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The Concept of Advance Formation of Anthropotechnical Security of Functioning and Life Quality of a Human in Cyberphysical Building Systems Using Digitalization

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ABSTRACT
In the technical and sociological spheres of activity, the practice of averaged rationing developed, based on "swallow whole" (the so-called "reliable") not always domestic statistical data. Among the many methods, techniques and technologies of the formation of directive (prescribed for use) standards of integrated security, there are three categories: original, adapted and borrowed. They are distributed to many areas of public life (environmental, social, industrial, informational, energy, etc.). For each of them, as appropriate, averaged standards of integrated security are developed. With an officially specified period of its functioning. In the environment of cyberphysical systems (combining aspects of the maximum use of computer devices and software to ensure their effective application and the use of traditionally known engineering systems, that operate on the principles of physics and theoretical mechanics), digitalization is an indispensable basis of the entire set of processes of functioning of instrument monitoring and management of numerous parameters of functioning of the structure. This functioning implies a wide variety of aspects, including integrated security, comfort of life, industrial activity or simply human habitation. The model of such functioning is considered to be the infographic system "person-technics-environment, PTE", which is able to fully and unambiguously set the parameters, limitations and modes of the instrument monitoring and management processes in the "smart building". Digitalization of management and decision-making automation reduce the number of managerial personnel, increase the reliability of management, ensure the effectiveness of made decisions, increase profits and save resources.
Keywords: *advance formation, anthropotechnical security of functioning, life quality of a human, digital management, digital economy, cyberphysical systems, computer monitoring*

1. INTRODUCTION

Among the many methods, techniques and technologies of the formation of directive (prescribed for use) standards of integrated security, [1-4, etc.] there are:

- fundamentally new (original);
- developed "with analogy with world experience" (adapted);
- borrowed (taken out of the context of "alien" cultures and imposed for unconditional use by administrative and command methods).

These standards are applied to all known spheres of life:

- "environmental" or the sphere of coexistence of human and nature [5-11, etc.];
- "social" or the sphere of collective relationships and interactions in the community;
- "technogenic", recultivated, or the sphere of all material things, created in the processes of mental activity and subsequent human production activity [12, etc.];
- "informational" or the sphere of origin, perception, processing, accumulation, transmission and impact of information, reaction to it, as well as its destruction;

- "energy" or the sphere of detection (production) of energy, its accumulation, transportation and use (that is, a paid burden on the consumer by it).

Modern theoretical concepts (not related to business and employment problems) combine two spheres, named last, into one "informational-energy", based on the well-known functional dependence of the "bit" and "joule" units (according to Falker [13]).
For each of the above five spheres of life, as appropriate, legitimate (authorized for use by the official authorities) averaged standards of integrated security, which have an officially specified period of their functioning, are created.

2. METHODS OF RESEARCH

Systemic, comparative and qualitative analysis, infographic modeling and anthropotechnical management were selected as the basis of the study.

3. STUDY RESULTS

Anthropos (greek - "man") is a part of nature, the most complicated and not fully known living organism, a personal (individual) unique object of study in many natural sciences (biology, physiology, psychology, pedagogy, medicine, etc.).
As a result of studying the properties and manifestations of human, it was revealed, that in almost all of his diagnosed parameters and characteristics, each individual exhibits an individual adaptive standard of his state (physiological and psychological), behavior (individual and social) and activity (mental activity, creative activity, productive activity, life activity, etc.)
The mental activity (thinking) of an individual is the most important type of human activity to ensure the security of functioning and quality of life. It must certainly be the initial stage of any other type of human activity. Here, a person creates a project of any subsequent applied (then materially realized) activity, which he then needs, develops the technology of its implementation, the required resource provision, and outlines the desired results. In this project, one of the most important (if not the most important!) aspect is the "human factor", the technique of working with a person (anthropos), that is, anthropotechnique.
There is an aspect of anthropotechnical security of functioning and quality of life.
In this aspect, two fundamentally different approaches to solving problems can be distinguished.
The first approach implies unconditional compliance with the existing directive (officially prescribed for use) standards of integrated security. A law-abiding performer of these standards (for example, a builder, who erects or reorganizes a building or structure) can be sure that there will be no complaints about this part and his products will be legitimate on the market. In the "construction business - directive standards integrated security" system everything is in order with the standards.
It is believed, that the future consumer-operator of construction products (buildings or structures) is formally and anonymously taken into account when forming a directive standards of integrated security based on averaged statistics. In the domestic mass housing construction of economy class objects, buildings and structures, oriented towards adaptive norms of the state, behavior and activity of a particular person are not erected.
The first approach is averaged, like the development of a construction organization project (COP) based on data from construction standards and regulations (CSaR) for entering a tender. Then, the general contractor, identified at the tender, develops a work performance project (and, if necessary, a plan of organization of work, POW), which considers the picture of the construction performance of a particular object by a particular construction organization in particular realities. That is, even with the first approach, when the future specific consumer-operator of construction products is not known in principle, construction passes through two phases: generalized ideas about the processes and technologies for their implementation (POC) and the most specific ideas (WPP and POW).
The second approach immediately implies the presence of two stages:

- The first stage of the second approach involves compliance with the current directive (prescribed for use) standards of integrated security at the stage of creating primary construction products in order it enter the market. This stage corresponds to the current idea of the customer, who formed ("built") the building or structure and sold it to the owner or operator on the construction market. The latter, in turn, can repeatedly resell or lease this property in whole or in part to other owners or operators. The process of changing ownership can go on forever.

- The second stage of the second approach involves taking into account the individual adaptive standards of the state, behavior and activities of a particular person or group of persons (community) in a building or structure, preliminarily erected or rebuilt at the first stage in compliance with the current directive standards of integrated security. That is, without denying the need and the prevailing understanding of the advisability of the first stage, it becomes possible to take into account and anthropotechnically implement the individual adaptive norm of the state, behavior and activity of a particular person-operator of the housing.

The usual way of reacting to incidents in it by modern Russian society when implementing the first approach to ensuring the anthropotechnical security of functioning and quality of life is “post factum” [14]: something happens and only after that the response to such an emergency event begins.
The concept of the advance formation of anthropotechnical security of functioning and quality of life (AFAS-concept) seems to be much more promising, which includes:

- individual adaptive standards of the state, behavior and activity of a particular person or group of persons (community) in a particular building or structure can be identified in advance;
- pathological interactions of the components of the "person-housing-activity" system and building processes and technologies, that compensate them, anthropotechnical techniques and health aids can be unambiguously determined and implemented in advance;
- diagnostics and monitoring of security parameters of functioning and quality of life in the "person-housing-activity" system can be performed in the necessary cycles in order to identify and timely compensate for violations of the volume and quality of human health.

Two main approaches to evaluating situations are known:

- The most ancient, taking into account the generalized results of private opinions (expert approach) [15, 16, etc.].
- Based on quantitative (digitalized) instrumental evaluations of the current values of the standardized parameters of the object of study by a scientifically grounded methodology in the framework of computer information technology. This approach requires certain efforts, resources expanses (time, finance, etc.) and discipline in compliance with the standards of the used information technology in instrumentation quality evaluation. But it ensures the objectivity of the evaluation (its independence from the properties and personal manifestations of a series of changing operators) and its compatibility and comparability with the evaluations, performed for other objects of study, using the same express technology [17-19, etc.].

This technology is one of the components of the cyberphysical systems of construction objects and uses the digitalization of diagnosed parameters as one of the innovative development principles. The ontology of terms and the relationship of medical and technical cybernetics are shown in [20]. The height of the modern development of cybernetics is the concepts of cyberspace and the cybersystem, in particular, the cyber-physical system (CPS), which "... integrates computing resources into the physical entities of biological and man-made objects" [21]. Cyberphysical systems in construction belong [22, 23, etc.] to applied cybernetics, they imply the study of natural phenomena and technical processes from the standpoint of the needs and limitations of a functioning person (designer, builder or building user).

3. DISCUSSION OF RESULTS

The original technique and its engineering instrumented anthropotechnical express technology, that implement it, is selected as the mean of diagnostic and monitoring of the security parameters of functioning and quality of life in the "man-housing-activity" system in the AFAS- concept to evaluate the comfort level of living (CLL) of a particular person in a particular environment.
Supporting characteristics of this position are:

- infographic approach as a method of anthropotechnique;
- the system "man-technics-environment" as an object of study and design in anthropotechnique;
- methods, techniques and means of express diagnostics in anthropotechnique;
- a person as an object of study in the processes of diagnostics and monitoring, as well as the only objective criterion of comfortable living;
- individual and subjective nature of CLL;
- technology and organization of engineering monitoring of CLL.

The concept of advance formation of anthropotechnical security of functioning and quality of life can be the basis for functioning:

- housing and municipal complex of market services, since it relates to the sphere of housekeeping, and not as it is now - to the construction industry;
- a new direction of the construction business, implemented at the second stage of the second approach to solve the problems of anthropotechnical security of functioning and quality of life;
- a new direction of the implementation of market business services on the diagnostics and monitoring of individual adaptive standards of the state, behavior and activity of a particular person or group of people (community) in a particular building or structure.

The total of these approaches form the basis of the scientific direction “Anthropotechnique of integrated security of activity”.

The main principles of the AFAS-concept are implemented in the "Iris" housing complex (Moscow region, Odintsovo district, the village of Lesnoy Gorodok), which stands out from many new buildings with a creative design and consists of two buildings. The first building consists of eight sections of variable number of storeys, which, with a "bird's eye view", look like a closed triangle. When viewed from a human height, it becomes clear, that this small “fortress” has a convenient entrance and access inside a cozy courtyard. A little at a distance there is a five-story building with a slightly different facade design. Roof architecture, reminiscent of unknown birds with a rather large wingspan, which is extremely unusual, compositionally combines the "Iris" complex of buildings into one whole

The design of the monolithic and brick structure is extraordinary and is clearly look grace against the background of long-bored rectangular high-rises. The sections of the buildings are located around the perimeter of the triangle, forming a complex line of the facade with smooth curves, alternating with the angled ledges of the loggias. The floor-space of apartments, depending on the number of rooms, varies from 40.4 to 96.5 square meters.

Recently, domestic developers are increasingly using the term “economy-comfort”, putting into the head of the housing owner the idea, that half of this term, contained in the word “economy”, refers to value, and the other half - “comfort”, - this is all the rest, that the housing purchaser decides to evaluate for himself.

Figure 1 "Iris" complex: at the top - view from the outside of the complex; below - a bird's eye view of the complex.

A person is usually not capable to unambiguously and well-reasonable determine whether a housing (as an environment for its future habitat) will be pathogenic (damaging the quality and volume of its health), neutral or recreational (providing it with restoration and improvement of the quality and volume of health) and he even does not think about the possibility of such a prospect. Knowledge or determination of the adaptive standard of this person may be a focus in solving this problem.

Figure 2 "Iris" complex : at the top - view of the complex from the courtyard; below - the layout of apartments in an acute-angled connection of buildings.

Usually a person tries to find a compromise between costs and his idea of comfort. There are few three-room apartments in the "Iris" housing complex, based on the potential audience. However, the floor-space of one-room (40-46 sq.m) and two-room (62-75 sq.m) apartments can be considered quite large. Studio apartments with a small kitchen, located in an acute-angled connection of buildings cause some caution and the need to demonstrate extraordinary thinking from buyers (bottom image in fig. 2).

In the design and erection of the "Iris" housing complex, the AFAS- concept, considered above, that contributes to the level of profitability of housing sales, beneficial for the developer and improvement of the quality of life for its purchasers, was successfully applied.

Housing complex "Iris" can well be transferred from an economy class to a full-fledged comfort class by any measure.

4. CONCLUSION

1. Scientific study and practical application of the concepts of “cyberphysical system” and “anthropotechnique of management”, the corresponding concepts, their combined consideration and development in the construction industry lead to significant effects.
2. A wide field of potential scientific and practical directions of studies and new activities is opening, aimed at increasing the comfort of human habitation, significantly increasing the volume and quality of his health, which allows him to successfully carry out many types of fruitful activities.
3. The interconnection of the computing and physical components of activity in the cyberphysical systems “person-technics-environment, PTE” based on intelligent management and digitalization increases adaptability, efficiency, functionality, reliability, security and ease of human living in buildings and structures.

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