Monument restoration - a controlled task does not limit creativity

Eva Vojtekova, Jana Gregorova, Beata Polomova & Karolina Sasikova

Slovak University of Technology in Bratislava
Bratislava, Slovakia

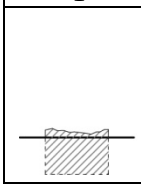
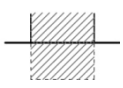
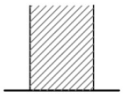
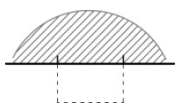
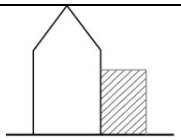
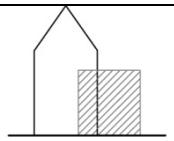
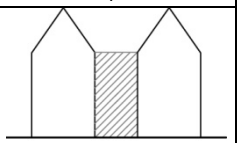
ABSTRACT: The education of architects in design lasts six years, in which students of architecture are asked to solve tasks focused on architecture, urban planning, interior design and, later on, monument restoration. The aim of the subject, Design Studio, in lower years of the study is to strengthen the student's creative thinking in composition, typology and construction. In the Design Studio dedicated to monument restoration, an acceptance of the original and traditional is most important. In the process of searching for optimal designs for monuments and new inserted structures, the variant solutions have to be tested with respect to a given restoration methodology. Determinants of a monument's restoration have to be perceived by students as an inspiration and not a limit. The determinants of monument restoration are better taken into account by using collective consultations of the whole group. In the design process, there are several determinants influencing the final proposals.

INTRODUCTION

A type of architectural education is based on a validation of variant solutions and searching for the optimal design for monument restoration by means of visualisations or sketches of variants. This was the subject of grant project SK-VEGA 1/0951/16 *Transparent and Translucent Structures Applied on Architectural Buildings in Specific Conditions.* This specific approach, *research by design,* involves searching for optimal sustainable ways of monument restoration.

The basis of the grant project was the definition of individual rudimentary situations or objects according to their conservation value. These situations created a framework for the design of new transparent or translucent structures. The potential rudimentary situations are presented in Table 1. The new created space under inserted glass at the existing terrain level is marked as crosshatched areas. For the Design Studio tasks, the authors were looking for examples of an existing particular situation and objects, which require the insertion of new cover structures for restoration or to assert new functionality or for the presentation of an archaeological find. During three semesters, the following situations were considered and solved as Design Studio and seminar tasks by students.

Table 1: Traditional building objects in spatial relation to the new added lightweight structures (Archives of the authors).

Destroyed building object (ruin)				Preserved building object (tectonic)		
1	2	3	4	5	6	7
						

Model solutions are defined according to the restoration value of the monument. The first model situation was from the National Cultural Heritage prehistoric settlement in the cadastre of the village, Budmerice in Slovakia. Prehistoric settlements often are a complex of objects conserved under the level of existing terrain (Table 1 - 1).

The new cover structure is designed as a middle-spanning or long-spanning structure over most objects (Table 1 - 4). The second model situation was based on the ruin of the National Cultural Heritage Romanesque Palace of the Spiš Castle, which is conserved in perimeter walls up to the crown cornice level (Table 1 - 3). The third model situation was based on the conserved style object of the National Cultural Heritage Franciscan Monastery and Church in Kremnica (Table 1 - 7).

MODEL SITUATION 1: ARCHAEOLOGICAL REMAINS UNDER THE TERRAIN LEVEL

The remains of the original object are conserved under the existing terrain level. The relation of the new structures to the archaeological remains is shown in this simulated situation. The middle-spanning or long-spanning structures cover the original object to excavation or at terrain level (Table 1 - 1). Table 1 - 4 shows more *remains objects* as covered.

The student's task was to choose the design of cover structure for the National Cultural Heritage archaeological prehistoric settlement in the cadastre of the village, Budmerice, which is the subject of archaeological research. The location is close to the village Jablonec and belongs to a type of prehistoric settlement known as the *Madarovce* Culture. Prehistoric settlements from the bronze period are marked by a semi-circular defensive system of ramparts and ditches, which were built around the central part of the semi-circle. The ramparts and ditches were caused by torrential terrain scarp. According to archaeological research, the prehistoric settlement Budmerice was surrounded by four irregularly curved earth ramparts with ditches, which were in the periphery of the terrace's torrential scarp [1]. The findings are situated approximately 1.5 metres under the existing terrain.

Finding an approach to the presentation of the archaeological locality in the contemporary landscape was the problem. The main task was to create, by presentation of the archaeological findings, an added value for the contemporary landscape. The presentation of earth structures of the ramparts and ditches, and the presentation of identifiable parts of the territory (entrance gates in the ramparts and the central part of the semi-circle) were chosen for reconstruction. The presentation of the extinct objects in the archaeological locality required a high degree of abstraction. The forms of the objects were not known. However, analogous examples offered an inspiration for their design. The final appearance of the prehistoric settlement is presented as a hypothetical reconstruction.

The urban solution of the archaeological locality's presentation was processed in the pre-diploma Design Studio and served as a basis for seminar tasks in the lower years of studies. The essential demand for the design of the presentation was the integration of the archaeological locality into a new functional 21st Century landscape. The new landscape connects the archaeological locality's presentation with new educational and cognitive functions of relaxation and sport. The urban solution is shown in Figure 1.

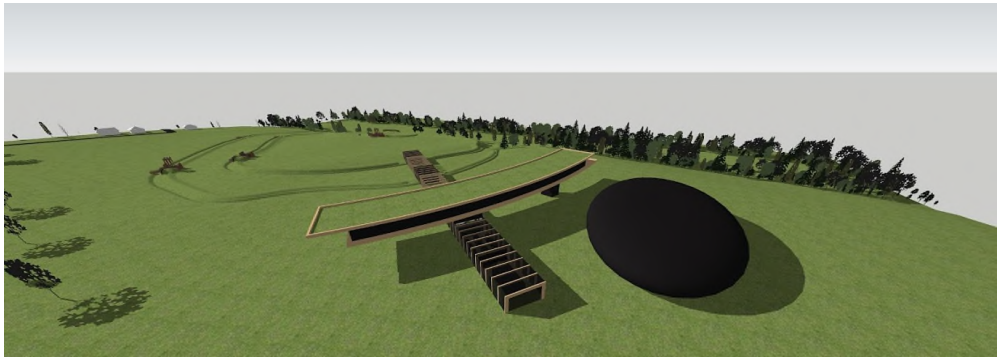


Figure 1: Presentation of the archaeological locality by reconstruction (Archives of the authors).

The urban design of the archaeological locality's presentation arranges the entrance to the archaeological territory on the north-west axis, where the prehistoric entrance gate was supposed to be located. The remains of the gate will be presented under the existing terrain and covered by lightweight cover structures aboveground. In the central position of the prehistoric settlement, the remains of found artefacts will be presented in a similar way. The task for the group of students was to design a new aboveground lightweight cover structure with a transparent or translucent envelope. The choice of location was for the students to determine.

The new lightweight structure was situated in open landscape. The principle of the *new form* was applied to the design of the new cover structures. Consultation during the design process was used to determine the shape and the design of the support structure. The depth of the basement under the support structure was limited by its position in the archaeological locality. Shallow prefabricated horizontal basements with stigmatic vertical metallic whorls are applicable.

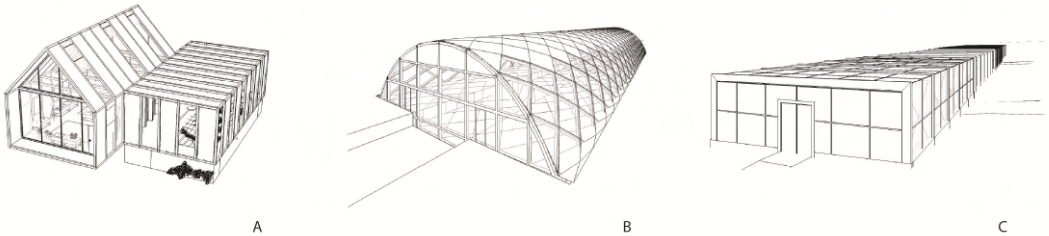


Figure 2: Lightweight structures covering prehistoric entrance gate and depth under the existing terrain (Archives of the authors).

Consultation during the design process was also used to determine the shape and the design of the support structure. The pavilion objects cover the putative gate in the north-west entrance path to the settlement. The support structure of the pavilions was designed as parallel repetitious frames along the linear path with various shapes for the frames. Some designs used barrel vault shells as a support structure. The pavilion objects are shown in Figure 2.

In the central site of the settlement the central shaped objects were designed for covering the artefacts *in situ* with various types of support structures (e.g. lightweight glass-steel shell roof with ball-shaped surface, centre-symmetric dome with pre-stressed membrane envelope and irregularly arched frames arranged in a semi-circular plan). Central objects are shown in Figure 3.

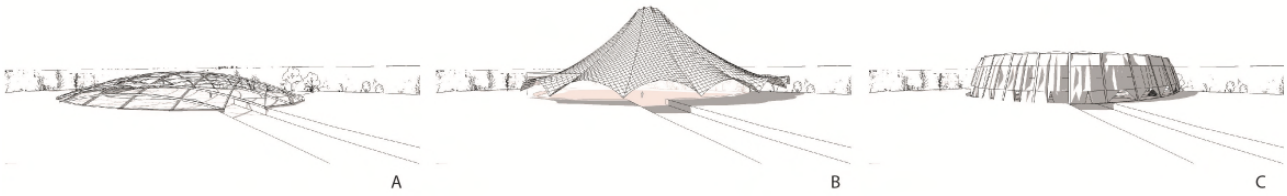


Figure 3: Lightweight structures covering the artefacts in the central position of the prehistoric settlement (Archives of the authors).

MODEL SITUATION 2: DESTROYED BUILDING OBJECTS ABOVE THE TERRAIN (i.e. A RUIN)

The original of the traditional building object is partially conserved aboveground. Perimeter walls are conserved up to the original level or to aboveground. This enables interior spaces to be created.

The authors chose for this modelling a dominant medieval ruin, the Romanesque Palace, Spiš Castle, which is on the UNESCO World Heritage List. It was the task for the students to develop the parameters for a cover roof structure. The selected Romanesque Palace of the Spiš Castle has passed through many structural periods, i.e. Romanesque, Gothic and Renaissance [2]. It would be possible to partially reconstruct these periods on the basis of saved archive materials. The interior does not exist and the perimeter walls create a raised landscape landmark. Inner structures and the roofing of the palace were changed in historical periods.

The perimeter walls of the Romanesque Palace are now perforated by window openings from all structural stylistic periods. The reconstruction of a particular structural period enables openings to be walled up from another period and to create in their positions shallow niches, which increase the loadbearing capacity of the perimeter walls. Hypothetical structural periods for the palace are shown in Figure 4.

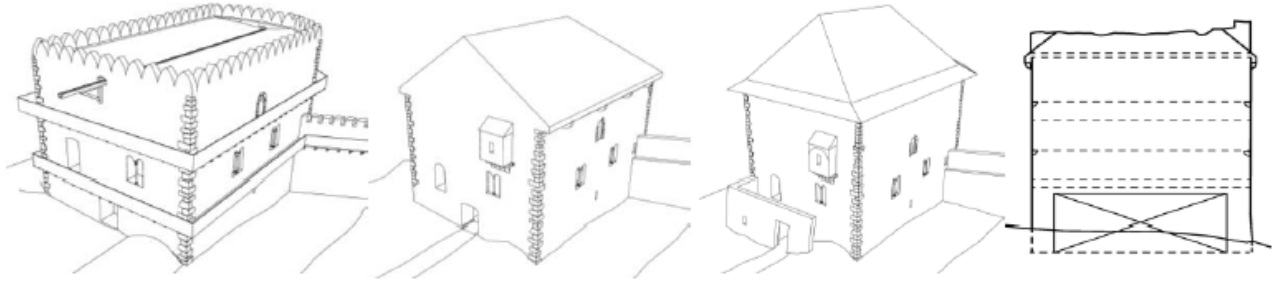


Figure 4: Visualisation of the hypothetical structural periods of the Palace - Romanesque, Gothic and Renaissance (Archives of the authors).

The students were acquainted with various structural periods corresponding to historical stylistic periods. Students were allowed to choose, according to their own deliberation, which type of the cover roof structure to design. The main condition was to include the whole range of the roof structures according to defined criteria. Designs processed by students were reviewed by members of the Institute of History and Theory of Architecture and Monument Restoration, as well as the Institute of Architectural and Engineering Structures.

The approach to the ruin's restoration was defined by the restoration method taking account of the shape of the inserted roof, the loadbearing capacity of the original walls and conservation of the ruin's silhouette in the landscape. Three approaches to the presentation of the ruin are possible: style restoration, reconstruction and new-style intervention [3]. The insertion of a new lightweight structure on an existing ruin offers students three possible structural solutions:

- The new roof is supported by only horizontal structural elements: beams or trusses embedded at the top of the perimeter walls or to the original stone cantilevers, which are positioned on the inner side of the perimeter wall (Figure 5).
- The second structural solution consists of an insertion of new vertical and horizontal elements; vertical elements in this case are embedded in the four original stone bases situated over the underground floor in the longitudinal axis

of the interior space; horizontal elements are partially embedded in the stone cantilevers on the inner side of the perimeter wall (Figure 6).

- The third structural solution involves the insertion of new frame structures, where vertical elements have been placed along the inner side of the existing perimeter walls (Figure 7).

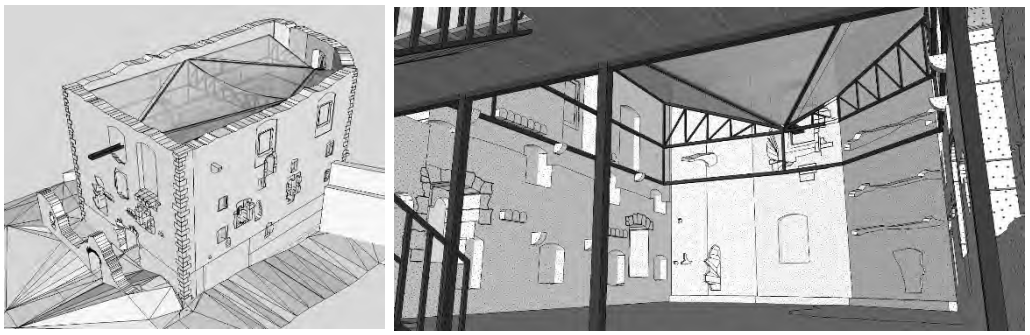


Figure 5: The roof supported by irregularly positioned trusses embedded in the original stone cantilevers (Archives of the authors).

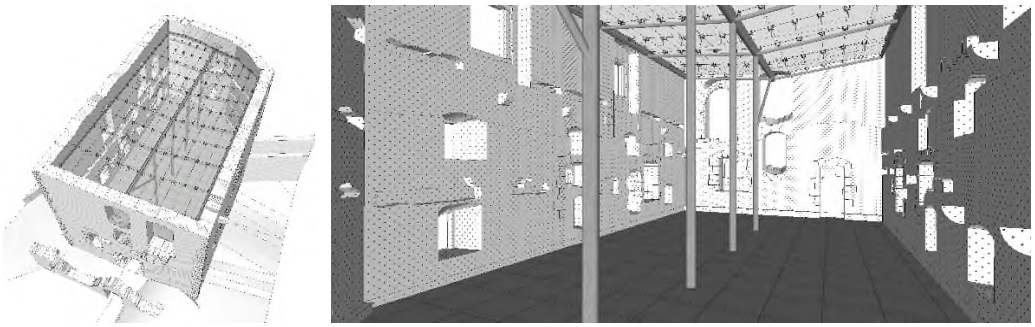


Figure 6: The roof supported by four columns embedded in the original stone bases and horizontal elements partially embedded in the stone cantilevers of the perimeter wall (Archives of the authors).

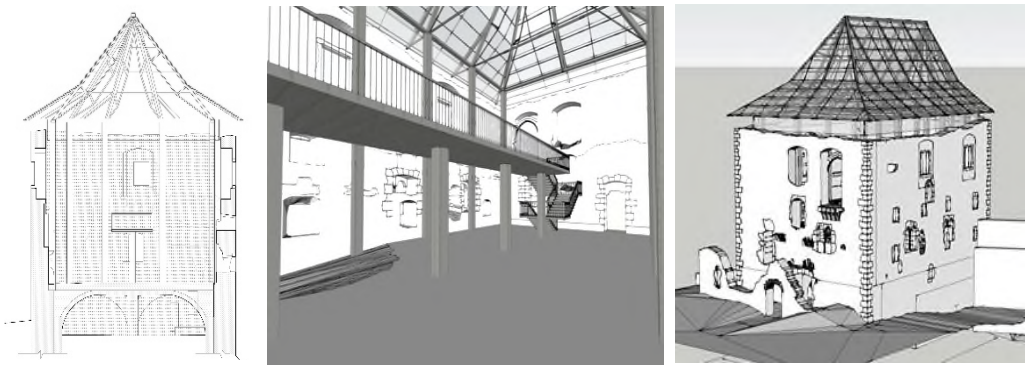


Figure 7: The roof supported by new vertical elements placed along the inner side of the existing perimeter walls and horizontal trusses with triangular geometry (Archives of the authors).

MODEL SITUATION 3: PRESERVED BUILDING OBJECT

The original historical building object is conserved in a complete manner. The relation of the new transparent or translucent structures to the preserved original building object with a floor plan with lateral wings (L and U shapes) enables the parallel addition of a new mass (Table 1 - 5) or addition of the roof structure over the closed courtyard (atrium), (Table 1 - 7).

The authors chose for this model a stylish object of the National Cultural Heritage - the Franciscan monastery and Church in Kremnica. This enables the insertion of a new roof structure over the heavenly courtyard. Designs of the roof structure aimed to be new-style interventions. The new lightweight structure added to the completion of the object. The design was limited by the embedding of the bordering wing masses and the existing windows' positioning at the highest levels of the building's wings. The object had passed through many evolutionary phases and was presented as a characteristic baroque expression [4]. The form of drainage, loadbearing capacity of the original structure and chosen support structure of the new roof were the determining factors in the design of the roof as a new-style intervention. The simple cloistral object in baroque style assured the restoration approach with respect to the invasion of the existing walls and the expression of the roof as a new-style intervention.

Three variants of the new roof structure were proposed. The first variant solution proposes the insertion of a lightweight glass-steel shell roof with a ball-shaped surface. The ball-shaped roof is embedded over the existing roof cornice. The drainage is solved by means of new interior downpipes. The invasion of the original mass of the monastery is minimal (Figure 8 - A).

Parallel embedded steel braced beams were used as a support structure for the glazed roof in the second solution. The beams were laid at a slight slope over the level of the cornices. The shape of the inserted roof is a shed with drainage in the slope's direction by means of new downpipes along the perimeter wall. The shed roof presents a neutral shape with respect to the monument's expression (Figure 8 - B).

In the third solution, a completely different approach was used by application of the membrane pre-stressed arched roof. The roof shape relates to the arched windows on the highest level of two opposite perimeter walls of the courtyard. The roof is in visible contact with the perimeter walls under the level of the cornice and presents the design as an invasion to the original baroque structure (Figure 8 - C). Visualisations from the interior are shown in Figure 9.

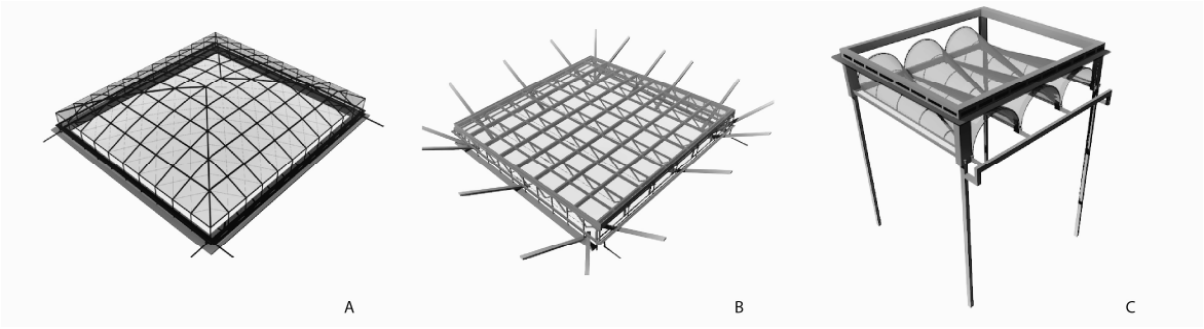


Figure 8: Visualisations of the new forms of inserted roof (A, B and C) (Archives of the authors).

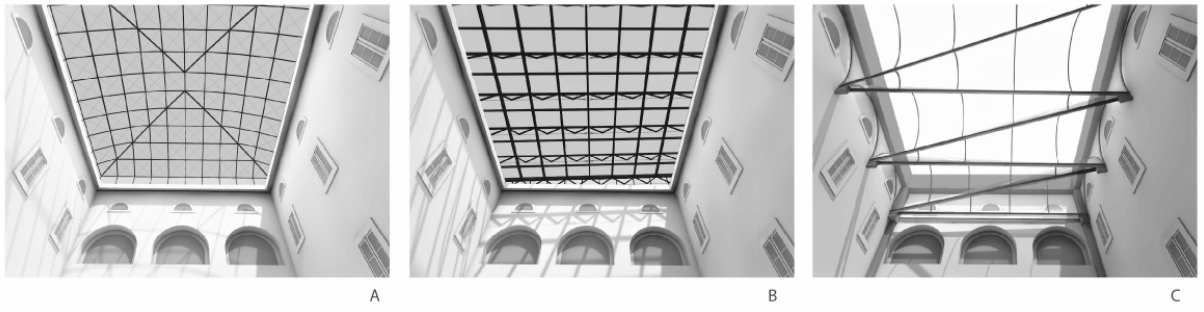


Figure 9: Visualisations from the interior (Archives of the authors).

CONCLUSIONS

The aim of the teaching was to test optimal combinations of models by designing new transparent and translucent structures for historical built-up settlements, which are characterised by their individuality. The results of the *methodical designing* are optimal solutions as a basis for recommendations for new structures for monument restoration.

M*ethodical designing* could be used by institutions as material to search for optimal design solutions in the pre-project preparation phase. Variant solutions for important monuments could be helpful in the restoration process. Examples developed at the Design Studios at FA-STU by *methodical design* were reviewed by employees of the Monuments Boards and demonstrated interdisciplinary education, with the participation of the relevant institutions.

The regulation of the students by setting limits beforehand is not an obstacle to the development of the students' inventiveness and inspiration. The regulation of creativity informs the students about searching for an adequate expression of a new structure, while respecting the style of a preserved object. The interdisciplinary mode of design assists in the extraction of combinations of designs of structures, with respect to monument restoration.

The article is partial output of the research task of the Grant Agency of the Slovak Ministry of Education - VEGA 1/0951/16 - *Transparent and Translucent Structures Applied on Architectural Buildings in Specific Conditions*.

REFERENCES

1. Jelinek, P., Hlavata, J., Vavak, J., Benus, R. and Jamrichova, E., Natural scientific analyses at the archaeological excavation in Budmerice: methods, results and perspectives. *Interdisplinaria Archaeologica - Natural Sciences in Archaeology*, 39-61 (2013).

2. Janovska, M., The Architectural Historical Research of Spiš Castle. Separate Research Elaborate - Regional Monuments Board Košice (2008).
3. Gregor, P., Restoration as a creation and creation as a restoration. *Proc. 7th Architecture in Perspective 2015*. Ostrava, Czech Republic, 24-25 October 2015, 84-88 (2015).
4. Retkovska, A., Husovska, L. and Hraskova, N., Franciscan monastery in Kremnica - history and structural evolution of the monastery. *Monument Revue*, 4, 30-37 (2015).