

# Structural Preservation—Priority of the Sustainable Management of Bulgarian Cultural and Historical Heritage Buildings

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**Abstract:** Bulgarian cultural heritage is the most important part of the national wealth and a major factor in the accreditation of the Bulgarian cultural identity. Preservation of cultural and historical heritage valuables of one nation determines its development and presents an integrated project for their use in accordance with the contemporary needs of the society. Sustainable management and adaptation of Bulgarian cultural and historical heritage buildings are a guarantee for preservation of their value, including social, economical, political, scientific, aesthetic, philosophical, spiritual, architectural, structural, archeological and sentimental aspects of this value. Regarding to this, structural preservation presents a priority of the sustainable management of Bulgarian cultural and historical heritage buildings. For that type of buildings, the traditional methods for structural strengthening are not applicable and the development of individual rehabilitation programs is required. They must always reflect the specific conditions and building's importance. The existing technical regulations in Bulgaria are presented and general recommendations for their applications and future development are done. Regarding to the Bulgarian current law and governing regulations, the implementation plan for the conservation and management is presented in this paper. Based on the analysis of the principles of the sustainable management and especially of the structural preservation, some general conclusions are made.

**Key words:** Cultural and historical heritage, sustainable management, structural preservation.

## 1. Introduction

Bulgarian culture whose valuable dignity is the cultural and historical heritage is distinguished from those of the neighboring nations with line peculiarities. Important differences are its rich and diverse cultural heritage and deep cultural layers on which it grows. Due to its special geographic location, Bulgarian land is an intersection of many nations since ancient times. On Bulgarian lands, one of the oldest cultures of Europe and the world occurs. Land of Bulgaria becomes a bridge between east and west, node between two continents and three seas, and Bulgarian

culture—mediator between the cultures of ancient and highly developed nations. All this determines the importance of the Bulgarian cultural and historical heritage not only for the native but also for the European and world culture.

Today in Bulgaria, a remarkable evolution in the perception for the Bulgarian heritage is realized: expanding its content to include tangible and intangible evidence of values, beliefs and traditions; expanding its territorial range—from single monument to historic towns, cultural landscapes and cultural routes; expanding temporal scope to cover the traces from the nearest history. The results of this evolution are three important sides of the new approach to the cultural heritage in Bulgaria [1, 2]:

- Firstly, the heritage, not only individual valuable

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objects in the environment, but also the environment as a whole and its interconnections and context, is determined;

- Secondly, the enhanced content and scope of cultural heritage cause the emergence of a new concept: cultural values (properties), to be characterized by vast variety of valuable objects and links. The most significant of them is protected by traditional legal protection status—culture monument, but it remains a huge variety of cultural unprotected values—not so important, but part of the spirit of the place and its identity. Today, more communities realize their interest in protection of these values unappreciated until now. Under the status of heritage now, the world is understanding not only the limited number of protected sites—monuments of culture, but also the whole set of cultural values—objects and connections protected and unprotected, with role identity place considered as a cultural environment and landscape. Exactly, this is the meaning of the new content of the concept of “landscape” launched by the European Landscape Convention, ratified from Bulgaria in 2000. Under the “landscape”, not only a natural beauty, but also an integrated space is understood: “the result of the action and interaction of the natural and/or human factors”. Therefore, it can be everywhere—in town and country, in developed or underdeveloped areas, areas with no landmarks or monuments. The importance is to be the winner of identity. The landscape is valued as an important factor formation of local cultural traditions, the main component of European cultural and natural heritage, contributing to the consolidation of the European identity;

- And thirdly, the enhanced content and scope of cultural heritage logically lead to the need to expand the scope of the defense. To be protected and unprotected, also, previously cultural values were included in the new action, unconventional tools integrated conservation—a method that converts protection part of plans for socio-economic

development through development plans with regulatory regimes and specific plans for the protection.

The process of sustainable management of cultural and historical heritage in Bulgaria is regulated by the Cultural Heritage Law, the Law for the Protection and Development of Culture, the Law of Regional Development, the Ordinance for the Scope, Structure, Content and Methodology for the Development of Plans for the Conservation and Management of Individual or Group Immovable Cultural Values, the National Strategy for the Development of Culture 2012-2020, and the Plans for the Conservation and Management of Cultural Valuables.

As a part of United Europe, Bulgaria has to conform also with the international regulatory documents as a convention concerning the protection of the world cultural and natural heritage (UNESCO (United Nations Educational, Scientific and Cultural Organization), November 16, 1972) and related to its recommendations. The international conventions are subject to ratification, acceptance or accession by member states. They define rules with which the states undertake to comply. Recommendations are instruments in which “the general conference formulates principles and norms for the international regulation of any particular question and invites member states to take whatever legislative or other steps may be required in conformity with the constitutional practice of each state and the nature of the question under consideration to apply the principles and norms aforesaid within their respective territories”.

The concept of sustainable management of cultural and historical heritage for development is generally understood as encompassing three interrelated dimensions: environmental, social and economic sustainability that “meet the needs of the present without compromising the ability of future generations to meet their own needs”. The relative importance of each of these components may change from time to time and in different circumstances, but

in the long run, each of these must be fulfilled for sustainability to be achieved.

The World Bank uses a broad definition of physical cultural resources: “movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archeological, paleontological, historical, structural, architectural, religious, aesthetic, or other cultural significance”. The World Bank also recognizes that “physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development, and as integral parts of a people’s cultural identity and practices” [3].

The cultural and economic values of historic preservation have become widely recognized and have moved preservation issues into the forefront of public policy and popular interest. The most sensitive aspect of the preservation of existing buildings is their structural preservation, i.e., their structural viability. Preservation of heritage buildings is a way of sustainable development and also an act of culture.

## **2. Interventions on Cultural and Historical Heritage Buildings**

The sustainable management of cultural and historical heritage buildings generally aims to extend the life of the buildings. Longevity of the buildings includes the valuation of the physical characteristics of cultural heritage (the construction materials of historical buildings, the structure, the objects of material culture, etc.) and their continued existence in good condition. The general concept of preservation relates to the safeguarding of cultural and historic resources. The degree of the significance of the resource relates to its values. These values include social, economical, political, scientific, aesthetic, philosophical, spiritual, architectural, structural, archeological, sentimental, age considerations and so on. Some of these resources may have a limited value in the present but can increase exponentially in the future [4].

According to Ref. [5], it is possible to have four different levels of interventions on the existing heritage buildings for extending their lifetime:

- Preservation includes the measures necessary to sustain the existing form, integrity, and materials of a historic and cultural buildings and structures. Preservation work generally focuses on the ongoing maintenance and repair of historic fabric rather than extensive replacement or new structure;
- Rehabilitation is an approach for best adaptation and compatible use of a building that has a long period of use than a precise moment of historical importance through repair, alteration, and additions, while preserving those portions or features that convey it’s historical, cultural, or architectural values;
- Restoration focuses on the retention of materials from the most significant time in a property’s history, while permitting the removal of materials from other periods. Restoration presents accurately depicting the form, materials, features, and character of buildings and structures as it appeared at a particular period of time. Restoration retains as much of the historic period fabric as possible;
- Reconstruction establishes limited opportunities to recreate a non-surviving site, landscape, buildings, structures or objects in all new materials.

All these modes of conservation demand a very rational and scientific approach which starts with a study of structural integrity and takes the course of determining the causes of deterioration, planning the corresponding remedial measures, selecting compatible repair and restoration materials, site planning in consonance with the objectives and meticulous execution with the help of qualified contractors.

## **3. General Concept of Assessment and Preservation**

The preservation and protection of the cultural and historic heritage buildings is a systematic process of inquiry learning, identification, documentation,

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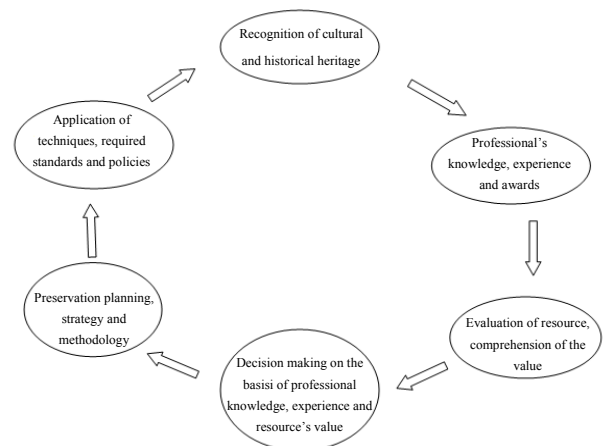
registration, conservation, restoration and adaptation. The protection of cultural and historic heritage is a system of measures to ensure its preservation for the public interest [6, 7].

The cultural and historical heritage buildings can be viewed as a work of art representing its own time. It represents the culture and techniques of time along with the sentiment, intent and conscience of its designer, artist or craftsman. What is essential to any work of art or part of cultural and historical heritage is the recognition of its values and significance by individuals or the society.

When recognition of a work of art registers in an individual or a professional (such as a historical architect, historical landscape architect, archeologist, curator or craftsman), that is the moment when the values of the object or structure are fully appreciated and recognized. The recognition and comprehension of the cultural and historical heritage values also has a direct relationship to the knowledge, awareness and experience of the professional person or individual. This recognition influences the selection of the method, policy and degree of intervention and the approach towards the preservation of cultural and historical heritage. This recognition should create a connection between the cultural and historical heritage and the professional's intelligence, knowledge, experience and comprehension of values, decision-making and selection of preservation methodology, and application of techniques (Fig. 1). The presented cycle or thought process takes place several times during the preservation of the cultural and historical resources.

Recognition of the values and significance of the historic/cultural site, the historic/cultural structure or the work of art dictates the fundamentals of the planning and the procedures of the preservation are not determined/fixed until the cultural heritage is more studied and understood.

Regarding to the Bulgarian current law and governing regulations, the implementation plan for the



**Fig. 1 Process of preservation of cultural and historical heritage.**

conservation and management includes:

- (1) general requirements and recommendations for the implementation of activities to implement the plan;
- (2) powers and duties of the authorities, the expert advisory board and specialized personnel in the implementation and execution of programs, plan and projects;
- (3) projects: identification, name and description of the project; budget and sources of funding; officers and partnerships; stages of implementation; system for monitoring, reporting and control;
- (4) long-term program for implementation of the plan forecast period of 20 years: long-term vision for conservation action, maintenance, use and presentation of real cultural value and its historical, cultural and natural context; long-term vision for the cultural and socio-economic development of the territory covered by the plan; estimates and funding sources; periods and implementation mechanisms; system for monitoring, reporting and control; timely reporting on specific indicators of need for changes to the plan; forecast for resizing;
- (5) five-year program: necessary activities for the period; necessary costs and sources of funding; action plan for implementing the program; monitoring, control and reporting of performance on specific indicators and marks;

(6) one-year work program: tasks and activities for the period; responsible persons and an annual budget; schedule for implementation of the program; monitoring, control and reporting of performance on specific indicators and benchmarks; review of the objectives; review of programs; determination of future projects; determining the next one-year work program.

#### **4. Principals of Sustainable Management of Historical Buildings**

The structural preservation of heritage buildings should be organized as a part of a program of adaptation of the building in the contemporary conditions. The adequate adaptation should be a priority requirement of the structural preservation and should fulfill the following principles [8, 9]:

(1) Feasibility analysis of the project. It is the first step and aims to present the possibility to realize the idea of the sustainable reuse and adaptation. For historic building renovations, to evaluate minimally invasive alternatives, especially in the structural elements, requiring the least amount of change to character-defining features, should be made sure;

(2) Project planning. The project timelines and scopes of work should be structured to allow for ongoing collaboration through meetings among the historic preservation and sustainability specialists and other critical team members. Building facilities staff and others knowledgeable with a historic building and its uses should participate in discussions about existing building conditions, operational standards, and ongoing maintenance needs;

(3) Conceptual design. The agency lead reviews potential concept designs with the architects and structural engineers and, if necessary, the historic preservation specialist should identify the effects that those design options may have on the character-defining features and significant spaces within the historic building. Meanwhile, the agency lead should continue or initiate discussions to keep

sustainable historic projects on schedule, especially for those projects that involve new construction or substantial alteration;

(4) Design development. As the agency lead works with the architect and the structural engineer through design development, the historic preservation and sustainability specialists should attend project meetings to ensure that the design solutions will comply with acting standards, sustainability goals and sustainability certification requirements. The design project should present the best structural solution [10]. The performance of the structure is very important for the following steps of the sustainable adaptation. First, a detailed assessment of the existing structure is necessary. The results and the conclusions are decisive for the future interventions. If necessary, a new structure should be designed. The project for the sustainable adaptation should be prepared according to the following: compatibility of the structural solution with the existing structure, limitation of the damages and design of appropriate foundations—improvement of the existing and construction of new foundations if necessary;

(5) Construction. Special inspection tours may be necessary to ensure correct execution of the project and effective protection of significant spaces or character defining features in the case of historic building. Design specifications should be provided to all specialists prior to materials purchasing. The opportunity to review and comment all the changes should be given to the specialists during the construction phase;

(6) Completion. Specialists should attend a special tour to identify any concerns and confirm compliance with requirements, including sustainability certifications. The building facilities staff and the design team including the architect, engineers, historic preservation and sustainability specialists should collaborate to develop a maintenance manual that addresses ongoing building system operations, sustainability measures, etc..

**5. Structural Preservation of the Buildings from the Bulgarian Cultural and Historical Heritage**

The main objective in the case of the structural preservation is related to the solution of the problem “safety versus the authentic historical preservation”. To meet new building standards, preservation without severe impact on the cultural value of the building is generally impossible. Whether to preserve the cultural value as close to the historical original as possible and take the risk or to assure the safety of the people and the continuing existence of the building in time, accepting the unavoidable changes, or indeed decide something in between? There is no generally applicable answer and the decision should be based on the specific situation. A few main objectives should be considered.

*5.1 Condition of the Building*

If the building is well preserved, it indicates that it have withstood the test of time and, therefore, its structure is adequate and could be trusted to be safe, even if it does not meet current code provisions. Is it strictly necessary for a building from the cultural heritage to have the same capacity as a new building? Some advanced codes recommend that the building should be considered safe if it has a certain portion of the capacity, required by the standards for new structures. It all depends on the level of risk, that is considered acceptable by the authorities.

*5.2 Cultural Value of the Building*

If there is a need of any structural interventions, they are to be chosen with great care so that any impact is minimized. Unconventional methods might be considered. The members of the team that is to choose, design and execute the interventions should be skilled experts with experience in similar tasks.

The actions carried out for the structural assessment of the building and structures’ preservation should be undertaken in the phases of the structural assessment

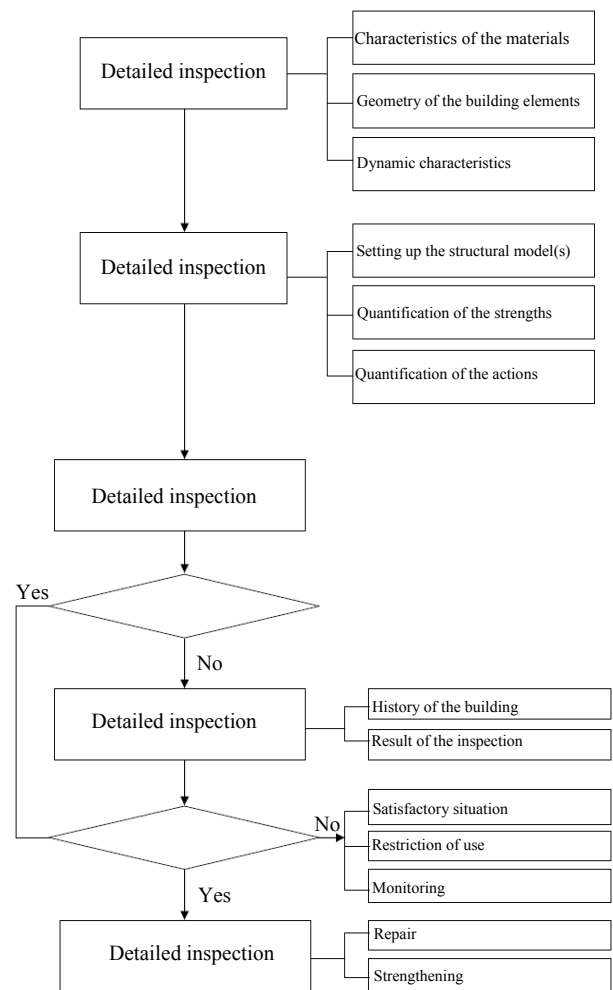
(Fig. 2) and documented in a report, in which all considerations and justifications for the options and decisions taken should be presented.

*5.3 Current Use of the Building*

The “form” of the historical building defines its function, that is to say that the use to put in should be consistent with its architectural and structural properties. Nevertheless, sometimes the significance of the function of the building (that might be its original function) prevails over its cultural value.

*5.4 Continuity of History*

Most buildings are not “frozen in time”—they are living and changing through the years. It is very



**Fig. 2 Flowchart of the actions in the phase of the structural assessment of the building and structures’ preservation.**

important to define whether and which of these changes are (or would be) a part of the cultural value of the building or on the opposite—they violate its historical integrity. The main question here is why the building is valuable. If it is historical monument of an event (or a chain of events) that happened in it, or is the dwelling of a historical figure, or represents relatively short historic period or certain architectural style, then any interventions that have happened after the considered period or that are planned, should be considered a violation of the history. If the building is valuable because of its function over the years, or because it represents the development of a society over a relatively long period of time, or because it has architectural or structural value on itself but no any particular historical significance, then any changes through the considered period (which may or may not extend to the present) should be considered continuity of history. In this sense, in many cases, alterations and interventions are just a stage of the development of the building, a new page in its history. Of course, they still need to be chosen, designed and executed with great care, so they “fit” into the overall look of the building. It also need to keep in mind that the sustainable management is to make some changes to a building that has certain cultural value, even if they are significant, and keep it living this way, than to leave it into ruins or even demolish it.

The preservation works can be generally categorized into two kinds:

(1) Repair. When the purpose is simply to restore the load-bearing capacity of the building elements;

(2) Strengthening. When the purpose is to increase the load bearing-capacity and strengthening measures are adopted, their efficiency should be demonstrated through the modeling of the building.

The design of the work for the structural preservation of heritage buildings and structures consists of written documents and drawings to enable the execution of the works.

The design can be developed in phases, as for new

buildings (preliminary design, technical design, detailed design, etc.), but in general, it is developed in a single phase after, and as a consequence of the structural assessment that has been carried out on the building. The structural assessment of heritage buildings presents the evaluation and deciding of its structural safety. It is an essential phase of the preservation, phase of determination of necessity measures and its extent.

The structural assessment of the building is usually based on the modeling of its structural behavior, in which, as for new buildings and structures, through certain hypotheses, the effects of the actions on the building and structures are determined and combined, being the results compared with the strength of the building and structures (or in strategic points of the building) [11]. However, due to the specifics of heritage buildings, there are substantial differences in the procedures to be used on both the structural modeling and on the safety verification, in comparison with new buildings.

Concerning the structural modeling of the heritage buildings, the results obtained are, in general, less reliable. Concerning the safety verification, specific issues also arise. In modern codes, the uncertainties, both on the side of the strength of materials and on the side of the actions, are taken into account through the application of successive safety coefficients, which lead, in practice, to a high safety level on the buildings and structures.

Finally, the decision-making is always a complex problem in all cases of rehabilitation of existing structures. It has to be based on objective evaluation by different criteria—social-economic, architectural and structural. In the case of heritage buildings, in addition to the common criteria, there are a few others: transparency of the interventions; reversal of the interventions; compatibility of the interventions; durability of the new materials/structures; avoidance of historical forgery [5].

The choice of the solution to be adopted for an

intervention of preservation should be justified and be the object of cost-benefit analysis, in order to provide an efficient design at a cost as low as possible, whilst respecting, as much as possible, the cultural value of the building and structures.

The works proposed for the intervention should be accompanied by detailed specifications for their execution, namely about the materials to be used and their conditions of application, the phases of execution, and the equipment necessary. An estimate of the cost of each work, established in a realistic way, should also be included. In the case of buildings that continue to be used during the execution of the works, the fact should be taken into account in the establishment of the phases of the execution and in the estimate of the costs.

The huge research effort carried out around the world, during the last decade, with the purpose of evaluating the performance of solutions for the preservation (repair and/or strengthening) of structures, in particular of heritage buildings and structures, should not be overlooked. As a result, there are, nowadays, multiple solutions that have proved to be efficient for the repair or the strengthening of heritage buildings and structures, depending on the defects to be corrected.

Bulgarian cultural heritage in general is treated<sup>1</sup>. It is defined that all interventions (with the exception of some unobtrusive ones) on buildings from the Bulgarian cultural heritage are to be approved by National Institute for the Immovable Cultural Heritage. There is not, however, in this law or in any other legislative document, any specific reference to the assessment and retrofitting of heritage buildings, with the exception of a single paragraph in Ref. [12]. Ref. [12] treats design of structures in seismic areas.

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<sup>1</sup>Bulgarian regulatory documents: Cultural Heritage Law, the Law for the Protection and Development of Culture, the Law the Spatial Development, the Ordinance for the Scope, Structure, Content and Methodology for the Development of Plans for the Conservation and Management of Individual or Group Immovable Cultural Values, the National Strategy for the Development of Culture 2012-2020, and the Plans for the Conservation and Management of Cultural Valuables.

Article 6.1 [12] treats the seismic assessment of existing buildings. Article 6.4 [12] allows in the case of heritage buildings variance with Article 6.1 [12] but the degree of variance is not clarified.

Another legitimate code concerning assessment and retrofitting of existing buildings in Bulgaria is Eurocode 8-3 [13]. However, it does not address the specific case of cultural heritage. Other codes and guidelines that could be used as a reference are, for example, Refs. [14-24], etc..

## 6. Conclusions

The conclusions drawn are as follows:

(1) Recognition, professional knowledge, experience and awareness, evaluation of cultural and historic heritage, comprehension of the values and ultimately proper decision-making are fundamental factors for preservation planning and approach toward the protection of cultural and historical heritage;

(2) Preservation of cultural and historic resources can take place in many different ways. It all depends on the recognition, sensitivity, experience and awareness of the professionals and the planning, procedure and methods they ultimately choose;

(3) The first principle for the protection of cultural and historical heritage buildings is its permanent maintenance;

(4) The original design, configuration, materials, character defining elements and the technique or techniques of construction originally utilized to bind them together should be respected, protected and preserved. The project for historical buildings must take into account the position of the building, the type of structure and materials used, the constructive system, the damages in the structural elements, etc.. Sometimes the change of those factors may make the project infeasible;

(5) Older design concepts mostly focused on the effects of gravity loads and they did not dedicate enough attention to provide the lateral resistance and ductility. Most of historic buildings provide limited ductility when subjected to seismic action;

(6) Using the existing structural elements sometimes is a very expensive solution and very often this solution is contrary to the original vision of the historic buildings;

(7) Sometimes, the innovative technologies for retrofitting show that those solutions are not suitable for every case. Technical and economical reasons can be leading in the final decision for seismic retrofitting;

(8) The most important factor for the historic buildings is occupancy. The inappropriate occupancy may dictate inadequate interventions;

(9) Every effort, including thorough research, should take place to ensure that the preservation intervention does not diminish or change the character, integrity, authenticity and the values of the cultural and historical heritage.

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