Analysis of Impact Contract Change Order (CCO) on Time & Cost (Case Study : Counterweight and Tano Ponggol's Channel Project in Samosir Regency)

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Abstract*. In many projects, changes often occur due to on-site conditions. These changes are made to ensure that the work can be carried out properly and in accordance with actual field requirements. Typically, such changes—whether additions, reductions, or replacements—lead to modifications in the contract documents. These modifications result in a Contract Change Order (CCO), which can affect several aspects of the project.This study aims to analyze the impact of Contract Change Orders (CCOs) on project duration and cost, using the Counterweight and Tano Ponggol Channel Project in Samosir Regency as a case study. The results of the study indicate an increase in project duration by 175 days. In terms of cost, the CCO led to a reduction in the counterweight work budget from IDR 25,018,491,000 to IDR 18,768,883,000.*

Keyword : cco, counterweight, time, cost

1. INTRODUCTION

In a construction project, it is common for design changes to occur due to inconsistencies or difficulties in implementing the original plan on-site. Therefore, changes are inevitable—whether related to materials or construction methods—which in turn affect the project documentation. These changes, whether additions, reductions, or substitutions of work items, are commonly referred to as addenda. CCO (Contract Change Order), addendum, and contract amendment are terms used interchangeably, although the latter two are typically subsequent products of a CCO [1]. A Change Order refers to a request for modification (variety request) in construction projects coordinated by public authorities [2]. Generally, a Contract Change Order is issued to align the contract with on-site conditions, reassess risks, and prevent disputes among stakeholders. The causes of a CCO can be categorized based on the parties involved: the project owner, the design consultant, the contractor or service provider, and external factors [3].

In the case study of the counterweight and Tano Ponggol channel project in Samosir Regency, several work items were ultimately modified. These changes were triggered by adjustments to the construction methods based on updated analyses, resulting in the addition, reduction, or substitution of work items, thereby necessitating a Contract Change Order (CCO).Such changes significantly impact project performance, as the project's continuity relies on the interdependence of three key factors: quality, time, and cost [4].

2. METHODOLOGY

This study employs a descriptive qualitative research method with a quantitative approach. Primary sources refer to data obtained directly from respondents, while secondary sources are those that do not provide data directly to the researcher, such as through intermediaries or documents [5]. Primary data in this study were obtained through interviews, while secondary data were collected from technical justifications, contract amendments, the bill of quantities, unit price analyses, and the implementation action plan. These data were used to support the analysis of the impact of Contract Change Orders (CCOs) on the project timeline and cost.

The effect of CCOs on time and cost is assessed by comparing data using the Unit Price Analysis Table based on the government-approved Indonesian National Standard (SNI). Additionally, the cost impact of CCOs is evaluated by comparing the budget plan (RAB) before and after the CCO, with a focus solely on the work items affected by the change.

3. RESULTS

The study found that CCOs resulted in changes that affected several work items. The differences in work items before and after the CCO are presented as follows:

Table 1 Difference if Work Items Before & After CCO

No	Before Contract Change Order	No	After Contract Change Order
	Counterweight		
A	Ground Anchor	B	Geobag & Geofam
	Driving Ground Anchor		Manual Soil Excavation
	Anchor's Tendon		Concrete Demolition
	Anchor Head		Removing of existing Paving Block
	Drilling Case		Installation of reclaimed paving block
	Installing Ground Anchor		Dismantiling and reinstalling curbstones
	Precast concrete demolition work		Backfill
	Precast concrete demolition work (Under Water)		Driving Geofoam (Teca Foam TF 15)
	Drilling work		Driving Geobag (Geobag NW)
	Tendon Installation work		Installing Geofoam
	Grouting		Filling and Installing Geobag
	Stressing		Driving and Installing PE Sheet
	Coring		Driving and Installing Hibritex
			Driving and Installing Connector Line

No	Before Contract Change Order	No	After Contract Change Order
	Formwork		K.225 Concrete Work
	Reinforcement Steel Work		Formwork
	Concrete Base Grand Anchor K350		Reinforcement Steel Work
	Concrete Base Grand Anchor (under water) K350		Installing Gravel
	Driving H-Beam		
	H-Beam Installation and welding		
	Driving Cement type I @50 Kg (Grouting)		
	Driving Cement type I @50 Kg (Free Grouting)		
	Driving PVC Pipe 6" diameter		
	PC Strand (Tie Back) Work		
	Driving PC Strand		
	PC Strand Installation		
	Driving HDPE Pipe 4" diameter		
	Driving Steel Pipe 60 cm diameter and 14 mm thick pipe		
	Piling Steel Pipe 60 cm diameter and 14 mm thick pipe		
	Horizontal Drilling Work		
	Formwork		
	Reinforcement Steel Work		
	Concrete Work K.225		

3.1 Impact of Contract Change Order (CCO) on Project Timeline

The initial project duration, based on the original contract before the design change, was 16 weeks—from the last week of January to the second week of May. To determine the revised project duration using the new design, productivity calculations were performed for each work item based on field conditions.

The most time-consuming task was the filling and installation of Geobags, making it the critical path activity. The estimated time required for completion was calculated as follows:

- Total Geobags to be Installed: 22,400 units
- Daily Installation Capacity: 145 units

- Installation Duration Required: 155 days
- Supply and Delivery Time: 20 days
- Total Project Duration: 175 days

Comparison of Project Duration Before and After CCO

Table 2. Recapitulation of Implementation Time Before & After CCO

No	Job Description	Durations (days)
1	Anchor Method	112
2	Geobag & Geofam Method	175

3.2 Impact Contract Change Order (CCO) on Project Cost

To assess the financial impact of the Contract Change Order, a cost comparison was conducted between the initial and revised Budget Plans (RAB). The budget calculations were based on unit prices set by the local government. The results are summarized as follows:

Table 3. Budget Plan before CCO

No	Job Description	Cost
A	Procurement Ground Anchor	
1	Anchor's Tendon	Rp 5,538,375,000.00
2	Anchor Head	Rp 575,125,000.00
3	Drilling Case	Rp 2,200,000.00
B	Installing Ground Anchor	
1	Precast concrete demolition work	Rp 9,628,850.00
2	Precast concrete demolition work (Under Water)	Rp 206,419,007.81
3	Drilling work	Rp 5,538,375,000.00
4	Tendon Installation work	Rp 1,041,678,500.00
5	Grouting	Rp 1,572,625,000.00
6	Stressing	Rp 198,875,000.00
7	Coring	Rp 327,875,000.00
8	Formwork	Rp 264,352,708.13
9	Reinforcement Steel Work	Rp 2,625,105,931.86
10	Concrete Base Grand Anchor K350	Rp 1,893,744,035.16

No	Job Description	Cost
11	Concrete Base Grand Anchor (under water) K350	Rp 206,419,007.81
12	Driving H-Beam	Rp 1,397,150,625.00
13	H-Beam Installation and welding	Rp 572,992,200.00
14	Driving Cement type I @50 Kg (Grouting)	Rp 839,986,875.00
15	Driving Cement type I @50 Kg (Free Grouting)	Rp 584,151,750.00
16	Driving PVC Pipe 6" diameter	Rp 493,143,750.00
C	PC Strand (Tie Back) work	
1	Driving PC Strand	Rp 11,960,000.00
2	PC Strand Installation	Rp 4,604,000.00
3	Driving HDPE Pipe 4" diameter	Rp 47,840,000.00
4	Driving Steel Pipe 60 cm diameter and 14 mm thick pipe	Rp 705,600,000.00
5	Piling Steel Pipe 60 cm diameter and 14 mm thick pipe	Rp 12,200,000.00
6	Horizontal Drilling Work	
7	Formwork	Rp 25,000,000.00
8	Reinforcement Steel Work	Rp 20,330,574.00
9	Concrete Work K.225	Rp 15,954,300.00
		Rp 22,287,303.28
	Total Cost	Rp 25,018,491,753

Table 4. Budget Plan After CCO

No	Job Description	Total Price
1	Manual Soil Excavation	Rp 76,025,070.00
2	Concrete Demolition	Rp 721,338.42
3	Removing of existing Paving Block	Rp 46,200,000.00
4	Installation of reclaimed paving block	Rp 250,477,500.00
5	Dismantiling and reinstalling curbstones	Rp 16,579,420.00

No	Job Description	Total Price
6	Backfill	Rp 4,051,080.00
7	Driving Geofoam (Teca Foam TF 15)	Rp 2,630,278,457.91
8	Driving Geobag (Geobag NW)	Rp 9,932,768,000.00
9	Installing Geofoam	Rp 61,368,419.79
10	Filling and Installing Geobag	Rp 5,919,424,000.00
11	Driving and Installing PE Sheet	Rp 34,812,330.00
12	Driving and Installing Hibritex	Rp 224,843,520.00
13	Driving and Installing Connector Line	Rp 33,059,334.00
14	K.225 Concrete Work	Rp 17,314,374.25
15	Formwork	Rp 22,272,291.14
16	Reinforcement Steel Work	Rp 27,627,498.40
17	Installing Gravel	Rp 11,060,775.00
	Total	Rp 18,768,883,409

Budget Plan (RAB) Analysis Before and After Contract Change Order (CCO)

Based on the cost calculations, the initial Budget Plan (RAB) for the counterweight work before the Contract Change Order (CCO) was IDR 25,018,491,000 (Twenty-Five Billion Eighteen Million Four Hundred Ninety-One Thousand Rupiah). After the Contract Change Order (CCO), the revised Budget Plan (RAB) for the counterweight work was IDR 18,768,883,000 (Eighteen Billion Seven Hundred Sixty-Eight Million Eight Hundred Eighty-Three Thousand Rupiah). This indicates a significant cost reduction due to the CCO. The difference between the initial and revised RAB is IDR 6,249,608,000 (Six Billion Two Hundred Forty-Nine Million Six Hundred Eight Thousand Rupiah), meaning that the cost after CCO was lower than before.

4. CONCLUSION

Based on this study, the impact of time and cost in the case study of the Counterweight and Tano Ponggol Channel Project in Samosir Regency can be concluded as follows:

a. Based on Table 1, which compares the work before and after the Contract Change Order (CCO), it is evident that the CCO had a significant impact on the project timeline. The project duration increased by 175 days to accommodate the implementation of the counterweight work using the geobag and geofoam method.
b. Based on the RAB (budget plan) summary in Tables 3 and 4—before and after the CCO—it was found that the total contract value decreased by IDR 6,249,608,000 (Six Billion Two Hundred Forty-Nine Million Six Hundred Eight Thousand Rupiah) from the original contract. The RAB using the anchor method amounted to IDR 25,018,491,000 (Twenty-Five Billion Eighteen Million Four Hundred Ninety-One Thousand Rupiah), while the RAB after the

CCO—using the geobag and geofoam method—was IDR 18,768,883,000 (Eighteen Billion Seven Hundred Sixty-Eight Million Eight Hundred Eighty-Three Thousand Rupiah).

REFERENCE

[1] Maulana, Aceng. 2016. Faktor Penyebab Terjadinya Contract Change Order (CCO) Dan Pengaruhnya Terhadap Pelaksanaan Proyek Konstruksi Pembangunan Gedung. Jurnal Infrastruktur. Vol 2 (2)

[2] Lela, Jeanne Corry, Fabian J. Manoppo, dan Cindy J. Supit. 2022. Analisis Penyebab Dan Pengaruh Contract Change Order Terhadap Kinerja Kontraktor Pada Proyek Konstruksi di Kabupaten Minahasa Selatan. Jurnal Ilmiah Media Engineering. Vol. 12 (1)

[3] Widhiawati, Ida Ayu Rai, Anak Agung Wiranata, dan I Putu Yudha Wirawan. 2016. Faktor-Faktor Penyebab Change Order Pada Proyek Konstruksi Gedung. Jurnal Ilmiah Teknik Sipil. Vol. 20 (1)

[4] Putu Ayu Darma Yanti, I Gede Ngurah Sunatha, dan I Putu Yana Hermawan. 2024. Pengaruh Contract Change Order (CCO) Terhadap Waktu Penyelesaian Pembangunan Gedung Polda Bali. Jurnal Ilmiah Teknik UNMAS Vol.4 (1)

[5] Sugiyono. (2022). Metode Penelitian Kualitatif. Bandung: Alfabeta