OBsolescence of the Building
Contributions to Fundamentals Obsolescence

By

ANA GALĂȚCI*  
“Gheorghe Asachi” Technical University of Iași  
Faculty of Civil Engineering and Building Services

Received: October 20, 2011  
Accepted for publication: January 30, 2012

Abstract. Buildings as goods that best express the quality of life (compared to other categories of goods), are defined by their quality requirements.

Quality requirements associated with construction have both temporal and spatial characteristics. The temporal characteristics result from the quality requirements that express the current level of human knowledge and technology in a specific period of time. Spatial characteristics result from the fact that quality requirements associated with construction express social and economic status of the country as whole.

Buildings as material goods are designed to satisfy the most important human needs (which express the quality of human life), and they achieve this goal through the way they are used. From the functional perspective, buildings are subject to a complex process of wear, namely, normal physical wear, accidental wear, and obsolescence.

Normal physical wear and accidental wear are based on methodology definitions formulated by INCERC Romania. However, the same methodology creates a certain level of confusion, since it defines obsolescence of capital goods group 1 “construction”, without regard to the characteristics they present.

Key words: building; quality requirements; normal physical wear; accidental wear; obsolescence.

* e-mail: AnaGalachi@mail.ru
1. Introduction

After the Second World War humanity was facing a grave economic and housing crisis. For a Europe destroyed by war the only feasible way to resolve the housing crisis was large-scale construction of housing blocks.

Technical solutions implemented at the time were based on achieving the lowest cost, thereby solving the problem in terms of quantity but not quality. This led to subsequent high costs in the period of the buildings’ use, and had a significant impact on theirs residents (as these are buildings in which people spend approx. 80% of their time), because the buildings do not possess the characteristics needed to satisfy all requirements of their inhabitants, taking into account various factors.

2. Characteristics of Construction

Construction, also referred to as real estate goods, are a form of immovable property, which cannot be moved from one place to another without losing its character or its initial purpose.

Fulfilling many essential human needs, buildings are the most important goods created by humans, fulfilling extremely important technical and economic roles.

The following characteristics of real estate goods – both technical and economic – distinguish construction greatly from any other goods, making them unique.

2.1. Long Service Life

One of the most important features of buildings is their long service life. This is influenced by their design, execution, and quality of materials used in the construction process.

2.2. Building Durability

Building durability means resistance of a building, resulting from sustainable construction elements under specific conditions of exploitation. Given the continued growth of destructive environmental events (natural and artificial), construction should be designed with a view to increased physical durability, in order to ensure a continued exploitation over the whole operating lifetime.
2.3. Reliability

Reliability means using design and execution in such a way, as to ensure all the qualitative elements needed to contribute to better use of the building throughout its lifetime (which according to normative acts can reach up to a hundred years).

2.4. Buildings are Immovable Property

This is because it combines a large amount of natural materials, shapes and dimensions. In general, materials constitute aprox. 60%...65% of the total cost of construction. The rest are costs of labor, mechanical means of execution, transportation and many other indirect expenses. All the above characteristics have a strong impact on the definition of obsolescence.

3. The Concept of Performance

Overall, performance is understood as the behavior of a certain product in relation to its usefulness.

The concept of performance in relation to real estate (buildings), differs from the concept of performance for movable goods. This is due to the characteristics listed above: buildings have a long service life, they offer durability and reliability; they are immovable property, and last but not least they are very expensive products.

![Graph](image)

Fig. 1 – Variation of performance and requirements of movable goods, as a function of time.

By contrast, mobile goods, are disposed of after a relatively short period of time due to their very low performance.
After their effective removal from service the mobile asset is broken into its final constituent parts and materials, then may be put to a new use (recycle). Such disposal results in the replacement of the discarded good (purchase) by a more performing product that matches new requirements of the user.

3.1. The Concept of Building Performance

Construction legislation in Romania interprets the quality of construction at the highest level through the concept of performance.

This concept signifies a systemic and global approach to the issues of quality in design, implementation and exploitation of buildings, starting from the activities and needs of users, regardless of material means and solutions used, emphasizing the functional characteristics of buildings.

Quality requirements have a longer validity. Unlike these, performance requirements are those that over the life cycle of the building are subject to changes (improvements), as a natural result of increasing human demands.

Fig. 2 presents the performance of a building during its life, depending on the requirements (as part of the essential requirements of quality) to which the construction should correspond.

Over the life time of the building, changes occur on one hand in the exploitation conditions and the requirements, and on the other hand in the action of external factors, that, over time, lead to a reduced performance of the building.

![Fig. 2 – Variation of performance and requirements of the real estate goods as a function of time.](image)

To avoid such decrease of performance of the construction over time, intervention works like modernization, rehabilitation, repairs or consolidation are required.
Such interventions aimed at maintaining the ability to use the construction throughout its lifespan (until demolition), all elements of construction must meet performance levels contained in six essential requirements set out in Law nr. 10/1995 (as amended).

4. Construction Wear

Every real estate good undergoes gradual depreciation of its technical properties and hence its value, as a result of economic use (amortization), and the actions exerted by natural influences. This impairment is called construction wear.

The three categories of wear related to construction are: normal physical wear, accidental wear, and obsolescence.

For normal physical wear and accidental wear, Romanian legislation stipulates a clear definition, and establishes practical methods of determination/evaluation.

However, obsolescence of buildings has long been ignored, lacking a clear definition and a proper evaluation method. This is because only economists were in charge of defining this type of wear, and they interpreted it in the same way as the obsolescence of other (movable) goods. Physical complexities of construction, and the complex requirements construction is subject to, result in a completely different content, and in an extremely complex manifestation of obsolescence.

For this reason it was considered that the meaning and content of the definition of obsolescence for buildings is irrelevant and unenforceable.

5. Obsolescence of Buildings

Given all of the above, we have defined obsolescence of buildings as the total of all nonconformities, expressed as a percentage of replacement of actual value, in relation to the applicable quality requirements as of the evaluation date, different from those that were part of the initial construction design.

Since construction is a set of elements, each of which has its role in determining its performance, it is considered that building obsolescence can’t be analysed or researched for the construction as a whole.

Nevertheless, a logical approach to the problem of obsolescence would be to analyse this type of wear for each of the essential requirements associated with different elements of construction. Thus, given that essential requirements have evolved over the past 50…100 years, there are inconsistencies between the essential requirements that led to the initial design of the buildings, as opposed to the new requirements that occurred during the period of use.
For an easier understanding of the concept of the buildings obsolescence, we comparatively analyze the acts of the past 20 years, the evolution of “Hygiene, Human Health, Restoration and Environmental Protection” requirement.

4.2. Occurrence of Obsolescence as a Result of Quality Requirement “Hygiene, Human Health, Restoration and Environmental Protection” Evolution

The principal characteristics which must be fulfilled are concentrated in Table 1.

| Table 1 |
|---------------------------------|-----------------|-----------------|
| Quality requirement: “Hygiene, Human Health, Restoration and Protection of the Environment” | Level of performance |
| Performance criteria | NP 016 – 1996 repealed law | NP 057 - 2002 |
| The concentration of polluting substances | In the form of volatile substances: max. 0.035 mg/m³ | |
| a) Content of formaldehyde in air, derived from material | containing not more than 25 mg formaldehyde / 100 g solid | |
| b) Carbon monoxide content | 6 mg/m³ | |
| c) Carbon dioxide content | max. 1,600 mg/m³ in the air (approximately 0.085% volume of the room) | max. 1,600 mg/m³ in the air (approximately 0.05% volume of the room) |
| d) Water vapour content | – max. 15.400 mg/m³ (Tmed = 25°C ± 3°C) in summer time; – max. 9.450 mg/m³ (Tmed = 20°C ± 2 °C) in winter time. | |
| e) Radioactivity content of radon 220 and/or 222 radon from soil or materials | max. 100 Bq/m³/year | max. 140 Bq/m³/year. Forbidden: the use of building materials containing radioactive substances |
| f) Dust content | max. 0.5 mg/m³ | |
| g) Oxygen concentration | 16.3% of the room | |
| Minimum number of exchanges of fresh air, for various types of rooms. | |
| A. Natural ventilation | Air exchange (the whole house) | 0.05…1 vol/h | 0.5 … 1 vol/h |
### Table 1

**Continuations**

**B. Mechanical ventilation (exhaust ventilation individual)**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Exhaust air flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the kitchen without windows</td>
<td>45…120 m$^3$/h</td>
</tr>
<tr>
<td>Bathroom</td>
<td>30…60 m$^3$/h</td>
</tr>
<tr>
<td>Shower room, with toilet and sink</td>
<td>min. 60 m$^3$/h</td>
</tr>
</tbody>
</table>

Exhaust air flow for living rooms will be provided invariably with the possibility of natural ventilation.

**Technical Conditions: Lighting**

<table>
<thead>
<tr>
<th>Environment</th>
<th>General lighting</th>
<th>Local lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>For living rooms:</td>
<td>200 lx</td>
<td>300 lx; 500 lx</td>
</tr>
<tr>
<td>Bathroom</td>
<td>75 lx (on $h = 0.85...1$ m of the floor)</td>
<td>200 lx</td>
</tr>
<tr>
<td>Kitchen</td>
<td>100 lx, (on $h = 0.85...1$ m of the floor); local lighting: 200 lx</td>
<td>300 lx</td>
</tr>
</tbody>
</table>

**Technical Conditions: Thermal Comfort Hygiene**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Temperature</th>
<th>Max. Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensuring normal hygrothermal ambience</td>
<td>23°C…26°C</td>
<td>max. 25°C</td>
</tr>
<tr>
<td>Heating system must ensure the minimum temperature</td>
<td>18°C</td>
<td>20°C</td>
</tr>
<tr>
<td>Heating system must ensure the minimum temperature in bathroom</td>
<td>18°C</td>
<td>20°C</td>
</tr>
<tr>
<td>The amount of heat from the foot of floor, connected to the cold-hot sensation in the living room:</td>
<td>$Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$; $Q_1 = 200 \times 10^3 ... 300 \times 10^3$ J/m$^2$;</td>
<td>$Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$; $Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$;</td>
</tr>
<tr>
<td>The amount of heat from the foot of floor, connected to the cold-hot sensation in the over room</td>
<td>$Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$; $Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$;</td>
<td>$Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$; $Q_1 = 40 \times 10^3 ... 50 \times 10^3$ J/m$^2$;</td>
</tr>
</tbody>
</table>
Performance of the new demands set out in applicable laws will determine the degree of noncompliance, and the level of nonconformity of the building elements the current quality requirements.

A further analysis of this problem would represent a remarkable beginning for the study of multiple, and complex meanings and manifestations of obsolescence.

4. Conclusions

Analysis of obsolescence makes it possible to assess the capacity of the construction for regular use, while meeting all the essential construction quality requirements.

The technological developments that are particularly emphasized (in the last 20 years) together with increased needs, have lead to a more pronounced obsolescence of buildings compared to other types of wear.

The knowledge of this aspect will induce all relevant subjects/participants involved in construction to adopt solutions that would correspond to as long a time-frame as possible.

REFERENCES


Metodologie de stabilire a coeficienților de uzură fizică normală și uzură fizică accidentală a mijloacelor fixe din grupa I „construcțiile” și din grupa II

UZURA MORALĂ A CONSTRUCȚIILOR

Contribuții la fundamentarea uzurii morale

(Rezumat)

Calitatea bunurilor este o problemă primordială ce îi preocupă pe oameni de foarte mult timp. Ea a fost definită ca totalitatea facilităților și caracteristicilor unui produs sau serviciu care satisface nevoile stabilite sau implicite. Însă, întrucât noțiunea are o largă utilizare, este extrem de dificilă definirea ei din punct de vedere științific dar și pragmatic.

Calitatea în construcții a fost definită ca rezultatul tuturor performanțelor unei construcții ce se află în exploatare, având scopul de a satisface cerințele utilizatorilor.
Aceste cerințe se pot diferenția astfel: cerințe funcționale, fiabilitate și durabilitate, psihosenzoriale (igienă și confort, estetice) și economice.

Conform acestor cerințe calitatea nu este exprimată printr-o singură caracteristică, ci printr-un ansamblu de caracteristici care variază continuu în relație cu nevoile clienților.

Legea nr.10/1995 privind calitatea în construcții stabilește șase cerințe de calitate pe care trebuie să le îndeplinească o construcție. Aceste cerințe de calitate sunt exprimări calitative a caracteristicilor clădirii: rezistență și stabilitate; siguranță în exploatare; siguranță la foc; igienă, sănătate, refacerea și protecția mediului; izolație termică, hidrofugă și economie de energie; protecția împotriva zgomotului.

Aceste exigențe, prin conținut și formulare determină un caracter îndelungat, însă performanțele acestor exigențe sunt supuse modificărilor în sens pozitiv, ca rezultat al creșterii cerințelor umane.

Prin utilizare construcțiile sunt supuse unui proces complex de uzuri, și anume: uzura fizică normală, uzura accidentală, uzura morală. Dacă pentru uzura fizică și cea accidentală există definiții clare și sunt stabilite metode de determinare/evaluare, uzura morală a fost mult timp ignorată, nefiind nici bine definită, nici corect evaluată.

Transferul definiției uzurii morale de la bunurile mobile (rezultatul activităților industriale) la bunurile imobile, de tipul construcțiilor, este lipsit de orice temei tehnic și economic, astfel încât ea nu a putut fi utilizată în domeniul practic.

Noaua definiție propusă se referă la construcția ca bun cu conținut complex (datorită caracteristicilor ce le fac diferite de celelalte bunuri) și o funcționalitate total diferită față de alte categorii de bunuri, considerate de asemenea mijloace fixe.

Analiza evoluției performanțelor esențiale ale construcțiilor, în baza actelor normative din ultimii ani (actele normative abrogate și cele în vigoare) permite determinarea gradului de neconformitate a elementelor unei construcții, respectiv stabilirea uzurii morale a acestora.

Cunoașterea acestui fapt va face posibil ca toți cei ce participă în procesul de execuție a construcțiilor să adopte soluții care să corespundă unei perioade de timp cât mai îndelungate.