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Analysis of Project Delay Impacts on Time and Cost In Elevator Work For A 10-Story Office Building Construction Project

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ABSTRACT
This study aims to analyze the impact of elevator installation delays on the schedule and budget of a 10-story office building construction project in Gresik. By comparing two scenarios—on-time elevator work versus delayed elevator work—this research uses a comparative analysis approach based on project documentation, interviews with stakeholders, and cost and time data. The findings reveal that delays in elevator work significantly affected the overall project timeline, causing a shift in the schedule and necessitating changes in structural methods, particularly the use of steel instead of concrete for the separator beams. This change expedited construction but increased costs substantially. The study also highlights the cascading effects of these delays, which led to further adjustments in the building's structure and increased labor and material costs. The research emphasizes the importance of early-stage planning, coordination, and the adoption of advanced project management techniques, such as Building Information Modeling (BIM), to minimize risks and ensure timely project completion. In conclusion, the study provides valuable insights into how elevator delays can disrupt construction projects and recommends strategies to mitigate such risks in future developments.

INTRODUCTION

Construction work is a very complex process and involves various types of activities that are interrelated with each other. In the context of high-rise building construction, one aspect that requires special attention is elevator installation. An elevator is not just a means of vertical transportation for users, but also an important component that affects various other technical elements in the project, such as structural design and supporting work stages. As part of the vertical mobility system, the planning and execution of elevator installation must be done with careful calculation to ensure that the project progress is not interrupted (Telaumbanua, 2024).

If elevator work is delayed, the impact can be cascading, creating various constraints on the overall construction project (Sajiyo, 2023). These constraints not only affect the project completion schedule, but can also increase costs due to the need for structural changes or the application of alternative work methods (Khalim, 2021). For example, in a 10-story office building construction project located in Gresik, delays in the implementation of elevator work are one of the main obstacles. This problem occurred due to the need to complete a number of additional structural works directly related to the elevator installation. For example, work such as the installation of separator beams or elevation adjustments to the structure were often delayed due to uncertainty regarding the technical specifications of the elevator to be used.

Such delays also require additional solutions, such as the use of additional materials, such as steel and *chemical anchors*. These measures not only extend the construction time but also have a direct impact on significantly increasing the project budget (Nugroho & Kirana, 2024). Thus, it is important to ensure better planning and coordination so that the elevator installation can run on schedule and not hamper the overall project progress.

The impact of delays in elevator work is not only felt on the technical aspects, but also on the overall project schedule and cost. In conditions where elevator works are delayed, modifications are often made to the existing structure (Sunatha et al., 2023). This process involves additional labor, more expensive work methods, and the use of special materials to accommodate the design changes. As a result, the project completion time is longer, and the cost required is greater than the initial budget (Fertilia & Aulia, 2020).

Elevator work also has unique characteristics that make it different from other work in a construction project. The type and specification of the elevator chosen will affect the initial design of the building, particularly elements such as hoistways and machine rooms. In some cases, if elevator work is not completed on schedule, this will affect finishing work or other structural work (Patriadi & Fatmawati, 2024). Thus, delays in elevator work have a domino effect on other interrelated work.

In elevator work there are several structural works that need to be considered:

1. Machine room height
2. Hoistway size
3. Elevation of separator beam

These three things can be different for each brand of elevator, so it takes the right time to determine the brand of elevator that will be used for the project (Wibowo et al., 2023).

In a 10-storey office building construction project in Gresik, the elevator works was one of the sections affected by this coordination challenge. Delays in the elevator work have resulted in the need for revisions to the project schedule, as well as structural design adjustments that increased the complexity of the work in the field. On the other hand, the delays also provided important lessons on the need for better planning and supervision in the management of elevator works.

This study aims to evaluate the effect of elevator work delays on the construction project schedule and budget. By utilizing relevant field data, in-depth interviews with relevant parties, and comparative analysis, this study will identify the factors that cause delays and calculate the financial impact. In addition, the study also aims to formulate strategic recommendations to minimize the risk of similar delays in future construction projects. Through this approach, it is hoped that the research can provide a more comprehensive insight into the consequences of elevator work delays, while offering practical solutions to improve time and cost management more effectively on future projects.

Literature Review

Previous Research

Sirait and Hidayat's research (2023) with the research title "The Tax Impact of the Application of Separate Contract Structures on Engineering, Procurement, and Construction Projects in Indonesia" aims to analyze the tax impact of the application of separate contract structures on Engineering, Procurement, and Construction (EPC) projects in Indonesia. The research method is carried out by analyzing tax regulations and case studies on several EPC projects, where the tax impact on the contract structure is evaluated through cost and financial impact analysis. The results of this study show that the implementation of a separate contract structure can incur a significant additional tax burden, affecting the profitability of the project. Factors affecting the tax burden are differences in the interpretation of tax laws and regulatory uncertainty. The recommendations given are more comprehensive tax planning and consultation with taxation experts from the early stages of the project Sirait and Hidayat, (2023).

Research by Yunianto et al. (2015) with the research title "Evaluation of Constructability Implementation in Building Construction Projects" aims to evaluate the effectiveness of the application of constructability concepts in building construction projects. This research method is carried out with case studies and project data analysis, where the implementation of constructability principles at the design and implementation stages of the project is evaluated. The results of this study show that the application of constructability can improve construction efficiency, reduce the risk of errors, and accelerate project completion time. Factors that influence the effectiveness of constructability implementation are collaboration between the design team and the implementation team, as well as understanding of constructability principles. The recommendation given is to increase education and training related to constructability for all parties involved in the project Yunianto et al. (2015).

Febrina's research, (2021) with the research title "Study of Cooperative Relationships of Parties Involved in Residential Building Construction Projects" aims to examine the dynamics of cooperative relationships between parties involved in residential building construction projects. This research method was carried out by surveying and interviewing contractors, consultants, and project owners, where the working relationship and communication between these parties were analyzed. The results of this study show that effective communication and good coordination are key to the success of construction projects. Factors affecting cooperation are clarity of roles and responsibilities, and the level of trust between parties. The recommendations given are improved communication management and the preparation of clearer cooperation protocols Febrina, (2021).

Elevator

An elevator is a vertical transportation device designed to transport people or goods between floors in a building. In the context of high-rise buildings, elevators are an essential means of enabling efficient vertical movement, especially in buildings with many floors. The elevator is not only used for the convenience of residents, but is also part of the overall building circulation system that supports daily operations, both for personal, commercial and industrial needs (Pratama & Sumarjo, 2018)

Elevators play a very vital role in high-rise buildings. Without an elevator, vertical mobility will be very limited, especially in buildings that have more than four floors (Andika et al., 2023). An elevator allows building occupants or users to move between floors quickly and comfortably. In addition, elevators also support accessibility, especially for people with disabilities, the elderly, and people with limited mobility (Tanuwijaya et al., 2024).

In building planning, the position and type of elevator should be carefully designed to ensure efficiency and convenience. The elevator should be placed in a strategic location that is easily accessible from all areas of the building, but still must consider technical aspects such as machine rooms and hoistways that do not interfere with the main structure of the building (Zayadi et al., 2016).

Types of Elevators

Elevators can be categorized based on their drive system and function. Based on Fahriansyah et al.'s research, (2021), these categories are important in selecting an elevator that suits the specific needs of a building:

1. Hydraulic Elevator Drive System

   It uses the pressure of liquid in a cylinder to move the cabin up and down. Hydraulic lifts are typically slower and are used for low to medium height buildings. The main advantage of hydraulic lifts is that they are more space-efficient as they do not require a machine room above the hoistway.
2. Traction Elevator Drive System

   It uses a steel rope driven by an electric motor to move the cabin. Traction lifts are divided into two types, namely geared and gearless. Gearless traction lifts are usually used in high-rise buildings as they can achieve higher speeds with smoother operation.

Elevator Function

According to Pratama and Sumarjo (2018), the elevator function can be divided into several types, especially for high-rise buildings, including:

1. Passenger Elevator

   Designed to transport people. The elevator is equipped with various safety and comfort features, such as door sensors, interior lighting, and an emergency communication system.
2. Freight Elevator

   Used to transport large quantities of goods or materials. These elevators have a larger load capacity and are usually not equipped with the comfort features found in passenger elevators.
3. Service Elevator

   It is commonly used in hotels, hospitals, or shopping centers to transport staff and goods required for daily operations. Service elevators often have separate access from passenger elevators.

Main Components of an Elevator

According to Andika et al., (2023), an elevator consists of several key components that function together to ensure safe and efficient operation:

1. Elevator Cabin

   The space inside an elevator used to transport passengers or goods. The cabin is equipped with various safety and comfort features.
2. Drive Motor

   The component that drives the elevator, either by hydraulic or traction systems. The drive motor is located in the engine room and controls the speed and movement of the cab.
3. Steel Rope and Sheave

   In a traction elevator, strong steel ropes are used to suspend and move the elevator cabin. The sheave is a wheel that guides the steel rope, ensuring smooth and safe movement of the cabin.
4. Governor

   A safety device that controls the speed of the elevator. If the elevator is moving too fast, the governor will activate the emergency brake to stop the elevator and prevent an accident.
5. Buffer

   Located at the base of the hoistway, the buffer acts as a damper if the elevator moves too far down, providing additional protection for passengers.

In Indonesia, elevator installation and operation must comply with standards set by SNI (Indonesian National Standard), such as SNI 03-6573-2001. This standard regulates technical aspects that include elevator room dimensions, load capacity, operating speed, to safety features such as brake systems and emergency alarms. This standard aims to ensure that all elevators installed in buildings in Indonesia are safe and in accordance with the operational needs of the building (Subairi et al., 2024).

In building structure planning, elevators have a significant influence on architectural and structural design. The location of the hoistway should be designed in such a way that it does not interfere with the stability of the building. In addition, the machine room and elevator installation path must be planned from the early stages of design to ensure smooth operation and minimize disruption to the building structure (Mafra, 2024).

Decisions regarding elevator type, capacity, and number of elevators should be made by considering user volume, building purpose, and operational needs. For example, an office building with a high volume of users may require more passenger lifts compared to an apartment building (Fahriansyah, 2021).

An elevator is an important element in a multi-storey building that affects not only vertical mobility, but also the overall design and operation of the building. With proper planning and selection of the appropriate elevator type, elevators can improve the efficiency, comfort, and safety of building occupants. In addition, compliance with existing technical standards and regulations is essential to ensure that the elevator operates properly and meets all safety requirements (Tarigan & Togatorop, 2022).

The research conducted by Sirait and Hidayat (2023) examined the tax impact of applying separate contract structures in Engineering, Procurement, and Construction (EPC) projects in Indonesia, revealing that this approach significantly increased the tax burden, which in turn affected project profitability. Similarly, Yunianto et al. (2015) analyzed the implementation of constructability principles in building construction projects and found that such principles helped reduce errors and accelerate project timelines by fostering better collaboration between design and implementation teams. These studies highlight the importance of efficient planning and collaboration in mitigating construction delays and costs, particularly in complex projects like elevator installation.

The urgency of this study lies in the critical role that elevator installation plays in high-rise construction projects. Delays in elevator work, especially in multi-story buildings, not only affect vertical mobility but also disrupt other interrelated structural and finishing works. These delays often lead to significant cost overruns and extended project timelines, which can undermine the financial viability and overall success of construction projects. With rapid urbanization and increasing demand for high-rise buildings, understanding and addressing the factors that contribute to delays in elevator work is essential for optimizing project delivery and minimizing financial losses in the construction industry.

While previous studies have explored various aspects of construction delays, including labor shortages and material delays, there is a lack of comprehensive research focusing specifically on the impact of elevator installation delays on the overall construction timeline and budget. Most existing studies have either looked at delays in general construction processes or specific components, such as structural works, but have not addressed the cascading effects of elevator work delays in buildings where such installations are crucial for completing other tasks. This gap in the literature presents an opportunity for this study to contribute valuable insights into the unique challenges and cost implications of elevator installation delays in high-rise building projects.

This research brings novelty by focusing specifically on the delays caused by elevator installation in high-rise building projects, an area that has received limited attention in the context of time and cost management. By examining the impact of such delays on project schedules and costs, the study provides a detailed analysis of how delays in elevator work trigger a chain reaction, affecting not only the immediate contractors but also the overall project. Furthermore, it introduces a comparative analysis between different structural methods—steel versus concrete—offering a fresh perspective on the cost-time trade-offs associated with these materials when used to mitigate the impact of elevator work delays.

The primary objective of this research is to evaluate the impact of elevator installation delays on the cost and schedule of high-rise building projects. By comparing the effects of delays on projects using steel and concrete structures, this study aims to provide actionable insights for construction managers and stakeholders on how to better plan for and mitigate the risks associated with elevator delays. The findings will help optimize project timelines, control costs, and improve overall project delivery. Additionally, this research will contribute to the body of knowledge in construction management, offering valuable recommendations for future projects to ensure smoother execution and improved coordination between contractors, ultimately benefiting the construction industry at large.

RESEARCH METHOD

Framework of Thought

The framework of this research is based on analyzing the impact of elevator contractor work delays on project cost and time. The main focus is to compare the elevator job delay scenario with the on-time job scenario. Using the split-contract method, where elevator work must be performed in a coordinated manner, a delay in one contract can affect the overall project schedule and cost.

The study also considered the use of site instruction and alternative design as a tool to evaluate the additional cost and time required to accommodate the structural changes caused by the delay.

Type of Research

This study used a comparative analysis method, focusing on the cost and time comparison between two scenarios, on-time elevator contractor work and delayed elevator contractor work. This method was chosen because it allows a clear measurement of financial and temporal impacts based on available project data.

Location and Time of Research

This research was carried out within a period of 6 months, starting from primary and secondary data collection to data analysis and preparation of the final report. The time was adjusted to the ongoing project stages and the availability of data needed for analysis. This research is located in an office building in an industrial area in Gresik Regency, East Java Province.

Study Approach

The approach used in this research is a case study. This case study will analyze in depth the impact of delays in the elevator contractor's work on projects that use the split contract method. Through this approach, researchers can understand the cause-and-effect relationship between delays and increased project costs and time.

Data Requirements

The data required in this study include:

1. Site Instruction for the separator steel works, which shows the structural changes required due to the delay in the elevator contractor's work.
2. An alternative design that illustrates the structure that will be used if the elevator is decided early.
3. Project cost data, including initial budget and realization of additional costs incurred due to delays.
4. Project schedule, including baseline schedule and revised schedule after delays.
5. Interview with the construction manager regarding the causes of delays in elevator work.

Data Collection Technique

Data was collected through two main methods:

1. Project Documentation

   Collect and analyze project documents such as site instructions, cost reports, project schedules, and alternative designs.

2. Semi-Structured Interview

   Conduct interviews with project managers, contractors, or other relevant parties to obtain additional information regarding the impact of delays in elevator work.

Research Methods

The research method used is descriptive quantitative analysis, which includes:

1. Additional Cost Calculation

   Calculate additional costs incurred due to structural changes and the use of additional materials such as steel and chemical anchors.
2. Time Analysis

   Analyzed the extension of time required to complete the project due to delays in the work of the elevator contractor.
3. Scenario Comparison

   Comparing the results of the two scenarios to assess the impact of delays on the overall project.

RESULTS AND DISCUSSION

Causes of Elevator Delay

Based on the analysis of the secondary data obtained, this study identified a number of key findings related to the significant impact of elevator work delays on the implementation schedule and cost of a 10-storey office building construction project in Gresik. The secondary data sources include project documents such as master schedule, work realization schedule, *request for information* (RFI) document, and *site instruction* (SI), which provide a detailed description of the dynamics of project implementation.

One notable finding was the substantial delay in the elevator work, which was originally scheduled to start in January but was only realized in April. This delay resulted in disruptions to a series of structural works directly related to the installation of the elevator, such as the installation of separator beams. This delay triggered a chain effect, where other works that were heavily dependent on the completion of the elevator, such as the completion of the upper floors and other installations, were also delayed. As a result, the overall project schedule experienced a significant shift, resulting in increased time and cost pressures.

The financial impact of these delays materialized in the form of increased project costs, resulting from the need to change materials and working methods. For example, the elevator separator beam, which was originally planned to use concrete, was switched to a steel structure. The choice of steel material was made to speed up the construction process despite the additional cost. This decision was made based on time efficiency considerations, so that the project could still be completed on target despite the initial obstacles. The implementation of this new method was facilitated through the issuance of a *site instruction* that served as an official instrument to address technical issues.

Furthermore, interviews with project stakeholders revealed that delays in the elevator works not only had a direct impact on the sectors involved, but also created a domino effect on other works. For example, building structures that had reached the 2nd floor had to undergo significant adjustments as a result of the changes in schedule and methods required to align the works with the current situation. This shortened the remaining project completion time and necessitated the use of more complex working methods and additional, more expensive materials. As a result, the overall cost of the project increased significantly, with the main focus being on maintaining the target completion time despite the major constraints.

Elevator Delay Impact Analysis

With the delay of the elevator work, the separator beam work which was previously planned to use a concrete structure turned into a steel structure. As a result, it is necessary to make changes to the design and methods that have an impact on increasing costs for the elevator separator beam work to be carried out by the sturkutr contractor. The amount of cost incurred can be known using the comperative analysis method or comparison method by comparing the cost when using separator beams using concrete and steel. The steps taken to analyze the impact:

1. Unit Price Analysis

The first step is to determine the AHS of concrete and structural works. Refer to the following table

Table 1. AHS Iron Profile

No.	Description	Unit	Koef	Unit Price	Total Price
1	2	3	4	5	6
A	Workers	OH	0,06	IDR 100,000	IDR 6,000
	Welder	OH	0,06	IDR 150,000	Rp 9,000
	Head Builder	OH	0,006	IDR 200,000	IDR 1,200
	Foreman	OH	0,003	IDR 250,000	750 IDR
B	Material				
	Iron Profile	Kg	1,15	IDR 15,000	IDR 17,250
	Welding wire	Kg	0,15	IDR 25,000	IDR 3,750
C	Equipment				
	Electric drill	rent-a-day	0,05	IDR 35,000	IDR 1,750
	Welding tools	rent-a-day	0,06	IDR 100,000	IDR 6,000
				Total	IDR 45,700
				Fee	IDR 6,855
				Unit Price	IDR 52,555

Table 2. AHS Chemical Anchor

No	Description	Unit	Koef	Unit Price	Total Price
1	2	3	4	5	6
A	Workers	OH	0,05	IDR 100,000	Rp5,000
	Head Builder	OH	0,005	IDR 200,000	Rp1,000
	Foreman	OH	0,0005	IDR 250,000	Rp125
B	Material				
	Anchor D16	m3	1	IDR 70,000	Rp70,000
	Chemical	ml	0,0282	IDR 500,000	IDR14,103
C	Equipment				
	Electric drill	Day Rental	0,05	IDR 45,000	2,250 IDR
				Total	IDR92,478
				Fee	IDR13,872
				Unit Price	Rp106,349

Table 3. AHS of K350 Concrete

No.	Description	Unit	Koef	Unit Price	Total Price
1	2	3	4	5	6
A	Workers	OH	1,65	IDR 100,000	Rp165,000
	Builder	OH	0,275	IDR 150,000	IDR 41,250
	Head Builder	OH	0,028	IDR 200,000	Rp5,600
	Foreman	OH	0,083	IDR 250,000	IDR 20,750
B	Material				
	PC	kg	448	IDR 1,160	Rp519,680
	PB	kg	667	IDR 250	IDR166,750
	KR	kg	1000	IDR 259	IDR 259,259

No.	Description	Unit	Koef	Unit Price	Total Price
	Water	liter	215	Rp 25	IDR5,375
C	Equipment				
	Molen	rent-a-day	0,076	IDR 250,000	IDR 19,000
				Total	IDR1,202,664
				Fee	Rp180,400
				Unit Price	IDR 1,383,064

Table 4. AHS of Reinforcement

No.	Description	Unit	Koef	Unit Price	Total Price
1	2	3	4	5	6
A	Workers	OH	0,007	IDR 100,000	Rp700
	Welder	OH	0,007	IDR 150,000	Rp1,050
	Head Builder	OH	0,0007	IDR 200,000	Rp140
	Foreman	OH	0,0007	IDR 250,000	Rp175
B	Material				
	Rebar	kg	1,05	IDR 16,000	IDR 16,800
	Wire	kg	0,15	IDR 15,000	2,250 IDR
				Total	IDR 21,115
				Fee	3,167
				Unit Price	IDR 24,282

Table 5. AHS Formwork

No	Description	Unit	Koef	Unit Price	Total Price
1	2	3	4	5	6
A	Workers	OH	0,66	IDR 100,000	IDR66,000
	Welder	OH	0,33	IDR 150,000	Rp49.500
	Head Builder	OH	0,03	IDR 200,000	Rp6,000
	Foreman	OH	0,003	IDR 250,000	Rp750
B	Material				
	Scaffolding Wood	m3	0,04	IDR 3,000,000	Rp120,000
	Multiplek	bh	0,35	IDR 100,000	Rp35,000
	Spikes	kg	0,4	IDR 20,000	Rp8,000
	Beams	m3	0,015	IDR 3,400,000	Rp51,000
				Total	IDR336,250
				Fee	IDR 50,438
				Unit Price	Rp386,688

2. Work Volume Analysis

To find out the volume of separtator beam work, refer to the elevator working drawings. By calculating the needs of each floor, the volume for the work will be found.

Table 8. Iron Volume of Separator Beam Profile

No.	Job Description	Volume	Unit
1	Passanger Separator Beam	2419,2	kg
2	Beam Separator *Service*	3148,8	kg

Table 9. *Chemical Anchor* Volume of Separator Beam

No	Job Description	Volume	Unit
1	*Passanger* Separator Concrete	864	bh
2	Concrete Separator *Service*	864	bh

Table 10: Concrete volume of iron beam separator

No.	Job Description	Volume	Unit
1	*Passanger* Separator Concrete	6,804	m3
2	Concrete Separator *Service*	8,856	m3

Table 11: Iron volume of Separator Beams

No.	Job Description	Volume	Unit
1	Iron D19 *Passanger* Separator	1467,113	kg
2	Iron D10 *Passanger* Separator	339,8436	kg
3	Iron D19 Separator *Service*	1909,575	kg
4	Iron D10 Separator *Service*	269,3575	kg

Table 12. Formwork Volume of Separator Beam

No	Job Description	Volume	Unit
1	*Passanger* Separator Formwork	90,72	m2
2	Formwork Separator *Service*	119,34	m3

3. Cost Comparison Analysis

   Once known for the AHS and also the volume of work, the next step is to compare the cost of the separtator beam structure using steel and using concrete.

Table 13: Cost Comparison of Concrete and Steel Structures

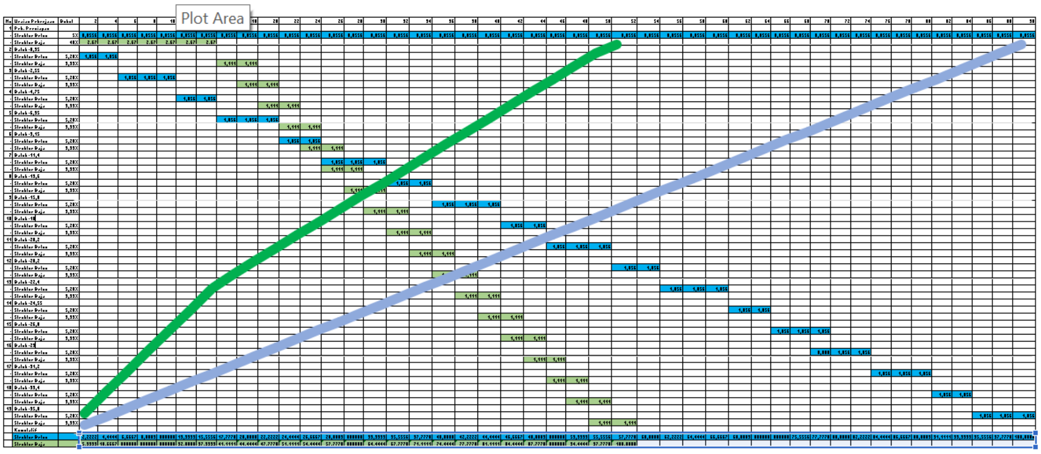
No.	Job Description	Volume	Unit	Unit Price	Total Price
1	PL Separator Beam	2419,2	Kg	IDR 52,555	IDR 127,141,056
2	SL Separator Beam	3148,8	Kg	IDR 52,555	IDR 165,485,184
3	Chemical Anchor	1728	bh	IDR 106,349	IDR 183,771,415
	Total				IDR 476,397,655
1	Concrete Separator PL	6,8	m3	IDR 1,383,064	IDR 9,410,367
2	Concrete Separator SL	8,9	m3	IDR 1,383,064	IDR 12,248,414
3	Iron D19 Separator PL	1467,1	Kg	IDR 24,282	IDR 35,624,793
4	Iron D10 Separator PL	339,8	Kg	IDR 24,282	IDR 8,252,167
5	Iron D19 Separator SL	1909,6	Kg	IDR 24,282	IDR 46,368,778
6	Iron D10 Separator SL	269,4	Kg	IDR 24,282	IDR 6,540,607
7	PL Separator Formwork	90,72	m2	IDR 386,688	IDR 35,080,290
8	SL Separator Formwork	119,34	m3	IDR 386,688	IDR 46,147,286
	Total				IDR 199,672,701

Based on this table, it can be seen that the deviation that occurs between the concrete structure of the elevator separator beam and the steel structure of the elevator separator beam of Rp. 276,724,955 is greater when using a steel structure.

Cost and Time Comparison Analysis

In this subsection, an in-depth analysis is conducted to compare the time and cost between two methods of elevator separator beam construction, namely steel structure and concrete structure. This analysis aims to provide a clear picture of the time and cost efficiency generated by each method in the context of project acceleration due to delays in elevator work.

As part of the discussion, a graphical S-curve between time and cost is presented to visually illustrate the relationship between the two. This S-curve will provide important information regarding the level of work completion along with the execution time and cost incurred, so that it can be used to evaluate the effectiveness of the selected method.



Comparative S-curve

Based on the S curve, it can be seen that the difference in work duration between concrete structure work (blue color) and steel structure (green color) there is a deviation of 38 days. However, with a total deviation of work price of Rp. 276,724,955 between concrete and steel structure work. Based on the S curve, it can also be concluded that each method has advantages and disadvantages.

CONCLUSION

Based on the study's findings, it can be concluded that the delay in the project necessitated a shift from a concrete structure to a steel structure for the elevator separator beam, aimed at expediting the work process despite incurring significant additional costs. Specifically, the costs associated with this change amounted to Rp. 276,724,955 more than if a concrete structure had been used. This illustrates that delays in elevator work have a domino effect, impacting both the overall project costs and timeline.

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