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REAL VALUE ESTIMATION FOR REINFORCED CONCRETE BUILDINGS

BY

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Abstract. The building activity has as final result a product in the form of construction. Currently there are several classifications of the buildings beginning from the general classification of buildings and civil engineering, civil buildings, industrial buildings, farm buildings, also in relation to the deformability of the outside action there are buildings with rigid structure, buildings with flexible structure, buildings structurally semi-flexible. In order of importance there are three types of civil buildings: civil buildings of high importance, civil buildings of medium importance, buildings of minor importance. Also we can classify buildings after constitutive elements and materials from which they are made of: the resistance structure, closing elements, elements of subdivision finishing elements. All these exposed classifications should lead naturally to estimate the market value of buildings on poorly regulated real estate market and left at the mercy of evaluators who are not civil engineers.

Keywords: construction management; cost estimation; concrete.

1. Introduction

In Romania currently the evaluation of residential buildings is regulated by Government Ordinance No. 24/2011 that founded the liberal profession of

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estate appraiser. According to current regulations and standards assessment, the evaluation of buildings is made by the following processes:

✓ **The market approach** - effectively compares identical assets subjected to correction,

✓ **The income approach** - takes into account the revenue that an asset will generate over its life,

✓ **The cost approach** - according to which a comparator will not pay more for an asset than the cost of buying or building a modern equivalent taking into account the type of wear due to the passage of time.

In the estimation of costs one can use three methods:

- ***The method of uniform comparisons***. It is used to determine the cost per area unit or per volume unit (in absolute amount). The method relies on known costs of similar structures, adjusted for market conditions for physical differences.
- ***The segregated cost method***. The method consists of a procedure for estimating construction costs, the total cost of construction is estimated by summing up the unit costs of different elements of construction.
- ***The estimates method***. The most accurate method of estimating the cost reflects the quantity and quality of all used materials and all categories of labor.

2. Presentation of the Methodology for Estimating the Value of a Building

So that the real estate assessments are correct, the evaluators should have access to "guarantee certificate" of each building through which to inform the property condition of the valuation date. The property condition at the date of the evaluation depends on the analysis of several factors such as (Table 1. Property value according to criteria proposed analysis):

- a) the design documentation;
- b) the execution documentation;
- c) the documentation regarding the reception;
- d) the documentation regarding the operation, maintenance, repair and follow up of the construction;
- e) the age of the building and remaining life;
- f) the sustainability of the structural frame of the building;
- g) the energy certification of the building;
- h) the existence of that real estate cadastre;
- i) the compliance with building permit.

Table 1
Property Value According to Criteria Proposed Analysis

No	Certification of the building Criteria for analysis of real estate property	The percentage of achievement criterion
1	<i>The construction book with all the chapters</i>	
1.1	The design documentation	$P_{1.1}=\%$
1.2	The execution documentation	$P_{1.2}=\%$
1.3	The documentation regarding the reception	$P_{1.3}=\%$
1.4	The documentation regarding the operation, maintenance, repair and follow up of the construction	$P_{1.4}=\%$
		$\Sigma P_{1.i}=\%$
2	<i>The age of the building and remaining life</i>	$P_2=\%$
3	<i>The sustainability of the structural frame of the building</i>	$P_3=\%$
	- concrete, metal, wood	
4	<i>The energy certification of the building</i>	$P_4=\%$
5	<i>The existence of that real estate cadastre</i>	$P_5=\%$
6	<i>The compliance with the building permit</i>	$P_6=\%$
	TOTAL	$\Sigma P_i=\%$

The global environment wear for housing construction, taking into account the normal wear for each element of the system - building for housing - will be:

$$V_{Finala} = \frac{\sum p_i}{n_i} (V_{imobil} - V_{imobil} G_{fn}), \quad (1)$$

where: $\sum p_i$ is the rate of completion of the criterion; n_i – the number of analyzed criterion; V_{imobil} – property value determined by the cost method.

According to Norm P135/1995 one can appreciate the following relationship where V_{ef} has an intermediate value between the values that we find regulatory analyzed:

$$G_{fn} = G_{un1} + \frac{G_{un2} - G_{un1}}{V_2 - V_1} (V_{ef} - V_1), \quad (2)$$

where: G_{fn} is the wear of the building, [%]; G_{un1} – the degree of impairment to normal physical age V_1 ; G_{un2} – the physical degree of impairment is normal for age V_2 ; V_{ef} – the actual age of the building.

3. The Analysis of Calculation Methodology for Determining the Value of a Property

Table 2
Detail of the Proposed Criterion

No	Certification of the building criteria for analysis of real estate property	The percentage of achievement criterion		
1	<i>The construction book with all the chapters</i>	<i>Correct</i>	<i>Partially correct</i>	<i>Does not exist</i>
1.1	The design documentation	$P_{1.1} = 100\%$	$P_{1.1} = 50\%$	$P_{1.1} = 0\%$
1.2	The execution documentation	$P_{1.2} = 100\%$	$P_{1.2} = 50\%$	$P_{1.2} = 0\%$
1.3	The documentation regarding the reception	$P_{1.3} = 100\%$	$P_{1.3} = 50\%$	$P_{1.3} = 0\%$
1.4	The documentation regarding the operation, maintenance, repair and follow up of the construction	$P_{1.4} = 100\%$	$P_{1.4} = 50\%$	$P_{1.4} = 0\%$
		$\Sigma P_{1.1} = \%$		
2	<i>The age of the building and remaining life</i>	$P_2 = \%$ Standard of the execution of maintenance and repairs to buildings and special constructions. Indicativ GE032-97		
3	<i>The sustainability of the structural frame of the building</i>	$P_3 = \%$ HG no. 2319/30.11.2004 Catalogue rules on classification and duration of fixed assets		
	- concrete, metal, wood			
4	<i>The energy certification of the building</i>	$P_4 = \%$ Depending on the energy performance of the buildings are classified into 7 classes on a energetic scale from class A characterizes by the lowest energy consumption by 125 kWh/sqm/year to class G appropriate the highest specific energy consumption or consumption by over 820 kWh/sqm/year		
5	<i>The existence of that real estate cadastre</i>	<i>Exists</i> $P_5 = 100\%$	<i>Partially exists</i> $P_5 = 50\%$	<i>Does not exist</i> $P_5 = 0\%$
6	<i>The compliance with the building permit</i>	<i>Totally</i> $P_6 = 100\%$	<i>Partially</i> $P_6 = 50\%$	<i>Not complied</i> $P_6 = 0\%$
	<i>TOTAL</i>	$\Sigma P_i = \%$		

3.1. Example of Documents to be Analyzed on the Execution of Concrete Structures (see item 1.2 of Table 2 – The execution documentation)

Table 3
Document Verification of Concrete

Concrete						
Checked item						
The check /the document	Mis conduct under rule	Observed mis conduct	Requirement met	The date of the check and of the document	Who attended the verification (name)	Score obtained when the requirement had been met
Check hardened concrete (sampling) NE 012/2-2010, Annex H-at least one sample for each concrete type, lot, on change, minimum 100 mc ($\leq C16/20$)/50 mc ($> C16/20$)			Yes			10
a) Sampling Minutes			Yes		Builder, engineer, analyst	10
b) Evidence of transmission docket			Yes		Builder, analyst	10
c) Results of laboratory tests carried out on samples			Yes		Chief analyst, analyst	10
Book of concrete completed to date according to Norm C56/85 and NE 012/2-2010			Yes		Builder,	10
Minutes for quality reception prepared after stripping which must contain according to pct. 2.7 chapter I, book V from norm C56/85			Yes		Builder, engineer,	10

Table 3
Continuation

Concrete						
Checked item						
The check /the document	Mis conduct under rule	Observed mis conduct	Requirement met	The date of the check and of the document	Who attended the verification (name)	Score obtained when the requirement had been met
a) The appearance of elements to signal areas that are encountering inappropriate concrete (concrete loose, segregated foals, concrete joints)			Yes			10
b) cross-section dimensions of the elements			Yes			10
c) distances between different elements			Yes			10
d) position of vertical elements (columns, diaphragm walls in relation to the proper level immediately located)			Yes			10
e) position of valves that will be embedded in elements that are then poured			Yes			10
f) dips crossing position			Yes			10

Note (arithmetic mean of all criteria of the table)

10

Conclusions depending on the note obtained: the concrete poured in this item meets the requirements, proceed to the next stage.

Table 4
Document Verification Reinforcement of the Building Structure

Reinforcements						
Checked item						
The check /the document	Mis conduct under rule	Observed mis conduct	Requirement met	The date of the check and of the document	Who attended the verification (name)	Score obtained when the requirement had been met
They were presented documentary evidence and traceability features of reinforcements according to Norm C56/85 and NE 012/2-2010			Yes		Builder, Engineer, Designer	10
Proof that quality determination made by the builder/processor: traction, simple bending, bending-unbend (laboratory tests) for reinforcements – three specimens/lot/diameter according to Norm NE 012/2-2010, pct. 8.1.7			Yes		Builder, Engineer, Designer	10
Acceptance protocol of fitted reinforcements with reference to procedures, record, traceability, staff qualification, treatment of nonconformities according to Norm 012/2-2010, pct. 8.5.6 and 8.6			Yes		Builder, Engineer, Designer	10
On completion of mounting reinforcements will be recorded in the minutes of the findings of checks made on			Yes		Builder, Engineer, Designer	10

Table 4
Continuation

Reinforcements						
Checked item						
The check /the document	Mis conduct under rule	Observed mis conduct	Requirement met	The date of the check and of the document	Who attended the verification (name)	Score obtained when the requirement had been met
a) number, diameter and position of valves in various cross-sections according to Norm C56/85 book V, chapter I, pct. 2.4			Yes		Builder, Engineer, Designer	10
b) distance between stirrups, their diameter and attachment			Yes		Builder, Engineer, Designer	10
c) length exceeding portions of the roof supports			Yes		Builder, Engineer, Designer	10
d) quality of welds			Yes		Builder, Engineer, Designer	10
e) number and quality if links between bars			Yes		Builder, Engineer, Designer	10
f) devices to maintain the position of reinforcement during concreting			Yes		Builder, Engineer, Designer	10
g) how to ensure the concrete cover thickness and dimensions			Yes		Builder, Engineer, Designer	10
h) position, attachment and size of embedded poles			Yes		Builder, Engineer, Designer	10

Note (arithmetic mean of all criteria of the table)

10

Conclusions depending on the note obtained: the reinforcements meet the requirements, proceed to the next stage.

4. Conclusions

Estimating the value of a building should be a process in which to examine several issues related to that building. The simple application of one single method for estimating the value is not accurate enough. Estimating the value of a house is not just a transaction that takes place at some point in time, but it should be a wider process and the analysis should be done throughout the lifetime of the building from conception in draft form until the use in the post-use period. The proposed methodology for calculating ensures this framework to analyze a building through the conception, execution, durability, life period remained in office and thus certifying the building quality.

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ESTIMAREA VALORII REALE A CONSTRUCȚIILOR DIN BETON ARMAT

(Rezumat)

Estimarea valorii de piață a clădirilor pe o piață imobiliară slab reglementată și lăsată la voia evaluatorilor care la bază nu sunt ingineri constructori are ca rezultat valori inexacte. O evaluare corectă este imposibilă fără o inspecție a documentelor

întocmite de-a lungul ciclului de viață din momentul proiectării până la momentul dezafectării imobilului. Această analiză trebuie realizată de o persoană cu o calificare profesională adecvată. Prin metodologia de calcul propusă prin acest studiu de estimare a valorii se aduce un real ajutor în determinarea corectă a valorii unui imobil.