

## ERGONOMICS IN DESIGN AND ITS ROLE IN SOCIAL LIFE

*Abdukarimov Begali Abdualievich*

*National Institute of Painting and Design named after Kamoliddin Behzod, Senior teacher of the "Design" department*

---

### Abstract

Modern production, aviation, water and land transport, service systems, and the domestic environment, which are widely provided with complex technical systems, make high demands on a person and force him to work in extreme conditions at the limit of psychophysical capabilities.

Unfavorable environmental conditions, the incompatibility of its elements (especially technical equipment, tools) with the objective needs and capabilities of a person make it difficult. This article discusses the impact of ergonomic factors on design in such unfavorable conditions.

**Keywords:** design, factor, maximum, physiological, psychophysical, social, individual.

---

Factors such as efficiency, comfort, safety, satisfaction, etc. should be taken into account when designing the environment where people live, work and rest, that is, human factors should be taken into account as much as possible when designing.

Human factors are defined as a set of socio-psychological factors affecting the human's anatomical, physiological, psychological and psychophysical characteristics, as well as the effectiveness of his life in contact with machines and the environment. The science of ergonomics helps in studying these factors.

Ergonomics is a scientific science that comprehensively studies the functional capabilities of a person in labor and household processes, reveals the laws of creating optimal conditions for a highly productive life and highly productive work.

Ergonomics does not study the work environment and its other types, which are the subject of other disciplines. For ergonomics, the impact of the environment on the efficiency and quality of human activity, its performance, and physical and mental well-being is important. Ergonomics determines the optimal values of environmental loads, both individually and in combination.

Ergonomics is inextricably linked with design, and one of its main goals is to create a harmonious object environment that satisfies the material and spiritual needs of a person. At the same time, not only the features of the external appearance of the objects, but mainly their structural connections, which give the system a functional and compositional unity (from the point of view of both the producer and the consumer), are developed. This is a general situation that allows us to consider ergonomics as a natural scientific basis of design. From a practical point of view, consideration of human factors is an integral part of the design process.

In recent decades, both in our country and abroad, the concept of ergodesign has been used more and more to express the field of activity that appeared at the intersection of ergonomics and design. Ergodesign integrates scientific ergonomic studies of the "human factor" with project design developments, so that it is impossible to draw a line between them.

Ergonomic design is carried out at all stages of the overall design process and includes the following steps:

1. Analyzing human activity, studying the factors of its implementation, studying regulatory documents.
2. Development of ergonomic requirements and indicators, as well as recommendations for their review.
3. Forming the ergonomic features of the designed equipment or product and the environment. Development of a technical and conceptual ergonomic project based on the designed object search scheme.
4. Assessment of the completeness and correctness of the implementation of ergonomic requirements. At the stage of technical specifications, it is important to perform a correct ergonomic analysis of design tasks, determine the real role of a person in system management, maintenance and repair, and the effect of his working conditions on him.

The first stage of ergonomic activity at the stage of developing a technical proposal and project project is the analysis of work tasks, activities of a person or a group of people, prototypes and analogs of the designed object, as well as regulatory and technical documents; carried out according to a selected or specially developed methodology. At the same stage, it prepares the ground for the implementation of ergonomic conceptual design, which includes the main idea of the ergonomic solution of the designed object and the rationale of the selected solution. When designing large systems, functional and mathematical modeling of human activity is carried out.

In the conceptual ergonomic design, it is necessary to clarify the distribution of functions in the "man-machine" system, the preliminary design of the work tasks of a person or a group of people, the ergonomic requirements for the technical system, the working space and workplace, the environment, the technical system management and maintenance. The number of people is shown. This creates the basis for the development of first extended and then detailed algorithms of human activity. Such an algorithmic description makes it possible to move on to the identification of psychological and physiological functions that ensure the implementation of individual actions and logical conditions.

A conceptual ergonomic project is developed based on the designed object search scheme.

The search procedure can be used to choose the best way to organize the equipment - thereby answering questions about its operation that cannot be solved by its ergonomic assessment.

The use of two-dimensional drawings makes it possible to solve the problems of workplace organization, as well as to check the location of controls from the point of view of ease of use, to check the equipment during maintenance, to determine the accessibility of points during testing and adjustment, etc.

In contrast to the search for experimental ergonomic research, a functional scheme (modeling complex) is created that can simulate the operation of the equipment (may not imitate the external appearance of the object). Here, human activity is organized in such a way that its main characteristics correspond to the characteristics of activity in the real system.

Models of this type can include simulators that represent the technical means of human training and implement the physical and (or) functional model of the "man-machine" system. With the use of computer technologies, qualitatively new opportunities for functional layouts have opened up.

A functional mock-up can be used to compare alternatives or validate a selected design, as well as to evaluate individual equipment features.

At the stage of development of the technical project, an ergonomic project is carried out as its component, its content is reduced to the final ergonomic solution of the designed object based on the distribution of functions in the "man-machine" system. The project includes ergonomic requirements for a person (a group of people), a technical system, a workplace, and the environment. The technical project also determines the final composition of specialists for the technical system, their functional tasks and work organization; composition of collective and individual means of displaying information,

control elements, workplaces and control panels; organization of workplaces, including the location of information display devices, control elements and their placement in the workplace. In other words, ergonomic design determines the ergonomic characteristics of the created object.

At the stage of preparation of working documents, the prototype is manufactured and tested, analysis and experimental evaluation of the latter is carried out to determine the degree of implementation of ergonomic requirements and proposals. If necessary, proposals for ergonomic improvements to the facility will be developed, including design changes aimed at ease of use and maintenance.

As a design act, ergonomic assessment goes through all stages of design and evaluates the prototype, summarizing it. The evaluation is carried out according to the selected or specially created program and methodology and includes the determination of the ergonomic evaluation criteria, the determination of the parameters of the "man-machine" system related to these criteria, and quantitative evaluation using measurements and experiments. Values for individual parameters are reduced to a single scale, which makes it possible to draw a conclusion about the level of ergonomic quality of the object as a result of the whole process.

The ergonomic design process should be planned with a certain advance of the work in the technical design stages, because ergonomic research and development, as a rule, is long and complicated in terms of method and technical execution.

Ergonomic design cannot be abstracted from the problem of economic efficiency, that is, from determining the relationship between ergonomic results and the costs of this result. The benefits of ergonomic development and research can be related to increasing production efficiency and improving the quality of industrial products, improving the efficiency and reliability of complex man-machine systems, health and safety, job satisfaction and personal development of workers.

The basis for the development of the project is ergonomic requirements, that is, ergonomic rules are formed based on the requirements applied to the "man-machine-environment" system in order to optimize the human-operator activity, taking into account socio-psychological, psychophysiological, psychological, anthropometric, physiological and hygienic factors.

Socio-psychological factors show that the design of the project for the organization of workplaces, the nature and level of group interaction, and the establishment of interpersonal relationships depend on:

Anthropometric factors determine the conformity of the structure, dimensions of the device to the structure, shape, size and weight of the human body, as well as the conformity of the nature of the product form to the anatomical plasticity of the human body.

Psychological factors predetermine the compatibility of the project with the strengthened and newly formed skills of perception, memory, thinking, psychomotor skills and work ability.

Psychophysiological factors determine the compatibility of the project design with vision, hearing and other human capabilities, ease of vision and orientation in the subject environment.

Physiological factors are designed to ensure that the equipment corresponds to the physiological characteristics of a person, his strength, speed, biomechanical and energy capabilities.

Hygienic factors determine in advance the requirements for the toxicity of materials used for the production of equipment and its decoration.

In addition, the use of synthetic (and natural) construction and finishing materials in the design of design objects has a significant impact on human health: interior, furniture and equipment. These materials, to varying degrees, affect the space of the buildings of the place of residence and the people who live there. There are three main mechanisms of such an effect: chemical, physical and biological.

#### **List of references:**

1. Азрикан Д.А. Эргодизайн. Проблемы и перспективы// Техническая эстетика, 1987, №
2. Барташевич А.А., Богуш В.Д. Конструирование мебели: Учебник. — Мн.: Выш. шк., 1998.

3. Грашин А.А. Дизайн детской развивающей предметной среды/ Учеб. пособие. – М.: «Архитектура-С», 2008.
4. Основы эргономики в дизайне среды. Часть I: Учебное пособие / О.С. Шкиль. – Благовещенск: Изд-во АмГУ, 2010. – 164 с.
5. Sultanova M. F. et al. The Effect of architectural design and its dimensions on human psychology //NVEO-natural volatiles & essential oils Journal| NVEO. – 2021. – С. 1601-1610.
6. Abdalimovich A. B. Application of plastic products in construction and design //Web of Scientist: International Scientific Research Journal. – 2021. – Т. 2. – №. 07. – С. 126-130.
7. Абдукаримов Б., Хасанова М., Аксунова Н. АРХИТЕКТУРНЫЙ ПОРЯДОК КЛАССИФИКАЦИИ //Материали конференции МЦНД. – 2021.
8. Мухайё Султанова Влияние архитектурного дизайна и объемов на психологию человека // ОИИ. 2021. №5. URL: <https://cyberleninka.ru/article/n/vliyanie-arhitekturnogo-dizayna-i-obemov-na-psihologiyu-cheloveka> (дата обращения: 13.03.2023).
9. Fahriddinqizi S. M., Axrorbek Akromjono'g'li A. Oliy O'quv Yurtlarini Loyihalashda Qurilish Me'yoriy Qoidalari Va Loyihalash Tamoyillari //Ijtimoiy fanlarda innovasiya onlayn ilmiy jurnali. – 2021. – Т. 1. – №. 6. – С. 117-123.