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공학석사학위논문

**Interpretation of the Architectural Strategy in Renzo Piano's
Urban Contemporary Museum Expansion**

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서울대학교 대학원

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Urban Contemporary Museum Expansion**

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Abstract

Interpretation of the architectural strategy in Renzo Piano's urban contemporary museum expansion

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Abstract

Renzo Piano has been practicing his expansion of urban contemporary museums using his clear process. By analyzing Renzo Piano's four major design components, I have found very specific, detailed information in regards to his expansions that those four specified perspectives assist to understand the composition of important matters and elements in the expansion of Renzo Piano.

From Piano's understanding of his composition of expansion, he has employed the new major space with his distinct belief of dividing programs and functions. Piano's sketches also help to understand the location and orientation of new major space. It was necessary to understand Piano's intention in regards to the new major space and his composition strategy in order to clearly interpret his architectural design strategy. Piano's refined details of design structure are revealed through his façades, ceilings and roof systems. His constant efforts to build expansions from a structural solution were clearly recognizable through the analysis of his architectural tectonics, a potential tool for Piano.

Moreover, Due to Piano's respect for existing architecture, I have found, though often seamless and invisible, simple, yet humble connections to the existing building in his expansions. The three types of connections were categorized; compound, corridor and underground. Within the same category, they shared the physical appearance of being connected; though the intention was never clarified. Relating to outdoor space, the piazza was mostly placed in the process of expansion, but not always treated as an outdoor space. The piazza to Piano was more than the literal definition; it was a public gathering space where the major activities concentrated. Coincidentally, I have found all ten of Piano's expansions were situated in an urban context.

From interpreting his spatial formation of new major space in an expansion, I have found Piano's intent is to find balance with the existing museum. It is about coexistence; the existence of two major spaces that balance the harmony in a new museum complex. It is also about Centrality; the communication between two distinct centers connected together. Piano knew the communication between two distinct Centralities should be communicated through both physical and conceptual connections.

In surface expansions, Piano used his usual transparent materials that often resulted in dematerialized surfaces. He treated the surfaces of an expansion as a filter for the natural and artificial light. The dematerialized surface also assisted in creating a transparent surface when necessary. Piano's intention in regards to the expansion of surfaces on a building was to implement transparency, or to his work on the building transparent. Rather than being intrusive, Piano believed his new expansions should be transparent and subtle. By bringing forth the characteristics of the existing architecture, he found his expansions would be functional and connected.

To create a more advantageous expansion, Piano knew the connection to the existing building was the key factor. Considered to be a demanding decision in expansion, Piano resolved to make his designs transparent and light with a simplicity that would reveal the purity of the existing architecture. He created transparency in between the buildings to

preserve the beauty of their existing architecture. With his simplicity of design, Piano created the lightness of connection in metaphysical sense.

Lastly, Piano's expansion created a new outdoor space as the front of a new expansion; the Piazza. This outdoor space composed new corners in the street and added new diversity to the museum exterior. From the analysis of his outdoor space and its effects by the expansion, I could relate this outcome to the theory of Jane Jacob's 'the four generators of diversity'. The physical changes of Piano's expansion to urban context corresponded with four generators of diversity in Jacobs' theory: mixed uses, small blocks, aged buildings and concentration. I found these four generators of Jacobs' were in an agreement in the Piano's strategy of outdoor space.

This study of Renzo Piano's architectural strategy has revealed important and relevant design factors that should be considered in regards to urban contemporary museum expansions. With the vast growing number of expansion projects outweighing the number of studies in museum and architecture expansions, this study will prove useful and beneficial. As Piano's careful consideration of the four major components proved crucial in his museum expansions; it can also be a valuable asset for any architect considering any type of expansion.

Keywords: Urban Contemporary Museum Expansion, New Major Space, Tectonic, Connection between Old and New, Outdoor Space, New Centrality, Transparent Surface, Connection of Lightness and Transparency, New generator of Urban Diversity.

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Chapter 1.Introduction

1.1. Background and objective

1.2. Preceding studies

1.3. Source and outline of research

Chapter1.

Introduction

1.1. Background and objective

Contemporary museums have specific functions for specific needs. The key role of Contemporary museums is to showcase various types of creations pertaining to scientific, artistic, cultural and historical importance. These can be displayed as both interior or exterior exhibitions. Thus, the demands for museum architecture are constantly evolving as art and culture must accommodate the various mediums and means that are capricious. For this reason contemporary museums began their transformation to more spacious and improved means. Lack of space for exhibition and storage are usually primary factors and at time they renovate when building lose the function for oldness and weaken structure. Those reasons have become prominent factors for design of new expansion. Furthermore, most contemporary museums tend to choose their locations in urban context to provide easy access for visitors. Albeit, suburban museums also keep their unique roles, contemporary or urban museums are evolving more actively; thus, they are considered to be more demanding in architecture. Hence, the constant phenomenon of urban museum expansions is a worthy subject for study in a proper format. Extraction of essential quality will come artlessly.

This dissertation is specifically an analysis on Renzo Piano's urban contemporary museum expansion. Italian born architect, Renzo Piano received the Pritzker prize in 1998 becoming one of the most significant figures of architecture today. His firm, Renzo Piano Building Workshop, is based internationally in Genoa, Paris and New York. Born in Genoa, Italy, in 1937, his love for the sea and port was irresistible and the love for nature in practicing architecture began from childhood. As an architect, he mentioned, how "places" influence every perception, every emotion, and every human activity. The places and people from his childhood helped mold him, influenced him, shaped him in becoming the architect he is today. He was born into a family of builders As he was born

into a family of builders, his relationship with architecture was inherent. Piano said, *“Rather than building heavy things out of brick and sand like my father, I wanted to make light thins. In a childish way,”*

Rather than introducing Renzo Piano in an ubiquitous or informational way, his definition of architecture would give deeper understanding to his background thoughts and beliefs those accumulated from his life experience.

During his Prizker Prize acceptance speech, Piano untangled his notion of architecture highlighting three key phrases: Architecture is a service, architecture is an ancient profession and architecture mixes things up. It is a service that serves a purpose. He believed if architects became too prominent in the process, the architectural service could not satisfy the client or user. In comparison to music, he explained that, one can ignore an awful music melody, but one can't ignore the site of an ugly building opposite to one's home. Architecture is an ancient profession. It creates shelter for the living and it has served as the first basic necessity for life from ancient times. Finally, architecture mixes things up. Renzo believes a integration of history, geography, anthropology and environment has to complete the architecture.

He continued on using imagery. Architecture is like an iceberg. In the seven eighths of an iceberg that lies below the water, we find the forces that push architecture up, that allow the tip to emerge: society, science and art.¹ Society – the effort to listen to people's voices; science – the constant effort to tackle reality with curiosity and courage; art – the technique to generate an emotion; are the forces that sustain architecture. Eventually, all three should accumulate in the building over time. The stratification of experience is the architecture with an architect's metabolism of experience.

With his distinguished thought, Renzo Piano enlightened museums in his own sensibility. He has built and transformed over twenty museums and cultural facilities in his career.

¹ Matteo Agnoletto, Renzo Piano(Milan: Motta Architettura srl, 2009), p.91

Of his ten remarkable museums expansions, he has completed seven museum expansions and three additional projects are in process of waiting for a proper inauguration.

Many architects have a great body of work in museums and some have even performed expansions successfully. Of all the great expansions, museums are fanatical to Renzo Piano's sensibility in expansion and extension. Why choose Renzo for expansion? He knows and understands the importance of existing buildings; the society, science and art they breathe under the structure. Piano is also known for adapting different approaches for each project. Unlike other worldly renowned architects who sign their signature on every building careless with location and usages, Renzo keeps his swagger under the ceiling and brings the foremost extension. Rather than conceding to a new architectural building design, Piano clearly designs new expansions valuing and preserving much of the existing buildings. In addition, his designs never lose the quality and characteristics of his unique intentions; he is successfully able to insert his altered creation in a seamless and transparent state of art.

In Precedent studies, expansion and extension were issued and mentioned in varied perspectives, but it was never regarded in the format of a dissertation. With the vast growing numbers of expansion projects, a formal study into the expansion of contemporary museums is noteworthy. In Renzo Piano's expansion of museums, there are four major components; the new major space, tectonic of surface, connection between old and new and the new piazza. Therefore, this study will analyze these four components to understand Renzo Piano's notion of expansion in depth. It is contemplating at the museum on the urban site because urban situation is more complicated and demanding to work with and has more chances to expand.

Therefore, this dissertation seeks to interpret the architectural strategy in Renzo Piano's urban contemporary museum expansion to understand and represent the unknown versatile factors in depth. While interpreting four major components, this study will find the new meanings in Renzo Piano's architectural strategy with his distinguished strategy of urban contemporary museum expansion.

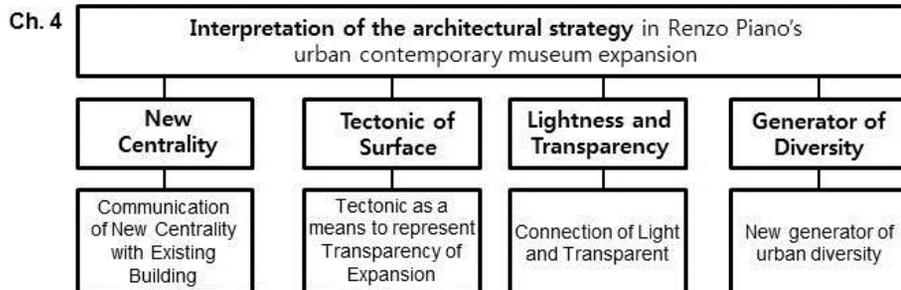
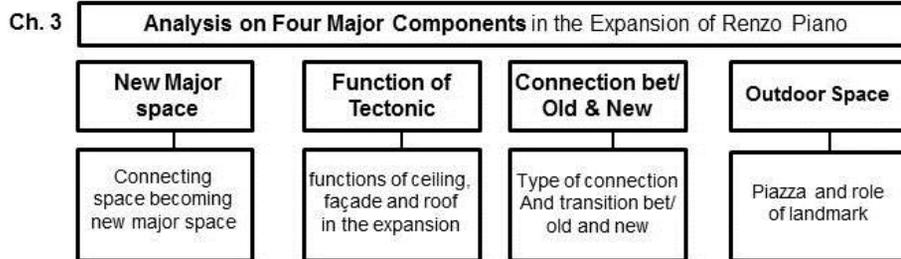
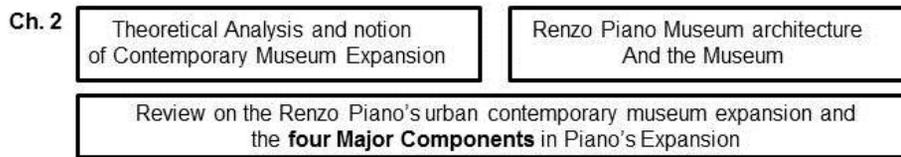
1.2. Preceding studies

Due to the lack of preceding studies on expansion, in addition to Renzo Piano's architecture, it was hard make arguments from general and objective perspectives.

1.3. Source and outline of research

The main source of this research is the documents pertaining to the museums of Renzo Piano, which include project review books, articles in criticism, news articles relating to his projects and articles from professional and non-professional journals.

1.3.1 The outline of research



Chapter2.

Urban Contemporary Museum Expansion of Renzo Piano

2.1. Contemporary Museum Expansion

2.1.1. Notion of Expansion

2.1.2. Type of Expansion

2.2. Renzo Piano Museum Architecture

2.2.1. Notion of Renzo Piano's museum

2.2.2. Urban thoughts of Renzo Piano

2.3. Renzo Piano's Urban Contemporary Museum Expansion

2.3.1. Characteristics of Renzo Piano's Urban Contemporary Museum Expansion

2.3.2. Dialogue between Old and New

2.3.3. Role of the new major space, tectonic, connection between old and new and the new piazza

Chapter2.

Urban Contemporary Museum Expansion of Renzo Piano

2.1. Contemporary Museum Expansion

In contemporary society, the demand for diverse experience in regards to scientific, artistic, cultural, and historical importance has vastly increased the need for changes in the social roles of museums. Accordingly, contemporary museums are busy shifting the forms, programs and functions of their facilities to cater to the needs of the people who visit them. Some cultured people are constantly seeking a virtuous place to rest and Nurture themselves in culture, while others visit museums just to delightfully immerse themselves in their surrounding environment for personal enjoyment. Then, the museums' role is to satisfy these needs and to exhibit various and diverse types of program displays for the public. Whether they display large-scale art in a huge hall or historical artifacts in a dark, private room, the form of exhibition is typically dependent on the structure of the museum. Other amenities, such as museum shops, cafeterias, and auditoriums are also affected by the structure of space. To adapt to the change in the social roles of museums it is important to understand the vast influence of structural organization in museums. The need for structural change is a prominent factor when museums consider shifting their functions and programs. This structural conversion is museum expansion.

The change in social roles have consequently forced museums to expand; however, there are other significant factors that must be considered when undergoing expansion. The first being collection size and storage space, or lack thereof, is a notable one. A museum's board of trustees invests time and effort to increase their collections. Thus, more storage space is necessary as museum collections tend to/can grow over time. Secondly, an increase in the number of visitors and their expectations, museums expand or renovate to accommodate the influx of people. Thirdly, museums expand when they need a new identity in the/a public domain. This is crucial as a museum's success is dependent on its' ability to attract visitors and make profits.

2.1.1. Notion and Types of Museum Expansion

Museum expansion begins from an existing museum building. The condition of the existing museum is interdependent on the type of expansion. It is matter of what can be used and what can be destroyed from the existing site; before considering expansion and extension. It is the architect's responsibility to decide what fits the most to such a condition.

In preceding practices, there were three basic reasons for working with existing buildings. The first was affordability. A new building was not affordable, or not seen as worth the investment, and so the old one was kept in use. The second applied to a building's status. If a building had landmark status, it could not be demolished, but could instead be incorporated into a new development. In the third case, an existing structure was altered in lieu of demolishing it. The attractive land use ratio of the existing building would no longer be permitted for the construction of a new one. Whereas the first reason is as old as the act of building itself, the other two reasons are consequences of landmark preservation regulations and of modern planning law.

Before going any further, we need to have an equal understanding of prevalent architecture terms to avoid confusion. Expansion is when a facility grows with the physical gain of space or renovation for improved spaces. A visibly extended building that has expanded from the existing line is called extension. This study is not to argue whether they have different functions, but rather to contemplate on the expansion and extension of urban contemporary museums to find the essential quality; that is obvious and clearly revealed in the space.

2.2. Renzo Piano Museum

2.1.1 Notion of Renzo Piano's Museum

“...He has remained true to the concept that the architect must maintain command over the building process from design to built work. Valuing craftsmanship, not just of the hand, but also of the computer, Piano has great sensitivity for his material, whether using glass, metal, masonry or wood. Such concepts, values and sensitivities are not surprising for someone whose father, uncle and grandfather were all builders”²

Having completed more than twenty museums and expansions, with three in progress, Renzo Piano has received more commissions than any other architect for this kind of building type. He is a master of structural detail, which in his hands typically has a clean modern sensibility. But his urban approach is also classically humanist, a combination that has made him a favorite of museum curators and visitors. His usage of transparency, lightness and vibrance of light fills museums with its flexibility and technical orientation.

Renzo Piano's first museum was Center National d'Art et de Culture Georges Pompidou, “house of culture”, completed in 1977, aptly named by Piano, which he designed in partnership with Richard Rogers. The Pompidou's exciting form and structure was also designed with the help of structure engineer, Peter Rice. The dimensions of the work exceeded over 100,000 square meters of surface, and the ambitious program required, exhibit spaces for contemporary art, multi-functional environments for music, a library, large areas for archives – were in fact resolved in a form that conspicuously contrasted with the historical building tradition in Paris. The need to arrange highly flexible space to accommodate different artistic events led to the adoption of five huge, completely free floors of 50 meter in depth and 170 in length.³ After Pompidou opened to the public, Piano and Roger instantly gained international

² Part of the jury citation at Pritzker prize ceremony 1998

³ Matteo Agnoletto, Renzo Piano(Milan: Motta Architettura srl, 2009), p.34-35

fame. The complex structured building received various public reactions at the outset, but 20,000 visitors have steadily flowed since its opening.

In 1987, Peter Rice, the engineer for Pompidou, also played a role in a second museum by Renzo Piano, the Menil Collection in Houston, Texas. Dominique de Menil, the Schlumberger heiress, together with her husband, John, had collected 1,000 works from Paleolithic age to the present. Louis Kahn, whom she had first hired to design her museum, was cut short due to his death. Since Piano worked with Kahn in the late 1960s, Piano was then appointed for the commission. In response to his strong-willed client's nineteenth century romantic equation of art and the divine, Piano didn't hesitate to abandon the complex and mechanical style of Pompidou in a favor of a more organic vocabulary.⁴ Renzo Piano clearly moved towards a more mature approach to museum architecture. With his fascination for details and materials, he no longer felt the need to show the technical "gut" of a building.⁵ The form and shape of the building was organized in a serene way. Although technical usage for the Menil Collection was more advanced than Pompidou, it didn't appeal the advanced technology. Piano's design of the Menil Collection revealed his ability to adapt to different sites and requirements. Sometimes recalled as Piano's best building, the Menil Collection is modest in appearance. Its wall and roof accordance with ceramic hues gives the feel of a simple white cube. The roof system was carefully studied by both Piano and Rice. They were fascinated by the simple structures of Japanese architecture. The main goal of the study was to observe the control of light in the space and the structure of the ceiling that corresponded. Their solution resulted in two unusual materials; ferro cement and ductile iron. They believed the combination weaved on the ceiling would give a preferable light control roof. The essence of ferro cement is that it is very durable, tough and only requires a minimal amount, while ductile iron is a form of iron that does not have the usual brittleness of cast iron. With Menil, Piano's search for lightness and transparency

⁴ Piano Renzo and Victoria Newhouse. *Renzo Piano Museums* (New York: Monacelli, 2007), p. 11

⁵ Jodidio, Philip, and Renzo Piano. *Renzo Piano* (Köln: Taschen, 2005), p8

reached new height. The ceiling series of ferrocement “leave” along with other defusing devices he has used since, have established Piano’s distinguished skill in illuminating art.

In two of Renzo Piano’s museums, these represent the essence of his design principle. The architect describes the serene and refined room of the Menil as “sacred”, and the opposite of the Pompidou, whose rough and ready open, exposed spaces, brightly colored beams and ducts, and active public spaces which he regards as “profane.”⁶ Despite the apparent difference between the two, there is definite relationship. Just as the girder system defines the Paris design, the ceiling leaf defines the one in Houston. In both, areas of the floor to ceiling glazing link interior and exterior.⁷ The space in the two museums shared two apparent characteristics. According to Piano, “Museums should always be clever combination of two extreme.” The discretion and flexibility of his museum work for all kinds of art-the magic ingredient for a successful museum.⁸



Figure 1

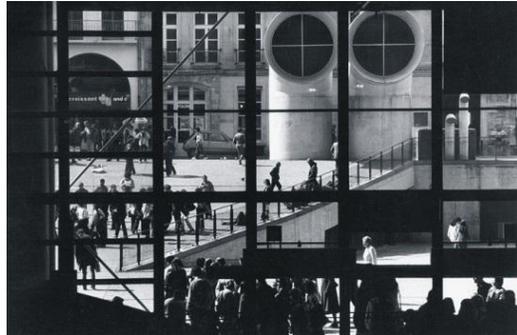


Figure 2

⁶ Piano Renzo and Victoria Newhouse. *Renzo Piano Museums* (New York: Monacelli, 2007), p.9

⁷ Piano Renzo and Victoria Newhouse. *Renzo Piano Museums* (New York: Monacelli, 2007), p.11

⁸ Piano, Renzo and Victoria Newhouse. *Renzo Piano Museums* (New York: Monacelli, 2007), p. 15

2.1.1 Urban man, Renzo Piano

Born in the city of Genoa, a port city of Italy, Renzo Piano often describes lightness, transparency and vibrance of light in reference to the Italian city. Piano said, “Genoa is most of all a port city, and the port is a miracle of lightness, with its cargoes dancing through the sky into ship’ holds, a place where nothing is still.” Renzo Piano makes the glimpse from these images of his childhood to a more adult vision of lightness.⁹



Figure 3.

For Piano, it was inevitable he focus his architecture within contemporary cities. The concentrated urban situation was a qualified site for him to make buildings more light and transparent. From his first museum, The Pompidou, he has since then executed great urban architecture. Since the mid-1990’s, Piano has demonstrated the importance of scale and location. In 1996, he was commissioned to reconstruct a large section of Potsdamer Platz, Berlin; the largest project of his career. With much difficulty in regards to schedule and scale, he had to train himself to be an urban architect, urban man and gain his own perception towards the city environment. His quote after completion explains sums it well, “Cities are beautiful because they are created slowly; they are made by time. A city is born from a tangle of monuments and infrastructures, culture and market, national history and everyday stories. It takes five hundred years to create a city, and fifty to

⁹ Jodidio, Philip, and Renzo Piano. *Renzo Piano* (Köln: Taschen, 2005), p6

create a neighborhood. We have been asked to reconstruct a large chunk of Berlin in the space of five years.”



Figure 4

Another notable urban architecture design by Piano is The New York Times headquarters in Manhattan, NY. The headquarters of the compelling American daily newspaper is composed of the main tower and a three story front part connected by garden. The steel structure is covered by a continuous curtain wall in double glass, layered with a sun screen system of cylindrical ceramic bars. These elements set the rhythm of the façade while generating chiaroscuro effects that accompanies the dematerialization of the building, to which Piano’s work, in pursuing amplifying lightness of architectural structure, is revealed to the public.¹⁰

¹⁰ Matteo Agnoletto, Renzo Piano(Milan: Motta Architettura srl, 2009), p.71

2.2 Renzo Piano's Urban Contemporary Museum Expansion

2.3.1. Characteristics of Renzo Piano's urban contemporary museum expansion

Renzo Piano enlightened museums in his own sensibility. He has built and transformed over twenty museums and cultural facilities in his career. Of his ten remarkable museums expansion, he has completed seven museum expansions and three projects are in process or waiting for a proper inauguration. From the Giovanni and Marella Agnelli Art Gallery in Lingotto, Italy to the Whitney museum expansion, New York, his ten museum expansions are coincidentally all sitting on urban sites located in the United States with the exception of the Agnelli Art Gallery in Lingotto which is in Italy.

Piano's museums not only preserve the existing building's desires, but they also feature a humble addition. Unnoticeable and neutral additions, usually white-cubes, glass and steel frames create a state of transparency and lightness. Piano doesn't have a signature style; he is a master of simple form and subtle effect. Most well-known expansion projects are recognizable for the style of design reveals architect's identity, whereas Piano's restless designs were adapted in many urban museum sites and also, known for having humanistic sensibility, his urban museum expansion brought close relationship with the users.

It is an undisputed fact that museums are at the heart of what Renzo Piano does best, enriching cities and experiences in a quiet but surprising way. It is also true with his expansion projects. He has his own skills to make a sustainable expansion with various environments that are not always convenient. The way he treats an expansion is not distanced from the new museum project and his tremendous expansions enunciate with ongoing projects.

In accordance with his principles to museum architecture, there are two prominent

components in his museums. First is the existence of Sacred and Profane space¹¹ within the format of Served and Servant space notion.¹² Piano believes that a serene and refined room of exhibition and rough, ready open and active public spaces should exist to fulfill the function of a museum. Two clear, opposite spaces can be described as Servant and Served space. Served space refers to exhibitions that are serene and Servant space refers to the other amenities that support the service space. These two spaces are separated, but connected by the space in between; this connection space is the profane space and it is often thought to be the major space of his architecture. Renzo also indicates this major space in his sketches.

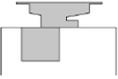
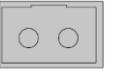
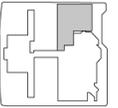
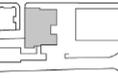
Secondly, Piano believes architecture begins with an assembly of small pieces and it is the art of jointing these materials into tectonics; that is architecture. From the Pompidou Center, he built a relationship with Peter Rice to show the enrichment he has brought to his own architecture by finding deeply into the applied rigor of the engineer. Piano's constant effort to complete his designs through structure earned him his reputation as a master of tectonics. With his tectonics, he controls the light in his space and plays with the sense of transparency and lightness.

These two crucial components of Renzo Piano's museum architecture are applied in his expansion projects. These characteristics successfully create the connection between the new expansions to existing buildings and enlighten the outdoor spaces to active public spaces with his notion of the Piazza. Connection of existing buildings and outdoor spaces-an outcome of expansion, can be considered another two extended components of his new expansions.

¹¹ More information will be discussed in detail in chapter 3.

¹² More information will be discussed in detail in chapter 3.

List of Renzo Piano's contemporary museum expansion

Expansion	Project	Type	Location	Status
	the Giovanni and Marella Agnelli Art Gallery at Lingotto, 2000-2002	Art Gallery	Turin, Italy	Built
	High Museum of Art, 1999-2005	Contemporary art museum	Atlanta, Georgia	Built
	Morgan Library and Museum, 2000-2006	Library and museum	New York, NY	Built
	California Academy of Science, 2000-2008	Science museum	San Francisco, California	Built
	Modern Wing, Art Institute of Chicago, 1999-2009	Modern art museum	Chicago, Illinois	Built
	Los Angeles County Museum of Art Expansion, phase II, 2006-2008	Art museum	Los Angeles, California	Built
	Isabella Stewart Gardner Museum Extension, 2005-2012	Contemporary art museum	Boston, Massachusetts	Built

	Fogg Art Museum Expansion and Renovation, 2006-2014	Art museum	Boston, Massachusetts	On construction
	Kimbell Art Museum Expansion, 2007-2013	Art museum	Fort Worth, Texas	On construction
?	Whitney Museum Expansion, New York, 2007-2015	Art museum	New York, NY	On construction

2.3.2. Dialogue between old and new

In the early stages of his design process for expansion projects, Renzo would begin by walking around the site and wait for a response from its genius loci. He believed this walking process was the key to a successful expansion, rather than studying the photographs and plans of an existing condition.

He begins his dialogue with the walking process; through which he is able to experience the old existing circumstance. Walking on the streets next to the museum and taking in all that it comprises the existing museum; all serve to listen to the desires of the existing architecture.

From those walking studies, Renzo Piano has built his own tactics and thoughts on expansions of museums; respect for the existing museum being the most critical design factor. The respect for the existing museum is the most critical design factor. He uses his sense of transparency and lightness to bring out existing qualities; his seamless touch appears non-existent.

2.3.3. Role of the new major space, tectonics, connections the between old and new and the new piazza

In his museum expansion, there are four crucial components differentiated from new building project and characterized his new expansion. They are the new major space, tectonics, connections the between old and new, and the new piazza; these components have importance in senses of function and significance.

The new major space is the main connecting space where the major force is concentrated in Piano's sketches. It is a new major public space in the expansion, and the locations vary through his projects. However, it always takes its location in between the Servant and the Served space.

He adapts a new center from the center of the existing museum. Renzo reasons that finding the new center is not shifting or ignoring the existing center; rather it is redefining the centrality to create the correspondence with the existing museum. The new center is the new public gathering space; releasing the high density of the existing center. It also gives a new sense of place; affecting new perceptions of the/a new museum's identity.

Piano does design through Structure of museum and those structures reveal the notion of his design. Understanding structure is a key point in Piano's understanding of architecture. The notion of tectonics in reference to structure is due to the lack of expression in his usage of material and form; it reveals more than a structure that sustains building mass. He uses his notion of tectonics mostly on the surface of his architecture. Tectonics applied to his roof systems, details in the ceilings and walls, control natural light into his spaces. Apart from the usual transparency and lightness in his new museums, in his expansion, these two characteristics have yet another role; making the existing visible with the new expansion and attaining the lightness of a new building. It brings out the characteristics of the/an existing atmosphere and creates his intentional atmosphere of space.

Connecting the existing circulation of a building to its new one is a prominent factor in any type of expansion. It is crucial factor in measuring the success of an/the expansion. Renzo Piano has his own way of dealing with existing architecture and it is very simple; respect the existing condition. He is patient. He waits and listens for a response; it's genius loci; the building's desire, before jumping into his design. By doing so, Piano's seamless connections between the old and new create an invisible convergence of two distinct characteristics.

Similarly, a building's outdoor space is just as important as its indoor space. The new outdoor space or the new Piazza and its natural physical changes also holds remarkable significance. It is another kind of public gathering space; affecting new urban public identity of new expansions. In the urban setting, the physical growth of museums affect the atmosphere and function of their existing neighbors. Piano's designs of the piazza create attentive and sociable public spaces; shifting old empty spots from obstacles to connecting links. It also creates diversity of activities at the front new expansion.

Chapter3.

Analysis on the Four Major Components in the Expansion of Renzo Piano

3.1. New Major Space

3.1.1. Between Served and Servant Space

3.1.2. New Major Space in the sketch of Renzo Piano

3.2. Function of Tectonic

3.2.1. Tectonic of ceiling and wall

3.2.2. Tectonic of roof, “flying carpet”

3.3. Connections between Old and New

3.3.1. Types of connections

3.3.2. Transitions between old and new and the Effect of new circulation

3.4. Outdoor space and the Piazza

3.4.1. The Piazza and the Neighbor

3.4.2. The Role of landmarks

Chapter3.

Analysis on the Four “Major” Components in the Expansion of Renzo Piano

3.1. New Major Space

Renzo Piano elaborates museum spaces with compositional balance using subtle juxtapositions of materials, textures, solids and voids allowing the buildings to reveal themselves in stages as you move towards them and through them. Piano eloquently exposes this notion in the new major space of his museum expansions. The new major space features the characteristics of centrality, meaning the “new” center has more varied functions and meanings. It is another centered space away from the center of the existing museum. Consequently, centrality intuitively becomes another public gathering place within the composition of old and new buildings.

In accordance with any new museum expansion, the new major space often reveals a brand new face. It is usually in the form of another entrance hall, which attracts visitors from the existing entrance. In this chapter, new major space is literally the new central space among sacred and profane space; those Piano uses to provide served and servant space. In his museum space, Piano clearly divides exhibition space and other amenities in a definite line; and this division can also be found in Piano’s expansion projects.

Piano's sketches have more meaning than mere form and geometry. His perceptions of space are well translated from his thoughts onto paper. In the sketch of Piano, spiral lines of red color pen represent the forces of public gathering spot of his space; and this becomes the new gathering place, so I rephrase, a “New Major Space”. With these characteristics of his major spaces, it is valuable to look closely at Piano’s new major space in his expansion and find the role and functions to understand his new building.

3.1.1. Between Served and Servant Space

The new major space in Renzo Piano's museum space is generated from the division of servant space and served space. The idea of Louis Kahn inherited in the design of Piano's museum space. The Menil Collection has two succinct spaces divided with a connecting space in between. The formation of two rectangles equally incised with another rectangular box; this connecting space often becomes the main entry and the hall of the museum and serves as the main stream of the entire museum circulation. The gap between those distinct functional spaces is the major space in the museum of Piano; and he also adapted this sense of space in the expansion projects.

1. Morgan Library and Museum, New York, 2000-2006



Figure 5



Figure 6

One of New York's most dignified cultural institutions, the Morgan Library and Museum occupies a landmark campus on Madison Avenue. The library was housed in a building designed by New York architect McKim, Mead & White in 1903. The goal was to alter the existing space into a more conservative one simultaneously increasing visitors and storage space. To meet this goal, the library asked Renzo Piano to redesign their facility. The architect succeeded in expanding the Morgan by roughly one third without exceeding the height of the history structure. Piano's solution is both subtle and radical.

To avoid overwhelming the existing structures, he hid most of the new space underground, sinking storage vaults and a concert hall four stories into the bedrock, as long as 50 feet.



Figure 7



Figure 8

Above ground a new glazed “piazza” created a sense of unity and coherence between the old and new areas. The piazza is now the new major space of the newly renovated Morgan library. Piano placed a glass-enclosed piazza or central court in the middle of the building and glass-enclosed spaces linking the complex. Together, they would constitute six existing buildings of the Morgan village.

Away from his usual notion of Served and Servant space, the center of the six building complex became the new major space in the entire expansion. Since the Morgan villages were composed in an array with an empty center, the notion of connecting space between servant and served space can be understood in a circular arrangement. Piano indicated that the historic rooms and exhibition spaces of the Morgan are sacred spaces like a church, while the shop, café and the area serving similar functions would be its profane. With this notion, exhibition spaces and other amenities are separated in a distance from

each program while the central court divides them by sitting in the middle.

2. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009

The addition to the Art Institute of Chicago, called the Modern Wing, is dominated by a three-story section, roughly square in plan that presents a façade towards Monroe Street and Millennium Park. The Modern Wing dramatically increases the size of the museum with exhibition galleries for modern and contemporary art as well as additional space for photography, film, video, architecture, and museum education.



Figure 9



Figure 10

In the expansion of the Modern Wing, Piano's extraordinary sense of balance comes into play. The vertical ribs of the glass curtain wall give it creates lightness, smoothness and solidarity. Though still light in color, it serves as a counter point to the metal and glass. The main entry leads directly into Piano's most significant public space, the Kenneth and Anne Griffin Court. The Kenneth and Anne Griffin court is a 300 foot long, 30 foot high, 30 foot wide axis that extends southward to join the existing Rice Building. It is more than the main circulation spine for the Modern Wing; it is an interior public street for the entire museum, a place; however great its collections and galleries, has never been

clearer in its layout, or function as a "main street," so called, "The New Major Space."



Figure 11

Renzo Piano adores complexity, ambiguity and the notion that buildings reveal themselves in stages as you move through them. As you enter the Art Institute from Monroe Street, not only will the layout of the new wing be instantly clear, a grand staircase on the left invites you up to the second and third floor galleries in/to the eastern pavilion, where the facilities in the western pavilion are plainly visible. The rooms are designed to be subdivided, and Piano has created a wall system that looks almost permanent, with reveals at the bottom that match the reveals on the perimeter walls of each room. The effect is to not only feel a sense of continuity, but also of solidity and enclosure in many of the galleries. Most of the large rooms are roughly divided into six small galleries; those filled with The Art Institute's tremendous collection of art works.

3. Los Angeles County Museum of Art Expansion, phase II, Los Angeles, 2006- 2008

The expansion of the Los Angeles County of Modern Art preserve the existing buildings, while adding the new entrance pavilion, the Broad Contemporary Art Museum and a large park. The whole expansion was planned in three phases. Renzo Piano had

completed phase II in 2008. At the core of the scheme is a new glass entrance pavilion that links the eastern and western parts of the campus. It is the transition and connection space between the urban space of Wilshire Boulevard to the south, and to the park at the north. To the west of the entrance pavilion is the new Broad Contemporary Museum. The BCM is an H-shaped plan three story building. It is volumetrically quite massive and speaks an industrial language. Clad in stone, it creates a unity between east and west sides of the LACMA. Similar to his Pompidou Center, the building showcases its mechanical systems by pushing it to the exterior, highlighting them in bright red, bulbous elements.

The contemporary art collection is displayed in about 60,000 square feet of galleries arranged on three levels. Gallery spaces are characterized by large scale proportions of 80 feet free spans that allow maximum flexibility in displaying art. A new pedestrian path, incorporating an escalator and access stairs, begins at the pavilion entrance and weaves through the campus, linking various buildings and the park.¹³



Figure 12



Figure 13

In the expansion of the LACMA, Renzo Piano adapted the new major space in the outdoor space. It is the new entrance pavilion. This pavilion is the center of gravity of the project. With its light canopy, it floats on a large outdoor plaza, creating connections vertically and horizontally through the axis of campus. It is a public gathering space for

¹³ Piano, Renzo. *Renzo Piano Building Workshop 1989-2010* p.46

visitors and a filter to the more contemplative atmosphere of the museum. Being in the outdoor space, covered with his glass roof, the space has a more definitive notion of served and servant space. Here, Piano employed the notion by treating the building as the space instead of using interior space within a building. In other words, this new major space is an outdoor structure between two exhibition buildings. With its expansion, Piano created a new type of division which still functions as the connecting space as well as the new major space.

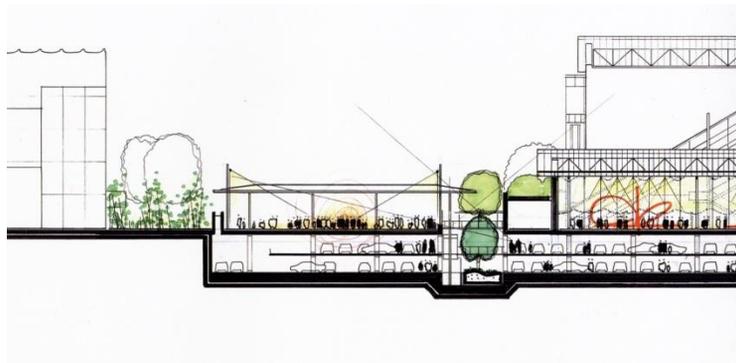


Figure 14

4. Isabella Stewart Gardner Museum Extension, Boston, 2005-2012

The Isabella Stewart Gardner Museum opened a new addition to the public in 2012. The new 70,000-square-foot wing was designed to preserve the historic 1902 building and to alleviate any pressures formed over the years of perpetual use. Situated behind the original building on its site along the Fenway, the new addition provides purpose, built spaces for concerts, exhibitions, and classes, along with enhanced visitor amenities.

The connection to its existing building, the palace, is by a glass link through the garden that extends from the palace's cloister along the side of Evans Park. The program is organized in four volumes along the circulation spine. The largest is the music hall, which cantilevers over the café garden. The second volume is a solid vessel for the

special exhibition gallery facing the palace. The other two volumes contain offices and conservation labs.



Figure 15



Figure 16

Piano employed the new major space as the music hall in this extension. It is a very crucial element; having another music hall at once released the burden of the auditorium in the palace. The concept of having three upper balconies surrounding the space facilitates a unique visual and distinct acoustical experience as desired by the client. With the main entrance on the third floor, the visitor enters the space in the middle rather than from the bottom. Exterior walkways provide the possibility of stepping out into the open during intermissions. The roof with its glazed center allows daylight to enter and illuminate the space.

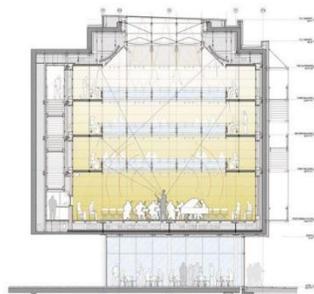


Figure 17



Figure 18

2. The California Academy of Science, 2000-2008

For the California Academy of Science, the center of the major forced space was already present; hence Piano emphasized it further with his new piazza. In the sketch, it shows a considerably large red spiral indicating the major space in his expansion and it includes the relation with the line of the roof top.

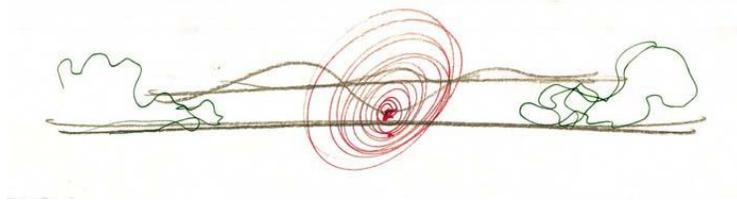


Figure 20

3. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009

In the sketch of the Modern Wing, the spiral lines are found in the elevation sketch and it clearly indicates the important role played by the sun's rays. The size and width of the spiral line and indication line for roof system shows the level of importance in his expansion. The perspective sketch includes a yellow shaded area with emphasis in transparency in the new major space. Piano's trademark red spiral lines are also found in the same sketch.

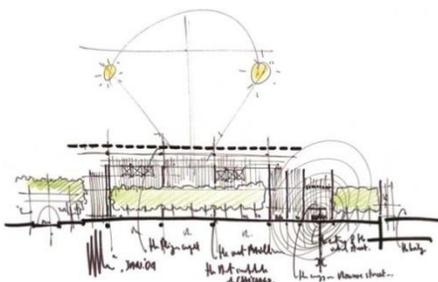


Figure 21

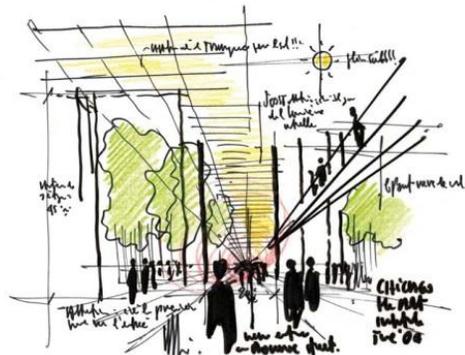


Figure 22

3.2. Function of Tectonic

His admiration for engineering goes far beyond mere curiosity. His relationship with Peter Rice shows the enrichment he has brought to his architecture by finding deeply into the applied rigor of the engineer. Piano's constant effort to complete his design through structure has earned him his reputation as a master of tectonic architecture. From the Pompidou Center to the Menil Collection, Renzo Piano has shown the most imaginative tectonics of architecture. His experience in tectonic practices has evolved allowing the possibility to express his design through structural detail; as opposed to the mere esthetic design of the building. In this chapter, Piano's perception of tectonics in general and in relation to his new expansions will be analyzed by examining his roof, ceiling and wall designs.

3.2.1. Tectonic of ceiling and façade

People perceive and experience space using their sense of touch, and movement. Inside a museum, it is the surrounding environment that tells a story or shows the characteristics of the space, not the prodigious art exhibitions or locations. If one walks into the main entrance of a museum building, matters of architecture iterate its identity with no vocal explanation. Sense of space deter by what can be seen or touched. In this notion, the ceilings and walls take on a crucial role in the museum. Piano's usage of structure is as unique in the interior finishes. Intricate patterns of narrow cable line fill the ceiling and interior walls of major halls showing a sense of scale and proportion. He often places glass ceilings under his roof systems, flying carpets; and creates correlating wall systems. His touch of expansion almost creates a gigantic airy hall and the details are usually found by the repetition of materials used in the formation of the structure. Curtain walls are detailed in a manner that gives new meaning and function. The ceiling controls the natural light into the space enlightening the variety of details inside and outside of his expansion. In his tectonic design, the ceilings and walls have their own role; those roles are varied in different types of expansions.

1. High Museum of Art, Atlanta, 1999-2005

The High museum of art, originally known as part of the Woodruff Arts Center, was designed by Richard Meier, and open to the public in 1983. The Woodruff Arts Center is composed of three cultural facilities: The Alliance Theater Company, the High Museum of Art and the Atlanta College of Art. The museum includes 5,000 square meters of exhibition space and seats 200 in its auditorium. As a result of Meier's work, the High Museum nearly doubled the size of its original collection and admitted more than 500,000 visitors yearly. These facts led to the foundation that commissioned Renzo Piano to build the extension, approximately 16,000 square meters in size. The foundation demanded additional gallery space, larger special exhibition areas and improved visitor amenities. A piazza centered the museum complex with multiple entries bringing visitors from the surrounding streets. The three new buildings, the Wieland Pavilion, the Anne Cox Chambers Wing and an administrative building, enclose the piazza on three sides, with the new main entrance on the north side.¹⁴



Figure 23



Figure 24

One of the most distinctive architectural features is the “coffered” ceilings molded with glass fiber reinforced gypsum. Both the Wieland Pavilion and the Anne Cox Chambers

14

Wing have this type of ceiling illuminating the wooden floor, made of white oak boards, six inches in width, aligned along the ceiling. The new building also has a floor-to-ceiling window seventeen feet in height. It opens visibility from the inside to the outdoor space which allows over-sized artwork to be exhibited. The lighting on the ceiling was custom designed by Piano's team as well as the furnishings.



Figure 25



Figure 26

2. Morgan Library and Museum, New York, 2000-2006

Renzo knew the Morgan Library and Museum is creating is of our time and believed it should reflect it. Due to Piano's knowledge in steel structure, he knew that steel would impart a comparable sense of strength and stability to the marble of the McKim building and Annex. He also believed that strength and stability, in a metaphoric sense, should be associated with an institution that preserves fragile materials of artistic and cultural importance.¹⁵ Glass was another essential material in Piano's plan. The interstices of glass between the buildings attain the sense of literal and figural lightness. Moreover, the interweaving of elegant glass and steel structures between the older buildings meet the street in two rectilinear facades showcasing steel boxes that appear to almost float

¹⁵ Byard, Paul Spencer. *The Making of the Morgan: From Charles McKim to Renzo Piano*. New York

between the old masonry structures.¹⁶



Figure 27



Figure 28

3. The California Academy of Science, 2000-2008

The California Academy of Science was established in 1853 at its current site. The 1989 Loma Prieta earthquake determined the facility's need for restoration; an unfortunate situation due to the academy's long history. Now, facing the De Young Museum, by Herzog & de Meuron, across the Golden Gate Park, the California Academy of Science was renovated and expanded by Renzo Piano. The museum was built with a mixed steel and concrete structure. The glass facade is screened in by a system of adjustable sunscreens and protected by a portico made of photovoltaic cells positioned on the level of the covering.¹⁷ The Academy's mission statement, "Explore, Explain and Protect the Natural World", coupled with the mild San Francisco climate, made this an ideal project

¹⁶ Byard, Paul Spencer. *The Making of the Morgan: From Charles McKim to Renzo Piano*. New York

¹⁷ Glancey, Jonathan, "Second nature" *The Guardian* (Nov, 3 2008): 1-2.

to incorporate more sustainable design strategies. Beyond just energy efficient heating and cooling, a more holistic approach was agreed upon; the recycling of materials from the old Academy and the way in which they were put together. Renzo Piano's new building retains the former location and orientation, and like the original Academy, all its functions are organized around a central piazza. Two spherical exhibits, the Planetarium Dome and the Rainforest Biosphere, are adjacent to the piazza. Together with the reconstructed Steinhart Aquarium entrance, they represent the focal elements of the Academy's work- Space, Earth and the Ocean.

Renzo lucidly explained, "This is complex building but we wanted it to feel natural and relaxed as well as easy to get around. Here you have scientists busy at very slow work, researching, and visitors who consume the experiences the academy has to offer in a few hours. But this was a good starting point for thinking about the design. When the academy started in the 1850s, there was always a kind of dualism at work. In summer, the scientists sailed on voyages of research and discovery, bringing their finds back to San Francisco. In winter, they were teachers, showing an eager public what they had found. So we have tried to create a building that balances the world of the scientist and the visitor, of science and nature, of technology and wildlife, all under one roof."¹⁸



Figure 29



Figure 30

In this expansion, Renzo adapted the new major space at the center of museum and

¹⁸ Renzo Piano's quote on the article of Glancey, Jonathan, "Second nature" The Guardian (Nov, 3 2008): 1-2.

placed the piazza under a glass covered roof. Piano's favorite notions are concentrated in one centered space. The piazza is the focal point of the new institution. Its structure is reminiscent to that of a spider web while the center is open to the sky. The two main aquarium tanks are adjacent to this space and connect the ground floor with aquarium in the basement. A sophisticated system of retractable fabric screens under the glass skylight maintaining the comfort level in this focal space. Sun and rain screens, as well as special screens to improve the acoustics, are important features that help to control the microclimate in the space.¹⁹



Figure 31



Figure 32

4. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009

Griffin Court, the main hall of the Modern Wing, stretches out straight ahead of you, and if you walk its full length, under a glass roof held in place by an intricate pattern of narrow steel cables, you will reach a wide doorway connecting to the existing, Rice Building. The placement of Griffin Court also gives the museum a new focal point, a kind of central intersection. This space is far and away the most upbeat public room in the entire museum. It is filled with natural light and offers a view to the northern part of Millennium Park and the city's skyline. It has Piano's sensibility of visible structure through into modern detail.

¹⁹ Piano, Renzo. *Renzo Piano Building Workshop 1989-P.83*

The ceiling of the Modern Wing has a cable post and tie system below the roof, in which several sets of cables form an unusual pattern that help to define the space: there is one set of cables crossing the space horizontally, another set, in pairs and somewhat heavier, in a vertical row running along the middle. The effect results in a kind of interior canopy below the glass ceiling giving the ceiling texture as well as assurance that it not appears black at night. It is tensile and it is composed. Piano is able to make spaces that are light and energetic and serene at the same time.²⁰

Piano likes to reveal structure; he likes to build in glass and steel; he likes to make functions clear, and he likes most of all to create beautiful forms.

“Everything in the Art Institute is stone, and Chicago is a city of steel,” he said, Piano’s relationship with Chicago was both tangible and conceptual, he came to the Art Institute, eager to design a building that would reveal the parallels between his own work and the tradition of the Chicago School. In this sense, he knew the choice of material should follow what seems appropriate to the city of steel and glass.



Figure 33



Figure 34

²⁰ Goldberger, Paul. *The Modern Wing: Renzo Piano and the Art Institute of Chicago*. Chicago, IL: Art Institute of Chicago, 2000) p. 93



Figure 35



Figure 36

The metal is white, the stone is limestone similar to that used in previous wings, and there is more glass there than any public section of the Art Institute. The glass is detailed in a manner that gives new meaning to the term, “curtain wall”. It is set between vertical steel mullions, and at several key points it extends up or down beyond the closed portion of building, as if to make clear that it is not a structure wall.

“Architecture is very pragmatic, but in the end it is pragmatic because you are looking for emotion,” Piano said, “You want the wall, and you want the light, so how do you get these things? How do you make them happen? It is about detail and refinement. You can be both powerful and refined. As an architect you have to be both a poet and a bloody builder.”²¹

²¹ Quote from conference speaks of The Art Institute of Chicago, at Chicago.

3.2.2. Tectonic of roof, “flying carpet”

“I’m simple enough to believe that making a roof is great art, but it is also the simple dream of shelter,” Piano said. “The idea of putting that roof up there, flying above the building, it is a shelter for art, a parasol, but also a shelter for life.”²²

1. The Giovanni and Marella Agnelli Art Gallery at Lingotto, 2000-2002



Figure 37



Figure 38

Considered to be Piano’s first museum extension, Renzo created an extension on top of his previous expansion of the Fiat’s factory building. The Lingotto factory conversion was designed and constructed in the early 1980’s when the factory’s automated production shut down. The Fiat chairman, Giovanni Agnelli, commissioned Piano to adapt the building as a mixed-use cultural center and considered it to be a monument in the city of Turin. The art gallery filled 2,800 square meters on top of north tower. Vertical arrangements of programs, four floors from the top, houses a book store, curatorial

²² Goldberger, Paul. *The Modern Wing: Renzo Piano and the Art Institute of Chicago*, interview

offices and three temporary exhibition spaces. The main gallery floats on top of the Lingotto like a “treasure box”. This simple steel structure mounted on four huge yet light looking feet.²³

Piano’s trademark roof was adapted in the first extension of museum. The roof structure is designed to admit natural light, filtering it through four layers. Its material is Ferro cement and ductile iron; this combination is weaved into the ceiling to give it a preferable light control roof. The essence of Ferro cement is that it has a very high toughness and uses the minimum amount of material and ductile iron is a form of iron that does not have the usual brittleness of cast iron.

The top layer is the “flying carpet,” a 1,000 square meter structure made of 1,700 white glass wings. Below is a horizontal glass panel acting as a lid under the “flying carpet,” an aluminum “venetian store” with a grid perpendicular to the glass panels of the flying carpet, and finally a white, translucent fabric ceiling in the gallery.

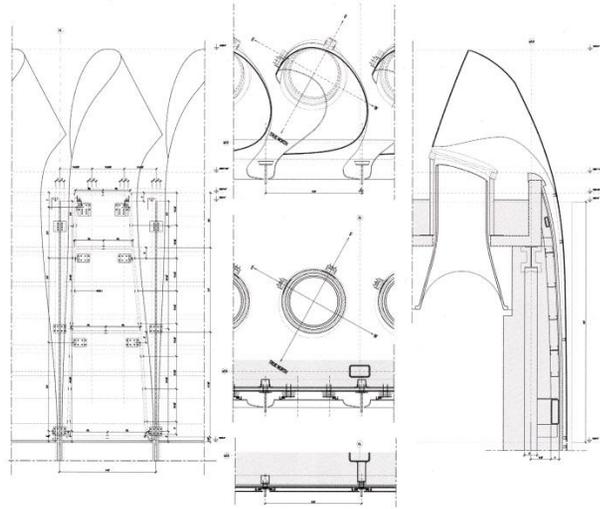
2. High Museum of Art, Atlanta, 1999-2005

The High Museum expansion included three new buildings by Renzo Piano: The Wieland Pavilion, the Anne Cox Chambers Wing and an administrative center. Both the Wieland Pavilion and the Anne Cox Chambers Wing have a special roof system of 1,000 light scoops that capture the northern light and filter it into the skyway galleries. In the Wieland Pavilion, these naturally illuminated galleries house part of the museum’s modern and contemporary collections; in the Anne Cox Chamber Wing, they house the special collections.

²³ Piano, Renzo and Victoria Newhouse. *Renzo Piano Museums* (New York: Monacelli, 2007), p. 110



Figure 39



Light scoop details (scale: 1/45)

Figure 40

The skylights are funnel shaped and extend through the roof, where each is surrounded by a sunshade, an element designed to further refine the direction and amount of light entering the building. These “light scoops” are oriented to capture the northern light. From an aerial perspective, the skylights and their surrounding sunshades look like an inverted egg carton. From the ground level, however, they look like perimeter skylights, completing the ribbon-like rise of the façade panels from ground level to roof.

3. The Morgan Library and Museum, New York, 2000-2006

Covered by a glazed, transparent roof, it is the focus of the project, where all the activities meet. This kind of “flying carpet” also covers the three new pavilions at the new Morgan. Constant usage of this kind of roof system gives the “lyrical” quality of natural light. As a consequence of its proper installation, there is a beauty, complexity, and poetry in having natural light coming from above.

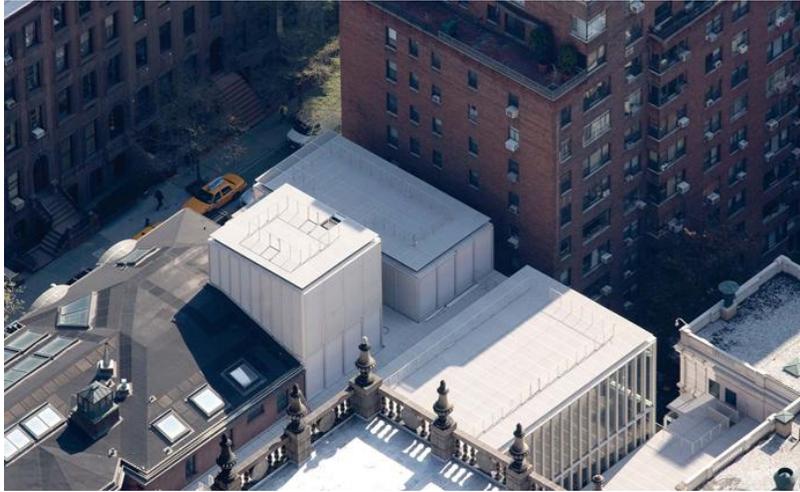


Figure 41

4. The California Academy of Science, 2000-2008

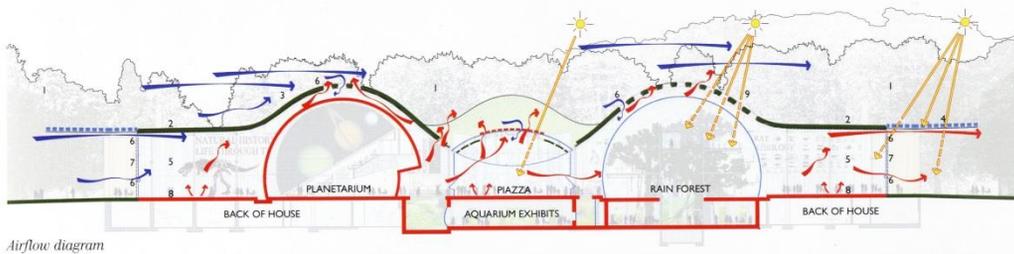


Figure 42

Renzo Piano's initial idea for this project was to bring all the spaces together under a single green roof, which went on to become the project's primary symbolic element. The roof formally unifies the organism: it's a "living thing" because it's covered with a thin layer of soil, upon which 1,700,000 specially selected plant species have been planted in 50,000 biodegradable coconut containers.

A two-year botanical research project allowed for the species to be selected that would best be capable of surviving in the Golden Gate Park microclimate without the use of

artificial fertilizers or irrigation systems. The vegetation not only serves as a decorative purpose, but a functional one as well: the moisture of the soil serves to cool the inside of the museum by 5 or 6 degrees, which has allowed for the use of air conditioning to be avoided for the public areas on the ground floor, in addition to the research offices located along the façade.

The wavy line of the roof, which is determined by the shapes of the interior spaces that go beyond the eaves of the roof itself, allows for excess heat to be accumulated and subsequently expelled. These shapes also result in the acceleration of the natural breezes that sustain and reinforce the structure’s natural ventilation. 55.000 photovoltaic cells provide more than 5% of the electricity required by the museum. These are contained between two glass panels, which make up a transparent canopy around the contour of the green roof sheltering visitors from the rain and wind.²⁴

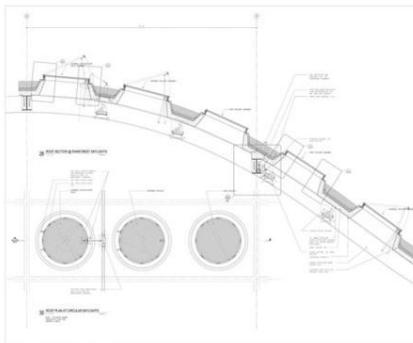


Figure 43



Figure 44

5. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009

On top of the Modern Wing, there is gigantic, overhanging canopy of extruded aluminum, which Piano calls the “flying carpet,” extending out beyond the eastern part of the

²⁴ Renzo piano foundation, extracted from web

structure on all four sides supported by thin steel columns. From a distance, it really does appear almost to float.



Figure 45



Figure 46

Piano makes reference to the “canopy” as both poem and prose. In essence a gigantic sunscreen, it is a descendant of the roof system Piano used in the Menil Collection and the Agnelli Gallery. The roof contains fins which capture the northern light and reflect it down into the galleries while blocking light from other three sides. It is both a key part of the process of controlling natural light in the galleries and a powerful visual composition in itself.



Figure 47

6. Los Angeles County Museum of Art Expansion, phase II, Los Angeles, 2006- 2008

The experience through the museum begins from the third level where visitors enter by escalators located in the entrance pavilion. The third floor galleries feature a glass ceiling with external shading and adjustable motorized roller shades. The glazed ceiling, serving as both skylight and weather barrier, is topped by north-facing aluminum sunshades that slope 45 degrees, blocking any direct sunlight. The blinds can reduce daylight levels on demand and are programmed to close as needed when early morning or late afternoon sunlight enters directly through the roofing system.

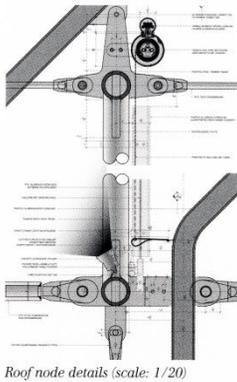


Figure 48



Figure 49

To create more uniform daylight conditions, Piano's team of lighting designers undertook an illumination vector analysis of both direct and reflected light within the space. With this analysis, Piano refined the geometry of the sunshade panels to balance daylight on the northern and southern facing walls.

7. Fogg Art Museum Expansion and Renovation, Boston, 2006-2014



Figure 50

The renovated Fogg Art Museum building, The Harvard Art Museum, will be the future home of the Fogg, Busch-Reisinger, and Sackler museum, the three existing museums at Harvard University. By combining the three into one facility, it would create a strong connection to the University and the community. Starting with the restoration of the Fogg Museum's historic structure, the new design will reconfigure all the museum space around the existing iconic courtyard. After careful consideration, the new design will be applied behind the existing structure, and atop the existing roof, crowing the building but carefully receding from the historic Quincy Street elevation. This new extension gives a new permeability to the building.



Figure 51

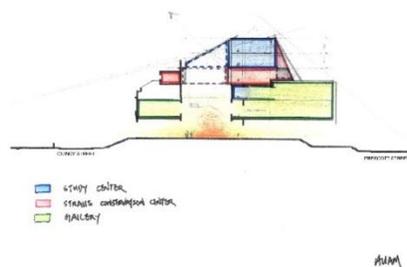


Figure 52

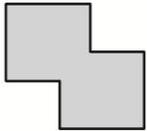
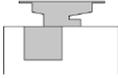
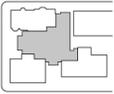
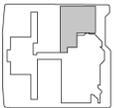
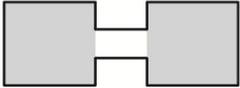
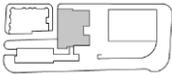
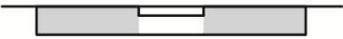
Significance of this expansion is the change in usages and design of the roof system that is Piano's hallmark. The study center lantern, winter gardens and Prescott Street entry level façades of the building will have custom designed glazed systems. The ventilated "sloped" roof of the study center lantern will use triple glazing for the enclosure, with a sun shading system just above it, that will in turn be protected by a manually operated outer single glazed assembly.

3.3. Type of connections and Transition between old and new

In the expansion of the museum, the foremost factor of success is the transition from the existing building to new expansion. Moreover, the connection between the buildings would be the most burdensome decision for an architect and the marriage of material that meet to the existing would probably be hard to affiliate appropriately. In most of his expansions, Piano applied invisible transitions in the physical and optical sense. Respect for existing buildings and seamless connections between old and new buildings is characteristic of Renzo Piano's expansions. In this chapter of research, it will sort the types of connections and transition space and investigate the effects of new circulation.

3.3.1. Type of connections

Of ten museum expansions of Piano, the types of connections for existing buildings can be sorted into three types of connections: compound, corridor and underground. These three categorical types can explain the different approaches in insertion in his new buildings. Here, we can discuss if it is expansion and renovation and extension of museum. Extensions constantly have a compound type; for they have to physically suit the existing requirements in order to extend; whereas, the corridor and underground types define expansion or renovation. The distance between new and existing buildings explains the lack of physical meeting of mass.

Type of Connection	Museum Expansion		
<p>Type A</p>  <p>Compound Type</p>	 <p>the Agnelli Art Gallery at Lingotto</p>	 <p>Morgan Library and Museum</p>	 <p>Modern Wing, Art Institute of Chicago</p>
<p>Type B</p>  <p>Corridor Type</p>	 <p>High Museum of Art</p>	 <p>Los Angeles County Museum of Art Expansion</p>	 <p>Isabella Stewart Gardner Museum Extension</p>
<p>Type C</p>  <p>Underground Type</p>	 <p>Kimbell Art Museum Expansion</p>		

*California Academy of Science, Fogg Art Museum and Whitney Museum Expansion are renovation and expansion project. The California Academy of Science and Fogg Art Museum shares the existing condition of space which doesn't have a physical extension or connection to the existing building. For the Whitney Museum Expansion, the expansion site is in another location away from the current location of museum.

3.3.2. Transition between old and new and the effect of new circulation

1. High Museum of Art, Atlanta, 1999-2005

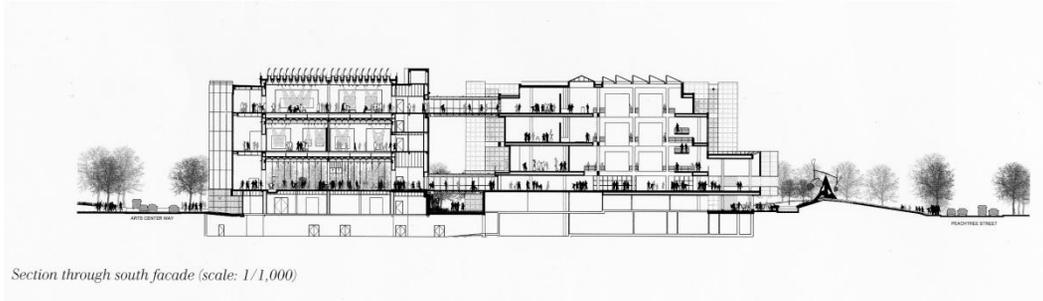


Figure 53

The new two buildings are designed to complement and link seamlessly to the High Museum's existing Richard Meier's building, the Stent Family Wing. All three are clad in painted aluminum façade panels to unite the complex with the existing building's signature white enamel façade. Glazed pedestrian bridges link the Wieland Pavilion to the Stent family Wing at the lobby and skyway levels, as well as connect the Pavilion to the second and third floors of the Anne Cox Chamber Wing. Additionally, two passenger elevators and a grand staircase sides either of a glass enclosed bridge connecting the Wieland Pavilion lobby and the Stent Family Wing's atrium.



Figure 54

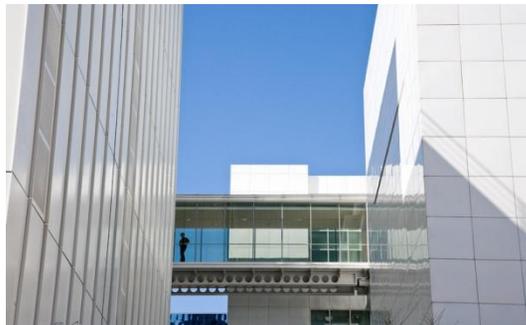


Figure 55

2. Morgan Library and Museum, New York, 2000-2006

For the Morgan expansion, a very important aspect of the design is that much of circulation connecting to existing buildings. Forming an architectonic hyphen between the McKim and the Annex building, Piano designed a space that formed a perfect cube, “six meters by six meters” (Fig. 56). On the north side, a new four story building, which directly connected to the Morgan mansion, contains new office spaces facing both the piazza and 37th Street. Now, the McKim building is directly connected to the piazza. As a whole, new and old elements are persuasively integrated, in part because the new building offers access to all of the wings of the library and museum



Figure 56

Former New York Times architecture critic Herbert Muschanp called Renzo Piano the “Poet of circulation,” and the clarity of the internal arrangements, adjacencies, and horizontal and vertical axes he offered was brilliant.²⁵

²⁵ Byard, Paul Spencer. *The Making of the Morgan: From Charles McKim to Renzo Piano*. New York

3. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009

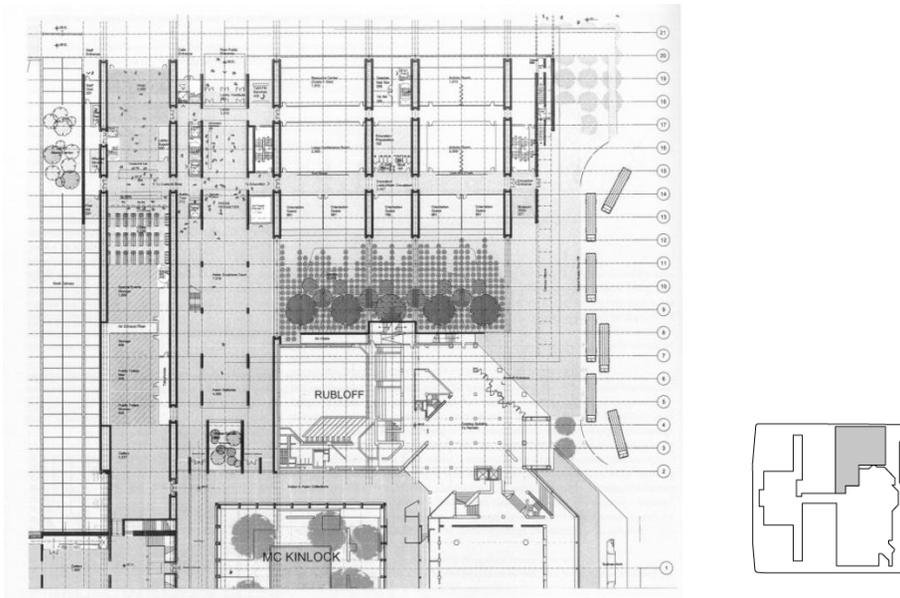


Figure 57

While technically the role of Griffin Court is just to serve as an entry and organizing spine for the Modern Wing, its implication for the entire Art Institute are difficult to miss, and they go beyond matters of circulation. Piano likes to make much of circulation. He uses the major space to enter the old Rice building. The directional hallway functions as a “main street” in the circulation and distributes public exposure to existing building and other exhibition spaces.

The material finishes between the buildings are clearly covered with wood panels and gives atmospheric distinction in the assembly point of the two buildings. In the exterior of this assembly point, Piano used limestone façade in coordination with the Art Institute’s Beau art style stone tile.

4. Los Angeles County Museum of Art Expansion, phase II, Los Angeles, 2006- 2008

The pedestrian path, also named the “spider” due to its references to the lightness of a weaved spider web, links the different blocks of the museum, moving westwards along the BCAM to end in the lobby of LACMA west. In the other direction, it climbs up to the Ahmanson building in LACMA east side. Piano now has his quartet of new structures, and has remarked his intention of “carving through the site with the precision of a surgeon and creating a carefully measured sequence of architectural spaces, a procession through the museum’s collection and the city’s cultural memory.”²⁶

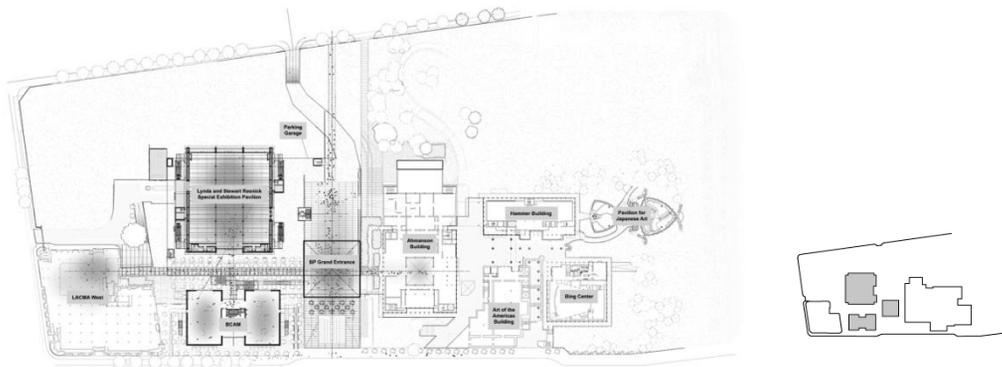


Figure 58

5. Whitney Museum Expansion, New York, 2007-2015

The board of trustees of the Whitney Museum of American Art was frustrated in their failed attempt to build an addition to their Marcel Breuer building by worldly renowned architects, Michael Grave and Rem Koolhaas. Consequently, Renzo Piano, who was

²⁶ Piano, Renzo. *Renzo Piano Building Workshop 1989-2010* = *Renzo Piano, Birudingū Wākushoppu, 1989-2010*. Tōkyō: + U Pub., 2010. Print. P.83

increasingly becoming the architect of choice for difficult museum situations, was chosen to solve the complicated relationship between the new and old buildings with difficult urban context. Piano's solution: sheathe in stainless-steel panels, sensibly set as far back from the existing structure as much as the rather tight lot would allow.

Canceling their original bright and efficient scheme, the Whitney opted to commission Piano to design a new building on a different site elsewhere in the city, part of the Meatpacking district and adjacent to the southern entrance to the High Line. Here, the type of expansion dramatically shifted from working with existing buildings to an entirely new building project. The creation of the new building would expand the new identity and create an extreme physical increase in space.



Figure 59



Figure 60

It is projected the new building will include 50,000 square feet of indoor galleries and 13,000 square feet of rooftop exhibition space, offering considerable breathing space to the original Madison Avenue Whitney's collection and temporary shows, as well as fortifying its connection to the area; after all, the museum was founded in nearby Greenwich Village, by Gertrude Vanderbilt Whitney in 1930. The museum is planned to be ready for the public in 2015.

3.4. Outdoor space and the role of landmarks

Cities are highly dense with the weight of uncountable matters. Within this busy context, Museum expansions affect more than a city's physical growth; it also affects its cultural identity. The physical growth of contemporary museums especially influence urban context competently. In regards to physical changes, extensions split an urban grid or existing site line into a smaller scale. For instance, urban contemporary museums are massive in scale and usually sit on a large city block. Extensions stretch out on a smaller scale of mass as new buildings gain a humanistic scale; consequently, cultural neighbors are altered to more attentive and sociable public space. Furthermore, the empty spots next to old facilities change their functions from obstacles to connecting links.

3.4.1. The Piazza and the Neighbor

When Piano plans a building design, his consideration for a piazza is found in most of his projects. As an Italian born architect, his sensibility to public space is flexible, generous and emphasizes the importance of proper public space. He knows the building exists with the sidewalks and the outdoor spaces; and he believes the successful architect should understand their surroundings. Maintaining the respect of existing museum, Piano creates a nice harmony between a new expansion and its surrounding environment. This chapter will take a closer look at the relationship between the new expansion and the surrounding elements.

1. High Museum of Art, Atlanta, 1999-2005

Understanding the expression of major space in Piano's sketches, he made the forced space, the New Major space, in the High Museum expansion. At the center of his expansion is an outdoor space rather than a major interior hall. At the heart of the expansion is its landscaped Sifly Piazza, whose proportions echo those of the Piazza San Matteo in Genoa, where Renzo grew up. He understands that public space serves many purposes. It brings visitors in from surrounding streets with its multiple entries. Chairs

that can be moved from place to place will encourage people to gather informally. There are outdoor sculptures installed in the piazza that can serve to engage their curiosity about what awaits them inside the galleries.

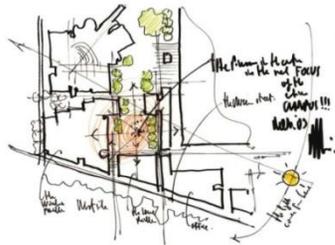


Figure 61



Figure 62

Although situated in an urban setting, the results of this expansion boast an abundance of green space. An emerald green zoysia lawn fronts the Stent Family Wing and extends towards the South; a surrounding series of sculptures and meets the magnolia lined walkway new to the Memorial Art Building. Adjacent to the Memorial Art Building, is the new restaurant Table 1280 located with an intertwined arbor, which forms a canopy in front. It is another natural element that over the years will shade guests seated at outdoor tables opposite the Wieland Pavilion's main entrance.²⁷

²⁷ Piano, Renzo, Kelly Morris, Linda Boyte, and Heather Medlock. *Renzo Piano's Village for the Arts: Expansion of the High Museum of Art and Woodruff Arts Center*. Atlanta, p.29

2. Morgan Library and Museum, New York, 2000-2006



Figure 63



Figure 64

At the heart of the new complex, a “piazza” distributes the space, facilitating circulation between the six different buildings of the Morgan Library and Museum. Piano remarked that new Morgan complex would look and function like a village and the central court be regarded as a piazza, like those in the villages of his homeland.

3. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009



Figure 65



Figure 66

Atop the third floor of the Modern Wing's west pavilion adjacent to the Terzo Piano restaurant, Piano's employed roof top terrace, The Bluhm Family terrace. It is an open area of about 3,400 square meters that offers a breathtaking view of Millennium Park. As an outdoor exhibition hall, it is used to host temporary installations. This space basically serves as a meeting place for the museum's visitors and is connected to the building by a stairwell, which is made of glass at the point in where it connects to the terrace providing direct access to Griffin Court.

The north end of every room is covered entirely with the glass curtain wall and look out towards Millennium Park and the skyline. The middle bay at the south end has windows that face towards a new garden sculpture court, the Tom and Martgot Pritzker Garden, that Piano created between the Modern Wing and the Rubloff Building.

3.4.2. The Role of landmarks

The result of a successful expansion creates a brand new identity for the city and museum itself. Even with the unnoticeable and humble design of expansion, Piano's museum expansions take representative identities for each city.

1. High Museum of Art, Atlanta, 1999-2005



Figure 67

The expansion of the High Museum of Art left a footprint in the Museum's history. Piano has fashioned an architectural masterpiece in Midtown Atlanta that has transformed the High into a lively, year-round destination for the arts. His new façade and roof design also gave it an iconic identity to the city as well as to its neighbor.

2. Morgan Library and Museum, New York, 2000-2006

The façade of the Madison Avenue pavilion brought the most attraction as a landmark of New York City. The harmony between Beau-art style and a modernistic floating box give it an unforgettable impression to people from sidewalk. Given that a steel-paneled grid formed the overall building façade, these panels were the logical material and pattern for

the façade of new entrance. With this, the pavilion engages the street more hospitably and it seems to express urbanistic gesture that had the practical result of forming an enclosed vestibule.



Figure 68

3. California Academy of Science, 2000-2008

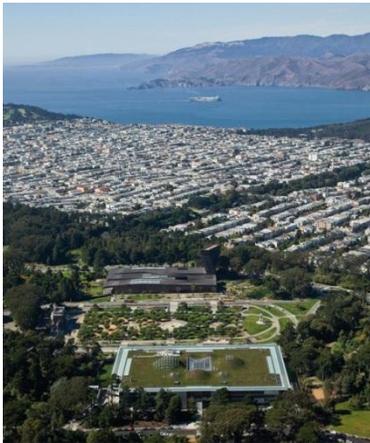


Figure 69



Figure 70

The California Academy of Science sits in Golden Gate Park, San Francisco. Facing the De Young Museum across the park's open air music concourse, it has been an instant crowd pleaser. While there are other museums in parks, they tend to sit on a major boulevard on the edge of park. Museum in the park don't usually communicate with the park. However, Piano communicates from inside to outside of park having created viewpoints that tell you where you are and this public building about nature set in the cool fog near the Sunset district.

4. Modern Wing, Art Institute of Chicago, Chicago, 1999-2009



Figure 71



Figure 72

As a late addition to the building, the punctuation mark of an arising pedestrian bridge was designed by Piano. As the Modern Wing became a landmark to city of Chicago, Nichols Bridge helped to build the landmark quality. The bridges take visitors from Millennium Park across Monroe Street directly into the upper levels of the new Modern Wing.

5. Kimbell Art Museum Expansion, Fort Worth, 2007-2013

Another great museum challenge faced Piano in Fort Worth, where he has accepted to

design an addition to the Louis Kahn’s Kimbell Museum of Art. In 1972, there was an expansion attempt by Romaldo Giurgola, who expanded it by simply extending Kahn’s design. It would have turned the building into the architectural equivalent of a stretched limousine. Piano’s precise replication was to build an entirely separate structure across the street. Piano has taken the middle ground, and has conceived a plan to expand the museum by building in the open space that Kahn had left in front of the museum’s ceremonial, main entrance. The new building would connect to Kahn’s building underground, but have no direct connection at the ground level. 90 feet apart from the original building, Piano added a plaza atop a new underground parking garage through which most of the visitors will enter. To give the space between the old and new Kimbell galleries more visual interest, Piano has planned a large square reflecting pool at the center of the space between the two buildings. This water feature would be just a few feet away from Kahn’s symmetrical pair of raised “infinity” pools, the most sublime fountains in all of modern architecture.



Figure 73



Figure 74

Pertaining to the role of a landmark, Piano’s extension of the Kimbell Art Museum set an architectural remark of meeting of two great architects, Louis Kahn and Renzo Piano. Through respectful design strategy, Piano emphasizes the landmark quality of its existing architecture. Along with the Modern Art Museum of Tadao Ando, this complex of art will represent the formidable identity of Fort Worth.

Conclusion

Renzo Piano has been practicing his expansion of urban contemporary museums using his clear process. By analyzing Renzo Piano's four major design components, I have found very specific, detailed information in regards to his expansions that those four specified perspectives assist to understand the composition of important matters and elements in the expansion of Renzo Piano.

From Piano's understanding of his composition of expansion, he has employed the new major space with his distinct belief of dividing programs and functions. Piano's sketches also help to understand the location and orientation of new major space. It was necessary to understand Piano's intention in regards to the new major space and his composition strategy in order to clearly interpret his architectural design strategy. Piano's refined details of design structure are revealed through his façades, ceilings and roof systems. His constant efforts to build expansions from a structural solution were clearly recognizable through the analysis of his architectural tectonics, a potential tool for Piano.

Moreover, Due to Piano's respect for existing architecture, I have found, though often seamless and invisible, simple, yet humble connections to the existing building in his expansions. The three types of connections were categorized; compound, corridor and underground. Within the same category, they shared the physical appearance of being connected; though the intention was never clarified. Relating to outdoor space, the piazza was mostly placed in the process of expansion, but not always treated as an outdoor space. The piazza to Piano was more than the literal definition; it was a public gathering space where the major activities concentrated. Coincidentally, I have found all ten of Piano's expansions were situated in an urban context.

Therefore, those four components are the main components that help to understand the processes and the outcomes of Piano; however, with the neutral facts, there was a limit in understanding Piano's architectural thought process and design strategy of the expansion.

Chapter4.

Interpretation of the architectural strategy in Renzo Piano's urban contemporary museum expansion

4.1. The New Centrality of Museums

- 4.1.1. Spatial formation of new major space in the expansion
- 4.1.2. Communication of New Centrality with Existing Building

4.2. Tectonic as a means to represent Transparency of Expansion

- 4.2.1. Part and Whole of surface, Tectonic
- 4.2.2. Function and Type of Transparency
- 4.2.3. Tectonic as a means to represent Transparency of Expansion

4.3. Connection of Lightness and Transparency

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- 4.3.1. Transparent Connection for Purity of Existing Architecture
- 4.3.2. Connectivity and Integration between Expansion and Existing Building

4.4. New Generator of Urban Diversity and Monumentality

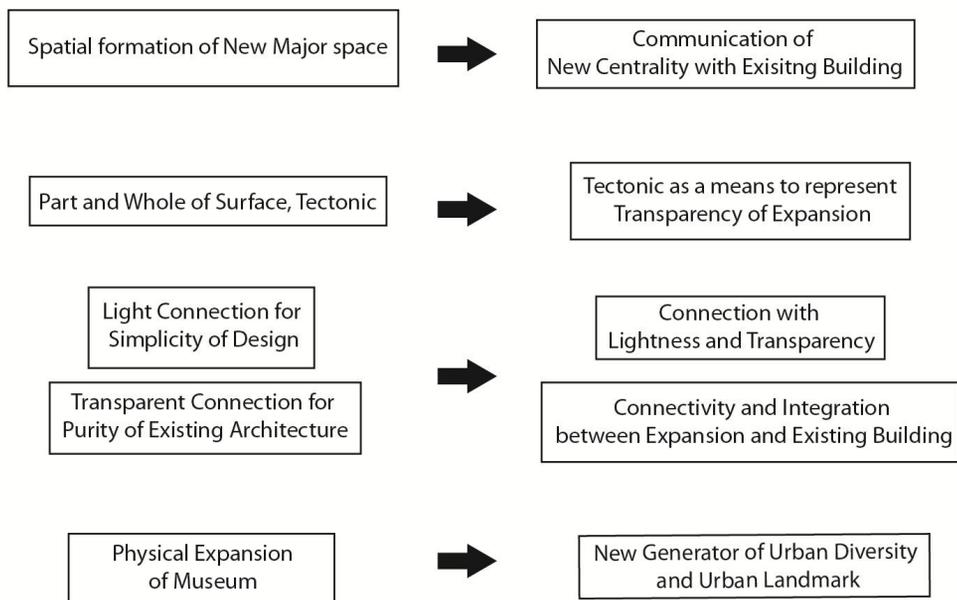
- 4.4.1. New generator of urban diversity
- 4.4.2. Urban landmark

Chapter4.

Interpretation of the architectural strategy in Renzo Piano's urban contemporary museum expansion

Renzo Piano's **Architectural Strategy**
of Urban Contemporary Museum Expansion

Outcome effects of Expansion



4.1. The New Centrality of Museums

4.1.1. Spatial formation of the new major space in an expansion

Through the analysis of his museum expansions, Piano's intention for including new major spaces were clearly recognizable for their conspicuous forms and characteristics. The results of the new major spaces in ten different museum expansions seemed varied in their shapes and locations; however they share the same ethos of Renzo Piano. His approaches to dividing programs with a connecting space help the memory of his

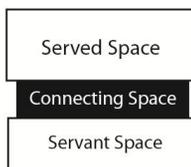


Figure 75

ubiquitous served and servant space. He applied this notion not only in his exhibition layout, but to the entire layout of a museum expansion. It is not always the notion of served and servant space; this connecting space also comes from his belief in spatial formation of different museum functions. He treats diverse functions and museum programs as different entities but with the equal respect of their existence. Nevertheless, Piano rejects vague arrangements or convergence of functions and programs. Each program has its unique role and Piano affirms this strongly by arranging them apart from each other. When he diffuses diverse functions in his expansion, his new major space sets them apart as a major dividing factor and it releases the tension between them.

Renzo Piano's museum expansions are about finding balance with the existing buildings. To find the balance, he employs spatial formation of the new major space, applied accordingly to the spatial formation of the/an existing condition. Since the conditions of existing museums are varied by their status, Piano had to execute his architectural strategy in divergent ways. In addition, the divergent strategies of inserting the new major space had to compromise with the genius loci of existence. As a result of the analysis, I found the new major space has specific functions and they contain various characteristics.

Thus, his strategy for spatial formation of new major space can be divided into three types. The first type of spatial formation redefines the museum space arrangement with distinct purpose. Piano’s addition resets the existing land use ratio in the most delicate and efficient design. His new major spaces are also easily accessible from versatile directions that advertently link together existing museum programs. The outcome is characterized as a huge open space that figures as the museum’s new center; and refigures the circulation of whole museum experience. This spatial formation was adapted in three of his expansions and they are the Morgan library and museum, the Modern Wing and the Isabella Stewart Gardner Museum.

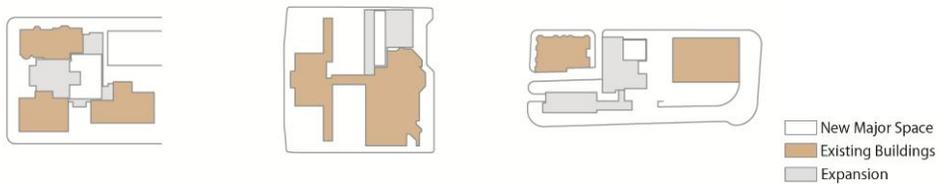


Figure 76

For the Morgan, the most ruling challenge of this formation was to constitute the six existing buildings. With his piazza, Piano embedded glass enclosed boxes in between the existing buildings. This insertion of extension set the ideal balance of the whole museum complex and the existing spaces were more organized with the convergence of the transparent glass box. In the Modern Wing, the location of the extension was determined by the architect. With the given empty land at the north side, Piano added an extension implementing a steel and glass structure. The simple form and careful details to his façade creates a transparent state to the nearly unnoticeable addition. Within the museum extension, he rearranged the space with his rectangle connecting court to define the new major space. This “main street”, called Griffin Court, Served a distinct purpose as the new entrance to the museum while connecting to other amenities of the new extension. This huge open space not only set the balance between old and new but also served its authentic purpose of connection.

In the Isabella Stewart Gardner Museum, the extension was constituted by two distanced existing museum buildings. To make the correspondence to the existing condition, Piano placed his extension in the middle of the two; connecting them with a seamless glass corridor. For this project, the new major space resulted in the music hall of the museum much to the delight of the clients. A large open hall surrounded by three upper balconies is not only visually attractive but also allows for an explicit acoustical experience. With its/the unique seating arrangement and unusual music hall experience, this new major space dramatically increased the number of visitors and aroused their senses; thereby fulfilling the distinct function of its intention.

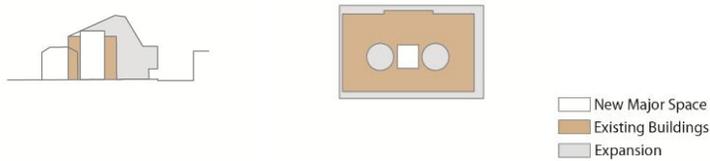


Figure 77

The second type of formation redefines the museum space with the rebirth of an existing building's major space. Due this fact, the new major space is not as advanced; rather it is reinterpreting an/the existing major space. When an existing building possesses landmark statues or has an attractive land use ratio, this type of spatial formation occurs to preserve as much of the original features as possible. There is little modification to the arrangement of the existing space itself; however, this type of spatial formation does rearrange the formation of the programs. One notable expansion project displays this type of spatial formation; the California Academy of Science. Piano retained the original location and orientation in his new building for the California Academy of Science, but he reinterpreted the existing major space into his new piazza in the middle. Thus, the spatial formation is more literal relating to the programs around this new major space. This strategy also will apply to the current expansion project for the Fogg Art Museum at Harvard University. This expansion that is currently under construction will combine

the three existing museums of Harvard University into one largely expanded Fogg Art Museum. It also will concede the existing major space to Piano’s new major space. Inside the major space, the aged interior façade will be clad with wood panels to stress the major space. The wood panels will be applied in a transparent manner to reveal the timeless beauty of the building original features. Piano utilizes the existing major space efficiently to show acknowledgement and respect for the existing orientation as indicated by the two projects mentioned.

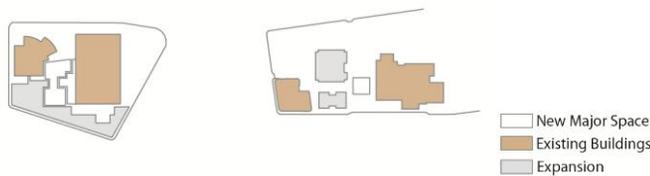


Figure 78

In the following two examples, the new major space was created outside of the building; thus, the new major spaces in the High Museum of Art and the Los Angeles County Museum of Art resulted in an open outdoor piazza. This spatial formation redefined the museum’s outdoor space with the characteristics of a collective space. This formation not only configures as the new center of the museum complex but it also invites visitors and serves as the main entrance in the new museum complex.

In Piano’s expansion of the High Museum of Art, the new complex gained a south barrier which hugs the new campus. Next to the Richard Meier building and the Woodruff Arts Center, is the new major space, the piazza, which was created effortlessly. Now, from this new piazza, visitors have both visual and physical contact with the surrounding buildings. For the Los Angeles County Museum of Art, the new major space was placed outdoors with a light canopy topping this new “Piazza”. This new major space, called the BP pavilion, was embedded to function as the main entrance. This collective space is the hub for circulation of the entire museum and is a perfect meeting place for the most accessible location.

The three types of spatial formation of new major spaces share similar characteristics, all possessing the quality of “Centrality”. It may be obvious that major spaces gain centrality; however, Piano’s new major space communicates with the preexisting center. It is a communication of respect and coexistence of two prominent components in one museum complex. This communication between the new “Centrality” and the existing building is exposed in the expanded museum complex of Renzo Piano.

4.1.2. Communication of New Centrality with Existing Building

Before examining the communication between two major spaces, defining the characteristics of Centrality is needed to be clear in understanding how the two centers’ correspond to each other. The archetype of “Central Space” originated from the architecture of the late eighteenth century museums. It was evident that architectural plans, designed by Boullée, Durand and Schinkel, characterized central space as a huge rotunda surrounded by a continuous gallery. Such ideas were adapted and rationally elaborated in modern architecture. For Renzo Piano, it was explicitly effective in instrumental and symbolic terms; huge open spaces accessible from any direction, uninterrupted visibility and integration of circulation.

Precedent studies share some common properties from which we can induce the characteristics of central space. They decipher center space in museums as follows:

1. Figured property: A huge open space that is of a relatively simple geometrical shape.
2. Primary function: A main exhibit or place for main functions in a building.
3. Spatial configuration: A primary place in a museum which is easily accessible from any direction.
4. Visual Transparency: An open visual field that penetrates to the other relevant areas.

5. Social interaction: A place to make events for the conscious collective experience of museum visitors.²⁸

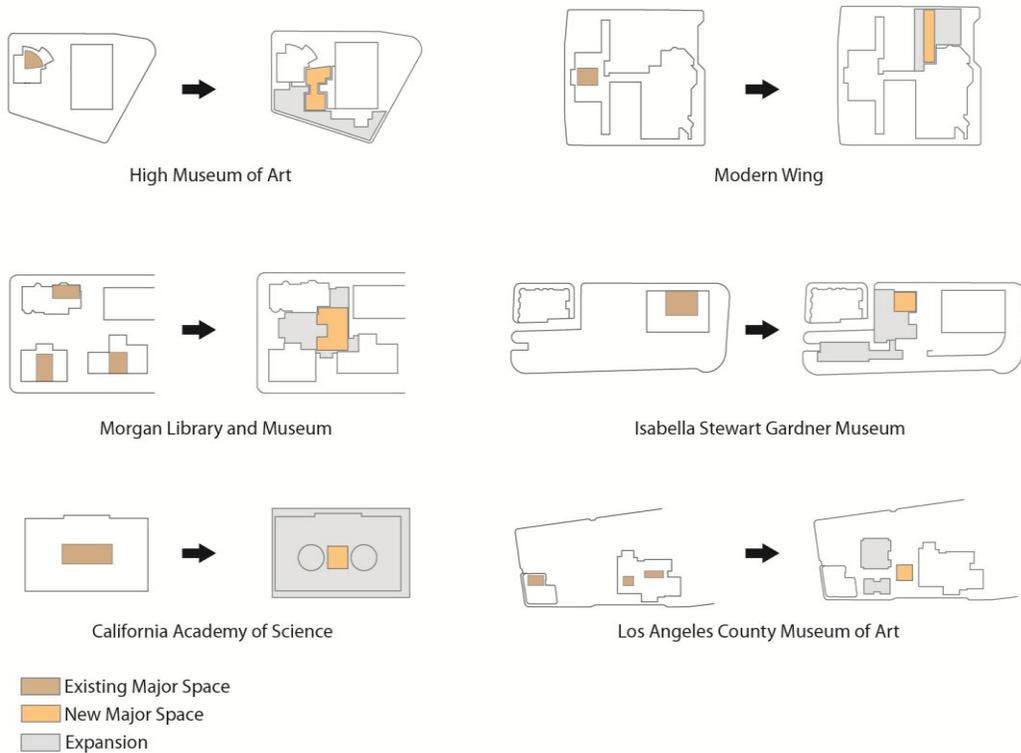


Figure 79

From comprehending the characteristics of Centrality, it shares about five common properties; those properties are crucial factors for understanding the relationship between the old and new centrality. Thus, Interpretation of new centrality is the key to understanding the way in which expansion layouts work. Changing central space is not simply about formal transitions in museum expansions but changes in museum principles that are associated with the social transition. Whether current centrality remained at the same existing location or moved within the expansion, the effect of new centrality is

²⁸ Five characteristics of Central space, Extracted from “A Comparative Study on Centrality in Museum Layouts”, Young Kweon.

extremely powerful such that it configures centrality of the/an entire museum complex. Therefore, Piano creates a new communication between the existing and new centrality; and he expresses it in either a conceptual or literal sense.

In the case of the Morgan library, literal connection space is opened up to the users where people see and feel the centrality of where they stand. The atmosphere of the space reveals itself with the wholeness of being in one large open space. For this figured property linking the Morgan's preexisting central spaces, this new piazza is physically attached to the existing central space; it makes direct communication by convergence of dispersed central spaces into one.



Figure 80



Figure 81

For the California Academy of Science, its new central space is the existing central space. Although the atmosphere and size of the space have changed with the transparent roof and extended glass façade, the communication to the existing central space is to increase the amount of social interactions and visual transparency. The primary function of this piazza in Piano's expansion is for visitors to experience the museum from this central space as the point of origin.

The existing central space in the Art Institute of Chicago is the main entrance lobby; a huge rotunda surrounded by a continuous exhibition space. With the expansion of the Modern Wing, the Art Institute of Chicago gain more exhibition spaces for its modern collections as well as a new entrance to the entire museum complex. This new entrance hall, Griffin Court, created a new connection to the existing circulation and released the

density from the existing central space. Griffin Court's figured property and spatial configuration earned new centrality and its centrality communicates with the existing central space by a directional interior path that Piano also designed with the expansion. Wood paneled on the top part of the wall partially extending to the ceiling, is attached from the meeting point of the Modern Wing and the Art Institute's original circulation. They serve to guide visitors towards the direction of the existing central space. Thus, the visitors have easy access to the existing museum space as well as the existing central space.



Figure 82

The Sifly Piazza in the High Museum of Art is an open public space that allows people to gather informally. This outdoor Piazza is the new central space in the museum complex. While sitting in the center of the entire museum complex, this new central space communicates with the existing building and the existing central spaces. Both Richard Meier's Stent Wing and the Woodruff Art Center had interior central spaces; both located in the main lobby; however, now, as the piazza has created centrality, both of the museums' entrances can visually communicate with the open central space. The Sifly piazza's visual transparency composes the social interaction between the existing center and the new central space.

As Centrality has become pervasive, the new major space has created its own centrality; all the while its formation continues to communicate with the existing central space. Piano's respect for the building's existing architecture and its central space is clearly visible through the coexistence of two central spaces in one museum complex. Moreover, Renzo Piano's expansion and existing museums have created harmony with the communication of two central spaces, establishing a new identity to the entire newborn museum.



Figure 83



Figure 84

4.2. Tectonic as a means to represent Transparency of Expansion

The very image of modernity is substantially derived from the interaction of light and human vision articulated through the tectonic manipulation of enclosing elements, openings, glazing and interior spaces. The materiality of architecture now largely consists of glass and the other, which is often that which supports the glass. Openness or open planning of interior spaces generously illuminated with natural light and divisions or boundaries between spaces that are not solid, but dependent on transparency and light, are sacred parts of modern architecture's appeal for authority. The architecture of glass and light was an important desideratum of Renzo Piano's architecture and it also applied in the expansion of urban contemporary museums.²⁹

4.2.1. Part and Whole of surface, Tectonic



Figure 85

In the details of Piano's architecture, the influence of Louis Kahn took a crucial role in building the perception towards the way of using material and the way they are put together. In understanding the relationship between material and structure, Louis Kahn expanded his notion of materiality to existence and meaning of architecture. Thus, he enlightened the material not as a simple component in the part of structure, but rather to express the true characteristics of material in tectonics. Kahn considered the ornament of architecture was to reveal the connection or joint part of the material. This type of material connection is called "dis-joint". The concept of dis-joint was the concrete tool to show the tectonics of surface and construction processes to enhance the presence of joint.

²⁹<http://formandwords.com/2011/05/09/renzo-piano-light-and-lightness/>

In other words, it meant to display the boundaries or gaps between the materials to actualize the tectonics of surface. The reason for this type of dis-joint is to show and emphasize the structural system.³⁰

Similar to Kahn, Piano also adapted this type of joint system in his detail work. The importance of copula of material became one of the main characteristics which he revealed mostly with the joining glass and steel. Moreover, Piano's constant effort to complete his designs through structure configuration evolved into a more advanced material usage as he found the better ways of expressing architectural quality through the tectonics of surface.

In Piano's understanding, it is hard to separate light and transparency from light construction and what he calls "immateriality"; they are congruent and part of his conception of space in architecture. For example, in his "Logbook" he outlined something of the scope of the transparency/lightness duality in his architecture:

"I have spoken of immaterial elements. These are such things as light, transparency, vibration, texture and color: elements that interact with the form of the space (in some cases they are a consequence of it) but are not just a function of it. I started out, in an ingenuous, even rather primitive way, from lightness. Anyone can build using a lot of material... Taking weight away from things, however, teaches you to make the shape of structures do the work, to understand the limits of strength of components and to replace rigidity with flexibility..."

"When you are looking for lightness, you find something else that is precious and that is very important on the plane of poetic language: transparency. By taking things away you also remove the opacity from material."

"Lightness is an instrument and transparency is a poetic quality: this is a very important difference".³¹

³⁰Kim, Nak-Jung. "A Study on the Meaning of Dis-joint in the Architecture of Louis Kahn." P. 41

³¹Piano, R (1997) Renzo Piano Logbook, p 253



Figure 86

Both transparency and lightness represent the most of Piano's notion in architecture; however, interpretation of his tectonics of surface can excerpt another "immaterial element" or may be considered another factor for the sense of transparency and lightness.

His strategy of building surface is from joining pieces of small material into plain structure. Small joints that make the part of the whole detailed surface, most of the time, this notion is applied in the façade, ceiling and roof systems.

In the expansion of urban contemporary museums, his tectonic manipulation of those enclosing elements mostly consists of glass and steel. The repetition of those materials in his detail work makes distinct surfaces that generate diverse sensibilities.



Figure 87

Moreover, this surface gives a distinct perception by the distance of observer. If you look closely into the detail of his façade, the elaborate surface shows the complicated joints of steel and glass that are detailed in Piano's style. Albeit if you look at Piano's museum

expansion from a distance, it eradicates the details you perceive when nearby. This ambivalent experience occurs mainly from the dematerialization of surface.

Dematerialized surface is the whole space and assembled components integrated together, resulting in a coordinated object of optical illusion in structure with a strong symbolic expression. Optical illusion through dematerialized surfaces results in the transparency of the space. The main purpose in dematerializing a surface is to show the true quality of the space with the 'light instrument' that is the surface of Piano's architecture and urban contemporary museum expansions.



Figure 88

This method is to create a transparent state of exterior as well as the interior of a surface. By visually interacting with natural light, it reveals the interior space of expansion; and when night falls, the interior space illuminates lights unveiling the exterior façade. This effect generates variations of spatial depth and volume; thus, the ambiguous boundary that surfaces brings out the true quality and diversity from inside the museum space. This phenomenon on the surface created by Piano can be defined as “visual transparency” that is literal and clear transparency; visibility over the surface that reveals the purity of material and space.

As Piano said the transparency is the poetic quality and the lightness is an instrument which helps the state of transparency. Lightness of surfaces creates a poetic quality of transparency in both the inside and outside of the surface. Furthermore, Piano's roof systems were treated with the similar intention. Piano's “flying carpet” has the surface of lightness and transparency that can be describe better as “ambiguous transparency” than

a visual transparency. Ambiguous transparency is to represent the perception of space or object over the surface; though it doesn't visually interact with them.

Contrary to visual interaction, Piano's roof systems reveal their transparency by exposing the light; the natural light into the space and the artificial light out to the exterior. This experience can be more dramatic inside of the museum where you can acknowledge the lightness of the structure and the movement of natural light from the sky. The details of this roof system become more poignant as you look more closely into it; Piano intentionally placed the circulation to his roof system where the visitors can see the details of its "fins". Nevertheless, this roof system gives you a distinct sense of the material and the surface. Here, it mirrors the essence of a carpet fabric; a structured plane that penetrates the lights.



Figure 89

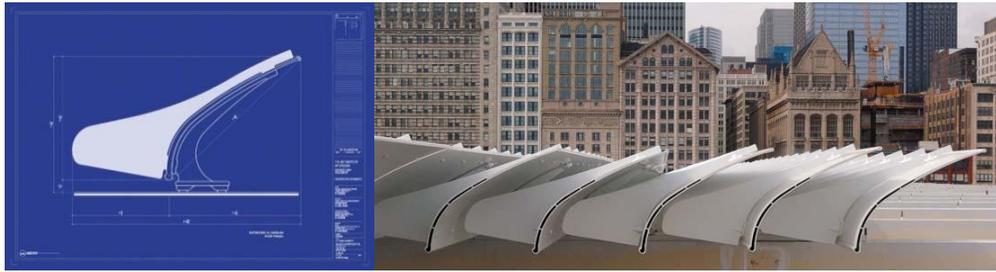


Figure 90

Figure 91

To a certain degree, the surfaces in Renzo Piano's architecture dually evolve into visual transparency and ambiguous transparency through dematerialized surfaces. From this advanced design and technology, Piano reinterprets the transparency in his unique application of surfaces in urban museum expansions.

4.2.2. Strategy and Type of Transparency on the Surface

Before looking in to the transparency in Piano's expansions, it is imperative to understand the types of transparency and their strategies in expression. Piano has used various senses of transparency and applied them to different components of his museum expansions; most of which are surface transparencies shown through the tectonics of his façade and roof systems. However, the transparency of the surface can be used in diverse manners and can also be interpreted more deeply by their characteristics. By studying other existing characteristics in the transparency of surfaces would avail to understand clarity in the transparency of Piano.

With much desire to be more transparent in modern architecture, precedent studies have interpreted various strategies in expressing transparency with their own perspectives. In the study on *Representation techniques of transparency in the surface and space of contemporary architecture*,³² Characteristics in surface transparency can be organized into

³²A study on the Representation technique of Transparency in the surface and space of contemporary architecture, Yoon, Gab Geun, 2006.

four categories: Emphasis on the “Materiality” of surface, literal “Lightness” of material, “Dematerialized” surface, and “Visual Ambivalence”.

1. Emphasis on the materiality of surface: expressed by the light, transparent glass and layered materials.

2. Literal lightness of material: expressed by refined “High-tech” material and reflective material.

3. Dematerialized surface: expressed by ambiguity and repetition of material, digital representation on the surface

4. Visual Ambivalence: expressed by overlapping and layered surfaces

4.2.3. Tectonics as a means to represent Transparency of Expansion

Apart from the original characteristics of the surface, Renzo Piano created his own strategy of expressing transparency applying it to his architecture as well to the urban contemporary museum expansions. To Piano, the transparency was not just about the surface’s condition; it was about creating an atmospheric transparent condition of an entire building. The expansion of a museum is about adding a new creation with the sum of its existing buildings. Piano respects an existing condition for its history and authenticity reaffirming his principles in design; hence, he knew his new addition would not be boisterous, but more simple and humble in design.

Thus, Piano’s strategy in urban contemporary museum expansions is to make the existing visible in the literal sense. It is to “bring forth” the existing architecture. To accomplish such a goal, he again applied transparency to his expansion. It is about make the existing visible through or by the expansion; revealing the true quality of an existing condition and the genius loci of the site. When revealing the existent condition, he also creates harmony between the old and new in material and design.

It is not always about the surface, rather it is about the tectonics of surface. In fact, it is about the “tectonics of the entire buildings” and how Renzo Piano assembled it visibly through the joining of small pieces into the urban contemporary museum expansion.

Additionally, Piano’s expansion projects reveal each of their various transparencies by the site and condition of the existing museums. The types of transparencies also differ by the intention and conception of the projects.



Figure 89



Figure 90

For the Morgan Library and Museum, the enclosed glass box detailed in a steel frame takes on transparency in literal lightness of the material which is glass. While steel frames form the definition of the view port, inside, the existing building is still clearly visible. Additionally, the purity of the existing stone clad building elevation is not visibly apart from the neutrality of glass. From above, the natural light plays another important factor in making the structure more transparent. Piano also applied the same tectonics and material on the ceiling; hence, the shadow of the steel frame on the ceiling draws a grid of lines to enlighten and decorate the interior wall with another texture. From this piazza that Piano created, all six existing Morgan properties are visible with Piano’s emphasis on surface material playing the most important role.



Figure 91



Figure 92

The central piazza of the California Academy of Science creates the most visual transparency despite the fact that the expansion maintains the same orientation and location. For the interior, Piano used and revealed the existing affordable walls inside of the museum. The exterior on the other hand, had no existing elements outside of his expansion; therefore, Piano created transparent picture frames of the surrounding nature in and out of Golden Gate Park, the De Young Museum by Herzog and the De Meuron, which also faced the new museum in the park. To emphasize the glass and create more transparency, the spider web-like steel grid is thinner than the usual details by Piano. Likewise, the singular gigantic roof benefits and widens the view despite its thin and simple form.

In the expansion of the Modern Wing, there are dual factors that contributed to the transparency of the expansion; the first being the transparent façade, ceiling and roof, the other being the entire museum expansion itself. Both were completed in harmony with the absolute proportioned volume, color and feel of the exterior materials. This subtle design makes the new building unnoticeable, giving it a sense of transparency from the larger scope of new complex as if they were built in the same time period.



Figure 93

Moreover, the façade and ceiling's main function is penetration, reflection and control of the natural light from all sides of expansion while revealing the dynamics of its steel columns at the exterior and interior of the new building. As time passes, the experience of this transparency shifts severely from a penetrable glass box during the day to a glass bulb box illuminating the light at night. This dematerialized surface exposes the duality of this space with variations of spatial depth and volume. With its visual ambivalence, it is a conceptual spatial expansion of the interior by unveiling the enclosure of the building.

From the inside of the Modern Wing, the dividing wall in Griffin Court clearly captures the urban landscape of Chicago which leaves an impression upon visitors as they enter and exit the new main entrance of museum complex. On the top of the west pavilion, the terrace has a steel frame that continues from the bottom of building and is vertically erected above height of a regular floor. This design recaptures the Chicago's skyscrapers in Renzo Piano's sensibility of lightness.



Figure 94



Figure 95

To conclude, Renzo Piano uses tectonics as a means to represent the transparency of an expansion building. To emphasize visual transparency, Piano has adapted dematerialized surfaces thereby adding the various experiences of transparency; those which have resulted from the refined tectonics of Piano's sensibility. The utilization of his tectonics is still evolving on another level to express further transparent states in architecture of which Piano's future completed expansions will be based upon.

*"We live in an age where certitude of knowledge, wisdom and truth are attained primarily through our sense of vision."*³³ Renzo Piano

³³Piano, R (1997) Renzo Piano Logbook, p 250

4.3. Connection of Light and Transparent

As I argued the important role of transparency in Renzo Piano's expansion of urban contemporary museums, it can also be found in the physical connections to existing museums. A physical connection is the connecting strategy of how a new building meets the existing one in terms of circulation, materials, form, and volume. As important as transparency is, the lightness of the architecture is another key to the expansion of urban contemporary museums as it is in the practice of Piano's architecture. Lightness refers to the light characteristics of a building in the tactile sense. Often, Piano affirms the importance of lightness especially in as high density of urban context. While all of Piano's contemporary museum expansions are built or will be built in urban context, the lightness of expansion is a crucial factor for Piano to consider. Moreover, He emphasizes lightness when physically connecting to an existing building using light materials and design

In chapter three, I categorized the three types of connections: compound, corridor and underground, which Piano strategized for ten of his expansions. The difference in each strategy mainly stems from the severity of the existing site condition even though all the connecting strategies contain the ideas and intentions of Piano. Although there are three types of connections in the same category, they don't all fit in understanding intentional architectural strategy.

Thus, to categorize connections based on architectural design strategy, Piano must deeply imbed his ideas and intentions to connecting strategy. Having unveiled Piano's intentions of lightness and transparency, the connection can be also described in terms of those two characteristics.

Consequently, the two characteristics can be divided into two types of design strategy: "Light connection for simplicity of design" and "transparent connection for the purity of existing architecture". Here, this categorization is extracted from Piano's respect for the existing buildings and their architecture. By adding a simply designed building, Piano

knew new expansions could confirm the harmony between two distinct characteristics. Piano not only added simple designs, but affordable ones to the existing buildings. Piano credited the purity of architecture and believed it should not be eradicated by the act of expansion. As I iterated the reasons for expansions in the first chapter, working with existing buildings usually originates from the landmark quality of the existing architecture or for the preservation of the existing land use ratio. Thus, the purity of architecture should not be removed; rather the existing architectural quality should be emphasized to elaborate alongside the expansion. In this way, existing museum visitors or users will share the same architectural experience of the previous architecture with the additional quality of experience that would increase everyone’s perception towards a newer museum.

4.3.1. Light Connection for Simplicity of Design



Figure 96

Renzo Piano added his new expansion with transparency and lightness which served their functions and intentions. To show the connection to the existing museum, Piano used similar strategy and intent to create a smooth transition between the old and the new. To make two different circulations into a singular museum experience, he knew that “light connection” should be applied while considering other influential factors in the diverse components. To make a light transition, the design strategy was to compose a

simple design in between; thus, the two distinct masses are not paradoxical nor do they collapse the harmony of the museum.

Piano's simple design can be found at the connection point of the Modern Wing and the existing Art Institute's Rice. The connection point is where the main circulation of the Modern Wing ends; the end of Griffin Court- "the new major space". With a steel glass door, the transition has simple design of an unnoticeable exit from the Modern Wing. From the Rice building, the existing circulation continues with a glimpse of the opening. This gives the visitor a sense of the transition with the wood paneled ceiling extending from the Modern Wing. The design of its decoration or annotation is more informational and straight forward for users. Relating to the material, the limestone wall of the Rice building produces harmony with the white wood panels. From this kind of effortless transition, this connection can be considered "light" with the simplicity of Piano's design solution.

In the plans for the Kimball Art Museum expansion, maintaining the respect for Louis Kahn's existing museum, Piano planned to connect the existing through underground. With the land mark quality and the divinity of Louis Kahn's architecture, it was a responsible decision to preserve as much of the existing design as possible; the solution to make a connection underground was also a more reasonable strategy. With the understanding museum's background, Piano simplified his design for the connection to the corridor. Since this project is still under construction, it is hard to argue the outcome; though the plan shows "the simple rectangle box," its' only function seems to act as a connector merely creating a distraction.

Thus, this kind of simple connection design can be considered a "light connection" also due to the lightness of the material and structure.

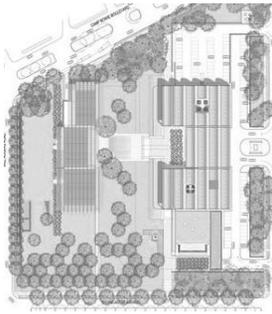


Figure 97

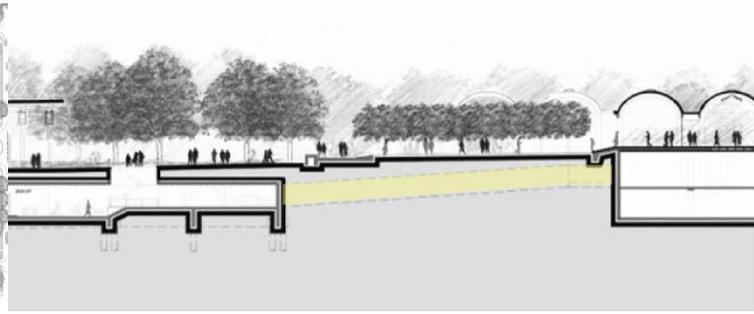


Figure 98

4.3.1. Transparent Connection for Purity of Existing Architecture



Figure 99

It is the transparency that defines the architecture of Renzo Piano. It may be too much to say the transparency but in the connection of few expansion projects, the transparency connection is found when physically attaching to the existing building. Piano's transparent connections are especially recognizable in the Morgan Library and Museum. As I described this expansion in the previous chapter, the enclosed glass boxes were inserted in the middle of the Morgan's properties. The convergence of the glass boxes and the old Morgan historic building made the transparent relation between their buildings. As you see in the Fig.102, the staircase was placed between the existing one and the expansion; it not only functions to create efficient circulation but it is also clearly visible which helps visitors understand the flow of the museum and its location. The Morgan has the most visual transparency compared to the other expansions and its

connection to the existing building has the most visual transparency. The effect of the transparent connection is that of its visual affinity between two distinct buildings; those from a different period of time. Due to the balanced mass and simplicity of Piano's, his expansion has already begun the architectural communication; additionally, the transparency in between aggrandized the visual balance. This visual balance is a result of Piano's transparent expansion and connection to preserve the purity of the existing architecture. Here, the purity refers to the original desires or characteristics of the existing architecture. This can also be interpreted as the genius loci of the existing site. Thus, the transparent connection of the Morgan expansion revealed the purity of the existing architecture which often veiled by the expansions.



Figure 100

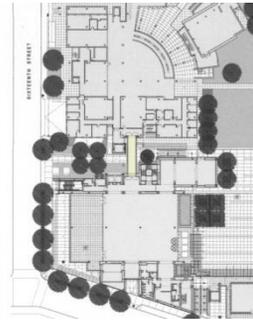


Figure 101

Due to the acknowledgement received by the Morgan Library and Museum, Piano applied the same strategy to the High Museum of Art expansion; however, this time, the existing building had strong characteristics. It was Richard Meier's Stent Wing; the existing modern art museum. Hence, Piano had to approach differently from the Morgan expansion. Here, Piano began to learn how to work with a strong colored architect who is also known for white architecture. A neutral colored building comprised the existing atmosphere. First, to make the correlation between the buildings, Piano at once decided the color of his expansion. With Piano's design of façades and roof systems, Piano created consensus with Richard Meier. Moreover, the connection between Piano and Meier made it more harmonious. A seamless bridge connects between the two in the first

and third floors of each museum. Piano also added another core to the building at this bridge; hence, visitors now have the choice of entering two museums from one combined core which has both elevators and escalators. This seamless connection appreciates the distinction of the two buildings while bringing forth the purity of Richard Meier's architecture. Piano exhibits good sportsmanship implementing the designs of others before his own; this selfless act is always reflected by Piano even if the architect is unknown.

4.4. New Generator of Urban Diversity and Monumentality

4.4.1. New generator of urban diversity

In this last chapter, I would like to interpret the effects of Renzo Piano's expansions. Since they are about "urban" contemporary museums, these types of expansions surely impact to the city as well as its neighbors. Expansions attain physical gain in museum size and sometimes gain dramatic expansions or extensions that change the urban block into different entities. For the museums that usually take landmarks of such cities, changes in the form and identity affects the perceptions of visitors and adjacent neighbors.

To measure the effect of expansions in urban context, they need reasonable interpretations with theoretical backgrounds. In the book *the death and life of great American cities*, Jane Jacobs argues the importance of proper urban renewal with urban components like sidewalks and neighborhood parks. Jane Jacobs was a journalist, author, and activist best known for her influence on urban studies. She argued that a modernist urban planner rejects the matters of the city, because living in a community is characterized by layered complexity and seeming chaos. The modernist planner uses deductive reasoning to find the principles by which to plan cities. In their place Jacobs advocated the "four generators of diversity": "The necessity for these four conditions is the most important point this book has to make." ³⁴ In combination, these conditions create effective economic pools of use."

The four generators of diversity are the need for primary mixed uses, small blocks, aged buildings and concentration. In other words, to make a diversified community, neighbor and city, these four elements should be able to coexist establish a safe and lively neighborhood.

³⁴ Jacobs, Jane. "Part Two. the Condition for City Diversity." *The Death and Life of Great American Cities*. P151

The generator of diversity of Jane Jacobs and the urban contemporary museum expansions of Renzo Piano seem to share some similar characteristic to a certain degree. First, urban contemporary museums exist to create cultural diversity in the city; and it is usually the most attractive place for visitors, naturally, since museums have the “high concentration” of people. Due to his great accomplishments, Piano’s expansions give cities a new identity and also enlightens existing museums, all of which are now full of people.

Moreover, when an expansion undertakes the existing urban museum, it is preserved before it is expanded. For Piano, it was one of the most important factors in his design strategy. Piano examines a building’s value and considers whether or not its existence would help the community. If he found value in his assessment, then Piano would do his best to “preserve the original qualities of the existing building”.

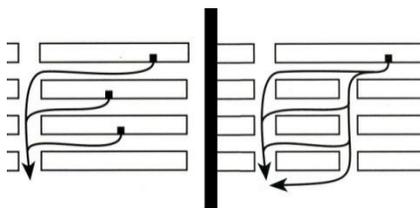


Figure 102

In addition, most of the museums are situated in the city as huge monuments, having authoritarian status, but Piano’s expansions diced large museums into smaller scaled ones. In other words,

Piano’s humanistic scaled buildings create new “small corners” where visitors can enjoy the museum experience in diverse circulation.

Referring back to Jacobs’ first generator of diversity, “the mixed uses”, She thought that if the streets were active at different times during the day, it would make the neighborhood more diversified and help decrease the crime rate during the evening.. Unfortunately, it is usually more difficult for museums to be used or open during the evenings; however, Piano’s transparent expansions illuminate the light in the darkness pushing the museums’ boundaries; filling them with visitors and tourists. It is the transparency that made Piano’s expansions suitable for mixed uses.



Figure 103



Figure 104



Figure 105

Thus, the generator of diversity by Jane Jacobs shares many great ideas about the vision of urban renewal and those ideas met by Renzo Piano's urban contemporary museum expansion.

Chapter5. Conclusion

Conclusion

When it comes to urban contemporary museum expansions, Renzo Piano represented some of the most innovative, and lucid architectural strategies with his distinct ideas and simple designs. The expansions were luminous and the existing museums Piano had designed have added new qualities that upped the scale in the field of architecture.

The manner in which Piano expanded museums has converged with his understanding of transparency and lightness, his definitive principle in architecture. Since an expansion is a different palette from designing a new museum, Piano's new strategies were adapted with the consideration of the existing conditions or architecture. However, not too distanced from his new museum project, he refigured his notion of transparency and lightness to fit in each of the existing conditions with another adaptable strategy.

From the analysis of his expansions, I have found four major components that Renzo Piano considered the most in his process of design. They are the main factors of his designs which are found in the studies of his writing, sketches and architectural drawings. The evidence of his succinct consideration assists to find the influential components of his museum expansions. The consideration of new major space was the first noticeable component. To construct a new expansion within an existing museum complex, Piano refigured the new center of the expansion in order to create harmony between the existing buildings. His new major space not only connected the existing building but it also became a new entrance and a new face to newly erected museum complex. Secondly, Piano elaborated the surface of the expansion with his unique technique of tectonics. The ceiling, façade and roof systems were immaculately expressed due to his careful details to control light into space and his clear understanding of the surfaces functions. If an expansion were built from an existing structure, Piano placed great consideration on the connection between the existing buildings and his expansion. From the courses he connected, it revealed Piano's belief in showing the utmost respect for the existing architecture. The types of connections are varied to accommodate the conditions of each

existing building. Lastly, as an Italian born architect, Piano's usage of Piazzas is diverse in terms of their locations. Piano placed piazzas in both interior and exterior locations of an expansion if the space allowed for a reasonable gathering space. In addition, due to the fact Piano's expansions were located within a city's boundaries, he considered the effects of his expansion towards and about the urban contexts that were deemed landmark quality.

From these analyses, it can be concluded that an in-depth interpretation of these four components is needed to understand Renzo Piano's design strategy more clearly. Although this type of interpretation has not been studied in the format of a dissertation, it is deserving of one to understand and appreciate the brilliance of Renzo Piano work.

Through interpretation of the four major components which completed Renzo Piano's urban contemporary museum expansion, I can interpret Piano's strategy with a deeper understanding of his prominent intentions. However, the four components are not meant to be understood in any chronological or design strategy order, rather it is a combination of these four components that is the essence in Piano's expansions.

From interpreting his spatial formation of new major space in an expansion, I have found Piano's intent is to find balance with the existing museum. It is about coexistence; the existence of two major spaces that balance the harmony in a new museum complex. It is also about Centrality; the communication between two distinct centers connected together. Piano knew the communication between two distinct Centralities should be communicated through both physical and conceptual connections.

In surface expansions, Piano used his usual transparent materials that often resulted in dematerialized surfaces. He treated the surfaces of an expansion as a filter for the natural and artificial light. The dematerialized surface also assisted in creating a transparent surface when necessary. Piano's intention in regards to the expansion of surfaces on a building was to implement transparency, or to his work on the building transparent. Rather than being intrusive, Piano believed his new expansions should be transparent and

subtle. By bringing forth the characteristics of the existing architecture, he found his expansions would be functional and connected.

To create a more advantageous expansion, Piano knew the connection to the existing building was the key factor. Considered to be a demanding decision in expansion, Piano resolved to make his designs transparent and light with a simplicity that would reveal the purity of the existing architecture. He created transparency in between the buildings to preserve the beauty of their existing architecture. With his simplicity of design, Piano created the lightness of connection in metaphysical sense.

Lastly, Piano's expansion created a new outdoor space as the front of a new expansion; the Piazza. This outdoor space composed new corners in the street and added new diversity to the museum exterior. From the analysis of his outdoor space and its effects by the expansion, I could relate this outcome to the theory of Jane Jacob's 'the four generators of diversity'. The physical changes of Piano's expansion to urban context corresponded with four generators of diversity in Jacobs' theory: mixed uses, small blocks, aged buildings and concentration. I found these four generators of Jacobs' were in an agreement in the Piano's strategy of outdoor space.

This study of Renzo Piano's architectural strategy has revealed important and relevant design factors that should be considered in regards to urban contemporary museum expansions. With the vast growing number of expansion projects outweighing the number of studies in museum and architecture expansions, this study will prove useful and beneficial. As Piano's careful consideration of the four major components proved crucial in his museum expansions; it can also be a valuable asset for any architect considering any type of expansion.

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