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THE REHABILITATION OF COLLECTIVE RESIDENTIAL BUILDINGS

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Abstract. The subject of rehabilitation and regeneration of the collective residential ensembles, characterized by a high level of physical and ethical wear and tear, has been the subject of interest for the contemporary society and not soon after 1990’s represents a matter of interests for Eastern Europe itself.

Beneficiary of an impressive building stock, of which a significant percentage being constructed using the prefabricated panels system) Romania becomes more and more interested in the subject of rehabilitation.

Therefore it is proposed a peek and a definition into the concepts of restoration, rehabilitation, restoration, urban rehabilitation with a breakdown of the process with all its components (architectural, structural and hygrothermal rehabilitation). Also in addressing the theme of rehabilitation there are specified the necessary steps to be taken to ensure the success of such interventions.

Key words: rehabilitation; urban and architectural landscape; collective residential buildings of big prefab panels.

1. Introduction

The subject of rehabilitation and regeneration of the collective residential ensembles, characterized by a high level of physical and ethical wear

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and tear, has been the subject of interest for the contemporary society and not soon after 1990's represents a matter of interests for Eastern Europe itself.

Beneficiary of an impressive building stock, of which a significant percentage being constructed using the prefabricated panels system), Romania becomes more and more interested in the subject of rehabilitation. Precast concrete panels construction systems have been used in more than two fifths of households in urban dwellings constructed until 1980, and more than fifty percent until 1990.

Renovation, rehabilitation, restoration, regeneration are words used lately very often. Their own meaning can be sometimes misunderstood, especially when associated with various phenomenons. Regarding these aspects it seems more and more useful that new definitions of the processes mentioned above to be given as clearly as possible, before discussing their different practical approaches in foreign countries.

2. Restoration

Restoration involves an ensemble of scientific procedures, based on preliminary documentation, which aims to reinstate an aspect as close as possible to the original one which belongs to building, a piece of art, of archaeology, ethnography, etc., as well as blocking the destructive processes and removing the caused damaged, by using appropriate methods and proper materials specific to each field.

This process works on buildings with undeniable historical, artistic or sentimental value, and demands detailed studies that require special and delicate techniques (which sometimes demands studying old construction techniques), usage of proper materials, which are sometimes extremely rare and most of the time very expensive.

3. Urban Regeneration

During the last 40 years in the European cities, more than any other time, a series of theories and experiments were initiated. One of the reasons of initiating theories and experiments was the radical restructuring of the city's economic base; the city stopped being a production center and has undergone a transformation directed towards services and consumption. The second reason is the process of decentralization or suburbanization that extracts several functions from within the town towards the periphery.

Public policies respond to both problematic issues through a process called *urban regeneration*. This process is described, with a great level of detail by Chris Couch, who teaches urbanism at Liverpool John Moores University. Charles Fraser and Susan Percy, both teachers at South Bank University, in *Urban Generation in Europe*.

Urban regeneration means the intervention of public authority in urban areas that are in difficulty, which are located in an established urban framework, but fail to get out of a continuous process of degradation. This requires a partnership and dialogue between local government and local community, only together having the ability to achieve an effective plan of action with real effects in everyday life.

Urban regeneration is “an ongoing effort for both urban planning and for social, cultural and environmental aspects, and aims to maintain, recover, improve, restructure and sanitation built areas within municipalities” (*Urban Regeneration Law*, Holland).

“Urban regeneration occurs only in an area that works under certain conditions, its essence being reconsidering for superior comfort, but also a positive change in positive aesthetics.” This definition is provided by prof. dr. Alexandru Sandu, Dean of Faculty of Urbanism, „Ion Mincu” University of Architecture, during one of his lectures regarding this subject.

Urban regeneration can have different definitions corresponding to the countries policy where are to be implemented to, and, more importantly, to the issues addressed by this process, however, the unifying element of all this policies being the involvement of public authorities.

4. Renovation

The action of renovating and its outcome, renovation, is a collection of technical papers, partial or general, made on an existing system (machines, buildings, equipment, etc.) without essentially changing the destination, in order to improve it in terms of comfort, of use, hygiene, aesthetics, etc. (Romanian Academy, 1996). The process is designed as a series of activities for recovering the bearing capacity, improve performance, extend life of existing buildings or facilities with sufficient quality. Activities include repair, strengthening and rehabilitation of old structures or damaged in order to increase the life of buildings.

In terms of engineering, renovation of concrete structures is quite a recent process. The purpose of redevelopment refers to an understanding of the degradation process, and involves the development of structural assessment techniques (such techniques must be non-destructive and fast). Also functional interventions, economic considerations, are not neglected and especially the establishing of reliable maintenance procedures.

5. Rehabilitation

Rehabilitation is the process of repairing a system that is in a poor condition. This is an improvement by upgrading (of a structure with major

damage) necessary for meeting the present needs, involving sensitivity to the construction and initial construction nearby. (Zongjin *et al.*, 2009) The operation consists in introducing new aesthetic or comfort elements, and improving the structure; it aims to improve the indices or indicators of determinants of the quality of housing construction to transform the circuit used to play every day. For instance, in France, around 1970, the National Agency for Habitat Improvement and Private Funds was created. Its goal was to help the regeneration process through a governmental program.

Priorities and emerging needs of those who live in these ensembles are the most important topics discussed and the solutions that must be found make reference primarily to solve them and then the other purely technical problems – structural, aesthetic, etc.

In broader terms less polemic, we can say that rehabilitation provides an opportunity not only for questioning the use of values but for questioning the aesthetic meanings of architecture, without functional significance being excluded. Moreover, in many instances this would be a challenge for architects, challenge that should not be denied especially in the poor global economic situation.

Sociologists use the term “architectural field” for explaining the assembly of social forces which opens a new path into social housing rehabilitation (Bourdieu, 1991).

Large residential ensembles (with particular reference to those built after 1960) generally suffer from a lack of original design, which requires the need of a large number of interventions to improve urban impact, especially for improving housing quality. However, it should be taken into account the fact that most of these ensembles have been designed for no more than two generations and in the future other districts should have taken this role. In France; this grace period is estimated at about 60 years.

Under these conditions, rehabilitation can be defined as a process of intervention on certain buildings that should not be limited to the most spectacular element and if in these precise areas, the rehabilitation is facing real questions about the concept, it would be a pity not to be placed in a wider context. The disfunctions observed in a number of buildings (bad sealing, infiltration, cracks in parament, degradation of facilities, etc.) are most often the results of poor maintenance. This is largely due to the fact that the owner (in most cases, state) did not engage consistently and constantly in correcting these deficiencies. Essential for this phenomenon is that the rules of construction and comfort are totally obsolete. These phenomena have been noticed on many of the great ensembles, and maintenance and repair techniques are quite expensive.

In the rehabilitation process occur phases of design and implementation of steps and components necessary for the safety of successful interventions, their purpose being to improve the quality of housing, upgrading architectural

and urban housing or assembly, improving the social climate and increasing the sense of social responsibility, reducing energy and polluting emissions.

The integrated rehabilitation process involves many directions and objectives namely

A. Construction and technical equipment that refer to improving energy consumption and reducing the operating costs and maintenance ones.

B. Architecture – functional and aesthetic improvements so that the final result is the increasing of the quality of housing.

C. Public facilities overall – improving facilities, equipment, housing and complementary facilities and increasing the availability of housing facilities and improvement of their qualities.

D. Social life – improving the conditions of social and community life, conflicts reduction and improvement of the decision making by the community.

E. Legislative and financial framework – the form of house ownership, legislation and funding that can be public or private are very important.

All these elements have as purpose better quality of life, environmental and economic sustainability and, of course, rewarding housing. Homes no longer meet the usual needs of a family: significantly lower surface area rules comparing to the ones modified by law, insufficient sized sanitary convenience items, boring plastic arts solutions of façades, etc.

Conducting rehabilitation process involves not only the construction and design interventions but also the involvement of local government.

Regeneration and rehabilitation policies should be determined and undertaken by local governments when it comes to their funding in a certain percentage, if it is strictly referred to hygrothermal rehabilitation and approval of all work.

6. Architectural Rehabilitation (Aesthetical and Functional)

Rehabilitation has two vital components for the success of the operation. The first intervention should be the functional one. Approaches must be the most complex, considering the structural and facilities implications. The success of the operation is directly proportional with the approach, but it depends also on the architects skills. The second component refers to aesthetic intervention

Improving the aesthetics of the façades is not just for correcting their dullness, but for professionals it may seem like an opportunity to see a different integrated architecture that includes solving specific problems however with a combined response to the interrogations resulting from sociological studies and beyond. Applying a decorative plaster after hygrothermal rehabilitation is a minor intervention, the real approach implying actions beyond the rudimentary of a simple colour change (Fig. 1).

Another series of studies made so far highlight a formal development of these compounds.



Fig. 1 – Deficitary urban composition of multiple architectural elements (collective housing, single dwelling, industrial elements, etc.).

7. Principles

a) Rehabilitation is a social, economic, architectural and urban problem, and not just technical.

b) Housing means not only buildings, but also the related space. Collective housing means not only land and buildings, but use, identity, rules, and public space should not be seen only as a legal and administrative category, but as a place of community.

Functional rehabilitation may be accomplished considering that an intervention on the structure is possible. For buildings made of large panels this type of intervention is more difficult given that any action on the structure has important implications. Practically almost the impossibility of modifying the structure leads to a diminished set of interventions.

8. Structural Rehabilitation

The degradation of the concrete usually starts from the surface materials and then move on to the structure (Fig. 2). The causes of this process can be of different nature: physical (caused by natural variations, thermal – freeze thaw cycles, etc.), artificial (produced by fires or natural disasters–earthquakes, etc.), abrasion, chemical (acid ion attack, sulfate, ammonium ions and magnesium salts, etc.), biological (biogenic attack), mechanical (impact, explosion, overload, etc.). In practice these two processes can occur simultaneously, so much on the material, as well as on the structure, the cause being different. The most serious is the corrosion of concrete which may create cracks that can lead to peeling – not a very happy situation.



Fig. 2 – Different types of degradation on different levels (structural, finishings, etc.).

From a civil engineering point of view, “rehabilitation of a building refers to the return at an active status by rebuilding some of the functions that were damaged during the utilization from different causes” (Budescu *et al.*, 2003).

Building rehabilitation must be a constant concern of civil engineers primarily due to degradation that may occur over time or due to the effect of aging of the materials as well as the effects of extraordinary actions. Earthquakes, wind, technological processes, aging of materials, the phenomenon of fatigue, and the usage of the buildings are main determinants contributing to the degradation of structures. This component is particularly important in the complex process of rehabilitation.

Structural rehabilitation may be achieved by

a) The change of the building – possible only if the structural system is not strongly affected, and by passing to a lower class of importance safety requirements could be fulfilled.

b) Replacement or partial modification of the building – it refers the exclusion of the construction, functional changes involving structural interventions, reducing the number of levels, interference volume by insertion of decorative elements and not only, etc.

c) Local structural restoration – it may be applied in the situations where only certain elements of the structure are damaged and common measures of intervention may be used.

d) Structural change – can be achieved by introducing structural elements adjacent, which together with the structure form another structural system, or by changing the structural concept in other processes that may increase operational safety.

Structural rehabilitation requires crossing of a series of steps. First of all a building expertise is required, operation which reveals the structural system status, diagnostic of the used materials state and experimental diagnostics of the system restored. The next step is the establishing of intervention measures, their design and execution of structural rehabilitation.

The construction rehabilitation involves interventions on the structure, infrastructure and the external causes.

The interventions on the structure involve changing of the static system structure which aims the discharge of the foundation, to reduce structural loads and to damp vibrations. Infrastructure interventions involve widening the area of the sole foundation, deepening and strengthening the foundations by underpinning pillars, building foundations by injection, reinforcing perimeter, anchors. Interventions on external causes involve land consolidation by compacting, sealing it, burning, freezing, reducing loads by reducing permanent tasks, changing of the static system by working on vibration dampening, insulation the construction, planning of the land around the building, repair of the vertical facilities.

8. Hygrothermal Rehabilitation

Also, an important issue in the complex process of rehabilitation is the hygrothermal rehabilitation. Hygrothermal rehabilitation of a building is a set of technical measures applied on the envelope components on which problems arose on the quality of indoor microclimate in order to improve their performance in the heat transfer behavior of the corresponding levels of demands determined by the requirements of comfort and the economy (Fig. 3).

Hygrothermal rehabilitation of a building is a set of technical measures applied to the envelope components, that record quality problems on the inside microclimate. The goal is to increase the performance in the heat transfer behavior, accordingly to the levels of demands determined by the requirements of comfort and energy savings.



Fig. 3 – Damages caused by moisture (infiltrations and condensed water) may have major impact on the building's structure and especially on the quality of the living space.

The basic component of hygrothermal rehabilitation is represented by thermal rehabilitation process that aims to ensure the improved insulation qualities to heat transfer sealing elements. Besides the thermal component in the

hygrothermal rehabilitation there is the hydrothermal rehabilitation, improvement of building elements in terms of water vapour diffusion behavior and the rehabilitation of ventilation, streamlining the exchange of air between inside and outside to ensure sanitary conditions and comfort required.

Researches directed towards identifying strategies and means to address the issues of energy and, more recently, of environmental ones, in the generous concept of sustainable development, have demonstrated that a multicriterial and interdisciplinary approach of the building design is fully possible in achieving a good architectural quality, a pleasant interior environment, comfortable, healthy and energy efficient. These attributes define an efficient energy building.

A comprehensive analysis of the relation energy consumption - indoor environmental quality, on residential and administrative buildings was made in the European Project HOPE (Health Optimization Protocol for Energy Efficient Buildings) which was held with 14 participants from 12 countries during 2002...2005. There were studied and investigated more than 160 household and administrative buildings, more than half of them having low energy consumption. The investigation consisted in a general inspection, a discussion with the building manager and questionnaires distributed to the habitants.

The results have largely refuted the thesis concerning the relationship of direct proportionality between energy consumption and indoor environment quality, allowing a classification of the buildings that made up the investigation in four categories namely

- a) Buildings with high energy consumption and corresponding quality indoor environment.
- b) Buildings with high energy consumption and low quality indoor environment.
- c) Buildings with low energy and poor quality of indoor environment.
- d) Buildings with low energy consumption and high environmental quality.

Therefore, it was found that energy consumption depends not only on the temperature inside, the rigors of climate and ventilation rate, but to an even greater extent on the architectural and construction solutions and operating mode.

9. Conclusions

As the subject of rehabilitation and regeneration of the collective residential ensembles, characterized by a high level of physical and ethical wear and tear, continues to be the subject of interest for the contemporary society, it might be said that it represents a matter of interests for Eastern Europe itself.

Therefore it has been proposed a peek and a definition into the concepts of restoration, rehabilitation, restoration, urban rehabilitation with a breakdown

of the process with all its components (architectural, structural and hygrothermal rehabilitation). Also in addressing the theme of rehabilitation there have been specified the necessary steps to be taken to ensure the success of such interventions.

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REABILITAREA IMOBILELOR DE LOCUIT COLECTIVE

(Rezumat)

Problema reabilitării sau regenerării marilor ansambluri de locuit aflate într-un grad de uzură fizică și morală constituind o temă ce a preocupat societatea occidentală și, de curând, după anii 1990, reprezintă un subiect de studiu pentru țările Europei de Est.

Beneficiara unui parc imobiliar impresionant (din care un procent important reprezintă blocurile pe sistem din panouri mari) România devine din ce în ce mai interesată de tema reabilitării.

Se propune așadar o incursiune în, și o definiție a conceptelor de renovare, reabilitare, restaurare, regenerare urbană cu o detaliere a procesului de reabilitare cu toate componentele acestuia (reabilitare arhitecturală, structurală și higrotermică). De asemenea, în abordarea temei de reabilitare sunt precizate și etapele necesare a fi realizate pentru a asigura succesul unei astfel de intervenții.