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Influence on Different Historic Buildings in the World

--The merging of old and new of the material perspective

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Abstract: This paper is mainly focused on the study of historic buildings in the world, specific the meaning of these buildings in the human history. These buildings built were influenced and started in the shaped historical era, which posed a very profound political and economical social background and fulfilled a significant function to the society. The materials used in the buildings presented the development of the science at that time.

Keywords: Buildings; History; Society; Material

1. Introduction

On April 16, 2019, a fire broke out beneath the roof of Notre-Dame de Paris Cathedral, destroyed two-thirds of the roof, and burnt down the iconic spire as well as severely damaged the upper wall. The Deputy Mayor of Paris, Emmanuel Gregoire, said the cathedral had suffered "colossal damages." Many newspapers filled the front pages with dramatic titles such as "heart in ashes" to report the incident; the entire world had its eyes on the event.

After the fire was extinguished, President Emmanuel Macron claimed the need for rebuilding the landmark. Paris government started searching for ideas to restore the burnt landmark. Such a quest started the debate: how to rebuild the tower, took the stage.

Some architects consider Notre-Dame as a historic heritage, which means no redesign should be allowed. They recommend the Paris government to build the old as the old with masonry. Other ideas, with the theory that today's architects are permitted to add elements reflecting the spirit of our century to the long building process of Notre-Dame have also emerged.

Forinstance, Foster and Partners studio has proposed the design of a tower with glass and iron for Notre Dame, symbolizing "light and modern". Studio NAB has come up with the idea of a "greenhouse roof" with recycled marine plastics to call for sustainable development and environmental-friendly living habits, largely fit into the 21st century big theme: environmental protection.

Following the Notre-Dame reconstruction plan debate, this article analyzes several proven solutions that various architects have practiced throughout history. All of them successfully merged old and new parts of the building by using materials from different time periods.

2. Materials Applied in the Buildings

Due to the different forms and functions of the building itself, the original materials used were different significantly. In the reconstruction process, for buildings with varying historical values or context, appropriate reconstruction methods should be selected.

If the original building form has sufficient historical or aesthetic value, while reconstruction is needed for slight damages done to the old building, it should be conserved as the old form; if the function of the original building is no longer suitable for the new era, original materials appeared to be not erosion-resistant, then new materials can be added as long as it harmonically mixes with the old.

For the purpose and convenience of clearly defining the fundamentals of the idea in the issue, we use the term “old” to define the original status and “new” for the later addition.

Materials, as the base of construction, play many essential roles. In general, materials contribute to the safety issues, for instance, the earth building used a 2-meter thick wall built up of san he soil to protect its residents from beasts. Materials make up the architecture's visual appearance, which helps to establish the styles and appearances that at the very moment attract visitors.

Building materials serve more significant and meaningful purposes than constriction. They are mediums in which the architects turn their ideas from blueprints into real structures, and they convey the meaning and inner spirit of the design themselves: witness of culture, ideology, and belief of a specific period. Considering ancient architecture, materials in residential areas also reveal the owner's social status--the pyramids in Egypt built with heavy stones are a typical example. Moreover, materials

even memorize the process of transformation, which acts as a history book for the proceeding designers to refer to.

3. Different Influence on the World for the Material Used in the Buildings

Choice of different material leads to different effects of the same form, vice versa, mainly categorized as new and old parts use the same material that created the same form, use different materials that created the same form, use different materials but created same forms, and those use different materials to create contrasting forms.

There are a few well-known buildings that have been remolded to the same form by using the same kind of materials throughout history.

Hundreds of years ago, books considering repair of paintings have put forward the theory: "repair the old as the old". However, some kind of misinterpretation of this theory has led to the practice as "repair the old building to make it look as if it was the previous one." Indeed, the true meaning should be: repair the old building with the same materials and working processes to reach a similar visual appearance instead of simply faking the previous "old building". Behind the words, what elevates the theory is that it proposes the inner spirit and process of architecture should never be lost in any edition. In the proceeding centuries, architects expanded the theory to redesign and expansion of architecture. Among the successful cases, The Ise Jingu Shrine is the perfection illustration of such theory.

The Ise Jingu Shrine is a Japanese palace that started construction in 690. Following a rule called "annual relocation", which requires the shrine to be rebuilt every 20 years, it has experienced reconstruction for 62 times (interrupted by warring kingdoms period of Japan for around 70 years). The annual replacement is a process that is uniquely used in Ise Jingu, which serves to worship the Japanese god. According to the records of Miscellaneous Events of Tai Shen Palace and the Yanli Ritual Accounts, this concept was proposed in 684, which means that at a specific moment, the main temple should be rebuilt on a preserved same size area with same techniques and materials. Since architects strictly follow the rule, techniques to build this shrine have been inherited up to now. Over 1300 years ago, the first temple was constructed in the wooden structure. The main material the temple uses is "divine tree" Formosan cypress, a rare tree species in Eastern Asia. To ensure the materials remain unchanged throughout centuries, architects preserved a forest—Shengong forest, which covers an area of 5500 hectaresonly to cultivate this type of tree for the construction use. What is engaging is that because the materials disassembled from the previous temple are not discarded but be reused in new smaller temples beside the Ise Jingu, the old temple gains legacy by spreading out the spirit carried by the materials. The "same material" approach is therefore made successful, and the shrine serves as a good example of "rebuild the old as the old" on the materialism perspective. Also, the processing methods pass from generation to generation thanks to the clear time limit for annual relocation: 20 years. Following is the commonly agreed explanation for the time length includes considering architecture approaches: the average life expectancy of Japanese people in the 7th century was 50 years old. If the relocation happens every 20 years, the majority of the last constructors would be able to teach processing methods to their processors. Reality proves that their decision was right. With the same techniques, the shrine manages to represent "rebuild the old as the old" on the perspective of forms.

At the same time, there are also building restorations that have adopted different kinds of materials but kept their original forms.

In the 19th century, German architect Gottfried Semper put forward a theory called "Stoffwechsel", which translated into "metabolism" in English. In his theory, Semper proposed that traditional building techniques could have different benefits when encountering new materials and environments. In other words, when the form of a building does not change throughout the expansion process, it's hard to determine whether the overall effect remains the same when architects use new materials. The two possible outcomes: remain and change, have been demonstrated throughout history.

The Cordoba Mosque, now called Cathedral of Cordoba, was Originally a Christian Church. In 786 A.D, after the Islamic conquest of the Visigothic kingdom, half of the Gothic church was converted into a mosque. During the 8th century and 13th century, the mosque was expanded four times, with each Caliph and his elite contributing to it. The expansion that happened to the mosque through the Muslim-ruled period should be considered a typical example of "same form, different materials" merging process. The design of classic pillars was common in mosques world-wide: double arches, one horseshoe arch, and an upper semi-circular arch permit higher ceiling, while alternative use of red brick and dolomite create visual impact. However, what makes the Cordoba Mosque unique is the layout of the columns. Every single column, in this architecture, serves as an element of the integrity, as well as a model for the proceeding constructors to expand the mosque. Early when the mosque was created, the constructors decided to take the conservative approach, which limited the imagination for further expansion: from the beginning, the distance between every two columns have been set at less than 3 meters, and for the same distance, the element repeated throughout the whole prayer's hall.

With this approach, when people went into the mosque, it would have made them feel that the mosque was never going to end. The same feelings were also experienced

by later architects. Therefore, even though the mosque wasn't completed until the 13th century and the building techniques were not taught by their ancestors, they could figure out exactly the building rules for expansion. It was said that the idea of equality among all living beings was best presented in the neat form of a colonnade. Yet, instead of changing the form of the mosque, all of the expansions contributed to further deepen the feeling of eternity for the prayers, as well symbolized the supreme power of the Islamic Empire at that time. However, different materials were used throughout the building process. The pillars were made from different materials: mainly porphyry, Jasper and marbles of various colors. The origins of columns also varied significantly: some were already in the Gothic structure; some plundered in European cities; some were selected from presents from Eastern Rome; others even came from the ruins of Carthage's ancient buildings. Among all the columns, the most eye-catching two were made of jade, with carvings and decorations different from those of other pillars. The fruitful material choice perfectly reduced the monotonicity of repeating layouts and added the memory of each era to the mosque. The "same form, different materials" way of merging the old and new in this case succeeded, both in creating harmonic integrity and introducing variations.

The Kolumba Art Museum, designed by Peter Zumthor in 1997, is an art museum built on the heritage of a German Gothic Church that experienced severe damage during the Second World War. Since the historic church was built with masonry and had weathered a long time, according to the "Stoffwechsel" theory, any new material added should create a distinct feeling, related to the instinct ability of the material itself. In this case, Zumthor chose grey brick as the main façade material, which naturally created a vintage visual effect. Harmonic integrity was established since the grey brick perfectly fit into the damaged masonry. The reconstruction program, therefore, did not change the overall setting of the old church. Looking from the bottom to the top, the masonry along with grey bricks successfully gave dignity to the existing relics. Zumthor introduced many small holes on the brick walls so that light could be transmitted into the museum. These holes also symbolized the trauma from the war and made the church a place for reflection about the melancholy experiences of the war-salvaged city. However, the new materials also portrayed the unique inner spirit of the building. Inside the building, Zumthor used blue glass, red wooden structures to redesign the structures. With the lights reflecting on these materials, a calm atmosphere was created in the upper parts of the museum. Therefore, the Kolumba Art museum achieved a mixture of reflective and calm, enjoyable feeling by the choice of materials.

Sometimes, the same kind of materials could also achieve surprisingly versatile effects.

Even though the use of the same materials in most cases serves to "repair the old as the old" as has been previously discussed, some architects did create effects for buildings that varied greatly with exactly the same materials. Peter Zumthor, in this case, coined a word called "knitting-on", which had been practiced even before the proposal in the 1990s since the textile-based analogy between old and new had been used in wooden-structured palaces. However, the modern understanding of knitting-on can be deeply explained by the reconstruction of the Gugalun House.

The Gugalun House is a 17th-century farmhouse that lies in the mountain area near Versam in Grisons. Up to 1990, it continuously acted as a residential house. However, because of deficiencies, the owner asked Peter Zumthor to reconstruct the house by adding more functions: a kitchen and a shower room were necessary for modern families. From the material perspective, the original Gugalun house was built by wood and stone, which were traditional construction materials that created warmth and heaviness. Only with these materials could the house fit into the environment. Zumthor's goal was to make his edition as if it was a part of the original script after several years when the new materials faded in color and merge with the old ones. For this purpose, he used the heavy solid timber as the main material, with stones added to his work while designing windows. Therefore, the façade did not turn to be inappropriately eye-catching, successfully keeping the modest and exquisite feeling. For the function needs, Zumthor designed a new kitchen part that appressed on one side of the main rooms and a corridor with stairs. These editions changed the previous form since the pile dwelling part was blocked by the newly-built wooden façade. However, to merge "new wood" with "old wood", Zumthor interlocked logs to make a single-layered structure without bracing or cladding (he removed the original cladding, and the layers overlap each other alternatively at the corners of the building.)With this technique, the old and new parts could have different sizes and textures but be interconnected under the same wooden roof that had been built hundreds of years ago. Since then, the knitting-on technique had been spread from the whole Grisons mount valley to many parts of the world, and the idea that the same materials can produce different forms inspired proceeding architects.

More than often, architects have changed forms of structures with different materials used. Such modifications have turned out to be great success.

Since modernism came in lead, principles of reconstruction have been gradually changed into a more flexible way: while encountering poorly destroyed ancient heritage, architects begin to think more about adding ele-

ments from the modern perspective instead of rebuilding the gone parts with the same materials, or in the same forms. However, the basic principles of reconstructing architecture, visual attraction and inner connection keep unchanged. Therefore, two theories begin to attract public concern: the "symbiosis" theory and the "stylistic restorationa" theory.

Symbiosis is defined as an interaction between two different organisms living in a close physical association, usually to the advantage of both. In the context of architecture, the term can be translated as "two or more different elements exist close to each other while sharing the same spirit." Among the examples that practiced symbiosis in architecture, the Louvre Museum Entrance plays an important role.

Similar to the Notre Dame, The Louvre Museum has enjoyed overarching status and served as a cultural icon by the time it was constructed. Originally built as the Louvre castle in the late 12th to 13th century, it has turned into the world's largest art museum. In the late 20th century, "The Grands Projects of François Mitterrand" took place, aiming at adding modern monuments to the historic city, Paris. The expansion of the Louvre, in 1983, was proposed by President François Mitterrand in 1983. Finally, Chinese-American architect I.M. Pei's design: a new entrance, the Louvre Pyramid, was built and inspired the world. The Grand pyramid was constructed in the main courtyard of the Louvre, along with three smaller pyramids besides to solve the overloading problem of the previous main entrance. From the perspective of forms, the tetrahedron triangle is one of the most stable structures, which practically deals with the large pedestrian volume; while the "pyramid" style gives people an impression of heaviness and solemnness, which fits into the masonry-based museum. The idea of symbiosis first came in since the pyramid is a space that can be operated independently: the pyramid completed the functions that the museum lack, while also connects the museum from other parts of the palace, showing the consistency between two objects with non-overlapping functions. Also, the pyramid was built next to a square pool. The reflection of the pyramid and the main museum varies with the weather, creating different but integrated views from every side of the entrance, which stands as an example of symbiosis between environment and architecture. Besides the differences between forms, the material choice of the edition added sparkle to its iconic spirit based on the idea of symbiosis. The transparency of glass allows visitors to view the scenery with their imagination: besides the main scene of the magnificent museum, from certain perspectives, they may figure out either an ancient patio or a busy commercial street. I.M. Pei also used the steel structure to build spiral stairs with a lift in the center, introducing modern functions for the visitors, which as well reflects the symbiosis idea. The functional and environmental symbiosis building process finally achieved the goal, as I.M. Pei said glass and steel structure has broken the traditional form, and the edition makes the Louvre museum belong to the architecture of our time.

Stylistic restoration is a controversial idea that emerged in the 19th century when confidence provided by the development of modern science enabled many European cities to begin to restore their city monuments with the most appropriate style that could refresh the architecture. Even though there's no answer toward whether stylistic restoration is better than keeping the old materials and structures, the idea inspired many more generations, who began to use the original architecture as the ready-made element, while adding more attractive parts to make contrasting visual effects between the old and new parts with material's characteristics and the surprising forms.

The Royal Ontario Museum is the largest and most popular museum in Canada, which was built and expanded throughout the 20th century. The original style was a synthesis of Italianate and Neo-Romanesque, which now acts as the west-wing. When the east wing was built, a neo-Byzantine style mixed with the Neo-Romanesque building. This edition is normally accepted, as it didn't change the façade material: yellow brick. However, what makes the Museum engaging, is "The Crystal" by Daniel Libeskind. "The Crystal", also called the Lee-Chin crystal palace, is a 175,000-square-foot part of the museum. It was built based on symbolic angular aesthetics and established canted walls to envelop the new and old façade. The edition took both the east and west wing are ready-made components, beside which an eye-catching new architecture came into existence. Therefore, the museum impressed visitors at first glance, reaching the goal to appropriately use stylistic edition and mixed in elements that fit into the main flow of today's architecture. Even more eye-catching, are the aluminum and glass roofs, supported by a steel frame. The transparency provided by the glass makes the crystal palace full of natural lights so that when visitors go through the corridor between the Romanesque parts and the crystal, natural lights become stronger step by step. Also, aluminum provides a sense of lightness, which severely contrasts with the heavy brick walls in the ready-made parts. New materials, in this case, represent an extension of stylistic renovation: without new technology and understandings about modern materials, the edition cannot come out.

Standing at "now", architects cannot rewrite the past, but can construct the future. The idea that "The only thing remains unchanged is change" always reminds us, that besides preserving the historic heritage, we have the right to add elements of our era. Therefore, every aspect discussed in this passage can be a scarifying solution to

the problem of whether Notre Dame should be reconstructed. Although, we can't determine what to do will be the best choice, architects today should deal with the problem. Ultimately, time will correct the decisions.

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