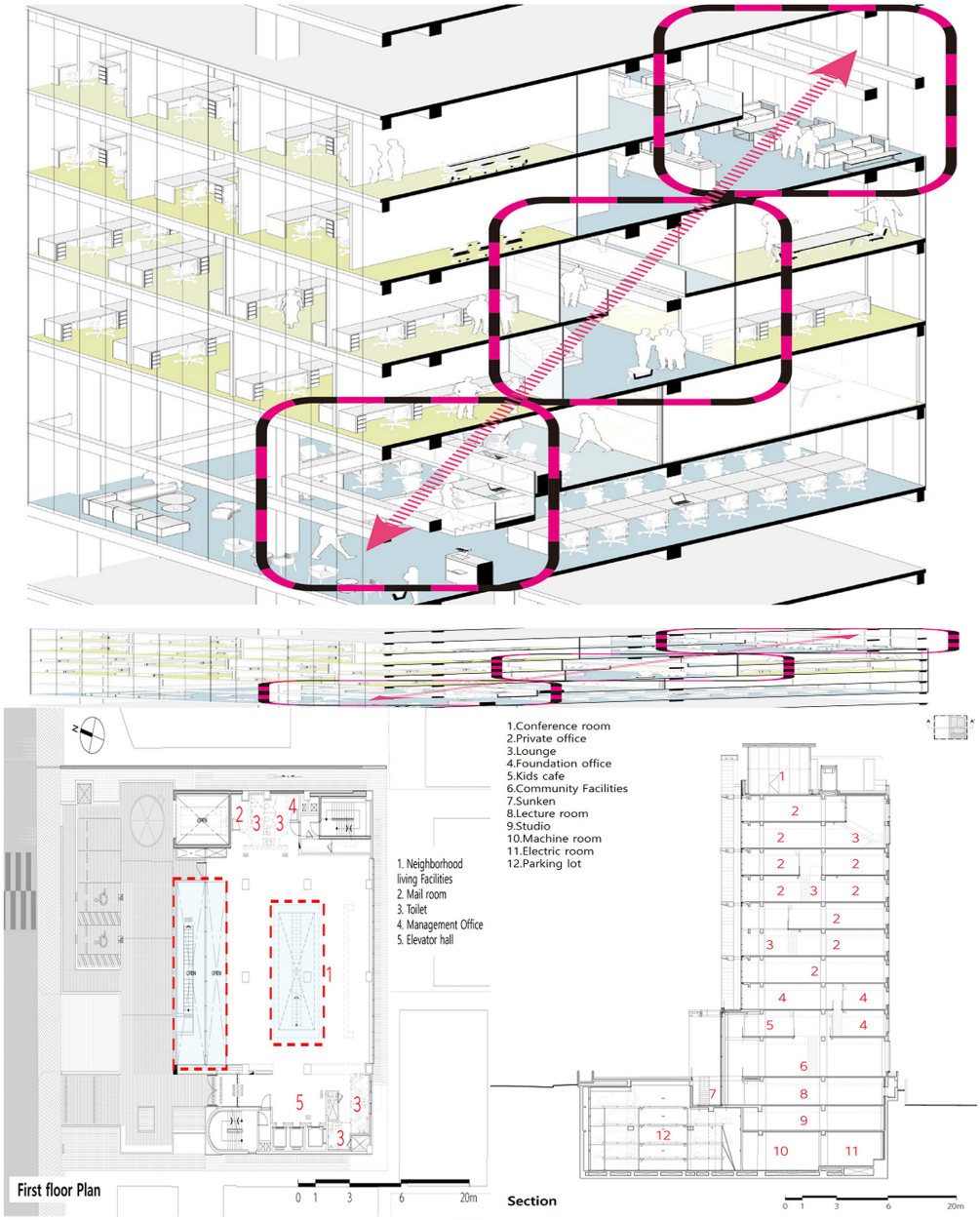


Figure 6. Expansion and step by step continuity of Maru 360 Building space.

Table 13. Space reconstitution direction and components in highrise building by cases analysis

Case	Space reconstitution direction	Components
Korea Exchange	Multi Space	Library, cafe, smart office, lounge
Shinyoung Securities	Multi·Concept Space	Bookstore, concert hall, cafe, lounge, retail
Maru 360	Open Space	Multi-ground, cafe, lounge
Samil Building	Concept Space	Lounge, lobby

space reconstruction project involved remodeling the Ubo Building, an office facility located in Yeoksam-dong, into the Asan Nanum Foundation's startup support center. Due to the nature of the Changwon Support Center requiring various collaboration and exchange spaces, the interior space needed to be reconfigured. Taking into account the characteristics of the tenant companies, the floors were opened up in units of two, creating community spaces and connecting them. These open spaces were converted into floor lounges, designed with diagonal vertical continuity, creating public spaces where people naturally gather, move, and communicate.

The Maru360 Building underwent remodeling targeting office spaces in cramped urban areas with limited external space. To address the constraints of space expansion, an open courtyard for interaction was incorporated as a vertical extension of the space. By opening up the floors, the basement level, first floor, and second floor were considered as a continuous ground space, connecting the spaces through the concept of visual and spatial expansion.

4.1.4 Samil Building Reorganized into Conceptual Space

Symbolism is typically a prominent element in the spatial reconstitution of buildings with historical significance. The Samil Building, once the first skyscraper in South Korea before the 63 Building, has been esteemed as a significant architectural asset representing the modern and contemporary eras of Seoul for over half a century. The essence of the Samil Building remodeling project lay in preserving its inherent sense of place and historical value. The exterior of the building was revitalized to reflect the original curtain wall design, particularly emphasizing the spatial arrangement of the lower floors to embody a coexistence of past and present. During the reconstruction of the lower floors, the original concrete beams and octagonal columns from the building's initial construction were left exposed, while the dismantled components of the existing metal curtain wall were repurposed and incorporated into the design.

4.2 Case Studies on spatial reconstitution and architectural responses in high-rise buildings

First, the components and directions of spatial reconstitution in high-rise building cases were consolidated, as shown in Table 13. The Korea Exchange Seoul Headquarters demonstrated the direction of spatial reconstitution towards a mixed-use space, comprising elements such as a library, cafe, smart office, and lounge bookstore. The Shin Young Securities Building showcased the direction of spatial reconstitution towards mixed-use and conceptual spaces, consisting of elements such as a performance hall, cafe, lounge, and retail area. The Maru 360 Building exemplified the direction of spatial reconstitution towards open spaces, including features like a multi-ground space, cafe, and lounge. Lastly, the Samil Building exhibited the direction of spatial reconstitution towards conceptual spaces, incorporating elements such as lounges and a lobby.

Next, the contents of spatial reconstitution in high-rise buildings and the architectural responses were summarized. The Korea Exchange Seoul Headquarters Main Building underwent spatial reconstitution through architectural responses such as integrating open lobby and mixed-use spaces using a unified platform plan, implementing voids and vertical circulation, and inserting public floor spaces. The Shin Young Securities Building transformed into an office building infused with culture, featuring experiential spaces for various cultural programs, uncertain spaces, and diverse spaces. Maru360 required a community-oriented spatial layout as a startup support center, thus employing architectural responses like flexible spaces, voids and vertical circulation, and interpenetrating spaces to create vertically continuous mixed-use areas. The Samil Building aimed to preserve and restore the building's historical and spatial values, resulting in a symbolically reconstructed space where past and present coexist harmoniously, achieved through architectural responses that ensure the continuation of the building's heritage and the integration of heterogeneous spaces.

4.3. Spatial Reorganization Architectural Correspondence Factors

In architecture, the direction of design in reconstruction work is determined by how existing physical and contextual conditions of the building are integrated with new programs. Unlike new construction projects where the form is often determined by predefined programs, spatial reconstitution involves maintaining the existing spatial structure while integrating new programs. The direction and detailed strategies of spatial reconstitution play a crucial role in shaping new spaces, considering the context of the existing spaces and necessitating architectural responses.

Analyzing the architectural responses in the cases of spatial reconstitution in high-rise buildings previously

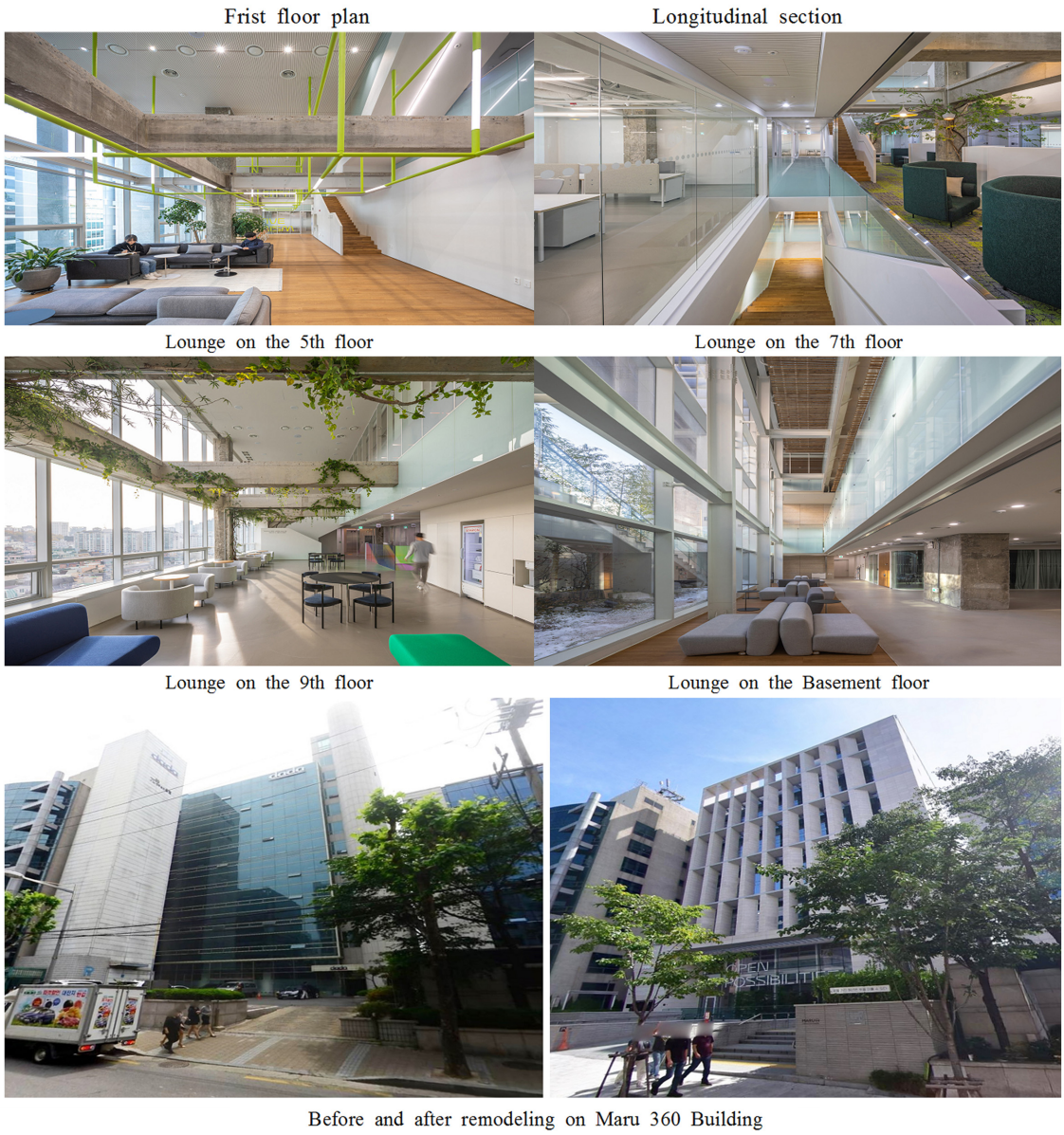


Figure 7. Continuous Maru 360 Building lounge configuration.

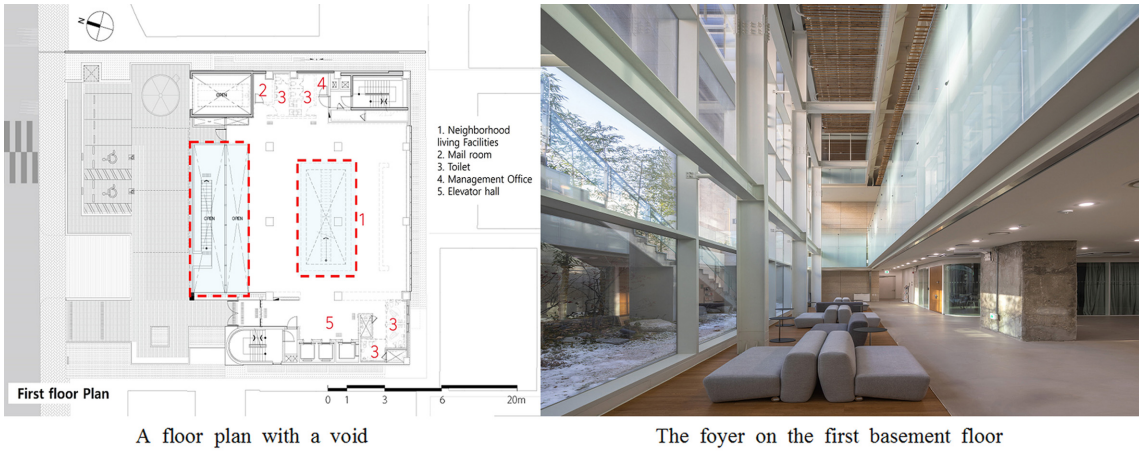
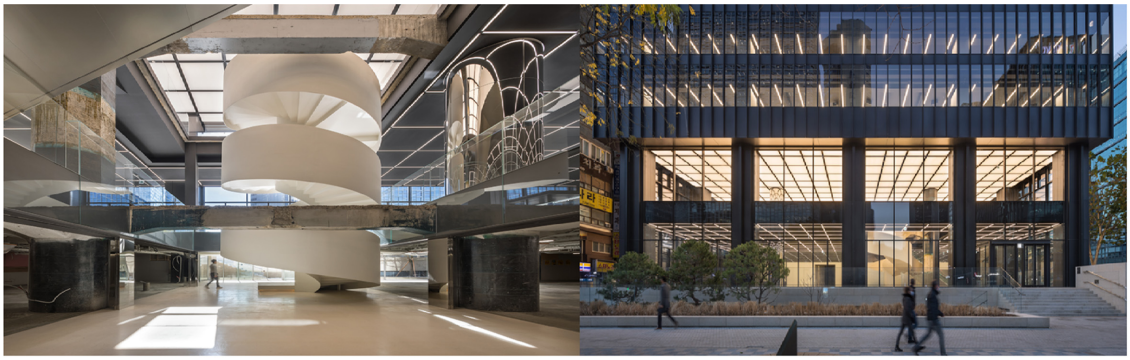
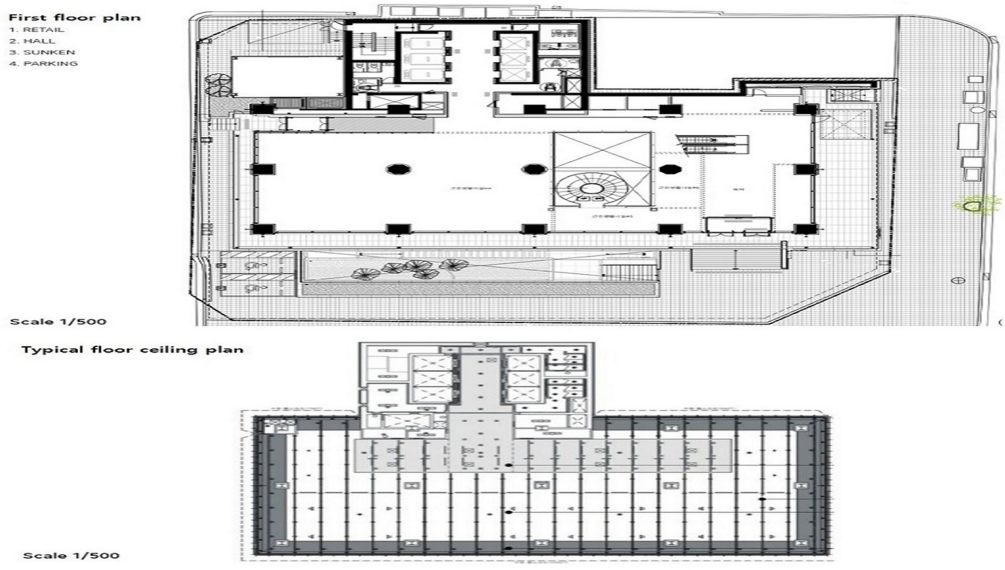


Figure 8. Vertical extended lobby configuration.



Lobby configuration that exposes existing structures





Before and after remodeling on Samil Building

Figure 9. Formation of Samil Building Lounge with historical symbolism.

examined, ten architectural responses were identified: integrative spaces, void spaces, insertion of public floors, spaces of uncertainty, diverse spaces, experiential spaces, interpenetrating spaces, flexible spaces, symbolic spaces, and spaces of heterogeneous coexistence. The architectural responses derived from spatial reconstitution in high-rise buildings are summarized as follows in English.

4.3.1. Fusion space

Convergence means 'melting to become one', and modern space creates a new space by fusion by complementary relationships between spaces of different characteristics on the same level. The most representative architectural response elements in the reconstruction of complex cultural spaces accommodating various programs include

Table 14. Space reconstitution contents and architectural response factors in highrise building by cases analysis

Case	Space reconstitution contents	Architectural Response
Korea Exchange	Integrated space configuration that connects spaces	Fusion space
	Two-story open lobby space	Void Space
	Mediated space configuration connecting upper and lower spaces	Insert the public floor
Shinyoung Securities	Organizing various spaces for cultural events	Experiential space
	Remove the physical boundaries of libraries, cafes	Uncertain space
	Various spaces for exhibitions, performances, culture, and relaxation	Polymorphic space
Maru 360	A cafe and cultural space are constructed on the first floor	Flexible space
	Two-story open community space configuration	Void Space
	Continuous configuration of open locations differently	Inter-intrusive space
Samil Building	A symbolic reconstruction of the value of an existing building	Symbolic space
	The past and the present coexist by preserving the traces of history	Heterogeneous co-prosperity

'expansion of space' and 'continuous space'.

4.3.2. Void Space

It refers to an open space that is not surrounded horizontally or vertically, and in space reconstruction, it is an open space through demolition and deformation of existing structures and is mainly used for lobby and lounge composition. In addition, it is a deliberately empty space for central space composition and is mainly composed in a space where the movement line is concentrated, and serves as a mediating space.

4.3.3. Insert the public floor

It is an area to expand publicity by creating a new layer of character between existing layers. It is used as an element of space expansion within a limited area of an existing building, or as a space with individual or intermediate characteristics.

4.3.4. Uncertain space

It is an area for creating various places and does not form the physical boundary that was divided in the past, but it is a space that creates the ambiguity of the boundary with materials such as furniture and transparent glass, and has the characteristics of a flexible space and a variable space.

4.3.5. A polymorphic space

It is an area for creating various places and does not form the physical boundary that was divided in the past, but it is a space that creates the ambiguity of the boundary with materials such as furniture and transparent glass, and has the characteristics of a flexible space and a variable space.

4.3.6. An experiential space

It is a space composition that induces active users' experiences, and it is an element that recognizes and activates the space through spatial experiences, spatial experiences, and program experiences. It is a space that considers experience as important and is formed through various programs such as viewing, leisure, and participation.

4.3.7. Inter-intrusive space

It refers to a space in a space that permeates between space and space, and it plays a role in connecting space and space in the form of a new space penetrating between the two spaces, such as overlapping space, visual and perceptual connection, and penetration between volumes, and performs its own functions different from the two spaces.

4.3.8. A flexible space

The area of space that can be used for space reconstruction is limited. It refers to a space that is empty or has no physical boundary formed in consideration of conversion to a different purpose than one space used for multiple purposes within a limited space, and is used as an element for space sustainability.

4.3.9. A symbolic space

It does not mean a landmark, but rather a symbol of the meaning implied by the space. It can be found in traces of preserving existing history, or symbolism is formed through spatial contrast between the past and the present.

4.3.10. Heterogeneous co-prosperity

It is a space where the past and the present coexist, minimizing demolition or change of existing space and inserting a completely new space while preserving the overall structure and shape as much as possible. It is a way to form a new place by not only maintaining the original historical value and place, but also symbolizing the present and future through the insertion of heterogeneous new spaces.[3)]

[3)]Roh Jeong-eun. "A Study on the Strategy and Method of Convergence Design for the Regeneration and Utilization of Architectural Space." Korean Doctoral Degree Paper, 建 National University, Seoul, 2008.

Table 15. Synthesis of space reconstitution contents in highrise building

Division		Contents	
Space reconstitution definition		A new spatial design method that restores social and physical functions by building a physical environment through remodeling based on regenerative architecture of social and cultural concepts.	
Space reconstitution direction	Multi Space	Diversification of programs	Diversify programs for public use and develop sustainable content.
		Hierarchy of spaces	Flexible spaces are constructed by removing the hierarchy of spaces and resetting the hierarchy of spaces.
	Open Space	Transition Space Configuration	It constructs a transition space for accessibility, openness, and connectivity.
		Openness and connectivity	By organizing the space in three dimensions, it secures openness and connection.
	Concept Space	Space Branding	A space composition that combines experience and experience-oriented culture and architecture.
		Creation of Convergence Space	It combines spaces of various personalities to form a space of a new trend.
Space reconfiguration architectural correspondence factors	Fusion space	A space where spaces of different personalities are complementarily related and fused on an equal level.	
	Void space	In order to construct a central space, it is a deliberately empty space and is mainly composed in a space where the movement line is concentrated, and serves as an intermediary space.	
	Insert the public floor	Areas that extend publicity by creating new layers of character between existing layers.	
	Uncertain space	A space that does not form the physical boundary that divided the space, but creates ambiguity of the boundary with materials such as furniture and transparent glass.	
	Polymorphic space	Conceptually, a space that implies the coexistence of differences and implies various meanings.	
	Experiential space	A space of spatial experience, spatial experience, and program experience as a space composition that induces active user experience.	
	Inter-intrusive space	It refers to the space in the space that permeates between the space and the space, and a new space penetrates between the two spaces.	
	Flexible space	A space that has not been emptied or boundaries in consideration of one space being used for multiple purposes and another.	
	Symbolic space	It does not mean a landmark, but rather a symbol of the meaning implied by the space.	
	Heterogeneous co-prosperity	It is a space where the past and the present coexist, and inserting a completely new space while minimizing and preserving the demolition or change of existing space	

Based on the previously analyzed cases, the derived contents are about representative architectural response factors required for spatial reconstruction, and in future spatial reconstruction designs, architectural response factors suitable for each project characteristic and situation should be derived.

5. Conclusions

In this study, the direction of spatial reconstruction of high-rise buildings applying the characteristics of regenerative architecture was set and the elements of spatial reconstruction were summarized. The characteristics and concepts of regenerative architecture were applied to spatial reconstruction of high-rise buildings, and the meaning of spatial reconstruction mentioned in this study is a complex of the meaning of remodeling and regenerative architecture, and 'improving the function of buildings through remodeling of high-rise buildings' and 'reflecting the value of regenerative architecture in high-rise building spaces' were defined as the meaning of spatial reconstruction.

This study proposes a “high-rise building space reconstruction reflecting the characteristics of regenerative architecture,” and the scope of space reconstruction was targeted at the lower floors of high-rise building business facilities, and the goal was to construct a complex cultural space.

Based on the characteristics of regenerative architecture and complex cultural spaces, three directions of space re-

construction for high-rise buildings were presented: “complex space,” “open space,” and “concept space.” Complex space aims to be de-regional and non-boundary, and open space aims to expand open space. Conceptual space aims to change the functional concept of space, and this spatial reconstruction direction setting aims to construct a flexible and variable space and increase usability by containing various contents. Complex space composition through spatial reconstruction in the detailed direction of high-rise building space reconstruction is a plan to diversify complex programs ② strategies for integrated space composition through spatial hierarchies, and open space composition through spatial reconstruction is a transition space. For conceptual space composition through spatial reconstruction, ① experience-oriented space branding ② convergence space creation strategies were suggested.

Next, based on the case, we looked at how the design characteristics of the spatial reconstruction of high-rise buildings were applied to the reconstructed space. In the case of the Korea Exchange's Seoul office, the direction of spatial reconstruction of complex spaces and conceptual spaces appeared in the case of the Korea Exchange, the direction of spatial reconstruction of complex spaces and the direction of spatial reconstruction of conceptual spaces appeared in the case of Shinyoung Securities' office building, and the direction of spatial reconstruction of conceptual spaces appeared in the case of Maru 360 Building. Based on this direction, the contents of spatial reconstruction were summarized, and the case analysis analyzed how the new architectural elements for the existing spatial reconstruction were responding architecturally. As a result of the analysis, 10 architectural correspondences were derived: convergent space, void space, public layer insertion, uncertain space, pluralistic space, experiential space, mutual intrusion, flexible space, symbolic space, and heterogeneous win-win. Table 15 below summarizes the contents of spatial reconstruction based on the above research results.

This study identified the concept of high-rise building space reconstruction accompanying the concept of regenerative architecture, and laid the foundation for a new methodology of space reconstruction by organizing the correlation between the characteristics of regenerative architecture, the direction, strategy, and architectural response factors.

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