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PREFACE

The platform, which was established under the initiative and leadership of Prof. Dr. Atila GÜL with the motto of "Common Platform Where Spatial Planning and Design, Building, Landscape and Construction Meets", has been organized since 2021 (1st and 2nd International Symposium on Architectural Sciences and Applications 2021/2022), the books he edited (Architectural Sciences and Sustainability and Architectural Sciences and Conservation), and the Journal of Architectural Sciences and Applications (JASA), which left its 8th year behind, are excited to add a new one to these academic studies that he brought to the scientific life.

In this context, the "Journal of Architectural Sciences and Applications" (JASA) was established in 2016 for cooperation, knowledge production, and sharing at the international level. (JASA link: https://dergipark.org.tr/en/pub/mbud)

As JASA's Journal Editors, scientific journals and scientific books are published to develop inter and multi-disciplinary cooperation and joint studies. In addition, international scientific symposiums are also organized.

We wish to continue this process that we have started in the coming years, and we will ensure the continuity of the books with successive numbers. We are proud to have reached these numbers with the contributions and supports from you.

First of all, I would like to thank the Reviewer Committee, Architectural Sciences and Applications Academic Platform, who contributed greatly to the publication of both books, and İKSAD Publishing House and its responsibles who successfully followed the process. Many thanks to Sibel AKTEN, Lecturer, who has meticulously dealt with all the details of the book and has taken care of the book's success from the editorial processes to the referee processes with great determination and stability....

The biggest thank you deserves you, the authors of the book chapter. Thank you for sharing the quality and valuable works you have prepared with us.

We hope that our book " Architectural Sciences, Sustainable Materials and Built Environment" will be useful to readers.

Best regards.

October 1, 2023

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The Use of Glass Materials in the Design of Contemporary Extensions to Historic Buildings

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1. Introduction

Many structures met the requirements of the time when they were built but could not meet the needs of today's conditions and, therefore, could not be used (Feilden, 2003). Historical buildings may wear out over time or face the danger of extinction. The structure can be damaged by natural disasters, human factors or just the return of time. Cultural heritage must be preserved in order to transfer it to future generations and to prevent the destruction of structures. A multidisciplinary study should be carried out in stages such as determining the causes of wear in the protection of the buildings, determining the damage to the structures and choosing the materials and techniques to be used in the restoration (Uğurlu & Böke, 2009).

Reusing these structures by giving them a different function, instead of causing economic and environmental damage by demolishing and rebuilding them, is a method that has been frequently used in recent years. This situation is especially seen in very old but still intact structures. However, historical buildings may need extensions for their new functions, as they are sized according to the function of the old period. Extension structures can be located on the roof or a facade of historical buildings, or they can be built by forming an outer shell or completing the historical structure without touching the historical buildings. Emphasizing the changes and extensions made in the historical building within the scope of refunctioning, attracting

attention, or creating harmonious integrity is ensured by the way the material is used and the design.

One of the most used materials in extension structures is glass. Glass material is flexible as it is suitable to play with its reflection and transmittance. These features of glass and the developing technology, along with the possibility of building in wider openings, have made it possible to use glass materials frequently in extensions. It is used with different shapes and structures according to the function to be regained and the image the designer aims for. It is seen that glass materials are used in the refunctioned buildings for objectives such as meeting the need for a space that needs to receive light, providing the use of scenery, and revealing the main entrance of the building. The study's main purpose is to examine the use of glass materials in the extension and how the extension is attached to the main structure through the sample structures examined. Within the scope of the study, the use of glass in the extension to the historical building and the method of adding it were examined through examples in the context of attachment location, purpose, size, transparency, reflectivity. In this context, the effect of glass materials on extensions was evaluated.

2. Material and Method

In this study, in the literature review direction, refunctioning and extensions to historic buildings, glass material and its use in

architecture are explained in systematically created by us. At the same time, examples of glass extensions to historic building are analyzed and evaluated within the scope of attachment location, purpose, size, transparency, reflectivity.

3. Findings and Results

The concept of protection; It aims to provide social continuity in social and cultural terms in order to transfer the past to the future and to preserve the historical traces in the building. Within the scope of the protection and survival of cultural heritage, the transformation of historical buildings by re-functioning has an important place among the types of intervention. Additional structures can be placed on the roofs or facades of historical buildings, or they can be built by creating an outer shell without touching the historical buildings or by completing the historical building. While using additional construction methods in repurposed buildings, the use of glass materials is frequently encountered.

3.1. Refunctioning and Extensions

The aim of architectural preservation is to preserve the physical texture of the building as well as its symbolic and artistic values. Structures must have one or both of these values to be protected. In other words, not only their physical existence is sufficient for the protection of buildings, but they must also have cultural value. Because these values have an important place in the collective memory or history of society or humanity or are aesthetically valuable

(Kurnaz & Anıktar, 2023). In this direction, a historical building structure, form, construction technique, material and artistic value of that period should be preserved as a whole, without deteriorating its original qualities.

Article 3 of the Venice Charter issued by the International Council on Monuments and Sites (ICOMOS) in 1964 states that "The purpose of preserving and restoring monuments is to preserve them as a historical document as well as a work of art" and in Article 4 "The basic attitude in the preservation of monuments is to protect them. to be permanent and to ensure its continuity" (Venedik Tüzüğü, 1964).

In short, conservation can be defined as the transfer of structures that have taken place in the historical memory of a society to future generations without destroying their originality, and the preservation of this cultural heritage by using the right methods with the least intervention in order to ensure the continuity of this cultural heritage (Ünlü & Ünver, 2019). Historical buildings can be protected by various methods according to their functions and existing physical conditions.

These methods are; Consolidation, which means physical interventions made to increase the durability of the existing structure, reintegration, which means integrating the missing parts of the structure with a new material, renewal (renovation), which is the renewal of the parts that make up the whole, documents a destroyed

structure and, if any, first in the light of the remains (Kurnaz & Anıktar, 2023). Reconstruction (reconstruction), which is to bring the building into its shape, cleaning (liberation) to remove the excesses added after the first construction of the building, and adaptive reuse, which can be recyclable when necessary, and bringing new functions by making it suitable for contemporary needs and uses (Turanlı & Satıcı, 2021).

Refunctioning; It can be defined as the reuse of existing structures that have lost their function due to many reasons such as environmental, social, cultural and economic, with a different function while preserving their spatial and unique structural characteristics. The fact that a building that continues to exist structurally cannot be used for the purpose of its construction necessitates its re-evaluation with a different function. Advantages such as reducing the damage to nature by evaluating the existing building stock, gaining economic benefits, cultural and historical continuity, and ensuring continuity between the past and the future necessitate this functionalization. Making analyzes and inquiries that take into account the structural and spatial characteristics of the building in the functionalization process; It is important in terms of meeting human actions with the new function and creating livable spaces in this context (Eryiğit & Anıktar, 2021). Functional change also allows historical values to come to life in the

city by enabling the society to interact with its past (Gazi & Boduroğlu, 2015).

It may be necessary to make a contemporary extension due to the reuse of historical environments, their active role in contemporary life, and the comfort conditions of historical buildings that have been given a new function (Letzter & Neuman, 2022). Contemporary extensions are a compromise between expanding historic buildings and emphasizing the important values of historic buildings. Extensions add new meanings to the field by acting as a bridge between the past and the future (Casakin, 2006). The resulting new structure has its history and establishes a new relationship with its surroundings. The extension's design must be differentiated regarding the historic building's structure, material, and style.

3.2. Glass and Its Use in Architecture

For the new function to be brought to life in this transformation process, the existing structure should be re-evaluated in terms of design and material. The choice of material and its usage should be determined accordingly. It varies in terms of structural features, such as the relationship between the main structure and the extension, the method of joining, dimensional difference, material harmony, or contrast. The design and the material can achieve effects such as harmony or contrast, being innovative or conservative, and mixed or single use.

Material compatibility or incompatibility differs according to the type or color of the material used in the extension. In this context, the extension can be compatible both in terms of type and color, it can be compatible only in color or type, and sometimes it can be incompatible in both respects. This compatibility or incompatibility also changes according to the perception that the designer wants to create. The effect of the material on the perception desired to be created in the extensions is high. Glass material is frequently used in refunctioning because it has more transparency and flexibility than other materials.

Glass is formed due to the sudden cooling of melted rocks due to volcanic eruptions, lightning strikes, or meteorite falls. Looking at some tools from the Stone Age, it is possible to see that glass has been used since that period (Raymond, 1961). In the 1st century BC, the invention of blown glass in the Syria/Palestine region stands out. The technique of blowing glass has the characteristic of being the first important step in the development of glass in architecture. The technique spread from Egypt and Syria and was also used for boats and large flat bowls, the precursors of windowpanes (Raymond, 1961).

It is thought that the idea of putting glass in the windows of houses came from the Romans. The 30/60 cm glass windows placed on the bronze windows in the Ancient City of Pompeii can be shown as proof of this practice. Glass has been made in increasing sizes and has been

a significant component of the architecture of the great churches of eastern and northern Europe, with techniques of attachment inside buildings being developed (Lyons, 2004). With the developing technology, glass usage areas and forms have also changed.

Technological advances in glass and expanded possibilities have made this material increasingly attractive to designers. However, integrating glass and steel in a structure provides the development of contemporary goals in lightness and transparency (Sev et al., 2004). In line with the building style that the designer wants to perceive, thick and precise glass joinery is preferred in some buildings, while frameless, thinly structured glass is used in some buildings.

The reasons for the use of contemporary extensions in historical buildings are not only related to the need to visually separate the main building from the extension. Additional construction with contemporary materials and techniques is also preferred due to the fact that contemporary materials are easy to disassemble, load less on the main structure, and can be integrated into the historical structure with less intervention.

According to Zeren, in historical buildings, suffixes are generally; They are applied horizontally, vertically or both horizontally and vertically as roof completion, facade completion, transition element between two buildings, fire escapes attached to the structure, eaves elements that are articulated to the structure, and structures in the form of integrations made on the facade of the building (Zeren, 2010).

Glass used as material in architectural facades:

Sheet Glasses: They are produced in sheet form. They are used in the windows and exterior cladding of buildings.

Empire Glasses: They are glasses shaped by the pouring-rolling method. The plane is obtained by passing a metal cylinder with an indentation-protrusion pattern over the molten frit poured on a casting table. It is used for decorative purposes in places where it is not wanted to be seen.

Safety Glasses: These are the glasses that break very hard on the balcony facades, where safety is important in buildings, or that do not form cutting pieces in the materials added when broken and do not scatter. It is mostly preferred in balcony facade cladding, stairs and railings (Özalp, 2010).

In the historical process, architectural spaces with building materials such as stone, brick and concrete were completely separated and abstracted from the physical environment in which they are located, while the interior-exterior distinction was eliminated with glass materials, and the borders became more flexible. Glass material, with its transparency feature, brings about variability in perceiving space and building in architecture, abstract dimensions, and unbounded encounters.

Adding an additional structure to a building from the past means combining a completely different building with the old one in terms of construction technique, materials and design principles. The most

important point here is that every modern extension to the building reflects its own period. However, it is another attitude that the new structure reflects today's life and technology within the framework of certain respect elements, without ignoring the existence of the old structure. According to research done; The sections to be made "additional" in the historical building can be classified under four main headings (Uluşahin, 1992):

- Extensions made on the roof of the historical building,
- Extensions made in the form of integration, new extension or inner shell on the facade of the historical building,
- Extensions made at the entrance of the historical building,
- Extensions made in the form of a bridge between historical buildings or between the historical building and the new building (Figure 1).

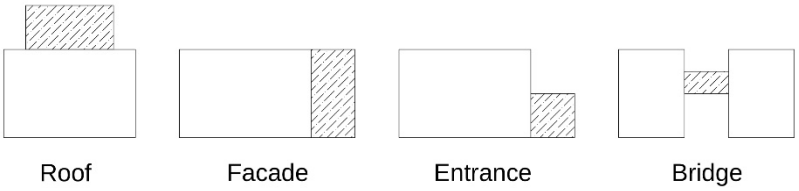

Figure 1. The sections to be made "additional" in the historical building.

In line with the perception that the designer wanted to create, the type of glass used also differed. This situation has revealed different evaluation criteria, such as the purpose of use, size, transparency, and reflectivity of glass in extensions. The study examined these criteria

on examples from different regions. Looking at the examples of use of glass as a material in additional structures in historical buildings, it is seen that there are different uses. The samples examined within the scope of the study were selected by paying attention to their location in different regions, attachment locations and the use of glass materials in different ways.

3.3. Examples

Tate Modern:

Tate Modern was built in London, England between 1947-1963 by Architect Sir Giles Gilbert Scott and was formed by converting the Bankside Power Plant, the largest building in the region, into a museum. The task of transforming the building, which was closed in 1982, into a museum with the architectural project competition held in 1994, was given to the Herzog & de Meuron team (Jacques Herzog & Pierre de Meuron).

For Herzog & de Meuron in its transformation into a museum, the building's original character was key. It was designed by preserving the main elements without making too many changes in the building. The chimney, which used to be the symbol of the Bankside Power Plant, has now become the symbol of Tate Modern. The turbine hall, where the old generator room is located, has been transformed into an impressive entrance.

The main building is constructed of 200 meters long steel structure. The exterior of the building is brick. There is a 99 m. long chimney in the north direction. The Herzog & de Meuron team used 5000 tons of steel and 7200 copper plates for the new design of Tate Modern.

The most important change made in the old Power Plant building is in the roof part. A rectangular glass prism with 524 glass partitions was formed on the roof to allow natural light to enter the halls from the roof (Figure 2). Most of the natural light that enters during the day is provided by this glass prism. At night, the glass prisms on the chimney and roof are illuminated with colored lighting. Thus, the presence of the Tate Modern in the city is felt throughout the night.

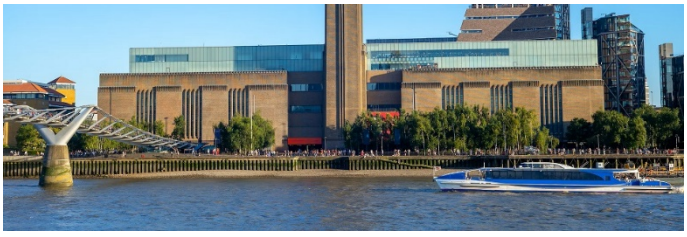

Figure 2. Tate Modern (Willis, 2020).

The purpose of Tate Modern's glass extension on the roof is to let the light in from the outside. It does not have reflective properties. The transparency effect is from the outside to the inside (Uysal, 2013).

English Museum:

One of the most well-known examples of contemporary extension applications to the historical building is the contemporary roof extension of the British Museum in London, designed by Norman

Foster. With this roof extension, the courtyard was transformed into an inner courtyard, creating a large public space. This extension to the historical building, which was built in 1753, was brought in 2000. The three main purposes of this roof extension designed by Norman Foster; he explained it as creating new areas, reviewing the gaps and revealing the hidden areas. While this area in the courtyard of the historical museum building was described as a lost and unused area, it was brought to life with the contemporary roof extension and opened to active use.

With this designed roof extension, the museum structure has ceased to be just an area to visit and has offered an urban experience to its visitors. With this cover, which also contributes to human circulation and pedestrian organization, the historical structure has been successfully integrated into the city. With its contemporary material and modern curvilinear form, the roof extension, which displays a contrasting approach to the historical structure to which it was added, exhibits a respectful attitude to the surrounding texture with its mass proportions and permeability despite these features. Glass and steel are used in the contemporary crop design. In addition to emphasizing its modernity with its color and texture, it contributed to the social and cultural continuity of the historical building. At the same time, while being structurally articulated to the historical building, it brought less load and ensured that the building was affected to a minimum extent.

There is no doubt that the contemporary roof covering added to the courtyard of the British Museum contributes to the character of the museum (Figure 3).

Figure 3. English Museum glass roof extension (Kayan, 2020).

The purpose of English Museum's glass extension on the roof is to let the light in from the outside. It does not have reflective properties. The transparency effect is from the outside to the inside (Kayan, 2020).

Moritzburg Museum:

Located in Halle, Germany, Moritzburg castle is an ancient building dating from the 15th century. After the changes it has undergone over the years, the surrounding walls, towers at the corners and the central courtyard remained from the castle structure (Figure 4).

Figure 4. Moritzburg Museum glass extensions (Kayan, 2020).

Some extensions were made within the scope of restoration works in order to renew, expand and bring the historical castle structure, which was in ruins for many years, to life. In this context, the exterior wall remains of the historical building were preserved and a contemporary structure was added inside. With its modern roof and facade appearance, this new extension, rising from the ruins of the historical museum, forms the expanded exhibition areas. The angular geometry of the metal tower on the roof of the museum creates a contrasting effect with the existing irregular shape of the historical castle. This contrasting effect emphasized on the facade is also maintained in the contemporary works of art exhibited inside the historical building. The walls of the historical building can be seen from the exhibition area under the contemporary extension of the museum, and thus the historical building can be seen as a historical artifact on display.

The purpose of English Museum's glass extension on the roof and facade is to let the light in from the outside. It does not have reflective properties. The transparency effect is from the outside to the inside (Kayan, 2020).

Mill City Museum:

The mill complex, which went through many changes from the explosion in 1878 until 2000, was transformed into museum and office units by Architect Tom Meyer in 2003 by preserving the north shell of the mill, which was damaged by the fire along the river.

The Mill City Museum establishes a strong relationship with the memory of the place, as well as its industrial past, the explosion and fire event it went through. By establishing his interaction with the space through this damage and neglect, the designer Meyer aims to maintain the feeling that "the wall in the courtyard will collapse in one day" and to preserve the evocative power evoked by the ruins. In the design of the public space, which aims to maintain the spiritual atmosphere of the mill complex, where the old and the new come together and are intertwined at certain points, the conservation and restoration works, which started with the strengthening of the ruins, brought along important difficulties. Stating that these difficulties constitute the power of design, Meyer states that “difficulty reveals the meaning and purpose of the building and organizes the building, does not create it” (LeFevre, 2004).

The destroyed shell in the courtyard is completed with a glass facade and the new shell accepts the old without pretense and fuses the old and the new. The details and connections between the existing building envelope and ruins and new extensions and materials enrich the space while at the same time making the old and the new legible (Çanakkale, 2012), (Figure 5).

Figure 5. Mill City Museum glass extension (Çanakkale, 2012).

The purpose of the glass extension is to preserve the historical facade features and to create transparent spaces. Glass has no reflectivity. Transparency is inside-out and outside-in.

Esma Sultan Mansion:

Esma Sultan Mansion, built by the architect Sarkis Balyan between 1873 and 1877, is located right next to the Ortakoy Mosque in Ortakoy, Istanbul. Esma Sultan Mansion has a masonry and stone carrier system and is a three-storey masonry structure. Its high and rectangular windows are located at the same level on every facade and every floor of the historical mansion. In this way, the historical mansion receives daylight from all four sides. The priority in the restoration works of the historical building was to strengthen the thick stone walls that formed the outer shell that survived the fire. After the stone walls forming the outer shell of the historical building were strengthened, a transparent shell made of glass and steel construction was placed inside the building (Figure 6). This transparent structure is placed inside the historical building in such a way that it does not

touch its walls. Although the glass structures are not suitable for hot climates, a layer is formed thanks to the existing stone walls in the outer shell, making them compatible with environmental factors such as sunlight and wind (Kayan, 2020).

Figure 6. Esma Sultan Mansion (Kayan, 2020).

The purpose of the glass used on the facade is to provide the use of view and light due to the location of the historic building. When it is evaluated in terms of glass size, it cannot be fully perceived when viewed from the outside, and when viewed from the inside, the windows and frames are visible. Thus, the landscape is used in a way that does not disturb the historic structure. When evaluated in the context of transparency and reflectivity, it is seen that transparency dominates the structure. Although it is not perceived from the outside, the transparency feature of the glass is used when viewed from the inside. Accordingly, the perception created by the glass in evaluating transparency and reflectivity in the extension is 'from the inside to the outside.

Louviers School of Music:

Louviers, an ancient monastery building complex built in 1659 in Normandy, France, has been used for many years in different functions. As a result of this, some deteriorations and destructions have occurred in the historical structure. The historical building was expanded through a re-functioning process and started to be used as the Louviers Music School. The stone appearance of the existing historical building at the Louviers School of Music and the river flowing under it were decisive in the design of the new extension. By making use of the transparent, permeable and reflective properties of glass, a contrast effect was created between the historical building and the contemporary extension. The new mass, which rises with contemporary extensions from the part of the historical building that was destroyed and lost in time, was planned in a way to highlight the river passing under it.

The additional structure, which is almost invisible by reflecting the sky on its facade during the day, makes its interior visible thanks to its illumination at night. In this way, the resulting conference hall can be perceived from the outside during event times (Figure 7). The contemporary extension, with the mirror glass material used and the modern architectural form, brings it to the forefront by creating a transparent and light effect next to the historical building it was added to (Kayan, 2020).

Figure 7. Loviers School of music (Kayan, 2020).

The glass extension of the music school can be felt from the front. Glasses have reflective properties during the day. The interior can be viewed at night. Transparency is inside-out, outside-out, and outside-in.

Louvre Museum Entry:

Pei wanted to create a transparent, sculptural effect between the historical museum structures in the middle of the courtyard for the entrance structure, which forms an underground system that includes warehouses, galleries and laboratories and also serves as a connection between the units of the historical museum structure (Figure 8).

In this direction, the entrance volume added to the historical museum was designed as a steel and glass pyramid that illuminates the sections under it. The glass pyramid, which has a height of 20.6 meters, consists of rhombus and triangular windows. Around this main pyramid are three small pyramid-shaped skylights to illuminate the other spaces below the courtyard. The glass and steel material used in

the monumental pyramid, with its construction technique and architectural style, is a contemporary extension that reflects its own period. In addition to this monumental appearance, it has mass proportions compatible with the scale of the historical building to which it was added. The sloping glass walls of the pyramid refer to the mansard roof of the museum.

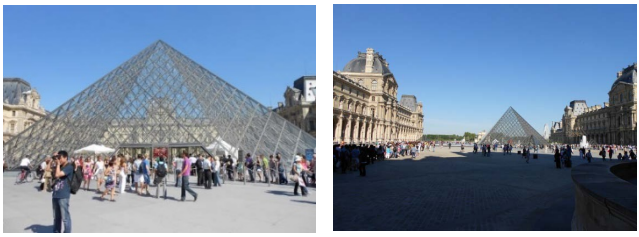

Figure 8. Louvre Museum entry glass extension (Kayan, 2020).

The transparency and permeability of the glass pyramid brought it to the forefront by contrasting the heavy and opaque character of the facade of the historic Louvre. The Louvre Pyramid has brought a lot of controversy since the day it was built. There are those who find this modern extension brought to the historical building incompatible, as well as those who see it as a successful blending of the new and the old by creating a contrast. Despite the criticism about the extension design, the Louvre Museum has become an icon and inseparable part of Paris (Kayan, 2020).

The purpose of museums entry glass extension is to let the light in from the outside. It does not have reflective properties. The transparency effect is from the outside to the inside.

Convent of St. Francesc:

Constructed in 1729 in Spain, the Convent of Sant Francesc continued to be used as a monastery until 1835. The historical building, which was in ruins because it was not used for many years, was opened in 2011 as a multi-purpose cultural center structure under the name of Sant Francesc Monastery Cultural Center after a comprehensive restoration process. In order to bring the historical building to life by preserving the interior features; Circulation elements such as ramps, stairs, which are contemporary materials made of glass and steel, and some technical units have been added to the outside of the building. The gaps formed due to the collapsed roof before the restoration were evaluated after the restoration, allowing the building to benefit from natural light. In addition, long and modern lighting elements suspended from the vaults are also included in the interior.

By using traditional and contemporary materials, which represent the past and the present, it is desired to achieve harmony from contrast. This difference has also been an approach that facilitates the differentiation of the pre- and post-restoration interventions of the building. The intense effect of the existing historical building from the

stone material is balanced with the transparency of the glass material used in the contemporary extensions (Kayan, 2020).

Figure 9. Convent of St. Francesc (Kayan, 2020).

The glass extension is arranged at the entrance. When examined in the context of transparency and reflectivity, it is seen that the element of transparency is used for the building (Figure 9). When looking from the outside to the inside, a more frosted appearance is achieved by using coated glass in certain areas of the extension to the side facade. In contrast, the glass frames are hidden in certain areas, resulting in a transparent appearance. No transparency or reflectivity can be perceived in the extensions made to the ceiling. When viewed from the inside out, it is seen that there is transparency in both the facade extension and the ceiling extension. Accordingly, the perception created by the glass in evaluating transparency and reflectivity in the extension is 'from the inside to the outside' and 'from the outside to the inside.

Glass Link In Grimma Castle:

The linear layout is visible in the 13th-century Grimma Castle. The historic castle complex was renovated, reconstructed, and

commissioned in 2013. The Grimma Castle became the seat of the court and the prosecutor's office. Three new glass structures were added as part of the utility function transformation. These included a glass corridor along the wall to connect the castle to the tower ruins and the entrance rooms. The link was almost 25 m long, and its structure was made of glass frames with a span of 2.5 m, spaced every 1.5 m. The link, perceived as neutral, was led along the northern wall of the castle.

Hence, it was decided that the connection between the parking lot and the shopping centre building, whose characteristic glass facade was decorated with an ornamental print, would be implemented with a glass housing. Due to the significant distance between the connected buildings, it was necessary to shape the footbridge structure to avoid intermediate support. To eliminate the need to introduce additional support in the Vaughan Way bypass and simultaneously reduce the footbridge span, a cantilever truss was designed to be anchored in the reinforced concrete frame of the shopping centre building. The funnel-shaped truss was introduced into the building body. This solution allowed for a smooth connection between the footbridge and the shopping mall in terms of functionality. The effect of the applied solution is also visible on the facade of the John Lewis Department Store (Jozwik, 2022), (Figure 10).

Figure 10. Glass link in Grimma Castle (Jozwik, 2022).

On the other hand, the footbridge was designed with an extended pier whose interior extends from the side of the car park. From the outside, its end corresponds with the glass facades of the car park. The self-supporting glass structure of the footbridge housing con- sists of glass beams that transfer loads to the walls of its housing; the structure cooperates with a steel railing mounted in the footbridge structure (Jozwik, 2022). The glass add-on establishes a link between historical buildings and new glass extensions. It has no reflective feature. Transparency is inside-out and outside-in.

4. Conclusion

Within the scope of the study, nine different examples, which were refunctionalized and added to the extension due to the new function requirement, were examined. All the examined structures were compared according to the order of explanation and evaluated in the Table 1.

Table 1. Comparison of examples

Buildings	Extension Position	Use Of Glass	Reflectivity	Transparency
Tate Modern	Roof	Lighting	None	Outside to Inside
English Museum	Roof	Lighting	None	Outside to Inside
Moritzburg Museum	Roof + Facade	View, Lighting, Function	None	Inside to Outside, Outside to Inside
Mill City Museum	Facade	View, Lighting, Function	None	Inside to Outside, Outside to Inside
Esma Sultan Mansion	Facade	View, Lighting	None	Inside to Outside
Louviers School of Music	Facade	View, Lighting, Function	Yes	Inside to Outside, Outside to Inside, Outside to Outside
Louvre Museum	Entry	View, Lighting	None	Inside to Outside, Outside to Inside
Convent of Sant Francesc	Entry	View, Lighting	None	Inside to Outside, Outside to Inside
Grimma Castle	Bridge	View, Lighting, Function	None	Inside to Outside, Outside to Inside

Examined examples differ in terms of the way the extension is added, its dimensions against the historical building, and the dimensions of the glass used. However, the purpose of the use of glass also varies in terms of transparency and reflective properties. If these differences are compared in terms of the examined structures;

- The location and size of the add-on differ according to the relationship between the old and new functions of the structure. While

the dimensions of the glass masses are larger in the roof and facade extensions, the entrance and bridge extensions are smaller.

- Facade add-ons differ in themselves. Moritzburg and Mill City Museums were used as an integral part of the glass facade. In the Loviers Music School, the glass add-on was added to the facade as a separate building in order to enlarge the space due to the lack of functionality. A glass facade was designed to create a transparent shell inside the historical outer walls, which are the only remains of Esma Sultan Mansion.
- It has been observed that glass attachments are supported by different frames in all structures. The frames of all glass add-ons are in a grid pattern, except for the entrance add-on examples and the British Museum roof add-on. With the examples of entrance attachments, the frames in the British Museum's roof extension were created at different angles to create a dynamic appearance.
- While glass material is preferred especially for the use of natural light in roof attachments, the most important use for all other add-ons is to let daylight in. The historical buildings and the view of the historical environment in the facade, entrance and bridge add-ons are also one of the purposes of use.

Although no generalization can be made for the glass dimensions, it varies according to the nature of the building and the designer's intended use. In connection with this, it has been observed that in the

samples examined, the glass is framed or unframed, and its perception from the inside or outside is different.

- Judging by the reflection situation, all glass inserts do not have reflective properties, except for the Loviers School of Music. Since the glass add-on on the Loviers Music School facade is large enough to compete with the historical building, it may have been desired that the add-on reflect the historical environment and sky during the day and not reflect the function at night so that it can be perceived.
- Considering the transparency situation, although all the buildings have differences from each other, less transparency is felt in the roof extensions. It has been observed that all of the facade, entrance and bridge extensions are transparent, and transparency is perceived both from the inside to the outside and from the outside to the inside. Loviers Music School has different transparency features according to day and night.

It is understood that in line with the examples examined, it serves to perceive the historical building, which has been refunctionalized with the use of glass material, or to stand out, draw attention and emphasize the added sections. In this case, it is seen that the material itself, how it is used, and how it comes together with other materials become important.

Based on these evaluations, the use of glass material has an important effect on the role of refunctioning in bringing together the historical and the modern, the old and the new, and the past and the future.

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