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Novelty
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Sustainability

Proceedings

Editors: M. Trivunić, I. Džolev, M. Šešlija

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AND GEODESY

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iNDiS 2023

Department of Civil Engineering and Geodesy, Faculty of Technical Sciences, University of Novi Sad, is organizing the sixteenth international scientific conference "iNDiS 2023" - integration, novelty, design, interdisciplinarity, sustainability. From this year, the modified format of the event starts, therefore the conference will be held biennial in the future.

Topic of the first conference, held in 1976, was "Industrial construction of apartments" because of its modernity in that period. Later, conferences were held with a considerably broader theme of "Construction Industrialization", and soon papers from all areas of construction appeared at the conference, from urban planning and design of buildings of various purposes, to maintenance and major interventions on the built construction stock. This led to the expansion of the area of expertise, covered by this conference, in which, in addition to civil engineers, urban planners, architects, engineers of other professions, who work in construction, sociologists, economists and others participate.

This conference, like several previous ones, covers the problems of planning, designing, construction and renovation of construction, geodesy, geoinformatics and risk management of catastrophic events, which have come across to an adequate response from researchers and engineers of various profiles, both from our country and abroad.

Members of the International Scientific Committee actively participated in the preparation of the conference, both as reviewers and authors. It is expected that the presentations of papers and discussions at the conference will enable the definition of the main directions of construction development, in accordance with modern trends, since many ideas and results, experimental and theoretical researches in the fields of construction have been promoted.

For this conference, the Proceedings consists of two books, namely Book 1. Papers in English and Book 2. Papers in Serbian, which enables better and more fruitful communication and exchange of experiences with colleagues from abroad.

Additionally, the possibility of establishing new and strengthening existing professional and collegial ties is also of the great importance. This year, authors from 13 countries are participating in the Conference, and the Proceedings Book 1 contains 94 papers in English, while the Book 2 contains 23 papers in Serbian, in total 117 papers.

The editors express their sincere gratitude to all the authors for the effort invested in writing the papers as well as for their contribution to this event.

Editors of the Proceedings

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AN APPROACH FOR RAILWAY PROJECT MANAGEMENT

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Summary:

This paper aims to solve this problem, which has recently become more common in railway projects. The key is in a planned approach and organization from the beginning of the project, which the candidate considers by elaborating a Methodology for the construction of the site in the form of a document. This methodology solves all the above and helps lead the project from its beginning to the end with a positive result. The scope of the methodology for the construction of a facility includes several scientific disciplines directly related to the realization of the facility, such as law, economics, ecology, quality management, construction, etc. Therefore, it should cover all matters in these areas and provide solutions and courses of action at the beginning and in the development phase of the site to adapt to possible needs and to be finalized. The conclusion is that the application of such a Methodology for the construction of the site is necessary, or it could be freely said that it is mandatory.

Key words: methodology, fidic, railway projects, quality management

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1. INTRODUCTION

For obtaining larger projects that are financed by various financial institutions and funds and which are almost regularly realized according to the rules of FIDIC Contracts, candidates are usually larger international companies or consortia formed specifically for the fulfilment of the project in question.

In addition to the basic rules of the FIDIC Agreements that provide correct relations, Investors, to protect their interests and the interests of the state, supplement the Agreements by using the section of Particular FIDIC conditions and setting specific requirements with which usually the entire (or almost all) the risk is transferred to the Contractor. Bidding companies cannot influence this, and their only option is to accept the proposed Contracts in the tender procedures as they are. The proposed Contracts in the tender documents are not usually "favoured" by the future Contractor.

The most important aspects of this topic are:

- the methodology is not just a document. It is a fundamental base that will allow achieving a positive (or expected) financial result at the end of the project,
- the building is being built within the planned construction period,
- construction quality is achieved,
- the reputation of the Contractor is protected and increased,
- the Contractor company's rights are protected in future disputes between the two parties to the Agreement.

The methodology achieves proper organization and work guidelines and guarantees the facility's construction following the rules of the Agreement signed by both parties.

2. OBJECTIVES OF THE METHODOLOGY

The methodology will locate all potential problems and risks that can lead to the extension of construction deadlines and cause a negative financial result for the project. The methodology itself will list all expected possible aspects and needs necessary to be considered, planned, prevented, and realized as part of such a methodology, with the aim of successful implementation of the project and a positive result. In addition, the method should provide preventive actions and measures to avoid (or minimize) all problems and risks.

The methodology is a sublimation of knowledge from many areas, planning, and management at the highest expert and scientific level. It unites construction, electricity, contact network, signaling, telecommunications, railway construction, law, finance, quality systems, FIDIC, etc.). The methodology coordinates and implements: management of complex processes, knowledge from different fields of science (construction, law, finance, etc.), experts from various fields, design with actual performance, work with human resources, coordinating and harmonizing with public services, associations and citizens, ecology, and protection of the human environment, safety at work, correct organization of construction, etc.

Railway projects are specific, as they require specialized equipment, machinery, and personnel. There are almost no such capacities in the area of the Balkans. There are some remnants of the old socialist companies that are in the process of collapse, or individuals have appeared who do not have any resources but present themselves as executors for the upper management or a contact network.

A general finding in railway projects is that the Contractor firms were much more successful than the Contractor-Consortiums. Also, Contractors who did some planning at the very beginning and followed through on the project realized better results than those who had no conception.

In our country, the following FIDIC projects have been worked on before:

Tab. 1 Project in Republic of North Macedonia

Project	Contractor	Deadline (months)	Total working time (months)	Status	Results
Tabanovce-Kumanovo Miravci-Smokvitsa	JV "Alpine&WIEBE"	12	24	Completed	Negative
Nogaevci-Negotino	"SK 13 Holding JSC"	12	36	Not finished	Negative
Bitola-Kremenica 1	JV "Bitola - Kremenica"	18	15	Not finished	Negative
Bitola-Kremenica 2	"STRABAG AG"	18	18	Completed	Positive
Kumanovo-Beljakovce	"WIEBE GMBH"	32	60	Discontinued project	Negative

There is a similar analysis for neighboring countries:

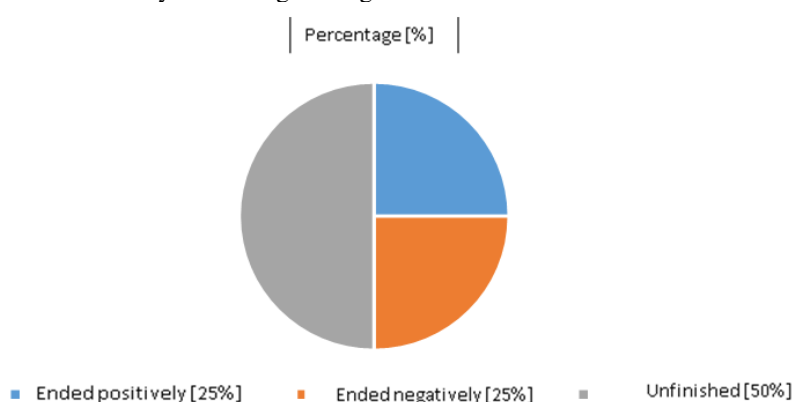


Fig. 1 Success rate of projects in neighboring countries

3. METHODOLOGY FOR THE CONSTRUCTION OF RAILWAY PROJECTS UNDER FIDIC AGREEMENT

Paper should The Project Manager is directly responsible for preparing and implementing the methodology. He is appointed by the company that performs the building. He makes the Preliminary Methodology for construction together with the Preliminary Project team formed by the primary heads of various departments, such as the Technical Head, Financial Head, Legal Head, Quality Head, FIDIC Head, and Program Engineer, as well as persons responsible for Occupational Safety, Human resources and for the protection of the human environment.

Its further elaboration and detailing until finalization, as well as all additional primary documents of the project, are produced under the control of the managers mentioned above.

For the entire time, the overall work for the full development and detailing of the plan is under the coordination and constant supervision of the Project Manager.

With the Construction Methodology, all crucial aspects of the project should be touched upon and solved: project team, documents required for contracts according to Fidic rules, quality management, the legal aspect, the economic-financial aspect, and the construction-operational part.

The project team is the one who manages the project for the entire period of project implementation. At the very beginning, the so-called Preliminary Project Team was formed by the fundamental managers of various sectors. These include the Project Team, managing it, and supplementing it as needed. Around the Project Team, the

following stages should be completed: Preliminary Project Team, managers and their tasks, Formation of a complete Project Team, and Logistics of the Project Team.

Documents required for Contracts according to FIDIC rules are the following: Preliminary working program, Working Technology, Employer's mistake report, Quality system management plan (Quality plan), Protection and Safety plan, Environment protection plan, and Risk plan for project implementation.

The first task of the Quality Manager is to deliver the Quality Management Plan. Project management depends on the prompt and quality application of the quality management plan. To apply the quality plan, it is necessary to work according to the following activities: Quality Management Service, Application of ISO standards-QMS plan, Project documentation, Trials and tests, Safety and security at work, Environmental protection and Ecology. By fulfilling them, the project will be able to guarantee quality in all areas of the project.

When you have officially received a notification that the project has been received and you are invited to sign an Agreement and its implementation should begin, it is very important to analyze the construction contract. The legal part of the project covers the following aspects: Legal services for monitoring the project, the construction contract analysis, and the possibilities from FIDIC.

The analysis of the Construction Contract from the point of view of local legislation and the point of view of FIDIC, the rules of the Contract are very important for the final realization of the project because it often happens after the completion of the project that the Contractor starts a procedure before the court of the country in question or before the Assessment Board of disputes under FIDIC rules (Dispute Adjudication Board-DAB).

Upon receiving the project and starting its realization, it is necessary to immediately approach the review of the project from an economic-financial aspect. Therefore, it is required to make the essential analyzes and documents as follows: Economic service for monitoring the project, Analysis of the offer and price, Creating a plan for financing the project - Cash flow plan, Risk-chance table, Creating a functional calculation.

The economic and financial documents start working immediately after the formation of the Preliminary Team for the implementation of the project. After the analysis made by the technical manager and the legal service, the table for risks and chances is made (Risk-chance table).

Construction-operational part of the project

Since it is a construction project, as a rule, it is the essential part of the methodology for the realization of the project and the region by which the entire organization and technology of the project are made. Therefore, it should define everything that will guarantee a quick, efficient, high-quality, and timely realization of the project. Only some things that would violate the planned construction deadline must be allowed - all possible documents and plans for the completion and finalization of the project are based on it.

It is necessary to uncompromisingly: penetrate the technical regulations of the country in which the work is carried out, ensure all the required certifications of personnel and machines, plan the construction technology that is most suitable for the project, prepare a sufficient number of mechanization, plus spare engines, plan the maintenance system and repairs of the machines, provide adequate personnel (technical and working), carry out with their capacities the main parts of the projects that lead the project (for example, if it is a railway project, the upper system dictates the project), makes a careful selection of local Subcontractors with constant control over their work.

The parts that need to be planned and implemented are the following: Construction site organization, Work technology, Work program, Personnel, and Mechanization.

Correct solutions for the points mentioned above will guarantee the project's successful realization. In general, for each topic, we will list introductory provisions that should be

paid attention to during the development of the construction-operational part of the project.

4. CONSTRUCTION-OPERATIVE SECTION BY EXAMPLE OF ONE PROJECT

4.1. CONSTRUCTION SITE ORGANIZATION

The right solutions will guarantee the successful realization of the project. In general, for each point, we will list introductory provisions that should be paid attention to during the development of the construction-operational part of the project.

The project's very opening starts with the construction site's organization and preparation for work. It is necessary to complete the following tasks in a concise period of time:

- Office space;
- Landfills and warehouses for old and new materials;
- Places for parking railway and construction machinery;
- Access roads to the facility;
- Field laboratory;
- Point for medical assistance;
- Transportation of machinery.

4.2. TECHNOLOGY FOR PROJECT WORK

Work technology defines:

- Scope of work,
- Basic technology for various types of project work,
- Phases for working on the project.

4.3. WORK PROGRAM

The working program is made in a suitable program, usually MS Project. This document is the subject of development based on long-established and approved work technology. In the beginning, it is a Preliminary work program. Still, after that, it should become an accurate and detailed work program that defines the time for the construction of the project, as well as the necessary resources.

4.4. PERSONNEL

The project staff is composed of the following:

- Project team,
- Personnel for work on the upper system,
- Personnel responsible for maneuvers and traffic within the project,
- Personnel for work on the lower system,
- Staff for working on a contact network,
- Signaling staff,
- Staff for building work,
- Personnel for construction work (bridges, culverts, overpasses, underpasses, etc.),
- Personnel for work on various types of cuts (water supply, sewerage, heating, etc.),
- Personnel for work on electrical and telecommunications cuts,
- Staff for working with metal structures (pedestrian overpasses).

The Work Program generally defines the number of staff. However, it varies and is in proportion to the starting job positions. Specific personnel should constantly be present at the building (superstructure, KM, and signaling) to fulfill the tasks and be able to intervene in all kinds of situations. The rest of the staff are tied to work-by-work phases.

4.5. CONSTRUCTION MACHINES

As well as the Personnel, the Work Program also defines the necessary machines for project construction. They are also divided into specific and classic mechanization. Specific machines are part of the teams to fulfill components such as the upper system, KM, and signaling.

This project requires the following:

- Mechanism for the upper system,
- Mechanism for KM,
- Signaling mechanism,

Classic construction machinery.



Fig. 2 Special excavators for the dismantling of rail fields



Fig. 3 Plasser und Theurer 08-32U



Fig. 4 GEISMAR PTH 350

5. CONCLUSION

The railway project management methodology provides results so that the project has:

- Positive financial results,
- Ensures timely completion of the project,
- Ensures high-quality construction,
- Preserves and improves the reputation of the Contractor company.

Also, the Methodology for managing a railway project can be considered a scientific paper that enables the successful realization of the project and a positive result. It acts preventively and minimizes all project risks.

Methodology for the management of a railway project is a sublimation of planning and management at an expert and scientific level, which unites knowledge from the fields of various sciences (railway construction, quality management, law, finance, ecology, human resources, safety at work, etc.). Preparatory work, proper planning, prevention, and, if possible, complete elimination of all objective and subjective risks are essential. All this leads to the only recommendation that this paper sends, which is to develop a Methodology for managing a railway project at the very beginning of the project. It is the only guarantee for the successful realization of the project. In addition, it guarantees personal satisfaction and professional upgrading of all involved parties in a successfully realized project.

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