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CONSTRUCŢII. ARHITECTURĂ

RELATIONSHIP BETWEEN CONSTRUCTION DEPRECIATION, DURABILITY AND FIABILITY

BY

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It is estimated that within Europe the value of all structures (infrastructure and built environment) represent a value of approximately 50% of the national wealth of most countries. Approximately 50% of the expenditures in the construction industry are spent on repair, maintenance and remediation of existing structures. In the future these expenses will probably increase even more. A large proportion of these expenses are due to problems related to lacking durability of concrete structures. Thus, to reduce these expenses it is required to make designs for the service life of concrete structures, in which the service life is explicitly specified.

The durability of a concrete structure is influenced by a number of chemical and physical processes, which develop in time. These processes change the performance of the concrete over time, *e.g.* reduction of the bearing capacity or changing the aesthetic appearance. The most common of these processes are: frost attack, reinforcement corrosion, alkali-aggregate reactions, and sulphate attack, etc.

The counting of the construction depreciation will be done by several posibilities according to the depreciation types; the parameter which express this depreciation is called *depreciation coefficient*. Usually the depreciation coefficient (G_u) depends upon the principal factors which cause the depreciation namely

$$G_u = f(D, M, C_m, C_{ei}, P_t), \quad (1)$$

where: D is the exploitation life of the construction from the first day to the moment when the depreciation coefficient is evaluated; M – the types of materials which enter in the construction, etc.; C_m – climatic conditions which damage the constructions including temperature variation between summer and winter, freezing – thawing effect, wind, earthquake, floads, etc.; C_{ei} – exploatation and preserving conditions depending on the reparations types of the constructions; P_t – the technologic progress which makes possible to renew the constructions from the technic point of view (s. Fig. 1).

The total depreciation expressed by the depreciation coefficient or the depreciation grade, G_u, supposes three distinct components:

a) normal depreciation expressed by normal depreciation degree, G_{un};

b) accidental depreciation expressed by accidental depreciation degree, G_{ua};

c) moral depreciation expressed by moral depreciation degree, G_{um};

The total depreciation degree, G_u, is not necessary the sum of the three components.

A dwelling, as well a construction may pass the life span without be affected by the moral depreciation. This situation is not very usually meet in the construction industry, only theoretically is possible. In this case

$$G_u = G_{un}. \tag{2}$$

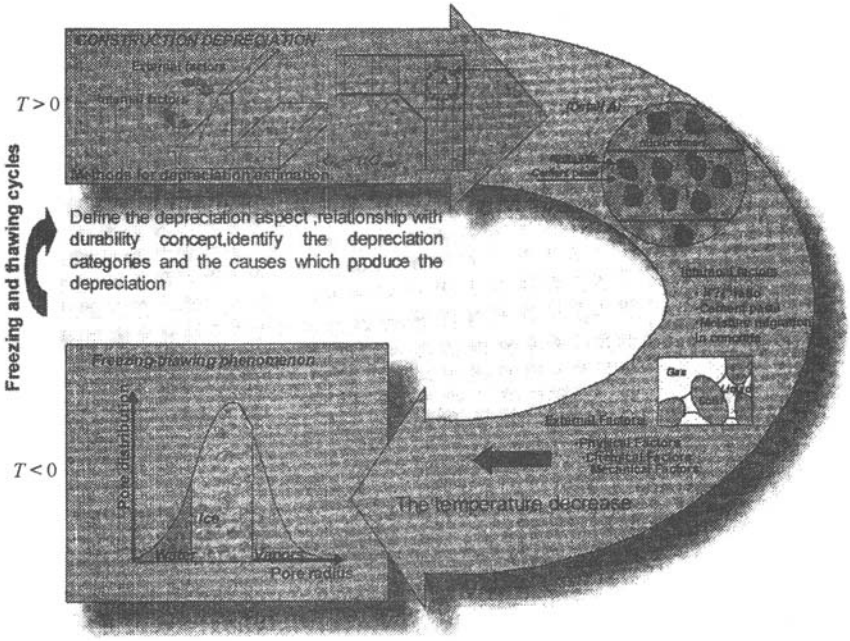

Fig. 1.- Factors which influence the construction's depreciation.

A construction even did not pass the entirely life span may be seriously demaged by exceptional phenomena such as: earthquake, floods, strong winds, etc. In these situations accidental depreciation accelerate the normal depreciation

$$G_{ua} \subset G_{un}. \tag{3}$$

A construction which pass a certain life span is constantly affected by the moral depreciation especially by the human comfort requirements changed. In these conditions the moral depreciation will be added to the normal and accidental depreciation

$$G_u = G_{un} + G_{um} \tag{4}$$

or

$$G_u = G_{ua} + G_{um}. \tag{5}$$

It is known that, generally, the constructions durability is the part of quality concept which means that can preserve these qualities to the constructions life. The same concept is defined by others, like the constructions performance to maintain the satisfactory exterior during in service life span without *extra* expenditure in a normal environmental conditions.

Joining the definitions of depreciations and durability, we can observe that the depreciation coefficient multiplied by durability coefficient are equal to 1. In conclusions when we have a high durability for a construction in a same time the depreciation coefficient is small.

We can express the durability of a construction by a unique parameter

$$G_{\text{dur}} = \frac{1}{G_{un}}. \tag{6}$$

Generally, the construction object can be analysed by fiability aspect even in the speciality literature is not usually this term. Fiability represents the probability of the construction to preserve the same qualities to a certain life span

$$R(t_0) = \text{Prob}\,(T \geq t_0). \tag{7}$$

In conclusion, the construction fiability is directly proportional with durability and also the durability is indirect proportional with the normal depreciation

$$R(t_0) = \frac{1}{G_{un}}. \tag{8}$$

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INTERDEPENDENŢA UZURĂ, DURABILITATE, FIABILITATE PENTRU CONSTRUCŢII

(Rezumat)

Măsurarea uzurii mijloacelor fixe se face prin diferite modalităţi, funcţie de natura acesteia, parametrul prin care se exprimă fiind *gradul* sau *coeficientul de uzură*. Punând alături definiţiile uzurii, respectiv durabilităţii, ambele concepte legate de construcţii, se poate uşor constata că uzura este invers proporţională cu durabilitatea. Cu alte cuvinte cu cât durabilitatea unei construcţii este mai mare, cu atât gradul de uzură normală a acesteia este mai redus.