

CAUSES AND EFFECTS OF VARIATION REGARDING CONTRACT IMPLEMENTATION IN TRANSPORT INFRASTRUCTURE

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Abstract: *The article examines the causes and effects of variations issued in contracts implemented in the field of transport infrastructure and financed from reimbursable or non-reimbursable external funds. The article analyzes one by one: the situations that generated the variation, including the variation into the contractual and legal provisions. The article analyzed the variations issued in the contracts in which the Employer provided the design, as well as those in which the design was provided by the Contractor, but also the probability that the total variations issued lead to a substantial change of the contract that was bid by the Contractor. The methods by which variations issued in these contracts can be reduced are another important subject of the article in cause.*

Key words: *Contractual Terms, variations, causes, effects*

1. Introduction

1.1 History and Evolution of FIDIC [2-6]

FIDIC is the French acronym for the International Federation of Consulting Engineers. This federation was established on 22 July 1913 by a number of independent consultants for World Trade Exhibitions.

Initially, the name was in French: "*Fédération Internationale des Ingénieurs Conseils*", later changed to English: "*International Federation of Consulting Engineers*".

The first standard contract form for the execution of works has been developed by FIDIC since 1957, entitled "*International Civil Engineering Contracts*"; it became known as the "*Red Book*".

Subsequently, without making any fundamental changes to the original version, the second and third editions of the Red Book were published in 1969 and 1977, respectively. FIDIC also made amendments to this edition through the successive republications of 1988 and 1992, as well as by a 1996 Supplement, and the last amendments were made in 1999.

In the implementation of a contract that is based on the FIDC contract terms, 3 parts are involved: Beneficiary Engineer and Contractor.

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The most commonly used standard forms of contract for the implementation of road projects are:

1. Red Book or "Red" FIDIC
2. Yellow Book or "Yellow" FIDIC

Given the continued development of the construction industry, FIDIC published in 1999 a new set of standard contract forms. This new set of books reduces the number of general clauses to 20, from over 60 in previous releases.

Advantages of FIDIC model contracts:

- Clarity
- Wide recognition
- Cost optimization
- Flexibility
- Coherence
- Uniformity
- Balance.

For public road projects funded by public funds, European Refundable or Non-Refundable Funds, the Ministry of Public Finance, the Ministry of Transport and Infrastructure and the Ministry of Regional Development and Housing have introduced in Romanian legislation three of the standard FIDIC contracts, namely FIDIC Red, FIDIC Yellow and FIDIC Green by Joint Order 915/465/415 of March 25, 2008 for the approval of general contract terms and special contract terms and conditions for the execution contracts that will be implemented from public funds.

1.2 FIDIC Contract Types and the Ways to Choose the One that you Need [3]

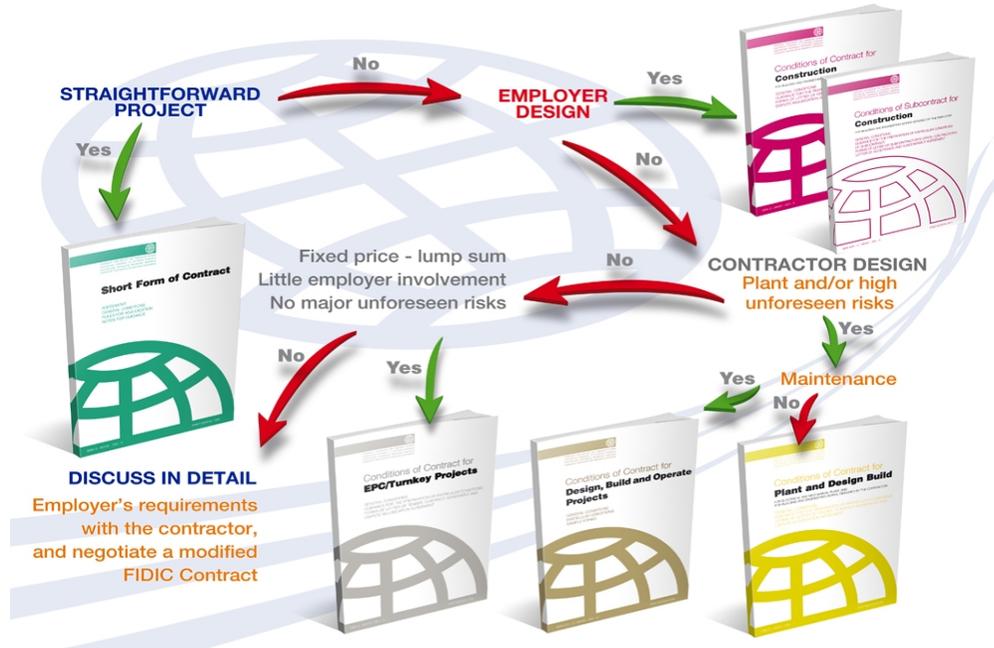


Fig. 1 How to choose standard contract terms

The standard contract terms of the Red Book (Execution Agreement) and the Yellow Book (Design and Execution) are composed of a number of 20 general clauses.

The obligations of the three parties involved in the implementation of a contract based on the FIDIC standard are distributed as follows:

- 74 obligations of the Beneficiary
- 85 engineer's obligations
- 211 Obligations of the Contractor.

2. Objectives

The main objective of this article is to identify the reasons for the variations and adjustments in the contracts implemented by the Employers in the road domain and to propose solutions to avoid such variations and adjustments.

3. Material and methods

In the article were analyzed 2 contracts implemented within CNAIR, the main Employer in the construction of roads and motorways from our country.

The two contracts are:

- "Construction of the Caransebeș By - Pass" - contract based on the standard RED FIDIC terms, where the design was provided by the Employer - Accepted Contract Amount of 30,229,926.21 euros; The Contractor had executed and completed the Works in accordance with the Employer's design and with the Engineer's instructions, and had fixed all the defects in the Works. [9]
- Rehabilitation of National Road 18 - Baia Mare - Sighetu Marmăției, km 3 + 522 - km 62 + 234" contract based on standard Yellow FIDIC contract terms, where the design was provided by the Contractor. The accepted contract amount was 182,402,700.77 Lei. The Contractor had carry out, and have been responsible for, the design of the Works. Design had been prepared by qualified designers who are engineers who complied with the criteria stated in the Employer's Requirements and in the feasibility study. [10]

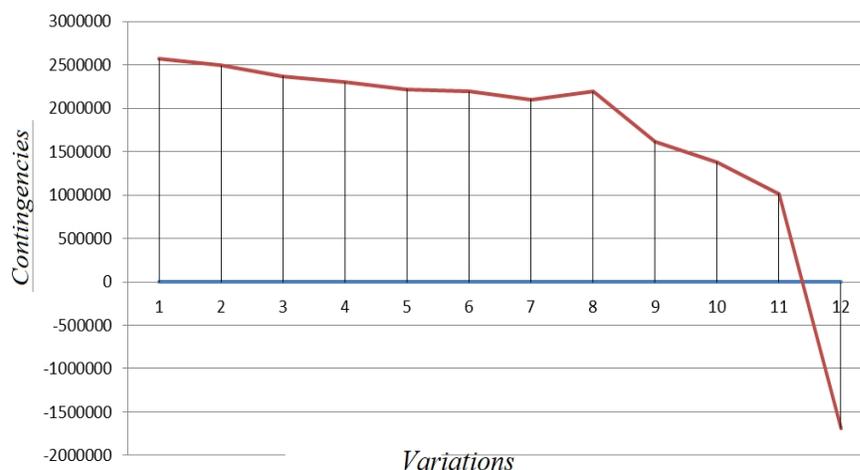


Fig. 2. *The Evolution of Contingencies*

3.1 Causes of the Variations Issued in these Contract

“Construction of the Caransebeş By – Pass” [9]

Table 1

No.	Subject	Value (euro)	Contingencies
			2,512,329.03
1	1. 1. Increase of the concrete class for drilled piles 2. Waterproofing on abutments 3. Reinforcement at the maintenance center 4. Formworks for superstructure 5. Culverts	-53,475.78	2,565,804.81
2	„The Engineer Main Office”	74,232.00	2,491,572.81
3	“Ultra-sonic pile testing”	123,032.80	2,368,540.01
4	„ The Engineer Main Office”	68,046.00	2,300,494.01
5	„Archeological works”	80,531.50	2,219,962.51
6	"Re-Design of the intersections for the improvement of the traffic safety”	30,503.05	2,189,459.46
7	„ Exceeded the quantities bridges”	89,070.65	2,100,388.81
8	„Changing solution for the bridge from km 7+735”	-91,251.87	2,191,640.68
9	Exceeded quantities and evaluation for the missed activities from drawings	574,939.74	1,616,700.94
10	Horizontal marking	234,549.38	1,382,151.56
11	Vertical signalization	370,215.67	1,011,935.89
12	Exceeded quantities from the bill	2,698,842.86	-1,686,906.97
The Total value of variations		4,076,203.20	

The information presented in Table 1 “The Variations issued in the contract “Construction of the Caransebeş By – Pass” and in Figure 2 “The Evolution of Contingencies” indicates that if there were no savings in the bill of quantities, the Accepted Contract Amount should be increased.

This increase would have meant the suspension of work by the Employer because he should identify the source of funding for difference.

The Causes of Variations [7][8][9]

Table 2

	Changes in legislation	Value Engineering	Omissions in the bill of quantities	Measured quantities	Additional Requests from the Employer	Changing the initial design
M1	-36,258.95	-	-	25,748.28	-42,965.11	-
M 2+4	-	-	-	-	142,278.00	-
M 3	-	-	123,032.80	-	-	-
M 5	-	-	-	-	-	80,531.50
M 6	-	-	-	-	30,503.05	-
M 7	-	-	-	89,070.65	-	-
M 8	-	-91,251.87	-	-	-	-
M 9	-	-	307,277.93	16,345.11	251,316.70	-
M 10	-	-	-	-	138,912.52	95,636.86
M 11	-	-	-	-	55,301.16	314,914.51
M 12	27,886.52	-	882,580.43	1,506,084	146,327.22	144,105.86
Total	-8,372.43	-91,251.87	1,189,858.36	1,637,248	721,673.54	635,188.73

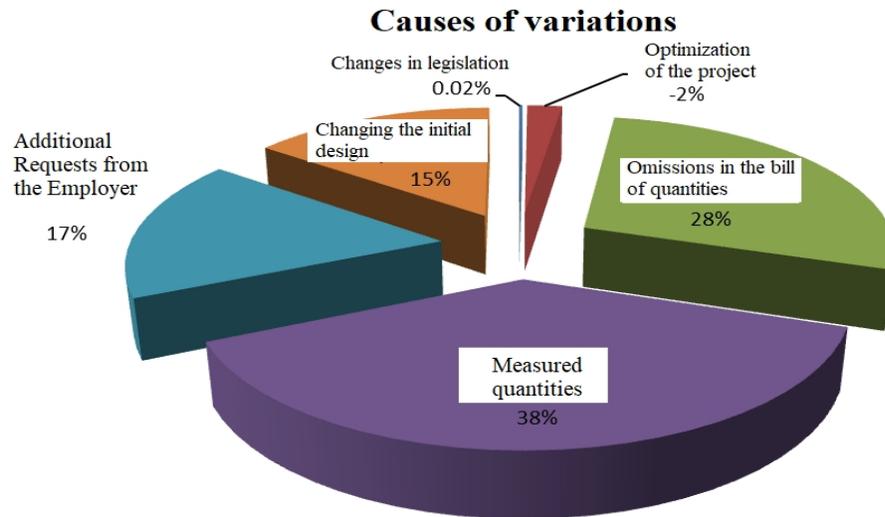


Fig. 3. The Causes of Variations

Including the variations into the contractual provisions [7][8][9] Table 3

	13.1 Right to vary	12.2 Method of measurement	12.3 Evaluation	13.3 Variation Procedure	13.7 Adjustment for changes in legislation	13.2 Value Engineering
M1	X	X		X	X	
M2+4	X		X	X		
M3	X		X	X		
M5	X			X		
M6	X			X		
M7	X	X		X		
M 8				X		X
M 9	X	X	X	X		
M10	X	X		X	X	
M11	X	X		X	X	
M12	X	X	X	X	X	

"Rehabilitation of National Road 18 - Baia Mare - Sighetu Marmatei, km 3+522-km 62+ 234"

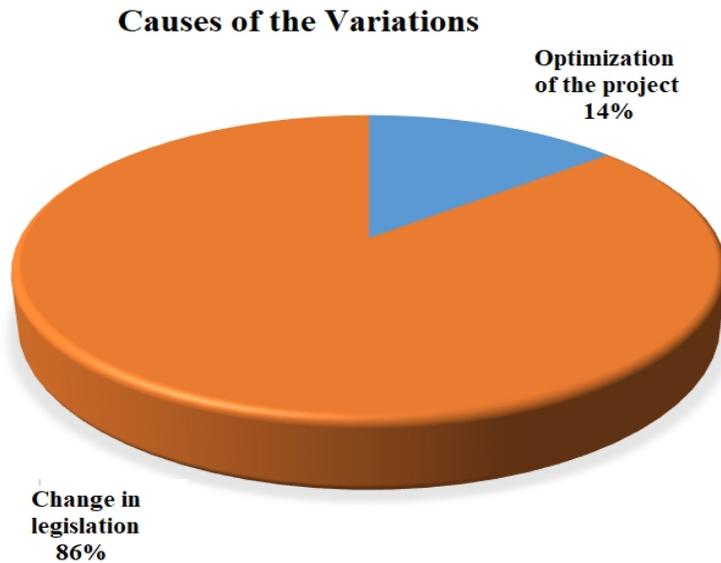
Table 4

No.	Subject	Value (Ron)	Contingencies
			22,773,731.98
1	Optimization of the project throw recycling in situ	-921,987.30	23,695,719.28
2	Horizontal marking*	854,864.30	22,840,854.98
3	Vertical signalization*	945,258.84	21,895,596.14
4	Guard rail*	3,874,347.00	18,021,249.14
	The Total value of variations		6,596,457.44

*Values estimated by Engineer

The causes of variations [7][8][10] Table 5

	Change in legislation	Optimization of the project
M 1		-921,987.30
M 2	854,864.30	
M 3	945,258.84	
M 4	3,874,347.00	
	5,674,470.14	-921,987.30

Fig. 4. *The Causes of Variations*

Including the changes in contractual provisions [7][8][10] Table 6

	13.1 Right to vary	13.3 Variation Procedure	13.7 Adjustment for changes in legislation	13.2 Value Engineering
M1		x		X
M2	x	x	X	
M3	x	x	X	
M4	x	x	X	

In the tables 3 and 6, and also into the figures 3 and 5, it is revealed that all the situations that cause a variation are included in the FIDIC contractual provisions because those contractual provisions have been updated over the time.

4. Effects

The main effect of the above mentioned variations was that, the Contractors claimed extension of the time for completion and additional costs.

The Engineer in accordance the sub-clause 3.5 [Determination] has granted to the Contractors extension of time, and the Contractors initiate disputes and went to Dispute Adjudication Board.

A large proportion of disputes from these projects have their origins in the formation and evaluation of Variations. The Contractors was required to proceed expeditiously with the Works and were not authorized to vary the Works without appropriate instructions from the Engineer.

These instructions may constitute a Variation as described in Sub - Clause 13.1 'Right to Vary '. In these contracts the Conditions of Contract were amended and prevented the Engineer of issuing Variations without the authority of the Employer.

The Employer, The National Infrastructure Management Company from Romania (CNAIR, Ex CNADNR), is a public authorities, and because of their bureaucratic procedures, were unable to respond as quickly as the situation required. Further, as a consequence of the controls from management authority, Romanian court of accounts, or audit authority, the whole process leading to the issue and payment of an authorized Variation was extraordinarily delayed.

4.1 The Analyzing of the Variations Issued on Both Contracts in Accordance with the Procurement Law [1]

The procurement procedures for both contracts analyzed were carried out in accordance with the provisions of "Emergency Ordinance no. 34 of 19 April 2006 award of public procurement contracts, public works concession contracts and service concession contracts "with subsequent amendments and completions, and the award criterion was the lowest price.

Thus, at the time of the analysis of variations, it was necessary to analyze them both from the point of view of public procurement and from financial point of view in relation to the accepted contract amount.

“Construction of the Caransebeș By – Pass”

Table 7

Nr.	Subject	Value (euro)	Evolution of the Variations Value versus Contract value Amount
1	1. Increase of the concrete class for drilled piles 2. Waterproofing on abutments 3. Reinforcement at the maintenance center 4. Formworks for superstructure 5. Culverts	-53,475.78	0.18%
2	„The Engineer Main Office”	74,232.00	0.42%
3	“Ultra-sonic pile testing”	123,032.80	0.83%
4	„ The Engineer Main Office”	68,046.00	1.05%
5	„Archeological works”	80,531.50	1.32%
6	"Re-Design of the intersections for the improvement of the traffic safety”	30,503.05	1.42%
7	„ Exceeded the quantities bridges”	89,070.65	1.72%
8	„Changing solution for the bridge from km 7+735”	-91,251.87	2.02%
9	Exceeded quantities and evaluation for the missed activities from drawings	574,939.74	3.92%
10	Horizontal marking	234,549.38	4.70%
11	Vertical signalization	370,215.67	5.92%
12	Exceeded quantities from the bill	2,698,842.86	14.85%

The total value of the variations, mentioned in Table 7 and issued for the contract "Construction of the Caransebeș By-Pass" exceeds by 4.85% the chapter “Contingencies“, which represent 10% from the value of works, within the Contractor's financial offer. At the same time, it is necessary to mention that absolutely all the works performed were executed in site, and the total value of the

changes resulting from the "Omissions in the Bill of Quantities and Technological Processes" and the "Measured Quantities" represent 9.35% from accepted contract amount.

Also, both of the above mentioned categories are part of the technical project approved and offered by the Employer, and any bidder would have the same conditions for executing and certifying of the works.

Therefore, the value of the actual variations from the bid technical project represents 5.50% of the accepted contract amount, and that is not representing a major modification of the initial project, so the public procurement rules have been respected in the implementation of this contract, because a major modification is represented by 10% of the accepted contract amount.

"Rehabilitation of National Road 18 - Baia Mare - Sighetu Marmăţiei, km 3 + 522 - km 62 + 234"

Table 8

Nr.	Subject	Value (euro)	Evolution of the Variations Value versus Contract value Amount
1	Optimization of the project throw recycling in situ	-921,987.30	0.51%
2	Horizontal marking*	854,864.30	0.97%
3	Vertical signalization*	945,258.84	1.49%
4	Guard rail*	3,874,347.00	3.62%

For this contract is very important to mention that the Employer did not assured the finances for the contract and the time for completion of the works was increased from 24 months to 60 months, and during this time the standard for marking, signalization and guardrail were modified, and the Contractor, who is also the Designer, had to update the initial technical project in accordance with the new standards. The total value of the variations, mentioned in Table 8 and issued for the contract *Rehabilitation of National Road 18 - Baia Mare - Sighetu Marmăţiei, km 3 + 522 - km 62 + 234"* represents 3.62% from the Contract value Amount.

5. Results and discussions

Therefore the contracts implemented in the road domain which are based on the standard contract conditions the yellow book in which the design is assured by the Contractor, the number of variations is considerably lower than the projects in which the design is ensured by the Employer.

Analyzing the reasons behind the variations, the following prevention measures are proposed:

- Ensuring financial resources to avoid extension of time for completion of the contract execution, thus avoiding legislative changes that may lead to changes to the initial contract;
- In the case of cancellation of a public procurement procedure, it is advisable for the Employer to update the technical design in accordance with the legislative changes and changes before resuming the procurement procedure;
- The expropriation corridor should be issued in accordance with the proposed technical design, as the additional expropriation procedures are very long;
- Identify all utilities by the Beneficiary and carry out relocation projects, or mention them in the tender documentation;
- When preparing the technical project, the Beneficiary Designer should pay close attention to the correlation of the quantity lists with the design, the price descriptions with the technological processes;
- The tolerance for the actual quantities to be executed shall be 10% of the quantity offered by the Contractor.

6. Conclusions

In order to avoid variations in the contracts based on the RED FIDIC contract, in which the responsibility of the designer is to the Employer, it is necessary that the technical project made available to the Contractor is complete and correct and during the implementation of the contract the Beneficiary will avoid the requests / additional changes that most often involve time extension reasons with / without additional costs.

At the same time, it is very important to keep in mind that the lists of quantities made available to the Contractor are estimated and represent only a common basis for calculating the accepted contract amount for all bidders.

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