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Evaluation of Methods and Materials on Examples of Restoration for The Disabled

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Abstract

Historic buildings pose numerous challenges in terms of accessibility, with structural impediments like narrow doors, steep stairs, and uneven floors creating barriers for individuals with disabilities. The absence of essential modern amenities, including elevators, toilets, and ramps, further compounds these challenges. Balancing the preservation of a cultural property's historical integrity with the imperative to enhance accessibility necessitates careful consideration of appropriate materials during the restoration process. Changes must be thoughtfully evaluated to ensure they do not diminish the building's historical significance, while simultaneously granting all users an equal right to experience the space. Beyond being a matter of social justice, this approach ensures that our cultural heritage is universally accessible. Unfortunately, accessibility remains a neglected issue, particularly in our country, where uncertainties surrounding material selection for entire historical structures impede progress. This study seeks to address this gap by evaluating materials and technologies that facilitate accessibility through global examples. The research begins by outlining international practices and subsequently classifies examples aligning with the Accessibility Monitoring and Inspection Forms of The Ministry of Family and Social Policies to contribute to Turkish initiatives. Within the study's scope, various examples, such as ramps, handrails, platform disabled elevators, disabled stair lifts, elevators, coating materials, tactile surfaces, sensor doors, parking solutions, mobile stair climbers, markings, smart watches, and smart canes, are presented based on existing applications and technologies. These architectural elements and technologies are carefully chosen to meet the needs of disabled individuals when navigating historical areas, ensuring a comprehensive and inclusive approach to accessibility.

1. INTRODUCTION

Accessibility is a principle that should be universally applied to all spaces where people reside. Each field of expertise should integrate accessibility considerations into their work without exception. In her book "Mismatch: How Inclusion Shapes Design," Kat Holmes emphasizes that during the creation of a product or system, designers often focus exclusively on their target audience, inadvertently neglecting others. For instance, some products may prove unsuitable for individuals with disabilities, left-handed users, or various age groups. A design that excludes any consumer group not only limits its market potential but also perpetuates inequity [1]. The failure to embrace accessibility within the scope of equality is the first obstacle to the regulations reaching their goals. If this awareness is reached as a society, it will evolve into a situation where accessibility in every living space and design will become a part of the product rather than being considered as an extra. Restricting accessibility improvements solely to new designs would constitute an inadequate approach.

Historical buildings should also serve as accessible spaces. In the context of sustainable preservation, emphasis should be placed on ensuring the accessibility of historical structures and their surroundings during the restoration phase. Cultural assets represent the living history of society, and it is a fundamental human right for every individual to have access to these spaces. In the pursuit of adapting these places to

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modern comfort standards, various enhancements such as lighting, heating systems, and security measures are typically employed. The imperative for these spaces to be accessible is equally significant. The key lies in developing appropriate solutions through collaborative efforts involving experts in this field. Crucially, the concept of preservation needs to be accurately defined, which encompasses:

• Adapting a building for socially beneficial purposes
• Undertaking all necessary actions to prolong the life of cultural heritage [2].

According to this definition, cultural heritage must be made accessible to align with its inherent identity. Furthermore, it is vital that these sites can be utilized to enhance the value of historical places. Consequently, the creation of accessible spaces should be regarded as a public service [3]. Among the most intricate and challenging aspects of achieving universal access is the historical environment, which is envisioned to be seamlessly integrated into daily life, bridging diverse tangible and intangible connections with the past [4]. Given their distinctive structures and unique characteristics, it is indeed significant that these areas, which constitute an integral component of cultural identity, are made accessible [5]. In the preservation of our cultural and natural heritage, it is imperative to integrate these elements seamlessly into everyday life, making these areas not only preservable but also livable. Historic buildings serve as integral components of our cultural heritage, encapsulating the stories and memories of our past. Nevertheless, many of these structures were erected before accessibility standards were established, resulting in challenges for individuals with disabilities. Initiatives aimed at facilitating accessibility for people with disabilities within historical buildings seek to provide easy access to these spaces while ensuring compatibility with the historical environment. This involves the careful selection and utilization of appropriate materials. When incorporating measures for individuals with disabilities into restoration projects while preserving the historical essence of the buildings, the objective is to guarantee a safe and comfortable experience for all visitors. The use of the correct materials contributes significantly to the quality and longevity of these accessibility initiatives. In restoration projects targeting accessibility for individuals with disabilities within historical buildings, numerous methods and materials are available for implementation. However, when it comes to historical buildings, all applications should be planned and carried out one by one, taking into account the characteristics of the building.

2. METHOD

Within the scope of this study, the arrangements made for the accessibility of historic buildings and their surroundings and the materials used will be examined through examples. This study aims to demonstrate through examples that making historical buildings accessible spaces is possible using suitable materials. Materials and technologies that enable cultural assets to be accessible will be evaluated through examples. Within the scope of the study, firstly, the applications in the world are mentioned. Then, examples in accordance with the items in the Accessibility Monitoring and Auditing Forms of the Ministry of Family and Social Policies were classified in order to contribute to the practices in Turkey. The reason for evaluating these forms is that the authority regarding accessibility in Turkey is the Ministry of Family and Social Policies. The Ministry ensures the accessibility of the building and its surroundings through these forms prepared by itself. Examples of ramps, handrails, platform disabled elevators, disabled stair lifts, elevators, coating materials, touchable surface materials, sensor doors, parking lots, mobile stair climbers, markings, smart watches and smart canes have been compiled based on existing models. While selecting these application examples, the areas that disabled citizens would need in the historical area were taken into account. Types of materials used within the scope of these needs. By examining these practices, the objective is to not only contribute to the ongoing discourse on accessibility in historic buildings but also to provide insights applicable on a local scale, enriching inclusivity and bolstering the preservation of our shared cultural heritage.

3. THE IMPORTANCE OF MATERIAL IN ARCHITECTURE

The role of "material" has been indispensable in every aspect of human history, evolving and enriching over time, significantly enhancing the quality of human life. The symbiotic relationship between architecture and materials has evolved in tandem with advancements in materials themselves, shaping architectural endeavors through the opportunities presented by these materials [6].

Materials have held a fundamental place in human history, evolving into valuable assets as they progressed from the past to the present, contributing significantly to the comfort and advancement of humanity. Materials have been so pivotal that they even lent their names to pre-civilizational eras. The progress of societies throughout history is closely intertwined with the development of materials tailored to meet the needs of each era. Consequently, civilizations have often been categorized and named based on the level of material development, from the "Stone Age" and the "Bronze Age" to the "Steel Age" and the "Plastic Age" [7].

Frampton articulates Viollet-le-Duc's perspective on architecture and materials in the following manner: There are two essential aspects to correctness in architecture: correct construction methods and accurate programming. Adhering to the program involves determining its requisites within the framework of specific needs. Correctness with regard to construction methods entails utilizing materials in harmony with their inherent qualities and characteristics, with artistic inquiries into form emerging as a secondary consideration [8]. Wright underscores the importance of designing while taking into account the properties of the materials, noting that a change in materials can fundamentally alter the entire structure [9]. Semper adds that selecting the appropriate material for a building can transform the architectural work into a symbol imbued with significance [10]. Challenges often arise when there is an obligation to make additions to cultural heritage properties, many of which have achieved iconic status in their own right. Selecting the right material can be a formidable task, even when it involves the preservation and restoration of existing elements that have suffered damage. Furthermore, the complexity deepens when addressing the incorporation of new elements into a structure to meet contemporary demands.

On the one hand, there is an obligation to meet the need. On the other hand, it is the case that the articulated elements do not preclude the cultural existence, are harmonious, and do not spoil the general perception. In line with these requirements, it is essential to proceed under the consultancy of experts.

4. MATERIALS USED TO MAKE THE HISTORICAL BUILDING AND ITS ENVIRONMENT ACCESSIBLE

Considering the criteria specified in the Accessibility Guide prepared by the Ministry of Family, Labor, and Social Services, the usage areas for needs to differ. There is diversity in the materials used in these differentiating areas. When it comes to historical buildings, the materials used are essential. Wood, iron, stone, glass, etc., are within the scope of accessibility in the restoration of historical buildings around the world. Since the characteristics of each historical building are different, the method and material to be used should be decided by the relevant experts in accordance with current laws and regulations. The following examples contain examples of materials used around the world. The materials used in historical buildings will be evaluated through these examples.

The table below has been created in line with the items in The Accessibility Guide prepared by the T.R. Ministry of Family, Labor, and Social Services. Considering the requirements in the guide, suitable material examples above have been added to the tables.

Table 1. *Accessibility Monitoring and Inspection Forms of the TR Ministry of Family and Social Policies*

Application area	Materials Used and Properties		Image
	Requirements	**Material and Quality Used**	
Carparking	Parking spaces designated for disabled individuals must feature markings that are highly visible, straightforward, easy to read, and universally comprehensible. The material chosen for these markings should possess qualities of durability, ease of cleaning, repairability, and the ability to be replaced when required. Furthermore, it is essential to shield the disabled parking area from adverse weather conditions such as snow and ice, and where feasible, provide overhead coverage [11].	The markings for the parking spaces allocated for the disabled must be visible, simple, legible and understandable for all. The material to be used for these markings must be robust, cleanable, repairable and replaceable when necessary. Disabled parking lot should be protected from weather conditions such as snow and ice, if possible, it should be covered.	Figure 26
Ramp	The surface must be coated with a smooth, stable, enduring, and slip-resistant material that performs effectively in both wet and dry conditions [11].	Portable; steel, iron ramps Ramps added using flooring material There are ramp samples applied with concrete coating.	Figure 1 Figure 4 Figure 5 Figure 6 Figure 7 Figure 8 Figure 9
Doors	To facilitate effortless detection, it should not align flush with the wall and should feature a contrasting color that distinguishes it from the surrounding surfaces. Additionally, sensor-activated lighting is the preferred choice for entrance doors, and thresholds should not be installed on the doors [11].	There are sensor mechanisms applied to wooden doors. Door width is one of the problematic areas in historical buildings. At this point, there are examples where the door passages are widened or both wings of the doors are used.	Figure 22 Figure 25

Disabled WC	Accessible toilets, including their entrance, maneuvering space, and all accompanying fixtures, are designed to ensure safe and comfortable use for individuals with mobility restrictions. One of the fundamental principles in the design of accessible toilets is the provision of a maneuvering area with a minimum diameter of 150 cm, excluding the toilet bowl, sink, and fittings [11].	The colors of equipment such as faucet mixers and grab bars employed in disabled toilets may differ, with adjustments tailored to the specific attributes of the building in which the installation takes place. Toilet bowls and sinks, on the other hand, adhere to standard specifications and are installed accordingly.	
Elevator	Multi-story buildings are required to have elevators to guarantee accessibility. The installation of accessible elevators in all publicly accessible buildings is mandated by relevant legislation. In the case of residential buildings, it is compulsory to incorporate accessibility features in elevators based on the number of floors specified by the legislation [11].	Glass elevators are preferred because they have the least effect on the facade. There are examples applied using facade cladding (wood, aluminum etc.) In addition, disabled lifts and mobile stair climbers are used.	Figure 10 Figure 13 Figure 14 Figure 15 Figure 17 Figure 18 Figure 19 Figure 20 Figure 21 Figure 27
Stair	Escalators are not deemed as an accessible solution. Additionally, spiral staircases are considered non-accessible due to their challenging usability. In the case of buildings open to public use, excluding those with specified uses according to legislation, all staircases must be equipped with tactile warning surfaces at both the beginning and end of the stairs [11].	Steel stairs Concrete stairs covered with flooring material Escalators are used, but escalators are not considered an accessible solution.	Figure 3 Figure 11 Figure 12 Figure 13 Figure 16 Figure 20

Floor Coverings	All pedestrian pathways should be level, stable, long-lasting, and surfaced with slip-resistant materials that perform effectively in both wet and dry conditions. The anti-slip characteristics employed in these areas must conform to the standards outlined in "TS 13882-Classification Rules of Pedestrian Walking Surfaces: Basic Requirements and Evaluation Methods." [11]. In general, any type of upholstered seating with cushions can pose significant challenges for individuals using wheelchairs, walkers, or maneuvering with other mobility constraints [35]. Tactile ground and guide tracks are manufactured in compliance with the Construction Materials Regulation and its fundamental requirements, as officially published in the Official Gazette No. 24870 on September 8, 2002 [11].	**Solid or engineered hardwood:** Hardwood floors have several advantages over other floor types that make them well-suited for handicap accessible applications. Hardwood can be reprocessed if scratched, which is common when using wheelchairs or walkers. Hardwood floors are also very easy to maintain. This tissue can help prevent slips and falls [12]. **Ceramic ile Floors:** Tile is an easy and very durable option for wheelchair use. Textured, non-slip tile is a great option for the disabled accessible home [12]. **Sensible ground and guide tracks:** Plastic, Thermoplastic Polyurethane (TPU), stainless steel, stone material is used. It can be adhered to the ground with strong adhesives, applied as a paving stone or fixed to the floor with screws.	Figure 1 Figure 3 Figure 4 Figure 9 Figure 23 Figure 24 Figure 25 Figure 33 Figure 34
Voice Sign	Irrespective of a building's designated purpose, it is essential to implement an adequate quantity of directional and informative signage. Particularly in publicly accessible buildings, informative signs should be prominently displayed to caution against potential hazards, provide guidance to various locations, and ensure the safe and independent use of the building and all its facilities [11].	These markings and routes often cannot conform to specific standards and may require placement in various locations with different color options as needed.	Figure 28

Guidance Signboard		WC plates are purpose-designed products intended to provide clear distinctions and prevent confusion within male, female, and disabled restrooms. These plates incorporate universal symbols, making them universally understandable regardless of language. Magnetic WC plates are a preferred choice due to their user-friendly and aesthetically pleasing design. The front surface can be constructed from materials such as plexiglass, aluminum, or stainless steel. Their modular system allows for interchangeable parts of similar dimensions. WC sign boards are indispensable fixtures in general-use areas. Thanks to the robust neodymium magnets used in the background, these panels securely adhere to each other and resist falling when touched. Additionally, they feature a modular system that facilitates easy removal without causing damage to the underlying surface when desired or when replacement is necessary. Comprising lightweight materials, these systems can be easily installed without the need for drilling or screwing. They leave no lasting damage that would necessitate extensive surface modifications when disassembly is required [13]. Brail embossed voice kiosks are used by mounting their feet to the floor [13].	Figure 28
Wearable Devices		Dot Scewo Transcence WeWALK EyeSense Wheelmap Wheelmate Liftware	Figure 29 Figure 30 Figure 31 Figure 32

Table 2. *Examples of materials used in the world within the scope of accessibility*

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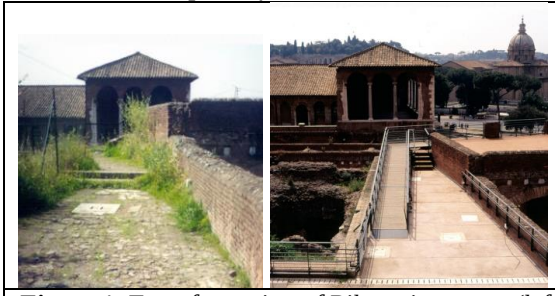
<tr><td>  </td><td>  </td></tr>
<tr><td>Figure 1. Transformation of Biberatica street (left; before, right; after) (MA) [14]</td><td>Figure 2. Whitby Abbey steel and timber balustrade (MA) [15]</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Figure 3. Example of disabled ramps and stairs with iron railings and wooden flooring- Trajan's Market (MA) [14]</td><td>Figure 4. London School Disabled Ramp(MA) [16]</td></tr>
</table>

Figure 5. *Barnabati Church Disabled Ramp (MA)* [16]

Figure 6. *Carmine Church Disabled Ramp (MA, EQ)* [16]

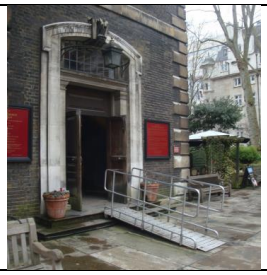


Figure 7. *St. James of Piccadilly Portable Disabled Ramp (MA)* [16]

Figure 8. *Mosteiro dos Jeronimos in Lisbon steel portable disabled ramp (EQ)* [16]

Figure 9. *Ramp created indoors using flooring material (stone) from Convento de Cristo, Portugal (MA)* [16]

Figure 10. *Concealed scissor platform disabled lift (EQ)* [17] [18]

Figure 11. *Iron handrail (MA)* [16]

Figure 12. *Wooden and aluminum handicapped handrail (MA)* [13]

Figure 13. *Winchester Cathedral disabled stairlift (EQ)* [19]

Figure 14. *Disabled lift (EQ)* [20]

Figure 15. *Media Luna elevator built using wood and glass (MA, EQ)* [21]

Figure 16. *Escalator application in a Medieval Town (EQ)* [22]

Figure 17. *Disabled Lift (EQ)* [18]

Figure 18. *Gironella's Historic Center elevatör (MA, EQ)* [23]

Figure 19. *Glass elevator and bridge connection-Guerzenich Building (MA, EQ)* [19]

Figure 20. *Elevator using Hernani, glass and composite coating (MA, EQ)* [24]

Figure 21. *20-storey aluminum-coated panoramic elevator that provides access to the walls (MA, EQ)* [25]

Figure 22. *Entrance arrangement for the restoration of Hacı Hasan Mosque (left; before, right; after) (MA, EQ)* [22]

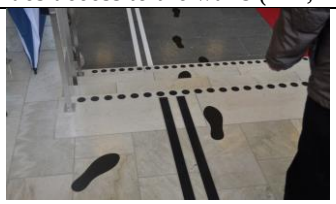


Figure 23. *Boris Municipality Cultural Center Building tactile surfaces (MA)* [26]

Figure 24. *Sensible surface on a special production carpet (MA)* [26]

Figure 25. *Sensor doors* (MA) [26]

Figure 26. *Disabled carparking* (SI) [27]

Figure 27. *Stair Climbing Chair* (EQ) [28]

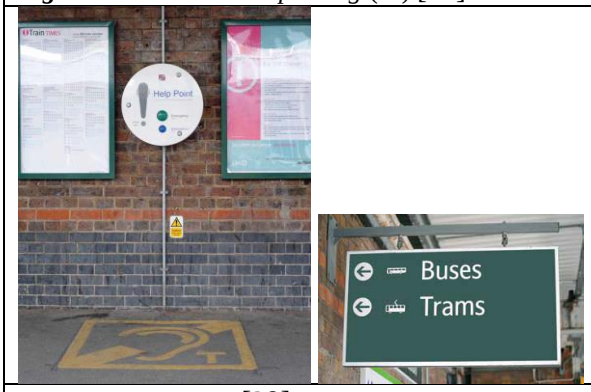


Figure 28. *Sign (SI)* [29]

Figure 29. *Dot* (TE) [30]

Figure 30. *Scewo* (EQ) [31]

Figure 31. *WeWALK* (TE) [32]

Figure 32. *Liftware* (TE) [33]

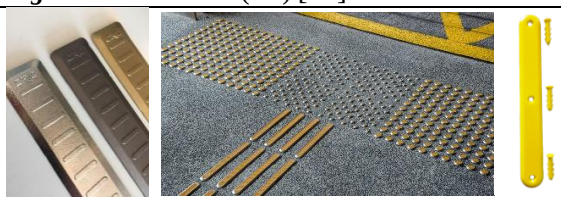


Figure 33. *Steel and polyamide surfaces paving (MA)* [34] [35]

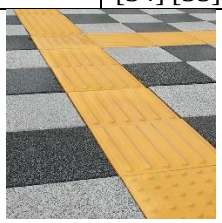


Figure 34. *Stone dot and line tactile paving foot path (MA)* [36]

Material (MA), Equipment (EQ), Signace (SI), Technology (TE)

5. CONCLUSION

Rosso et al. highlight the detrimental impact of mobility limitations on the social participation of individuals with disabilities, underscoring that such conditions can lead to a decline in functionality [37]. In light of this, there is a pressing need to shift attitudes toward physical disabilities to enhance social sustainability [38]. Historical sites serve as bridges connecting us to the eras we inhabit and our past. To ensure these spaces become accessible and usable for all, it is imperative for decision-makers to embrace this requirement as a priority. We need not make a choice between preserving historical environments and promoting accessibility. As exemplified by both successful practices and instances that fall short of meeting needs or preserving historical integrity, the coexistence of effective approaches demonstrates that historical environments can be made accessible without compromising their intrinsic values. It is at this juncture that experts must invest more time and exhibit greater sensitivity in selecting the most suitable materials. As observed in existing examples, the right approach allows everyone to partake in the experience of historical environments, thereby elevating awareness and the significance of these cherished spaces.

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