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ARCHITECTURAL RESTORATION IN SLOW TERMS, EMERGENCY AND RECOVERY SLOW: THE CASE OF POST-WAR IN SARAJEVO

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ABSTRACT

This paper is dealing with the case of restoration process in postwar Sarajevo, related to slow term restoration approach.
Contemporary approach to preservation of built heritage requires multidisciplinary interaction, team work of scientists of different branches in order to make valorization, preservation and usage of heritage on proper way and optimization of the intervention.
The best way to preserve a historically valuable building is if you can make the house owner be aware of the values of the building, that he gets the needed knowledge how to maintain it and that he is proud of being the owner.
The use of traditional crafts, techniques and materials that are facing the threat of extinction, is one of the important elements in the process of the built heritage protection. A full understanding of the structural and material properties of the building is required in conservation practice. Information on the structure in its original state, on the techniques that were used in the construction, on the alterations and their effects, on the phenomena that have occurred, and, finally, on its present state is essential.
The uniqueness of historic structures requires the organization of studies in precise steps that are similar to those used in medicine. Therapy should address root causes rather than symptoms.
Main goal of management plan is to set up the conservation and development dimensions in relation to sustainability. Each intervention should be in proportion to the safety objectives set, thus no actions should be undertaken without demonstrating that they are absolutely necessary.

Keywords: *Slow term restoration, Historical values, Management plan, Traditional crafts, Maintenance*

1. HISTORICAL VALUES AND SAFETY

Monuments are precious things that must be respected, and altered as little as possible. These observations could lead to contradictory decisions, at times accepting a higher degree of risk in order to avoid or limit changes to the original concept. This conscious respect for tradition stood in the way of eliminating the risk of collapsing.
The best way to preserve a historically valuable building is if you can make the historical heritage properties owner to be aware of the values of the building, see to that she/he gets the needed knowledge how to maintain the building and that she/he is proud of being the owner.
It is also important that the building is used and that it is used in a way that respects the historical values of the building.

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1.1. Contemporary interventions in historic centre of Sarajevo

Bosnia and Herzegovina holds a unique position in Europe. Country that shares its history with the Western Balkan and Mediterranean European countries has been recognized as a bridge of cultures between East and West, with its capital Sarajevo. Our efforts are focused on improvement of architectural rehabilitation of the Bosnian capital Sarajevo, a city with very long tradition, in order to attract investor's attention to realize that spirit of life lies inside the heart of the old downtown. Until recently, conventional education for architects and civil engineers provides little or no guidance for maintenance and protection of existing buildings. A huge number of historic structures are still being damaged by nonprofessional treatment.

All historic buildings have undergone several modifications in their lifetime. These modifications were alternating performed with periods of relative inactivity and negligence. Typically, minor repairs were carried out periodically. Maintenance, renovation and modification are usually performed occasionally. There is of course a constant pressure to some values and contributions that heritage makes to society. The loss of historic urban tissue of the old town in Sarajevo happened during the last war. The old town suffers from preconceived notions of what a structure in the old town should looks like and this paved the way for the spontaneous "uncritical regionalism" or nostalgic concepts that seem to lack the strength and credibility of their arguments. In order to be evaluated as appropriate, a contemporary intervention should meet the following criteria as: physical protection of a historic building or complex, including conservation and restoration actions, active preservation of a historic building or complex, incorporation into the modern urban matrix and permanent use. Therefore, it is necessary to perform appropriate revitalizations and interpolations. It is also possible to conclude that the contemporary interventions, like interpolation, have mostly contributed to the urban dissonance and degradation of the historic core, changing the essence and integrity of the historic heritage of Sarajevo. The historic heritage from the Austro-Hungarian period is endangered in two ways. First, according to Regulation plan from 1975 it has been planned elimination of almost the entire old building complex from the historic core. Secondly, it is also endangered by physical elimination of the parts from the wide area of the historic core in order to free space for the contemporary interpolations. The level of the common culture, knowledge and consciousness about the necessity of protection and preservation of the historic core is very low, as well as the competence of most architects involved in decision making. Long-term inappropriate contemporary interventions in the historic core of Sarajevo that cause ambient and urban disproportion have been happening. Degradation of the historic heritage manifested through disproportional structures, inappropriate solutions and forms of the modern architectural building changing essence of the historic core.

2. MULTIDISCIPLINARY APPROACH

The restoration of heritage properties is dictated by need, use, and available resources. Several people with a range of specializations must be involved, in particular: the investor or occupant/beneficiary, architects and town planners, civil engineers from various specialist backgrounds, primarily structural and geomechanics, surveyors, geologists, conservers and restorers, archaeologists and art historians. Each of these will have his/her own view of the solution, particularly as regards the priorities, extent and order of the necessary works.

The investor's aim is to achieve the desired objective at minimum cost, particularly when there is to be a change of use from the original use of the property, for example into a catering establishment, so as to recover the investment as quickly as possible and to make a profit thereafter.

The architect indubitably plays the leading role, usually also acting as project design and implementation coordinator. This means that he/she will be expected to have extensive and comprehensive knowledge of the wide range of problems involved, and will bear the greatest responsibility.

By the nature of their work, conservers and restorers are involved as required once a detailed project has been drawn up. Art historians must also be involved in defining the project, since the artistic valorization of the building or ensemble depends on their professional opinion.

3. METHODOLOGICAL FRAMEWORK

Successful realisation of any task assigned, including the reconstruction of damaged, or neglected buildings, requires methodical approach. If we are considering buildings of cultural-historical heritage, methodology of their reconstruction is set in more strict form than the one of ordinary buildings.

Table 1 Framework methodology for restoration

investor/manager of the property- project task ↓
draw up project documentation (selected design company) ↓
review ↓
selection of contractor – guarantee ↓
implementation ↓
supervision investor ↓ project designer
technical inspection of completed works

Confirmation of this statement could be found within the legal regulations which, underlying the importance of cultural-historical heritage, specifically define what kinds of objects these are.
Starting from the assumption that a valid detection has been preformed, including the detection of building damages and defined cause of it, and considering buildings' function(s), it is possible to make a decision on measures to be taken in order to restore building's functions, or in other words to make a decision on their future status. There follows a framework methodological approach to the implementation of restoration works on heritage properties or groups, which will be developed in greater detail at a later stage.

Table 2 Analogy health and structure

HEALTH	**STRUCTURE**
prevention	properly designed project
pathology	structural damage
examination and diagnosis	detection and diagnosis
CURE	**ELIMINATION**
conservative	repair
radical/aggressive	reconstruction
none/no treatment	demolition

4. PROJECT DOCUMENTATION

Along with implementation, this is the fundamental and most complex task regarding to the restoration of built heritage. Compiling the project documentation entails a range of activities that underpin the concept on which it is based.
Research or preparatory activities form the starting point of this range of activities, the most important of which include:

- Bibliographical research**,** an indispensable component of the preparatory activities, providing the project designer(s) with the initial data that enables them to create a picture of the building, as true as possible, and the historical background of the property up to the present day.
- Observation of the current condition of the building and its surroundings. Several separate observations must be carried out jointly with all major participants in the compilation of the project documentation and with each individual team member.

As has been demonstrated in practice, the first impression may also be the final impression, and hence any omissions or oversights will have an adverse impact on the completion of the task.
It must therefore be comprehensive and thorough e.g. it must cover the following areas:

- Regardless of whether there are any earlier drawings of the building, a detailed survey of the entire building is essential, along with its immediate surroundings. These geometric data must be very accurate, to avoid the need for additional surveys at a later date. The surveys should record and describe not only the details of the site, but also all damages observed, deviations, sagging of the interstorey structures etc.
- As a rule, this requires not only the removal of the outer cladding or even of parts of a wall to determine the depth of cracks but also, if there is any suggestion of subsidence, exacavations around the building or to the depth of the foundations.
- The bearing structure of the building must also be accurately identified. Even at this early stage of investigative works it may prove necessary to secure certain structural elements, or even the entire building, to prevent it from collapsing.
- Elements that need reinforcement or conservation can be identified during the initial visit, and measures can immediately be made to take the necessary steps to facilitate the load.
- It is very important at this early stage of observation of the building to determine the type of binders (mortar) used in the masonry structures, together with other structural connections.

It should be obvious that all this must be carried out with the greatest attention, accurately and systematically, since the data, and any works carried out at this stage, form the basis for drawing up the project documentation. Once all relevant data have been collected, work may begin on designing a renovation project, which must conform to all current standards for the drafting of project documentation. Though at first glance it may appear to be unnecessary or insufficiently accurate, the preliminary level of observations and collecting data is in fact the most important.
On completion of all these operations, the expert group either adopts an internal resolution on the need for further detection and diagnosis, or agrees that these preliminary findings are sufficient. If the latter, work can proceed on drafting the project documentation for the elimination of the damage.
This documentation should, as a rule, include:

- all the necessary drawings and plans of the building in the found condition, with the position of each instance of damage marked and specified by type, along with a written description,
- methodology by which the damage would be eliminated,
- a bill of quantities and estimated costs of the works to be carried out.

The first visit may be regarded as a preliminary survey, the primary level of detection, since it is very common for further inspections to be required, which also take one to a higher or secondary level, intended to obtain additional relevant information. Then again, as will become clear, the preliminary level may be regarded as the basis for conducting the next, secondary and tertiary investigations, if it should prove necessary. Common to both levels are additional detection and expert diagnosis of major damage. Secondary diagnosis is more challenging than preliminary diagnosis, since it is based principally on accurately identifying the properties of the building materials and checking the quality of constructioning, particularly details of joints and connections.
This type of diagnosis is particularly necessary in the following cases: large, wide cracks in the masonry, extending into the basic building material (e.g. brick), and deviations from the vertical in the case of walls, pillars, piers etc.
All these and similar features suggest the need to take samples and conduct laboratory tests. A proper judgment of the causes of major damage can be formed only once all these activities have been completed, including particularly all laboratory tests, and thereby the proper way to eliminate it. If all the activities listed above fail to produce satisfactory answers, the diagnostic process is raised to a higher level.
It should be said right away that the tertiary level is required only in exceptional cases of damages to outstanding buildings of which the stability has been undermined or which are sinking, as well as where there are series of major damages to a number of buildings on the same site.

5. A MAINTENANCE PROGRAM

A maintenance program is a support for the owner/caretaker of a historically valuable building and the daily maintenance. It describes “What to do and How to do it“ and It shall be done and revised by a professional architect in cooperation with the owner.

5.1. Preservation

The use of traditional crafts, techniques and materials is one of the important elements in the process of the built heritage protection, contributing to its adequate protection, restoration and conservation, as well as maintenance. Traditional crafts used in the restoration of historic buildings were facing the threat of extinction and that they should be supported. A full understanding of the structural and material properties is required in conservation practice. Information is essential on the structure in its original and earlier states, on the techniques that were used in the construction, on the alterations and their effects, on the phenomena that have occurred, and, finally, on its present state.

5.2. BiH experience

The development of the maintenance programs is not integrated in protection regulations of BiH legal system, where maintenance programs are recognized as needed only as a part of the management plan, namely for the applications for the World Heritage List.

5.3. Risk Management

Designers and investors, guided by building legislation, design standards and the construction zone, need to decide on the acceptable risk level and then, bearing in mind the costs involved, to select a method of achieving either full hazard avoidance or an acceptable level of hazard. The following sections deal only with the issue of the hazards of the action of seismic forces, wind load and land subsidence. Designers will also use their judgment in determining the level of protection against a given hazard: the cost of protection as ratio to the probable losses arising during one such incident. In many cases, it is uneconomic to erect a building that will be immune to extremes: earthquake, high winds, fire, etc. Full provision should be provided against hazards with a high probability of human casualties or extensive economic losses. Relevant factors on which the cost of seismic prevention depends are the seismic locality, local ground conditions, the type of structure, and normative aseismic design.

The basic aim in designing seismically active structures is to ensure continuity of the vital functions within the building, prevent human casualties, and reduce damage to a minimum. The earthquake load to be taken into account at the design stage is based on the selected recurrence period, which need not necessarily coincide with the maximum potential intensity of the earthquake expected to occur in the given area, and one must be certain that at that intensity of designed load the structure will not collapse and will suffer only limited damage.

Protection can also be introduced at the design stage of such structures, adhering to the criteria of aseismic design such as determining the level of seismic risk, the choice of alternative design techniques, following generally accepted principles, and taking a view on the expected impacts in zones for which there are no officially verified seismic parameters.

The structural engineers are requested to expertly balance between safety and required duration of a facility, respecting original conceptions and following the philosophy of minimal intervention. It is also necessary to perform accurate estimation of capacities. In order to accomplish a new satisfactory safety level, it is obligatory to take into consideration extent and type of planned intervention. Causes of collapses of ancient facilities are various and they range from insufficient tensing capacity of walls via insufficient continuity of walls, “economical aspect” of original construction, level of technical culture of that era, “extended” duration of the facility, mistakes made while creating the original design, to inevitable tear-and-wear process, especially in wooden and some types of stone elements, etc.

6. STRENGTH AND STABILITY

The primary requirement of the ultimate limit state design procedure is that the structure has adequate strength to resist and remain stable under the worst probable loads during its lifetime.

This includes all critical load combinations, augmented moments from second-order deflections (P-Δ) plus an adequate reserve; study all critical members whose failure may lead to a progressive collapse of part or the whole structure.

6.1. Types and identification of damages at built constructions, classification

Damages of built constructions are classified into two categories:

1. damage of structural elements and non-structural elements
2. damage of main support system

Table 3 Categorization of built structure, on the basis of identified damage level

Category	Description of damage level
First	Facilities with extensive roof damages, demolished chimneys, large areas of cracked plaster on walls and ceilings, as well as numerous cracks on partition walls and smaller cracks on support walls.
Second	Facilities with damaged roofs, partition walls, gable walls, deformed support elements on roof construction, and cracks on reinforced concrete posts.
Third	Facilities with serious damages on their roof construction, posts, partition walls
Fourth	Facilities with their constructional elements damaged
Fifth	Facilities with totally damaged constructional system.

Table 4 Classification of damage to masonry buildings, according to EMS

Grade 1	Negligible to slight damage (no structural damage)
	Hair-line cracks in very few walls. Fall of small pieces of plaster
Grade 2	Moderate damage (slight structural damage)
	Cracks in many walls. Fall of fairly large pieces of plaster
Grade 3	Substantial to heavy damage (moderate structural damage)
	Large and extensive cracks in most walls, roof tiles detach
Grade 4	Very heavy damage (heavy structural damage)
	Serious failure of walls, partial structural failure of roofs and floors
Grade 5	Destruction (very heavy structural damage)
	Total or near total collapse

6.2. Structural assessment of historical masonry buildings

Problems encountered during structural assessment of historical masonry buildings can be listed as follows: great historical and cultural value, aim to preserve aesthetic and cultural value, demands of modern structural codes, new structural element to be added, materials to be used insted of ancient materials, especially seismic codes and last but not list construction methods and procedures now and in a past.

No actions should be undertaken without demonstrating that they are absolutely necessary.

Each intervention should be in reasonable ratio to the safety objectives set, thus keeping intervention to the minimum to guarantee safety and durability with the least harm to heritage values.

Where possible, any measures adopted should be “reversible” so that they can be removed and replaced with more suitable measures when new knowledge is acquired. Where they are not completely reversible, interventions should not limit further interventions.

The collapse of masonry structures under earthquake effect of earthquake actions and characteristics on collapse mechanisms can be simulated. Simulation of full scale masonry structures up to collapse includes: methods, constitutive models and as a last step validation of the models.

Collapse analysis can be used as a flexible and powerful tool to assess the vulnerability of historical buildings under earthquakes and to choose the right structural measures for retrofitting if necessary. Interventions have to be regular and uniform on the structures. The execution of strengthening interventions on limited portion of the building has to be accurately evaluated and justified by calculating the effect in terms of variation on the stiffness distribution. Special attention has to be paid to the execution phase, to ensure the effectiveness of the intervention.

7. CONCLUSION

Cultural heritage are immovable and movable objects and groups of objects of importance for society on account of their archaeological, historical, sociological, ethnographic, artistic, architectural, urban and technical or other scientific or cultural values. The restoration of such buildings is dictated by need, use, and available resources. Coordination is therefore vital and the team in charge requiring a leader. Given the nature of the problem and the need for the widest possible overview of all the needs and requirements involved, the team leader should be an architect, and must be able to make independent decisions.

The entire process of drafting a study on renovation or restoration is not complete, of course, until the causes of the building's deterioration have not been identified. It is essential that these possible causes be carefully identified and analyzed in order to avoid, or prevent, a repetition of the mistakes that led to the present condition of the building. The repair and strengthening of historical monuments should be carried out without introducing any changes or strengthening of the main structural systems. Many monuments and buildings are today a masquerade of reality, the results of art, nature and history combined, brings us towards the question of what we are trying to achieve through their continued preservation.

One of the most significant elements of character is the sense of place, which may be perceived particularly through design, form and color, the spaces and relations between buildings and the users of buildings, all of which combine to produce a distinctive spatial and visual quality, helping to distinguish one place from another and create local identity. A sense of place conveys meaning to the individual about his or her position in the environment, and allows identification with a particular place. In considering the factors which contribute to the character of an area, it may be argued that the retention, rebuilding or replication of particular facades may play an important role in the conservation process. One important dimension of the urban conservation process is the aim of keeping intact townscapes that people understand and can relate to, where the cues and meanings are clear. To have meaning, townscape must be recognizable.

Revolution in constructions, initiated by use of new building materials, resulted in the discontinuity of knowledge transfer about dominant constructional method of that time – masonry. This knowledge and to-then experiences were lost during the time, owing to the fact that the method was based upon empiricism, no written records or data is available on this issue.

The dilemma about the method for damages elimination is as old as human participation in building. This statement is supported by the lack of a general consensus provided by scientific and experts' sources, which concerns methods for elimination of damages. Every effort should be made to conform to heritage protection requirements in the choice of materials and the preservation of traditional details of the original structure. Every intervention results in certain changes, causing further loss of some of the building's authenticity, which means that one must be extremely cautious when deciding on preventive interventions. The risk of possible impacts (usually from seismic forces) on the building under consideration must be taken fully into account, and only then should the decision whether to intervene or not be taken.

The best way to protect built heritage is in fact to ensure that they are kept routinely maintained and inspected. By this it is meant that they should be checked to ensure that no cracks (or any other damages) have appeared (cracks are invariably a sure sign of adverse changes to the property), that any existing cracks have not become larger, and that there are no signs of falling masonry or other building materials, water penetration and so on. In this regard, maintenance may be classed as preventive and corrective, with the use of modern measurement and warning aids to assist in early diagnosis of possible changes to the structure, and the mechanical maintenance of existing equipment in the building.

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