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# THE POTENTIAL OF STAIRWAYS TO INFLUENCE SPATIAL AND VISUAL INTERACTION OF LANDSCAPE ELEMENTS IN HISTORICAL URBAN ENVIRONMENT

## POTENCJAŁ SCHODÓW DO WPŁYWU NA PRZESTRZENNĄ I WIZUALNĄ INTERAKCJĘ ELEMENTÓW KRAJOBRAZU W HISTORYCZNYM ŚRODOWISKU MIEJSKIM

**ABSTRACT**

Stairways are one of the built elements of landscape architecture that shape the character of a space. Our research takes a closer look at the stairways of historical value in the environment of Buda Castle World Heritage Site. Firstly, through the production of sketches, the dominant spatial effects, views, focal points and motifs perceived during the use of the chosen stairways, were analysed. Secondly, an assessment matrix was formulated from criteria such as scale, materials, size, quality of adjacent green spaces, etc. Our aim is to underline and give evidence of the potential of stairways in influencing the open spaces and the views in historical urban environments.

**Keywords:** identity, aesthetic value, heritage site, character

**STRESZCZENIE**

Schody terenowe są obiektami architektury krajobrazu kształtującymi charakter przestrzeni. Omówione tu badania prezentują w bliższym ujęciu historyczne schody w otoczeniu wpisanego na Listę Światowego Dziedzictwa UNESCO Zamku w Budzie. Jako pierwsze przeanalizowano dominujące efekty przestrzenne, widoki, punkty formalnie ważne i motywy dostrzegane podczas korzystania ze schodów. Jako drugą — na podstawie kryteriów, takich jak skala, materiały, wielkość, jakość przyległych terenów zieleni itp. — sformułowano macierz oceny. Celem pracy jest przedstawienie dowodów na potencjał schodów terenowych do wpływania na otwarte przestrzenie i widoki w historycznych środowiskach miejskich.

**Słowa kluczowe:** wartość estetyczna, miejsca dziedzictwa, postać, tożsamość

## 1. INTRODUCTION

Stairways are essential elements of the built environment. Without them, it would be difficult to overcome major height differences. Their primary function is to provide comfortable solution for connecting public open spaces of different height. Stair flights basically serve the purpose of practical use, and thus must meet specific technical standards. The literature on these technical parameters is fairly rich (for instance: Sudell, 1953; Ormos, 1955; Landphair, Klatt, 1981); Haris-Dines, 1998; Dalányi, 1998; Zimmermann, 2015).

Beyond the purely technical and strictly functional characteristics of stairways, we can also identify various other values that stairways represent. Joint consideration of technical and aesthetic aspects is a fundamental approach, since the relationship between form and content is a value based evidence of all design and creative work. Function and form are inseparable, that is the technical-functional parameters and aesthetic design are closely related. Therefore any approach in design that would separate the two is false, and inevitably leads to contentless and impossible self-expression. These two aspects worth considering jointly also when analysing existing spatial compositions.

Regarding the design of outdoor structures, including stairways, a basic principle is to use materials that fit into the specific environment. The design must be adapted to the forms, scale, colours and materials of the setting. Appearance and dominance of stair flights is possible to either highlight, characteristically emphasise or temper through the choice of materials and dimensions of railing and the cheek and retaining walls. The built environment plays a primary role in the choice of these parameters, and has a fundamental influence on the materials, shapes and scale applied to the outdoor structure to realise. Judgement on the aesthetic quality and integration of structures into their environment is rather subjective, nevertheless it is still possible to approach on the basis of the use of materials and the scales. It is similarly difficult to survey and analyse the views from and the visual links of stairways (when using them either downwards or upwards) on a purely objective basis. This requires both professional experience and a good sense of aesthetics.

The subject of our analysis is the six stairways selected in the neighbourhood of Buda Castle (Budapest). (Ill. 1.) The location is important from the aspect of cultural heritage conservation, since it is

a World Heritage Site<sup>1</sup>. History of the castle area dates back to almost 800 years, although its built environment has been in decay or the subject of destruction<sup>2</sup> several times (Horler, 1955, pp. 44–45). Access to the Castle built on a hilltop was provided by numerous roads and stairways during the centuries. The history of stairways is closely related to the development of the castle area, with the stairways always adapted to their environment through reconstructions and renewals. The location, time of construction and materials chosen for the stairways resulted in varied appearance. The choice of materials and the related quality of elaboration provided distinct aesthetic quality and character of the stairways. That is how we can approach their aesthetic quality, considering their proportions, selection of building materials and design. Stairways are excellent to counterweight the most dominant mass (that is the building), but also to provide a transition so that with their use the emphasis of the built environment fades away towards the natural setting. In addition to being elements of the composition, stairways therefore also play a role in defining the character of the space. Several excellent examples in historic gardens illustrate this worldwide, where they are attached to palaces or connect terraces and terrains with major height differences<sup>3</sup>.

Regarding stairways, the significance of views and visual links they provide are rarely discussed. Beyond the technical parameters, in our study we lay a special emphasis on the introduction of the views and visual links that provide additional spatial experience related to stairways.

## 2. MATERIALS AND METHODS

We have chosen six stairways of Buda Castle Hill: Sándor Jávorka Stairway, Iskola Stairway, Gránit Stairway<sup>4</sup>, Schulek Stairway<sup>5</sup>, Ponty Stairway and Jezsuita

<sup>1</sup> UNESCO World Heritage Site: *Budapest, including the Banks of the Danube, the Buda Castle Quarter and Andrássy Avenue*, <https://whc.unesco.org/en/list/400>, (accessed: 29.04.2021).

<sup>2</sup> Just to mention the 150 years Ottoman occupation or the Second World War.

<sup>3</sup> The photos published in — for instance — (Cane, 1927; Holme, 1907; Holme, 1908) and (Jekyll-Hussey, 1927), truly illustrate the role stairways play in shaping the character and spatial composition of English gardens.

<sup>4</sup> Gránit Stairway consists of two sections that are different in character and also separated by a street. In the study we only deal with the covered upper section of the stairway, which is attached to the castle wall.

<sup>5</sup> We also have to note that our analysis concerned only the separate lower part of the Schulek Stairway, which is possible to evaluate independently, since the upper section that is an integral part of Fisherman's Bastion is so complex that

Stairway (Ill. 1). Two of the stairways have sections which are different in character (Iskola Stairway and Jezsuita Stairway), and which therefore were analysed also separately from certain aspects. Four of the stairways are located at the east slope of the hill looking towards Pest and the Danube, while two (Sándor Jávorka Stairway and Gránit Stairway) are on the west side, looking towards Sas Hill and Széchenyi Hill.

Surveys have been prepared with the participation of landscape architecture students<sup>6</sup> specialised in Garden Arts. During the site surveys, two methods were applied. One of the methods was based on form including a table to record information on: 1) technical parameters of the stairway, stair flights and steps; 2) solutions applied to railing; and 3) the quality of the relation to the setting. Since we had no geodetic surveys available, measurements were carried

out using surveyor tape, which could provide only approximate information on height data. Technical terms of the main structural elements are shown in Figure 2<sup>7</sup>.

Another part of the analysis was the preparation of freehand drawings, sketches and photos to record the impressions, feelings, atmosphere, values, visual links and spatial composition. Beyond the visual features and links which are possible to describe objectively, these characteristics reflect the perception of the person who prepared the analysis (Table 1). The results of these observations were then presented using the same template on a summary poster for each stairways. Figure 3 shows the general arrangement of the posters, while a final poster prepared for Jezsuita Stairway is introduced in Figure 4. Site surveys were then followed by desktop analysis.

I. Technical details			
Methodology of site analysis	1. Stairway — Stair flight — Steps	Tracing Used materials Measures of treads and risers Number and size of stair flights and landings	
	2. Railing	Any cheekwalls? Any railings? Any ornaments? What kind of? Use of materials	
	3. Context	Built and/or natural environment? Other objects, street furniture?	
II. The effect of stairways on spatial and visual composition in the historical environment			
Methodology of site analysis	1. Spatial aspects	Site analysis (infrastructure) Observing spatial qualities (recording features) Photo documentation (location of the stairways, interconnected spaces)	
	2. Visual — aesthetic aspects	freehand drawing analysis	Snapshots (visual experiences) Main focal points (landmarks) Visual axis (visual links) Historical panoramic view (valuable cityscape)

Tab. 1. Concise introduction of the two methods of the analysis.  
Source: prepared by the Authors.

Tab. 1. Zwięzłe wprowadzenie obu metod analizy.  
Źródło: opracowanie własne Autorów.

<sup>6</sup> is could be the subject of a separate study.

<sup>6</sup> Students who participated the study: Lilla Bérczi-Kubina, Zsófia Domak, Borbála Fülöp, Zsófia Vadász.

<sup>7</sup> This figure was prepared in order to clarify the terms used.

### 3. RESULTS

Although technical parameters are essential criteria for stairways, in addition to their primary function there are several other aspects to consider for their assessment. Beyond the fact that stairways facilitate overcoming height differences, the careful choice of their dimensions, materials, and details do not only contribute to the aesthetic perception of the stairway itself, but also to that of the setting, in our case established and developed jointly with the historic environment and World Heritage Site. Besides the direct context they are situated in,

In conclusion, stairways:

- make the historical area more varied,
- enrich the visual experience,
- enhance the appeal of the place,
- serve as a spatial, visual, and cultural link.

### 4. DISCUSSION

Our analyses showed a number of disparities between the parameters of the stairways. The tread size of Sándor Jávorka Stairway is significantly different (shorter) than that of the other stairways. (Table 2) The difference

	Steps (cm)		Pitch (%)	Number of steps
	Average rise	Average tread		
Sándor Jávorka Stairway	14	30	46,7	111
Iskola Stairway	15	34	44	110
Gránit Stairway	15	42	35,7	70
Frigyes Schulek Stairway (lower, unattached section)	15,5	33,5	46	28
Ponty Stairway	15,5	35,5	43,7	98
Jezsuita Stairway	13	35	37	130

Tab. 2. The dimensions specific to the stair flights in each stairway.  
Source: Table by the Authors.

Tab. 2. Wymiary charakterystyczne dla biegów schodowych w każdej klatce schodowej.  
Źródło: opracowanie własne Autorów.

stairways facilitate the visual connection also with the wider environment. This way new urban silhouettes, sights and panoramas of historical value are attached to the given site, thus increasing the touristic attractiveness and value of the place. The wider visual context plays the role of a kind of urban historical scenery too, as a background for the nearby environment. Although it is very difficult to corroborate the atmosphere of an environment through objective theorems, freehand drawing sketches attempt to commit characteristic elements to paper, from a personal perspective. Through the applied methodology, that is the combined study of both technical and aesthetic aspects, we have identified a numerous values. For the casual observer, these values may either seem to be evident or remain unnoticed in their details, having only a general impression that the place is attractive and pleasant to look at.

ranges from 3.5 to 12 cm, that is the stairway in question is this amount shorter than the others. In addition to this difference in size, the use of materials also differ. Each stairway consists of stone block steps<sup>8</sup>, except for Sándor Jávorka Stairway, which is made of basalt setts. The dimensions of a step, and the sizes coupled with a specific material fundamentally define not only characteristics of the step, but also that of the whole stairway. Whereas in the aforesaid cases the block-like design provides a more generous, tranquil form, the use of setts, due to the multiple division lines, results in a more dynamic appearance.

<sup>8</sup> Stone block step: the entire cross-section of the step is made of one piece of natural stone. In the case of the Gránit Stairway, steps are made of cast stone that conveys the same appearance as natural stone blocks do. All other stairways were built using natural stone block steps.

In our study, we ranked stairways 1) according to the gradient of the pitch line of the whole stairway (including all stair flights and landings), expressed as a percentage and calculated from the quotient of the overall height and length of the stairway, and 2), according to the gradient of each stair flight within the same stairway (See Ill. 5.). The diagram below does not only show which stairways overcome the greatest height difference or which stair flights are the steepest, but highlights also the overall gradient of the stairways relative to their height. In other words, this indirectly reveals how effortless or how demanding is to overcome the height difference by climbing the given stairway.

The size, material and proportions of the railing and cheek walls also contribute to the all-in-all appearance of the stairways (Ill. 6.). Quality materials, artistic elaboration, and impressive dimensions proved to be the cornerstones for our impressions during the assessments, and the basis for considering some of the stairways aesthetically more, while others less pleasing.

Based on their layouts, we have classified the six stairways into four main categories: 1. Straight, 2. Sectioned (2/a: Curved, 2/b: Z-shaped or angular), 3. Broken-line, 4. Combined (Ill. 7.).

Based on their relation to the setting (e.g. flanked by buildings or crossing a spacious green area, open from one side and closed from the other mostly by buildings, or surrounded mostly by green space) stairways induce particular qualities of atmosphere, and carry a wide variety of visual amenities. The analysis through freehand sketches highlighted several visual features and design details. Table 3 details the summary assessment of the atmospheres, spatial composition, and visual connections. This table contains observations conducted during summer, that is to say, in the growing season. It can clearly be established that, from an overall perspective, all six stairways are visually characteristic features. Depending on the placement and the height difference of the stairways, different visual connections can be identified. In those cases when the location of the stairways is favourable from both of these aspects, panoramic views of the both of the natural and built environment may be enjoyed (e.g. Gránit and Sándor Jávorka Stairways). It is not clearly sufficient that a stairway rises to a greater height for ensuring the existence of scenic views. An example of this is the Iskola Stairway, where the canopy level of the vegetation and the built environment permit only a very narrow angle of view. The majority of the visual attractions 'remains nearby'. Some of the stairways offer exciting, dynamic and varied micro-environments,

through the way the stair flights are divided, through their spatial connections, or through the connection of varied functional units. Such examples are Ponty and Jezsuita Stairways. These two provide a strong bond with their specific location through the atmosphere. Schulek Stairway is the smallest of the studied stairways, featuring only two stair flights. This staircase is a perfect example on how staircases that are located in between streets and hence are in an 'inferior' position, that is to say, they are not elevated, are possible to fit into their closest environment. Given here the small height difference and sufficient space for the layout, the stair flights were placed so that they are fully adapted to the terrain. From a visual aspect, this structural alignment ensures a humble and reserved appearance. However it can be noticed that in spite of the fact that during the summer period this stairway provides only one visual connection (towards the northern half of the Parliament located on the other side of the River Danube), this is still the stairway which has the greatest amount of visual features and focal points in its nearby environment or, from a visual aspect, in the middle range. This stairway has another special feature to mention: during the winter (leafless) period spectators can glimpse from here several more views through the branches of the trees (e.g. St. Stephen's Basilica, again on the Pest side of the city). Upwards (in the westerly direction) the whole Fisherman's Bastion can be seen during winter time (otherwise it is only partially visible), along with its complete built environment. According to the change of the seasons, the aforementioned visual surplus does not only bring diversity to the views, but also modifies the proportions of the space. This spatial and temporal change generates a dynamic dialogue between the natural and the built environment, with this tiny stairway in its center of gravity. Table 3 lists some other properties and factors of atmosphere related to the stairways.

## 5. CONCLUSIONS

According to the analyses prepared at the historic Buda Castle World Heritage Site, beyond the important technical aspects and the functional role as traffic routes, stairways represent significant values also from an aesthetic perspective. It can be concluded that various levels and layers of attractiveness are possible to distinguish. Scales and proportions of the immediate environment as well as the comfort of use of the stairways are possible to derive from the use of materials and the technical details. Visual links may be observed at short, middle and long range, which all may be limited by visual barriers though, and

SÁNDOR JÁVORKA STAIRWAY	ISKOLA STAIRWAY	GRÁNIT STAIRWAY
+	+	+
<ul style="list-style-type: none"> <li>&gt; impressive distant views (leaving the buildings behind, upper section)</li> <li>&gt; wonderful view to the city</li> <li>&gt; simply romantic (upper landing)</li> <li>&gt; upper landing with a theatrical effect</li> </ul>	<ul style="list-style-type: none"> <li>&gt; spatial surprises</li> <li>&gt; enclosed, intimate, visually confined spatial composition, easy to understand</li> <li>&gt; special atmosphere of the wooden stairs at the covered section</li> <li>&gt; mighty historic setting</li> </ul>	<ul style="list-style-type: none"> <li>&gt; intimate, enclosed space</li> <li>&gt; rhythm of repeated features (lamp brackets, cast iron railings, window-like openings above the parapet)</li> <li>&gt; mighty historic setting (castle wall and related views, adjacent buildings)</li> <li>&gt; elaborate details</li> </ul>
+/-	+/-	+/-
<ul style="list-style-type: none"> <li>&gt; steepness of sharp fall</li> <li>&gt; no cheek wall, only railing</li> </ul>	<ul style="list-style-type: none"> <li>&gt; upper, covered section: parapet</li> <li>&gt; lower section: broad cheek wall</li> </ul>	<ul style="list-style-type: none"> <li>&gt; covered</li> <li>&gt; parapet and wooden railing on the side of the castle wall</li> </ul>
-	-	-
<ul style="list-style-type: none"> <li>&gt; less elegant design of steps</li> <li>&gt; stairs unpleasant to walk</li> <li>&gt; lower quality of the built heritage</li> </ul>	<ul style="list-style-type: none"> <li>&gt; busy place</li> <li>&gt; space more enclosed down from the middle of the stairway, with no more distant views</li> </ul>	<ul style="list-style-type: none"> <li>&gt; narrow feel of space if used by multiple people</li> </ul>
Elements of the view		
Most distant:	Most distant:	Most distant:
nature panorama	narrow angle distant view	narrow angle distant view
Main sights:	Main sights:	Main sights:
city panorama	green space of intimate atmosphere in the middle and the Fisherman's Bastion	panoramic view of green spaces and the Fisherman's Bastion
Specific visual feature: 1	Specific visual features: 2	Specific visual features: 2
SCHULEK STAIRWAY	PONTY STAIRWAY	JEZSUITA STAIRWAY
+	+	+
<ul style="list-style-type: none"> <li>&gt; open, sunny, spacious</li> <li>&gt; pure, majestic appearance</li> <li>&gt; rich historic setting (Fisherman's Bastion)</li> <li>&gt; stairway fitted to the terrain</li> <li>&gt; cosy landing</li> </ul>	<ul style="list-style-type: none"> <li>&gt; characteristic green walls at certain sections</li> <li>&gt; spatial surprises</li> <li>&gt; chain of micro-spaces</li> <li>&gt; mighty historic setting (residential buildings)</li> <li>&gt; unique visual features, details (statue niche, fountain, benches, railing ornaments)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; elegant, generous stairway</li> <li>&gt; characteristic details</li> <li>&gt; quality materials</li> <li>&gt; mellow mood</li> <li>&gt; multiple cosy landings (pedestrian-friendly)</li> <li>&gt; good environmental and functional connections</li> <li>&gt; open and embedded into a natural environment</li> <li>&gt; rich historic setting</li> <li>&gt; spatial surprises</li> </ul>

+/-	+/-	+/-
> lower location, minor stairway > broad stone railing	> narrow, vertical space > rather shady > very few visual features but the stairway, the inherent richness of forms and functions dominates > cheek wall and elaborate metal railing	> long stairway > lower section: broad stone railing, upper section: cheek wall without railing
-	-	-
> marginal environmental context		
Elements of the view	Elements of the view	Elements of the view
Most distant:	Most distant:	Most distant:
no distant view	distant roofs, narrow angle of view	streetscape
Main sights:	Main sights:	Main sights:
adjacent built environment	characteristic roofs in the vicinity	historic buildings
Specific visual features: 5	Specific visual feature: 1	Specific visual features: 2

Tab. 3. Visual-aesthetic and atmospheric characteristics of the stairways.  
Source: Table by the Authors.

Tab. 3. Charakterystyka wizualno-estetycznego i charakteru klatek schodowych.  
Źródło: opracowanie własne Autorów.

the visual scales and spatial contexts may also vary alongside the stairways. Either consciously or being unaware, all these appear to the spectator, and reveal a complex system of values inherent to the historic cultural environment.

Our analysis provides an appropriate basis and reference for further research, since there are several additional stairways of different status and character in the neighbourhood of the Castle, which may have varied environmental context and visual qualities. For example, an approach from recreational aspect could be a potential new layer of the analyses.

To sum up, the chain of static visual links and spatial context is enriched by dynamic experience of

the space and atmosphere as walking the stairways. When analysed in a historical context, stairways do not only connect different levels, determine the spatial proportions and visual links, but through the use they also connect the past to the present in terms of cultural aspects and spatial design.

## ACKNOWLEDGMENTS

Analyses, site surveys and certain parts of elaboration were prepared by: Borbála Fülöp, Lilla Bérczi-Kubina, Zsófia Domak, Zsófia Vadász postgraduate landscape architecture students. Herein we would like to thank their work.



### III. 1. Location of the six stairways<sup>1</sup>.

Source: prepared by Patrícia Szabó.

### II. 1. Lokalizacja sześciu klatek schodowych.

Źródło: opracowanie: Patrícia Szabó.

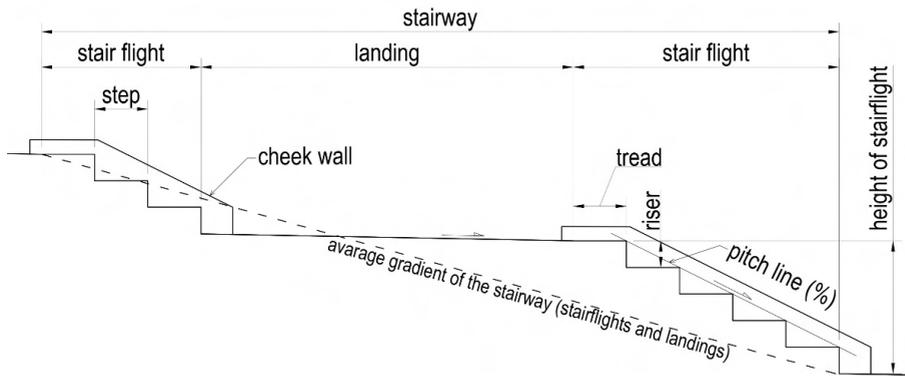
<sup>1</sup> The figure shows the location of the surveyed stairways and the date of the archive map they can first be distinguished on. The map archive of the website mapire.eu was used as a primary source. The maps referred to are as follows:

- Budapest (1786–1794) — *A budai vár helyszínrajza* [Survey map of Buda Castle]: the upper, covered part of Gránit Stairway; Jezsuita Stairway;
- Budapest (1837) — *Pest-Buda-Óbuda áttekintő térképe a jelentős középületek rajzával és látképekkel /Vasquez/* [A general map of Pest-Buda-Óbuda with the main public buildings and views /Vasquez/]: the upper, covered part of Iskola Stairway;
- Budapest (1867–1873) — *Pest és Buda kataszteri térképsorozata az 1872–1920 közötti változások utólagos jelölésével* [A series of cadastral maps of Pest and Buda with later notes of the changes between 1872–1920]: the lower part of Iskola Stairway; Ponty Stairway;
- Budapest (1874–1917) — *Buda belterületének kataszteri térképsorozata, az 1871 és 1920-as évek közötti út- és ingatlan-kiterjedések feltüntetésével* [A series of cadastral maps of the inner parts of Buda, depicting the plot boundaries between 1871 and 1920]: Schulek Stairway

Sándor Jávorka Stairway was not depicted on any of the archival maps as a stairway, only its location was noted for future use as street in 1912 (Budapest (1912) — *Budapest kataszteri térképsorozata* [Series of cadastral maps of Budapest]). However, a series of photographs about its construction dated in 1936 were found in the digital archive of fortepan.hu (e.g. Fortepan/Album 015 1936).

Schulek Stairway is well-documented as the work of the renowned architect Frigyes Schulek, finished in 1902 with the Fisherman's Bastion (Gerő, 1975). The present day form of Jezsuita Stairway was also constructed in 1902 as the inscription on one of its walls says. Gerő also mentions two covered stairways originating from the Baroque times; the upper part of Gránit Stairway and the upper part of Iskola Stairway.

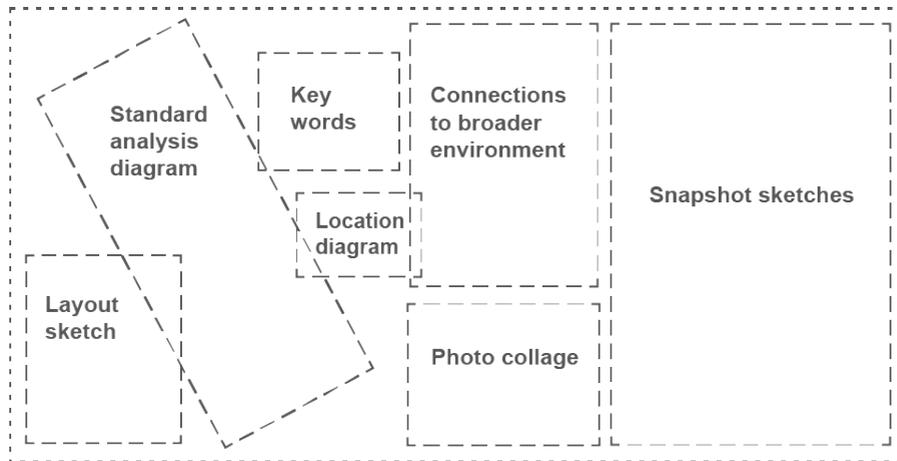
Although this paper has not fully researched it, it is likely and is our assumption that the stairways have gone through a number of reconstructions as their built environment changed and developed, most recently after the destruction of Second World War. This survey only takes into account the stairways in their present form and does not take a deeper look into those changes of spatial and technical parameters.



III. 2. Terms used for stairways.

II. 2. Terminy używane dla schodów.

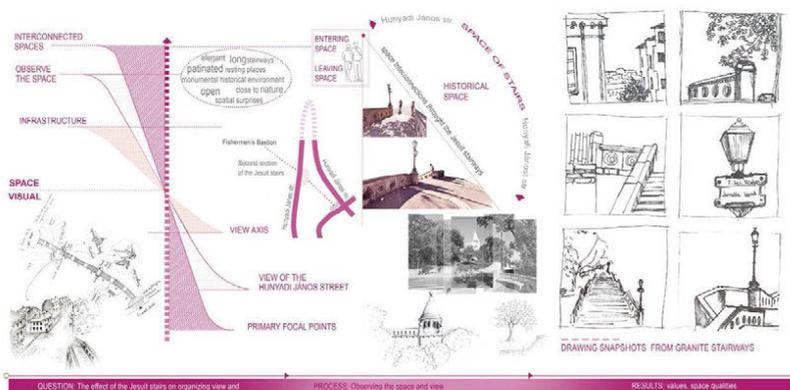
Source/Źródło: Máté Sárospataki.



III. 3. General analytical diagram, Diagram of the poster arrangement.

II. 3. Ogólny schemat analityczny, Schemat układu plakatów.

Source/Źródło: Brigitta Christian-Oláh, Patrícia Szabó.

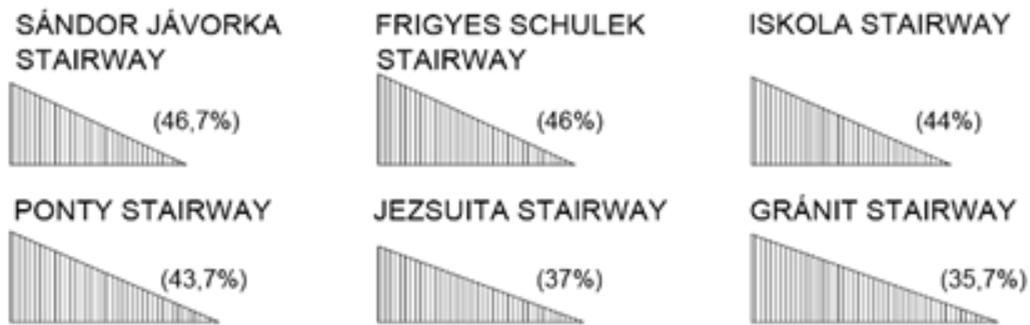


III. 4. Instance of a final poster prepared for the visual-aesthetic analysis of the Jezuita Stairway.

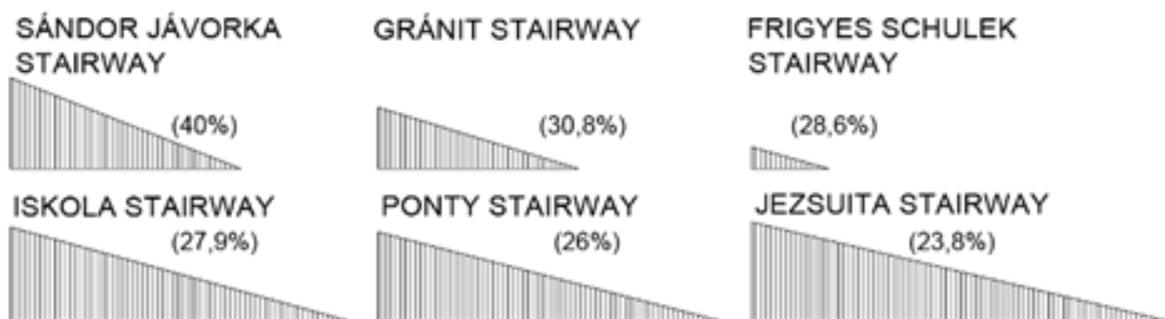
II. 4. Przykład końcowej planszy prezentacyjnej przygotowanej do analizy wizualno-estetycznej Schodów Jezuita.

Source/Źródło: Lilla Bérczi-Kubina, Brigitta Christian-Oláh, Zsófia Domak, Borbála Fülöp, Zsófia Vadász.

**Stairflights ranked according to gradient starting from the highest percentage  
(average gradient of stair flights within stairways)**



**Stairways ranked according to gradient starting from the highest percentage  
(the whole length of the stairway including stair flights and landings)**

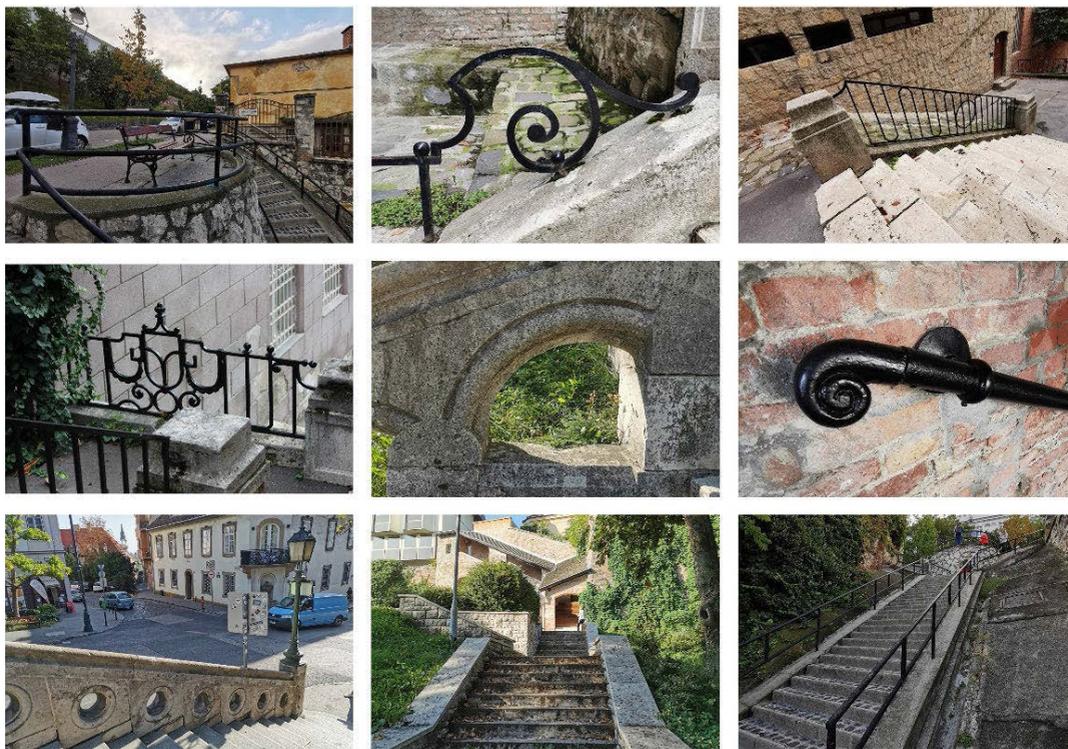


III. 5. The gradients of the stairways and stair flights (represented at the same scale).

Source: by the authors.

II. 5. Nachylenia schodów i biegów schodowych (przedstawione w tej samej skali).

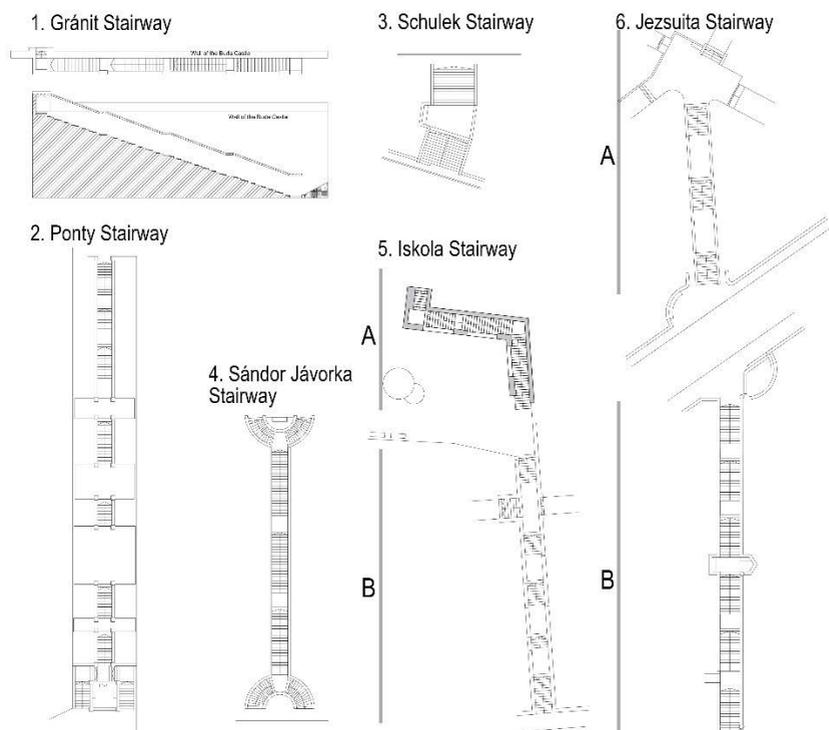
Źródło: opracowanie własne Autora.



III. 6. Railing details.

II. 6. Detale balustrady.

Source/Źródło: Zsófia Vadász.



III. 7. Layout types: 1) broken-line (fitted onto a wall), 2) sectioned, angular, 3) broken-line, 4) sectioned, curved, 5A) broken-line (fitted onto a wall), 5B) straight, 6A) broken-line, 6B) straight.

II. 7. Typy układów: 1) linia łamana (przymocowana do ściany), 2) linia przekrojowa, kątowna, 3) linia łamana, 4) linia przekrojowa, zakrzywiona, linia łamana 5A) (mocowana do ściany), 5 B) prosta, 6A) łamana, 6B) prosta.

Source/Źródło: Lilla Bérczi-Kubina, Zsófia Domak, Borbála Fülöp, Máté Sárospatoki, Zsófia Vadász.

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