

Safety and health protection in the implementation of construction projects

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Abstract

The implementation of construction projects in modern times is changing along with the development of civilization. Technological progress, education, communication, new materials, machines and devices, on the one hand, shorten the implementation time, on the other hand, they cause the emergence of new, hitherto unknown threats to the health and life of people related to the implemented construction project. The article reviews the basic legal regulations regarding health and safety during the implementation of construction projects.

Keywords: construction, safety and health protection, construction project

1. Introduction

Construction is a branch of the national economy characterized by a high level of threats to the health and life of participants participating in the implementation of a construction project. These threats are the result of improper design, implementation of a building and its use, working conditions, high variability of weather conditions and employee behavior resulting from the applicable legal requirements, rules and culture of work safety or omission of broadly understood safety issues related to the life cycle of a construction object.

In the assessment **of the safety and health protection (BIOZ) of a construction object**, all participants in the construction project implementation process play an important role. The construction process includes three basic stages: project preparation, construction project implementation and operation, which play a significant role in designing, maintaining and creating the safety and health protection of employees throughout the entire life cycle of a construction object.

Construction projects are an economic activity in which construction objects are created, characterized by a high level of threats to the health and life of employees and a large number of accidents. Regardless of the purpose of the building, all participants participating in the project should ensure safety during the preparation, construction and operation of the facility.

Using the definition of the organization of Prof. Kopaliński [11] and Prof. Kotarbiński [13] and the considerations of the creators and promoters of Polish organizational thought [3,10,18,19,22,24,26,39], each construction project can be presented as a whole composed of parts, which are treated as its fragments aiming at a common goal. The investor's task is to set goals for these fragments. With the help of procedures and schemes, complex situations occurring in the investment process are simplified, which individual parts of the organization encounter. This allows for easier interpretation and reference to situations with which a given fragment of the organization of the construction project implementation process had contact. The use of procedures merges all fragments and leads to the selection of the optimal solution that will meet the needs of the investor. The investor's activity in this area consists in the culmination of all parts of the organization of the construction project implementation process. The investor's lack of interest in this area may lead to unforeseen situations threatening work safety and the emergence of a threat to the health and life of employees.

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2. Project construction

The terms "*investment*" and "*venture*" are treated interchangeably in the literature. Lińczowski, in general, used the term "*investment*" to refer to the amount of living and objectified labour incurred in order to create functional fixed assets, including construction, extension, reconstruction of buildings [20]. In economic terms, *construction investments* were understood as financial outlays incurred for the construction, acquisition or modernisation of existing buildings [38]. In the Environmental Protection Act, the term "*investment*" has been replaced by the term "*project*" [36].

Kietliński, Janowska, Woźniak used the term *investment project* as a series of basic activities - m.in. planning and implementation of the plan and handing it over to the investor for use, which consists of various activities primarily of an analytical, conceptual and economic nature, e.g. securing funds for investment financing and administrative, e.g. obtaining the required decisions, permits, carrying out procedures tender [6,9].

In the investment process in the construction industry, Połowski distinguished a series of coordinated technical, legal, technological, organizational, financial activities, leading to the implementation and operation of a planned investment built at a specific time and with limited financial resources [2,27]. The condition for the successful implementation of the construction project was its organization in accordance with the applicable law and specificity [5].

A construction project, in organizational terms, is a process consisting of the following parts: technical, economic and environmental study, development of the concept of action, development of a construction project, organizational preparation, construction implementation and after commissioning of the facility its use [8,21,23,29].

2.1. The process of implementation of the construction project

The process of implementation of a construction project (investment) is an organizational form including activities spread over time, which include planning, design, logistic and economic aspects related to the preparation, implementation and operation of the planned investment (Fig. 1.).

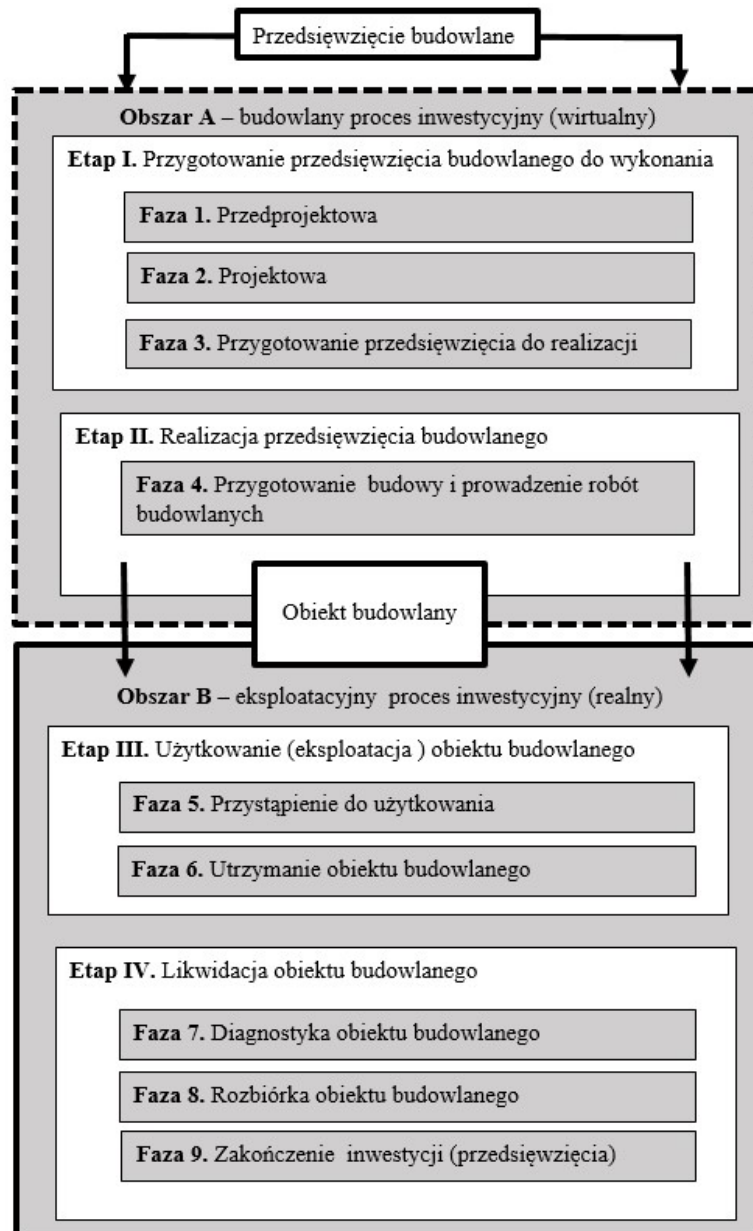


Fig. 1. Model of the construction project implementation process [26]

The model of the construction project implementation process (Fig. 1) coincides with the life cycle of the construction object proposed by Kasproicz [8] and covers two areas:

- *area A - construction investment process*, in which a virtual building object is created, which during construction transforms into a real object
- *area B - operational investment process*, in which there is a real construction object.

The life of the construction project presented in the model consists of four stages and nine phases. After the investor has made a decision on the investment in the form of a construction project (Area A, stage I), technical, economic and analytical studies of the feasibility of the project due to technical, economic and environmental conditions (phase 1) are carried out. They concern the conditions for the implementation of the project on the construction site and the operation of the building. On this basis, the concept is prepared and a project implementation project is developed, including the construction project (phase 2) and the preparation of the project for implementation (phase 3). In area A,

the construction object does not exist. It is a virtual object that during construction is transformed into a real building (stage II, phase 4) and a used object (stage III, phase 5, 6) until the decision on decommissioning (stage IV phase 7, 8, 9) or the decision on its modernization is made.

In Poland, there is a legal regulation regulating the course of the *investment process in the construction industry*. It is a law [37]. It defines the requirements for the design, construction, maintenance and demolition of buildings and defines the participation of public administration bodies in these activities. The Act distinguishes four basic participants in the construction process: investor, investor's supervision inspector, designer, construction manager or works manager and imposes certain obligations on them. The investor is responsible for the entire course of the process and for this purpose creates an organizational model for the construction project. The process of creating an organizational model of a construction project consists in adapting the organizational structure of the project to the goals, resources and environment.

Analyzing the actual conditions prevailing during the implementation of construction projects [1,2,4,7,12,16,17,27,28], shortcomings are noted in the documentation of the stage of preparation of projects in which the organizational security of planned investments is analyzed. These are mainly deficiencies of formal and legal studies resulting from imprecise legal provisions, deficiencies or errors in organizational and administrative procedures or lack of competence of persons involved in the preparation of investments for implementation.

The construction object being the subject of a construction project changes its parameters during the process. At the stage of preparation of the project for implementation, it is a virtual object, which during construction (stage of the construction process) transforms into a real object. During construction, in addition to changing the parameters, the building materials used, the tools used, the machines and equipment used and the environment in which the construction works are carried out also change. The behaviour of employees in the application to the works carried out is also changing, which in many cases leads to a reduction in the level of BIOZ on the construction site [25,26]. The investor and the employer are obliged to ensure the safe course of works during the implementation of the construction project due to the applicable legal regulations and moral responsibility for other people. Safe working conditions are one of the basic factors determining the success of business activity, and failure to do so can lead to accidents. Accidents may be the result of dangerous working conditions, its high variability during the construction of the object and improper behavior of participants in the construction project process, including dangerous behavior of construction workers.

3. Legal regulations regarding BIOZ during the implementation of a construction project

For safety and health (BIOZ) considerations, the definition of occupational *protection and occupational health and safety* was used. The definition of *labour protection* was developed at the Central Institute for Labour Protection (CIOP), where it was defined as a set of legal norms and research, organizational and technical measures aimed at protecting the life and health of an employee against dangerous and harmful factors in the work environment, as well as creating optimal conditions for him from the point of view of ergonomics, physiology and psychology of work interrelated [14]. On the other hand, *occupational health and safety* was treated as a set of legal norms and research, organizational and technical measures aimed at creating such working conditions for the employee that he can perform

work in a productive manner, without exposing himself to an unjustified risk of accident or occupational disease and excessive physical and mental strain [15,30].

Ensuring safe working conditions is the employer's obligation under Polish law. The most important legal acts in force in this area in Poland are the Constitution of the *Republic of Poland* [35] and the Labour Code [34] which include work safety as a result of cooperation between workers, employers and employees of supervisory institutions.

In Poland, there is a legal obligation to assess occupational health and safety [31,32,34]. This obligation applies to:

- a full-time OHS service or an OHS inspector (specialist) in the case of a one-man staff of this service;
- specialists from outside the plant entrusted with the performance of tasks serves OHS; an employer performing OHS tasks within the meaning of the Labour Code (Article 327);
- employers who are obliged to carry out systematic OHS inspections, with particular emphasis on the organisation of working time, the technical condition of machines and technical devices and determining the manner of removing irregularities [32];

OSH assessment should be based on:

- technological documentation,
- technical documentation of machines and other technical devices in terms of their harmfulness to the health of employees,
- risk assessment,
- protocols for measuring harmful and hazardous factors,
- protocols of inspections of working conditions carried out by internal services and external bodies supervising working conditions,
- personal files of employees in the field of information on employee qualifications, training, medical examinations, etc.,
- documentation of accidents at work and suspicions of occupational diseases and occupational diseases,
- accident analysis,
- programmes to improve working conditions.

4. Construction law

The Construction Law Act [37], defines construction works (Table 1), regulates activities covering the design, construction, maintenance and demolition of buildings and defines the rules of operation of public administration bodies in these areas.

Table.1. Types of building structures according to construction law [37]

| No. | Construction object | Type of construction object | Characteristics of the building object |
|-----|---|-----------------------------|---|
| 1 | <i>Construction object - a building, building or small architecture</i> | Building | A building object that is permanent bound to the ground, separated from the space by means of building partitions and has foundations and a roof |
| 2 | | Building | Any building object that is not a building or a small architectural object, such as: linear objects, airports, bridges, viaducts, flyovers, tunnels, culverts, technical networks, free-standing antenna masts, free-standing |

| No. | Construction object | Type of construction object | Characteristics of the building object |
|-----|---------------------|----------------------------------|---|
| | | | advertising boards and advertising devices permanently connected to the ground, earthworks, defensive (fortifications), protective, hydrotechnical, tanks, free-standing industrial installations or technical devices, sewage treatment plants, landfills, water treatment plants, retaining structures, above-ground and underground pedestrian crossings, utilities networks, sports buildings, cemeteries, monuments, as well as construction parts of technical equipment (boilers, industrial furnaces, nuclear power plants, wind turbines, offshore wind turbines and other devices) and foundations for machinery and equipment, as technically separate parts of objects that make up the usable whole. |
| 3 | | Small architecture object | Small objects, in particular: religious worship, such as: chapels, roadside crosses, statues; statues, water fountains and other objects of garden architecture; utility for everyday recreation and maintaining order, such as: sandpits, swings, ladders, garbage cans. |

The construction work as a whole and its individual parts, together with the associated construction equipment, shall, taking into account the expected useful life, be designed and built in the manner specified in the regulations, including technical and construction regulations, and in accordance with the principles of technical knowledge, ensuring in particular the requirements for:

- 1) **design:**
 - a) load-bearing capacity and stability of the structure,
 - b) fire safety,
 - c) hygiene, health and the environment,
 - d) safety of use and availability of facilities,
 - e) protection against noise,
 - f) energy savings and thermal insulation,
 - g) sustainable use of natural resources,
- 2) **building:**
 - a) health and safety conditions at work,
 - b) safety and health conditions of persons staying on the construction site,
- 3) **Usage:**
 - a) in a manner consistent with its purpose and environmental protection requirements,
 - b) maintaining in proper technical and aesthetic condition, not allowing excessive deterioration of its functional properties and technical efficiency, in particular to the extent related to legal requirements.

5. BIOZ information

Safety and health information is a document that is drawn up by the designer. The BIOZ information is a component part of the construction project [Construction Law Act] and consists of a title page and a descriptive part [33]. The title page of the BIOZ information contains data of the construction object, investor's data, data of the designer preparing the information. The descriptive part of the information on BIOZ includes, among others, the scope of works covering a

given task along with the order in which they are performed. This section provides information about existing facilities. The information on BIOZ focuses on safety and health risks in the form of:

- indicated elements that may endanger employees,
- the anticipated risks described,
- tips on how to conduct employee briefings,
- an indication of the measures to prevent the risks(33).

6. Plan BIOZ

The BIOZ plan consists of a title page, a descriptive part and a drawing part [33]. The title page of the BIOZ plan contains data of the construction object, investor's data, data of the manager or the person preparing the plan on his behalf. The descriptive part of the BIOZ plan largely coincides with the BIOZ information. It contains information about the scope of works, the schedule of their implementation and a list of objects to be demolished or adapted. There is also information on the place of storage of construction documentation, which cannot be predicted at the stage of project implementation and BIOZ information. As in the information on BIOZ, it is necessary to indicate here elements related to the hazards occurring during the execution of works:

- elements of land development that may pose a risk,
- a description of the anticipated risks,
- information on how to separate and secure work sites,
- information on how to conduct employee briefings,
- determining the method of storage and handling of hazardous materials,
- an indication of the measures to prevent the risks.

In the drawing part of the BIOZ plan there are the following elements:

- legend
- indication of factors likely to present a hazard,
- location of fire-fighting equipment,
- location of life-saving equipment,
- protection zones (e.g. storage of hazardous materials),
- auxiliary production sites, e.g. production of concrete or prefabricated elements,
- communication, place of transport, fencing,
- hygienic and sanitary rooms [33].

6.1. IBWR manual

The Instruction for Safe Execution of Construction Works (IBWR) is another document after BIOZ in the field of safety at the construction site. IBWR is carried out in order to inform about the ways of preventing risks associated with the performance of construction works specified in the construction law and how to proceed in the event of these threats [37].

Before commencing the execution of construction works, the Contractor is obliged to develop a safe instruction (IBWR) and familiarize employees with it in the scope of their works for the works:

- the nature, organisation or location of which presents a particularly high risk of endangering the safety and health of persons, in particular burial or falling from a height;
- where there are chemical substances or biological agents that endanger the safety and health of humans;
- posing a risk from ionising radiation;
- located in the vicinity of high-voltage or active communication lines;
- workers posing a risk of drowning;
- conducted in wells, underground and in tunnels;
- performed by drivers of vehicles powered from overhead lines;
- caissons with an atmosphere produced from compressed air;
- requiring the use of explosives;
- carried out in the assembly and disassembly of heavy prefabricated elements

It is also important to adapt the Instructions to the tasks performed on a specific construction site. These documents should contain the following particulars:

- the investment being carried out;
- the contractor and the general contractor;
- work performed (period and place of performance, weather conditions, scope and order of performance);
- employees (position, responsibilities and responsibilities, qualification requirements, number of employees);
- equipment and tools necessary to carry out the work (name, purpose, formal requirements);
- hazardous substances and materials [31,32,37].

Conclusoins

Construction projects should be carried out in accordance with the provisions of applicable law. Particular attention should be paid to ensuring safety and health protection during the implementation of the entire project process, starting from preparation, through construction to operation of the building.

Particular attention should be paid to ensuring: safety of construction, fire, use; appropriate hygienic and health conditions; environmental protection, protection against noise and vibrations, energy saving and adequate thermal insulation of partitions, in a manner consistent with their purpose, environmental protection requirements during the entire process of implementation of the construction project. Ignorance of the law does not exempt from responsibility.

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