



# **Time and Cost Overrun Mechanism of the FIDIC Emerald Book: Case Study in Istanbul**

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## **ABSTRACT**

**One of the main reasons for the major additional cost and extension of the time claims in underground projects is unforeseeable physical conditions. To assess, manage and mitigate the risks arising from unforeseeable physical conditions, the FIDIC and ITA jointly developed the Emerald Book as a new standard contract form.**

**The FIDIC Emerald Book adopts the adjustment of the Contract Price and Time for Completion on changing physical conditions for better or worse than described. With the main principle of the FIDIC Emerald Book, the case study has been evaluated and analysed under the contractual requirements for extension of time and additional cost claims.**

**This study presents to firstly key features of the FIDIC Emerald Book, after the summarize the chronological background of the case study, then case study has been analysed from the FIDIC Emerald Book principles and approach. Finally, applicability of the FIDIC Emerald Book has been discussed also given suggestions intended practical application.**

***Keywords: Unforeseeable Physical Conditions; Underground Works; FIDIC Emerald Book, Geotechnical Baseline Report***

## 1 INTRODUCTION

The Contractor may encounter different and adverse physical site conditions such as unforeseeable sub surfaces and ground water conditions, archaeological, geological findings during the construction, even if the assumption that necessary soil investigating of the site is carried out at the tender stage. <sup>1</sup>

Unforeseeable physical conditions have been determined as one of the main factors of claim and dispute in construction projects. <sup>2</sup>Improper risk identification and management may result in time and cost overruns as well as major claims and disputes. <sup>3</sup>Therefore, the FIDIC Emerald Book has been developed focusing on the ground and underground physical conditions and reactions and risk allocation.

Istanbul, Turkey's largest metropolitan and has contain different railway projects under construction, with its archaeological structure, earthquake history, geotechnical diversity and high land use rate. The case of the ongoing metro project in Istanbul, has been selected since the changing anticipated sub-surface conditions, ground water reaction, ground deformation, these are the major claim causes for the underground works.

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<sup>1</sup> Levin, P. (2016). Construction Contract Claims, Changes &Dispute Resolution, ASCE, Reston. ISBN :9780784479698.

<sup>2</sup> Totterdill, B. W. (2006) FIDIC Users' Guide a Practical Guide To the 1999 Red and Yellow Books.Thomas Telford Publishing.London

<sup>3</sup> Ertl, H. (2019). Risk allocation in the FIDIC forms of contract, and the Emerald Book's place in the Rainbow Suite, Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art – Peila, Viggiani & Celestino (Eds), pp. 4462-4467, Taylor & Francis Group, London, ISBN 978-1-138-38865-9.

## **2 FIDIC EMERALD BOOK**

The Emerald Book specifically has been developed for underground works based on FIDIC Yellow Book 2017 Edition. <sup>4</sup>The FIDIC Emerald Book has been priced in lump-sum form except Excavation and Lining Works that shall be re-measured depending on the adverse physical conditions. The Contract Price and Time for Completion adjustment has been centred on the Geotechnical Baseline Report (GBR).

Anticipated subsurface-related risks shall be defined in the GBR by the Contractor at the negotiation phase. Adjustment of the Contract Price and the Time for Completion shall be re-assessed on the pre-estimated prolongation costs with the aid of key contractual documents ie. Schedule of Baseline, Completion Schedule at the construction phase. Schedule of Baseline shall be completed by the Contractor according to conditions and items in the GBR. Schedule of Baseline which show the disruption items of the excavation and lining works and may defined unusual form of the Programme.

### **A. Key Features & Risk Management**

FIDIC Emerald Book aims to determine underground risks separating three stages; tender, negotiation and construction stage and allocate and assign the related parties.<sup>5</sup>

Sub-surface related risks should be defined as unforeseeable and foreseeable physical conditions on the Geotechnical Baseline Report (GBR). Defined physical conditions at the Geotechnical Baseline Report (GBR), and related disruptions shall be estimated by the duration of the works. In case of the anticipated physical conditions have occurred, the Time for Completion, and the Contract Price could be adjusted within the described limits in the Schedule of Baseline. The main idea of the sub-surface risk distributions is the site ownership of the Employer and assumption of

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<sup>4</sup> Dix, A.E. (2020) The Renaissance of Fairness in Ground Risk Allocation – The New ITA/FIDIC Emerald Book. International Journal of Civil Engineering and Technology, 11(1).

<sup>5</sup> Gomes, A.R.A.(2020). Considerations on the Practical Development of the Geotechnical Baseline Report (GBR) for the FIDIC Emerald Book and Similar Contract Forms. ITA-AITES World Tunnel Congress Malaysia 15-21 May 2020.

the Contractor expertise<sup>6</sup>. Responsible party bears the consequences of risks or will take advantage of the risks of the adverse sub-surface conditions.<sup>7</sup>

Society of Construction Law defines disruption as a disturbance, hindrance, or interruption to a Contractor's normal working methods, resulting in lower efficiency.<sup>8</sup> Disruption claims do not expressly specify the recovery in most standard forms, but they do address some of the specific events that could lead to disruption, such as unforeseeable ground conditions claim. In this regard, the FIDIC Emerald Book has been designed with pre-estimate the compensation of the disruption events at the bid and pre-contract stages. Although Society of Construction Law justify that the Contractor must submit claim with legal basis of its entitlement, the FIDIC Emerald Book does not need for explaining the disruption claims caused by defined physical conditions and known entitlement claim procedure of the FIDIC.<sup>9</sup>

## **B. Adjustment of the Time for Completion**

Schedules of the Baseline shall contain fixed production rates that shall be estimated by the Contractor and cannot be changed at the construction stage.<sup>10</sup> Since quantified the delay and disruptions amount has been estimated in terms of the duration (ie. working days) amount of the defined disruption (ie. interruptions, hindrances, shortage) can be adjusted depending on whether the physical conditions are favourable or worse than expected<sup>11</sup>. Based on the fixed production rates, evaluation of the encountered conditions shall be assessed on the anticipated duration of the disruptions in the Schedule of Baseline. In case of better conditions are encountered by the Contractor, the amount of the actual progress may decrease to the planned disruption activities. The effect of the conditions being better or worse than expected on the Completion Date has been formulated in this way.

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<sup>6</sup> Van Langelaar, A. (2019) The New FIDIC 2019 Emerald Book – Conditions of Contract for Underground Works. *Civil Engineering=Siviele Ingenieurswese*, 27(5), 47-53.

<sup>7</sup> FIDIC (2019). *Conditions of Contract for Underground Works*. 1. Edition. ISBN :978-2-88432-084-9

<sup>8</sup> Society of Construction Law (2017). *Delay and Disruption Protocol* 2nd Edition.

<sup>9</sup> Society of Construction Law (2017). *Delay and Disruption Protocol* 2nd Edition.

<sup>10</sup> FIDIC (2019). *Conditions of Contract for Underground Works*. 1. Edition. ISBN :978-2-88432-084-9

<sup>11</sup> Gomes, A.R.A.(2020). Considerations on the Practical Development of the Geotechnical Baseline Report (GBR) for the FIDIC Emerald Book and Similar Contract Forms. ITA-AITES World Tunnel Congress Malaysia 15-21 May 2020.

### **C. Adjustment of the Contract Price**

The Emerald Book enables the cost adjustment in two ways: lump-sum compensation claims entitlement with procedure according to unforeseeable physical conditions recognised FIDIC Yellow Book Procedure, or only Excavation and Lining works re-measurement of the Excavation and Lining works. <sup>12</sup>For the Excavation and Lining works, the only way of the adjustment of the Contract Price relies on the time-related items that have been determined in the Bill of Quantities by the Contractor. On the other hand, undefined physical conditions shall be assessed as the unforeseeable and entitlements of extension of time and/or additional cost claims will be executed Article of 4.12 [Unforeseeable Physical Conditions] as the FIDIC Yellow Book 2017 Edition.

## **3 CASE STUDY**

The project in which the case was selected is the underground metro project under construction unit priced contract in İstanbul. The Contract Price is calculated with the unit prices offered by the Contractor in the tender stage also quantities specified in the Bill of Quantities prepared by the Employer.

### **A. Methodology**

Interview technique was used in the case study to select the cases and obtain relevant information. Before the interviews with the project managers, a question matrix was prepared which included the factors that cause time and cost overrun in underground metro projects. During the meeting, verbal information was obtained about the projects in which events occurred depending on the factors determined in the matrix, and subsequently, relevant contracts and their annexes (technical specifications, unit price estimation table, unit price descriptions, addendums) and official correspondences have been obtained. Interviews have been analysed and a chronology has been constituted.

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<sup>12</sup> Neuenschwander, M.& Marulanda, A. (2019) Measuring the Excavation and Lining in the Emerald Book, Tunnels and Underground Cities: Engineering and Innovation meet Archaeology, Architecture and Art – Peila, Viggiani & Celestino (Eds), pp. 4530-4537, Taylor & Francis Group, London, ISBN 978-1-138-38865-9.

## **B. Factual Chronology**

*Underground deformation:* The Employer has informed to the Contractor about that ground water reaction has been occurred during production and stated that it could cause surface settlements and excessive dismantling of the ground.

*Landslip:* As a result, the Contractor did not respond to the letters and warnings made by the Employer about the scope of the geological and geotechnical survey mentioned above and did not take any necessary precautions, the improper applications caused deformations on the ground and a collapse occurred in the station area. Since the collapse area where transmission lines are located, wastewater started to come after the collapse and collapses occurred on the road.

## **C. Assessment of the Case by the FIDIC Emerald Book Provisions**

The Contractor has carried out ground research with additional drilling in addition to the geotechnical data and reports given by the Employer at the tender stage. Therefore, this information shall be assessed under the foreseeable risk, implemented to the GBR also accordingly Schedule of the Baseline. It is assumed that the Contractor's proposal has been prepared to this regard. Therefore, the case has been evaluated within the scope of foreseeable physical conditions.

*Underground deformation:*

According to Article 4.24 [Excavation and Lining Works], the Contractor is responsible for taking all necessary precautions to ensure that the excavation and lining works are carried out in a safe, stable and timely manner in accordance with the contract.

On the other hand, the Contractor can be entitled claim for the extension of time and additional payment pursuant to articles 13.8.3 [Adjustment of Time for Completion] and 13.8.4 [Adjustment of Contract Price], Since the Contractor shall determine the anticipated deformations within the GBR.

The Employer can be entitled to the delay damages stated in Contract Data according to article 8.8 [Delay Damages] because Time for Completion has been delayed due to the Contractor cannot fulfil any part of works in time according to the Article 4.25 [Milestones], 8.2 [Time for Completion]. *Landslip*

- Delay on underground works has been occurred after the collapse also affected other milestones. Completion of the works in safely and non-defective shall be under the Contractor's risk during the construction phase so it is shall be assessed as a non-excusable delay. Since the Employer determines that the Contractor cannot fulfil the responsibilities stated in Article 8.2 [Time for Completion], cannot complete all or a phase of the works and/or delays, pursuant to Articles 4.25 [Milestones], 8.8 [Delay Damages], the Employer has the right to claim delay damages determined in the contract data at a daily rate from the Contractor.

At the same time, in accordance with Article 7.6 [Remedial Work], the Contractor is responsible for complying with the instructions given by the Engineer as soon as possible and not later than the specified time frame. Within the scope of this article, cost of remedy works the Contractor's risk responsibility.



#### **4 CONCLUSION & DISCUSSION**

The paper presented key elements of the FIDIC Emerald Book and application for practical usage extension of time and additional cost claim based Unforeseeable Physical Conditions. The risk management system in the Emerald Book could be also applied or improved in other standard contract form to avoid from time and cost uncertainty for underground works. The Emerald Book cannot currently answer the "The estimated extension cost will cover the actual loss and damage" and "This will prevent other interruption claims" questions, but the results should be evaluated and discussed with practical use.

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