

BULETINUL INSTITUTULUI POLITEHNIC DIN IAȘI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iași
Tomul LIX (LXIII), Fasc. 3, 2013
Secția
CONSTRUCȚII. ARHITECTURĂ

ASSESSMENT AND CONSOLIDATION OF A BUILDINGS FRAMING ELEMENTS

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Received: June 3, 2013

Accepted for publication: June 17, 2013

Abstract. This paper aims to asses, propose and remediate the damages appeared in time on an existing building. The subject of this expertise is a building with a family home purpose GF+1L. For preparing the paper were taken into account all the factors that influence the quality of the work performed. Regarding the expertise done on the roof, there was found that due to his age and poor maintenance in time, the components of the roof structure of the building were affected by storm water infiltration through the roof. The causes and factors that led to the production of degradation are

- a) the action, on the building, of some factors that were not initially foreseen in the project;
- b) premature aging of components used in construction;
- c) execution failures that have increased in time due to the exploitation of the construction or the use of poor quality construction materials;
- d) attrition;
- e) humidity;
- f) climate factors (temperature and its variations).

All rehabilitation works proposed and implemented aimed to the increasing safety of the building and also the assurance of continuity use of the building concerned.

Key words: framing; walls; gutter; eaves; purlin; roof.

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1. Introduction

The building presenting an architectural style reflecting the multiethnic character of the locality has as purpose: the family home with GF +1L (Fig. 1). It was built in the mid-twentieth century, more precisely in the summer of 1955, located inside the locality, on a plot plan without creases, and at the foot of a hill near the bed of a stream (stream Nadas) which is nearby the national road E81 that crosses Cluj-Napoca – Zalău. The building plan has a regular shape - rectangle with dimensions of $9.00\text{ m} \times 12.00\text{ m}$ and the total built area is $A_c = 108.00\text{ m}^2$. Carried out $A_d =$ area is 216.00 m^2 . Location of the building was done in compliance with PUZ and PUD, based norms, standards and legislation in force at that time.



Fig. 1

2. Topography of the Site

- a) GF + 1L.
- b) Street alignment mode withdrawal 3.00 m.
- c) Ground 80% occupancy rate.
- d) Land use percentage 10%.

Also the location field construction complies with Civil Code neighborhoods: eaves drop kept from falling on the neighbor's fence.

2.1 Building Function

They are grouped into distinct areas that do not disturb each other:

- a) day functions are grouped at the ground floor;
- b) night functions are grouped at the first floor;
- c) underground are the utilities.

It was aimed to ensure as far as possible natural lighting and ventilation within the limits imposed by STAS norms and also the ventilation is achieved by double orientated rooms.

3. Description of the Construction from a Structural Point of View

The building has the following compositions:

- a) partial basement;
- b) ground floor;
- c) first floor;

Its structure is built with

- a) simple concrete foundation;
- b) brick masonry;
- c) floor.

The continuously type foundation is made of plain concrete with rectangular cross section with dimensions of 40 cm × 60 cm for external walls and 30 cm × 50 cm for interior walls. The partial basement walls are made of concrete masonry and the load-bearing walls of the ground floor and first floor are made of bricks with a thickness of 25 cm and 30 cm. The floor above the partial basement is made of reinforced concrete, and the one over the ground and first floor is made of main and secondary beams, planks of wood and sawdust filling, that are in a relatively good condition. The roof is of uncirculated type and it's made of wood framing and roofing of ceramic tiles. Vertical circulation is provided by a concrete outdoor staircase.

4. Description of Construction Status in the Moment of the Asses

Following the assessment on the building, there were found numerous damages and defects due to many causes, which together with the factors that caused them, led to the current state of the construction. The continuous type foundation is made of simple concrete. Given the foundations structure, building age, poor condition of the collection system and discharge of rain water (vertical pipes, gutters), the foundation suffered in time deformations that affected in some degree the structure of the construction.

On the building it have been done visual observations through which it was aimed to identify any cracks and fissures and the movement or deformation of the construction materials (vertical or horizontal deviation) it was also checked. On the most significant cracks were mounted plaster and glue witnesses in aiming to see if the cracking phenomenon is moving or it's stationary. Due to the building age and poor maintenance in time, there was found that the components of the roof structure of the building were affected by rain water infiltration through the roof.

4.1. The Causes and Factors that Led to the Building Degradation

a) *Causes*

The action of some factors that were not initially foreseen in the project.

Premature aging of components used in construction.

The emergence of serious damages to some of the structural frame elements.

Execution failures that have increased over time due to operation or due to the use of poor quality construction materials.

b) *Factors*

Attrition.

Humidity.

Chemical aggression.

Biological agents.

Climate factors (temperature and its variations).

Flooding.

5. Rehabilitation of the Roof Structure Elements

The degradation suffered by the components of the roof structure are extended almost on the entire surface of the roof. These failures are probably due to the damages suffered in time by the roof structure and roof elements, which greatly reduced the tightness of the roof, while allowing infiltration of rain water through it and through the floor above the first level (Figs. 2 and 3).



Fig. 2



Fig. 3

Most of the timber slats that support the tiles are in an advanced state of aging and deterioration (Figs. 4 and 5), so it was decided to replace them, which is an acceptable and cheaper solution than to remediate them (Fig. 6).

Due to the lack of a sealed roof, some elements of the roof structure are in an advanced state of deterioration, even rotting (Figs. 7 and 8), which also involved their replacement (Figs. 9 and 10).



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



Fig. 10

It also requires the replacement of some structural elements because in the new planned modernizations the scheme or static load, changes, so that the original structure no longer meets the new circumstances (Fig. 11).



Fig. 11

Also to create a more stable roof structure elements additional bracings were executed. It is necessary the replacement of some props due to the presence of a bending effect (Figs. 12 and 13).

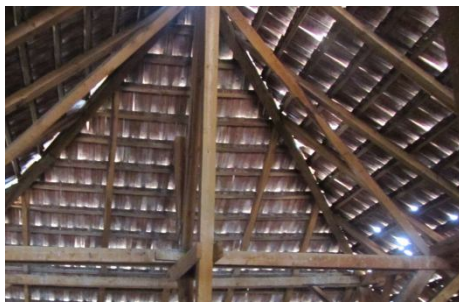


Fig. 12



Fig. 13

Tin collars around chimneys were originally incorrectly executed, being damaged due to water infiltration; there was required replacement of them (Fig. 14).



Fig. 14

The upper portion of the roof has some areas where the tiles were torn by the wind (Fig. 15). Others have some damages due to the passage of time; they were broken, deformed or displaced and following the assessment it was imposed the replacement of them (Fig. 16).



Fig. 15



Fig. 16

The gutters and vertical pipes that presented insufficient sections that could not take all of the water, especially in heavy rains, but also for other reasons such as clogging of the gutters with pieces of tile ripped by wind and the lack of the exhaust system accessories (boilers at the end of the gutters) (Fig. 17) were replaced by providing a system as in Fig. 18.



Fig. 17



Fig. 18

6. Conclusion

The present paper aimed to analyse, determining the defects and to present the basically solution in order to consolidate/repair the elements under discussion.

It has been observed that due to their nature, especially through the proportions they register, the defects constitute anomalies able to exert negative influences on buildings, both local as well on extended areas .

The occurrence of these inadmissible defects affects the functionality and comfort of the construction, no longer being satisfied the requirements for which the construction was executed and it creates difficulties in use.

It was observed that by the rehabilitation works, the construction properties have been largely unaffected.

It was recommended solutions to remediate the reported degradation, depending on their degree of damage and the amplitude of their expansion. All these proposed rehabilitation works implemented, aimed the increasing of safety of the building and also the use of the building concerned in smooth continuity.

For the delivering action to rehabilitate structural elements of the building and ensure its sustainability there have been used good quality materials and the authorized firm carrying out the works has proved to be a specialized company.

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EVALUAREA ȘI CONSOLIDAREA ELEMENTELOR ȘARPANTEI UNEI CLĂDIRI

(Rezumat)

Se are drept scop evaluarea, propunerea și remedierea deteriorărilor survenite în timp ale unei clădiri existente. Obiectul expertizei îl constituie clădirea având ca destinație locuința familială P+1E. La elaborarea lucrării au fost luați în considerare toți factorii care au influență asupra calității lucrărilor executate.

În ceea ce privește expertiza efectuată asupra acoperișului, s-a putut constata că datorită vechimii acestuia și a întreținerii necorespunzătoare a lui în timp, elementele componente ale șarpantei și, implicit, clădirea au fost afectate de infiltrațiile de ape meteorice prin acoperiș. Printre cauzele și factorii care au dus la producerea degradărilor sunt de menționat

a) acțiunea asupra clădirii a unor factori care nu au fost prevăzuți inițial în proiect;

b) îmbătrânirea prematură a elementelor utilizate la construcție;

c) defecțiuni de execuție care s-au accentuat în timp datorită exploatarei construcției sau datorită utilizării unor materiale de construcție de calitate necorespunzătoare;

d) uzura;

e) umiditatea;

f) agenții climatici (temperatura și variațiile ei).

Toate lucrările de reabilitare propuse și puse în aplicare au avut drept scop mărirea siguranței de exploatare a construcției și totodată asigurarea continuității utilizării în bune condiții a clădirii în cauză.