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Analysis of Factors Contributing to Project Delays in Separate Contracts: A Case Research of Elevator Work in A 10-Story Office Building Construction Project

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ABSTRACT

Construction projects often face delays, which can significantly impact both time and cost. This research focuses on identifying the factors contributing to delays in elevator work within the context of a 10-story office building construction project in Gresik, Indonesia. The objective of this research is to assess the causes of delays in elevator work and evaluate their impact on the overall project schedule and budget. The research uses a quantitative approach, analyzing secondary data from project documentation, interviews with relevant parties, and comparative analysis. Findings indicate that elevator work delays resulted in a 91-day deviation from the planned schedule. These delays were primarily caused by technical issues, such as late design approvals and the need to modify construction methods, which led to increased costs. The research also emphasizes the domino effect of these delays on other project components, thereby underlining the importance of effective coordination and planning. The research concludes by offering strategic recommendations to mitigate similar delays in future projects, particularly when using separate contracting methods.

Keywords: Elevator Work, Factor Analysis, Project Delay

INTRODUCTION

Construction projects are complex activities, involving various work components that are interrelated with each other (Patriadi & Fatmawati, 2024). In the construction of high-rise buildings, one of the important elements that must receive serious attention is elevator work. The elevator not only serves as a means of vertical transportation for users, but also affects various technical aspects in the project, such as structural design and other work. As part of the vertical mobility system, the elevator must be carefully planned and implemented so as not to hinder the progress of the project (Telaumbanua, 2024).

Delays in the implementation of elevator work can trigger various problems in construction projects. This problem not only impacts the implementation schedule, but also increases costs due to the need for structural adjustments or the use of different work methods (Khalim, 2021). In the construction project of a 10-storey office building in Gresik, delays in elevator work are one of the main challenges faced. This problem occurred due to the need to complete some additional structural work directly related to the installation of the elevator. For example, works such as the installation of separator beams and structural elevation adjustments are often delayed due to the uncertainty of the elevator specifications used. These delays can lead to the need to use additional materials, such as steel and chemical anchors, which ultimately add to the project cost (Nugroho & Kirana, 2024).

In Indonesia, many construction projects use the split-contracting method, including high-rise building projects (Simanjuntak et al., 2021). This method allows each type of work, including elevator work, to be managed independently by different contractors. Although this method provides flexibility and potential cost savings for project owners, its application often encounters obstacles in coordination between jobs. One of the main obstacles is delays arising from the lack of synchronization between the various ongoing works in the field (Febrina, 2021).

Construction contracts in Indonesia are generally prepared based on international contract standards such as FIDIC (International Federation of Consulting Engineers), but with adjustments to national laws and government policies (Purba, 2021). The Indonesian government, through the Construction Services Law No. 2 of 2017 and its derivative regulations, has established various rules that aim to protect the rights of all parties involved and ensure efficient and timely project implementation.

In construction projects in Indonesia, there are several types of contracts that are often used. According to (STATIK, 2019) the following are types of contracts based on the organization of the agreement:

1. General Contract Method
   This general contract is a contract method where the project owner (owner) makes only an agreement with one contractor. Project owners who use this method generally do not have the ability to manage the full control of the project. So that in general it will use the services of a consultant as a representative of the project owner. This method is very commonly used in private and government projects. The difference is that private contract rules have more flexibility than government contracts.
2. Separate Contract Method
   This method is a method of dividing various types of work separately by the project owner (owner) to contractors who have different specializations. Basically this method is the same as the general contract method but differs from the absence of a general contractor (main contractor). In this method the project owner (owner) must carry out project management control with his own efforts or use the services of other parties. The use of this method is usually used if the project owner (owner) has sufficient resources to organize project management that will run.
   The advantage in this method is that the project owner is able to save costs for the main contractor. In its development, this method can be modified if the project owner does not

have the ability to organize project management by appointing another party as the controller of the contractors.

3. Self-Managed Method

   This method is a method where the owner does not enter into a contract on the project to be implemented. In this method the project owner runs the project with his own resources to complete the project. Both in the form of labor, materials and tools. This method is very suitable if the project owner has a good organization and resources.

   The advantage of this method is that it can save costs from contractor and sub-contractor profits because everything is done in-house. This method is commonly used for projects with a small value. Such as maintenance or minor repairs.

4. Design Method

   In this method, the project owner uses a single contract system in the form of planning and implementation work in one contractor who has sufficient ability to carry out planning and implementation. This method is widely used for industrial projects.

   The main advantage in this method is the overlap between planning and implementation. With this method, implementation can be done before planning is complete. So that it can shorten the completion time. The disadvantage of this method is that the costs incurred by the project owner are greater than other methods. The amount of costs incurred is due to the amount of risk that will be borne by the contractor (Sajiyo, 2023).

Previous studies have primarily focused on the impact of general delays in construction projects, but there is limited research specifically addressing delays in elevator installation and their cascading effects on the overall construction schedule and cost (Raharjo & Azhar, 2024). Moreover, the use of separate contracting methods in elevator work, which is prevalent in many construction projects, has not been explored in depth in the context of its impact on project timelines and financial implications (Sholeh, 2023). This research seeks to fill this gap by focusing on the elevator work component and evaluating the causes and consequences of delays within the framework of separate contracting.

This research presents a unique contribution to the field by analyzing the specific impact of delays in elevator work on project time and cost within a construction project employing the separate contracting method. It combines quantitative data from field observations, project documentation, and interviews with key stakeholders, offering a comprehensive understanding of how delays in one component, like elevator installation, can disrupt the entire construction process. Furthermore, the research provides strategic recommendations tailored to mitigate similar delays in future construction projects, particularly in those utilizing separate contracting methods.

Based on the above background, this research aims to determine the factors causing elevator delays and their impact on project time and cost. Using actual data from the field, interviews with relevant parties, and comparative analysis, this research will evaluate the causes of delays and calculate the amount of additional costs incurred. The benefits of this research are multifaceted. First, this research will provide a more in-depth understanding of the specific challenges faced during elevator installation and their potential impact on the overall project schedule and budget. Second, this research will contribute to improving coordination between contractors in projects using the separate contract method, thus minimizing the risk of delays. Third, the strategic recommendations proposed by this research will offer actionable solutions that can be applied in future projects to prevent the same delays and improve efficiency in construction management. Finally, by identifying and addressing the factors that cause elevator work delays, this research will help project owners, contractors, and other stakeholders make more informed decisions, ultimately contributing to the successful and timely completion of construction projects.

RESEARCH METHOD

Type of Research

This research was conducted on the construction of the probolinggo city square project. The method is carried out to find out the latest conditions and the latest information about the situation on the object of research, as well as extract factual information, then the researcher evaluates the problems generated in order to get steps to make a handling plan for decision making.

In this research, researchers used quantitative research which starts from identifying, assessing and knowing the factors that occur in construction projects and then with the assessment and level of known factors analyzed how the dominant factor is the delay in project completion with the analysis method with the help of the SPSS 25 program and based on the results of SPSS 25 the next process is to mitigate the risk to minimize the delay in project completion with similar things.

Time and Location of Research

This research 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 research will identify the factors that cause delays and calculate the financial impact. In addition, this research 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 delayed elevator works, while offering practical solutions to improve time and cost management more effectively on future projects.

Data and Data Collection Techniques

The data in this research includes secondary data and primary data. Through these data, some data are needed to support the research. The data needs include site instruction, alternative design, project cost data, project schedule, and interview with construction manager.

Then, the data was collected in two ways, namely through project documentation and semi-structured interviews.

RESULT AND DISCUSSION

Data Description

This research aims to analyze the impact of delays in elevator work on the time and cost of a 10-storey office building construction project in Gresik. The data used in this research consist of secondary data taken from available project documentation.

Secondary Data

Secondary data consists of information obtained from pre-existing project documents. This data provided further context about the project and supported the cost and time analysis. The secondary data used includes:

1. Master Schedule

   The project schedule for this project includes all work until the project is completed.

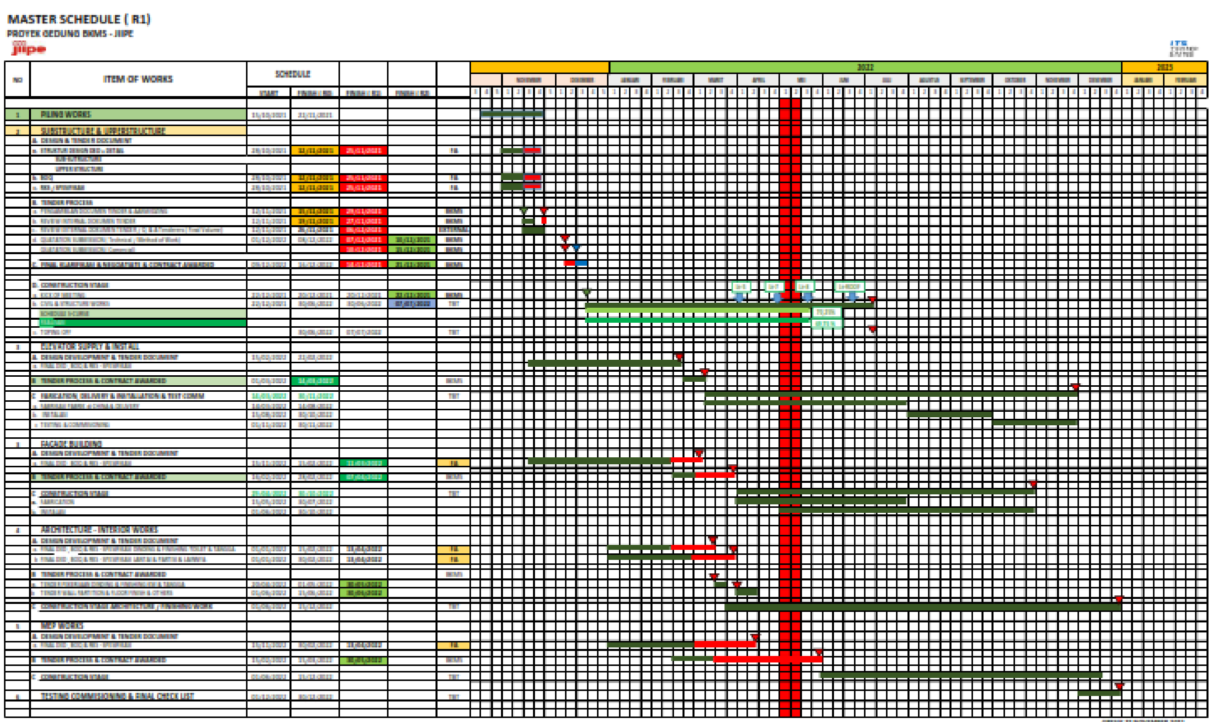

Figure 3. Master Schedule

2. Schedule Structure

   The structural work is carried out by a structural contractor which includes lower structure work to the upper structure and canopy steel work.

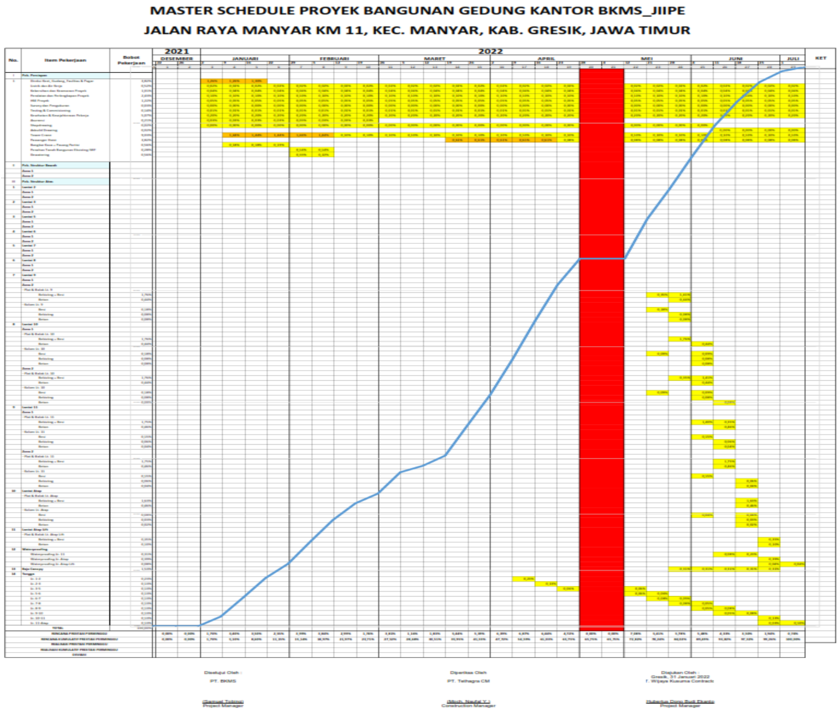

Figure 4. Schedule Structure

3. Schedule Lift

   The elevator work was carried out by an elevator contractor which included the work of 2 passenger elevator units and 1 service elevator unit. In the passenger elevator work, using a modified elevator because it has 2 door openings.

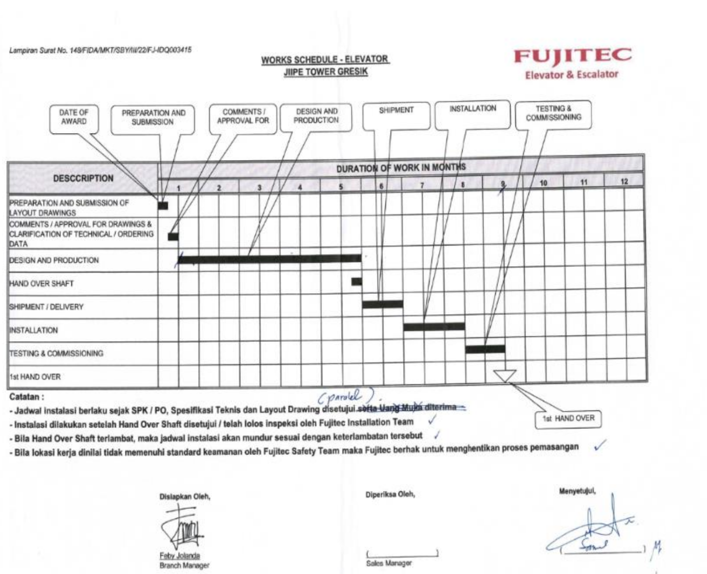

Figure 5. Elevator Schedule

4. Implementation Schedule

   This schedule is a realization schedule that occurs in the project. In the elevator work that should have started in January, the realization started in April. So that it will take acceleration to catch up with the delays that occur

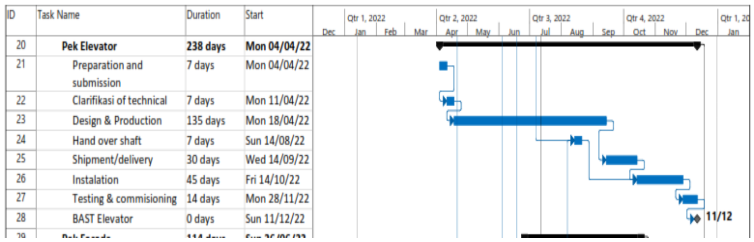

Figure 6. Elevator Work Realization Schedule

5. Request for Information (RFI) and Site Instruction (SI)

   To catch up with the delay in the elevator work, it is necessary to change the work method for the elevator separator beam work. What was originally supposed to use concrete, was then changed to use steel to speed up the work.

REQUEST FOR INFORMATION

No. : 015 / RFI / TCM - FA / 21.04.2022

No. Dokumen	4.1.3.1 / TCM.PQS / FML
Revisi Pusat	
Revisi Proyek	
Halaman	

Kepada : Pak Taufik
: Pak Budi
: Pak Ilyas

SUBYEK : ☐ Pondasi ☐ Struktur ☐ Arsitektur ☐ Mekanikal ☐ Elektrikal ☐ ....

PERTANYAAN

Pada pekerjaan separator beam lift, sudah diputuskan menggunakan IWF 200x100 oleh pihak BKMS. Yang ingin kami tanyakan :
1. Berapa jumlah angkur yang dibutuhkan untuk setiap separator beam?
2. Berapa dimensi angkur yang dibutuhkan?
3. Bagaimana desain angkur dan mur tersebut?

Karena jadwal yang ketat, kami harap jawaban bisa segera diberikan sebelum tanggal 25 April 2022. Atas kerja samanya kami ucapkan terima kasih.

Lampiran :

JAWABAN

Figure 7. Elevator Separator Beam

Based on the RFI, the answer was obtained to change the method from using a concrete structure to a steel structure. Because when the elevator sepator work was to be done, the floor structure work had reached the 2nd floor. While the separator beam work has started since the ground floor work. So if using a concrete structure, the processing time will be longer and the cost of the method will be more expensive. For this delay, a site instruction (SI) was issued for the use of a steel structure as a separator beam.

6. Shopdrawing and As built

   Before the elevator makes an order / production of the elevator, first submit approval in the form of shopdrawing and approval of material samples. To determine the distance between separator beams, structural work must refer to the shopdrawing of the elevator work as a reference for making shopdrawing elevator structures.

Research Findings

Based on data obtained from secondary data, this research found several key findings that illustrate the impact of delays in elevator work on the time and cost of a 10-story office building construction project in Gresik. Secondary data consists of project documents that include master schedule, work realization schedule, request for information (RFI), and site instruction (SI).

One of the key findings was that there was a significant delay in the implementation of the elevator work, which was originally planned to start in January, but was only able to start in April. This delay was caused by delays in the elevator works which resulted in delays in structural works directly related to the installation of the elevator, such as the installation of separator beams. This affected the overall project schedule as other works that depended on the completion of the elevator had to wait.

As a result of the delay, the project experienced additional costs, especially in the use of different materials and methods. For example, the elevator separator beam work, which was originally planned to use concrete, was changed to use steel to speed up the process. This change in method required additional costs, but was chosen because it reduced the duration of the work and ensured the project could still be completed despite the delay. The application of the steel structure was also made possible through a site instruction issued to address the issue.

In addition, based on interviews with related parties, it was found that delays in elevator work also had a domino effect on other interdependent work. The structural work that had been running up to the 2nd floor had to be adjusted to the changes that occurred due to the elevator delay. Thus, the time for project completion is getting shorter and the costs required are increasing due to the use of more expensive work methods and the use of additional materials to be able to achieve the right completion time.

Previous studies have investigated delays in various components of construction projects, including elevator work. For instance, research by (Radman et al., 2021) explored the impact of contract types and work delays in construction, highlighting how delays in critical path tasks, such as elevator installations, can cause significant project setbacks. Similarly, (Gbahabo & Samuel, 2017) studied the relationship between delays in specific cons truction components and their impact on overall project timelines and budgets, specifically in large-scale infrastructure projects. These studies found that delays in vertical transportation systems, such as elevators, often trigger delays in other parts of the project due to their interdependent nature, similar to the findings of this research.

Furthermore, (Banobi & Jung, 2019) examined the challenges faced in managing separate contracts in construction projects, emphasizing that delays often arise when there is poor coordination between contractors handling different components. This aligns with the current research's finding that delays in elevator work led to synchronization issues, resulting in additional costs and project delays.

Elevator Delay Analysis

This section discusses the analysis of delays that occurred in elevator work in a 10-storey office building construction project in Gresik. This analysis focuses on the comparison between the plan schedule and the elevator work implementation schedule which shows a time deviation.

The delays were analyzed to determine the main causes, the impact on project time and cost, and the corrective measures that have been taken. By comparing data from the Master Schedule and the realization of work in the field, this research provides a comprehensive picture of the extent to which delays in elevator work affect the overall project progress.

Based on the elevator work plan schedule and the elevator work implementation schedule, it can be seen that there is a time deviation of 91 days. For more details, see the following table.

Table 3. Schedule Deviation

No.	Jobs	Plan		Implementation	
		Start	Finish	Start	Finish
1	Preparation and submission	03/01/2022	09/01/2022	04/04/2022	10/04/2022
2	Clarification of technical	10/01/2022	16/01/2022	11/04/2022	17/04/2022
3	Design & Production	17/01/2022	01/06/2022	18/04/2022	13/09/2022
4	Hand over shaft	02/06/2022	08/06/2022	14/08/2022	20/08/2022
5	Shipment/delivery	02/06/2022	01/07/2022	14/09/2022	13/10/2022
6	Instalation	02/07/2022	15/08/2022	14/10/2022	27/11/2022
7	Testing & commissioning	16/08/2022	29/08/2022	28/11/2022	11/12/2022
8	BAST Elevator	29/08/2022	29/08/2022	11/12/2022	11/12/2022

With this table, it can be seen that the clarification of technical process which should have started on January 10, 2022 was delayed to April 11, 2022. As a result of the delay, the design of the elevator separator beam spacing design was delayed. In the initial design, the elevator separator beam used a concrete structure. However, due to delays in the elevator work, the design could not be used. The main reason the design could not be implemented was because the condition of the main structure had reached the fifth floor. So a new design and a new method are needed to solve the problem.

This delay analysis aligns with findings from (Rosyadi et al., 2022), who identified that delays in specialized components, such as elevator installation, often lead to significant schedule adjustments and rework in the overall project. Similarly, (Adewale, 2016) noted that delays in the clarification and technical design stages of construction projects, especially those involving complex components like elevators, can lead to cascading delays across various interconnected tasks. This research further supports these findings by demonstrating how delays in elevator work required a reevaluation of the design and adjustments to construction methods, thereby influencing the entire project schedule and incurring additional costs.

CONCLUSION

The conclusion of this research finds that elevator work delays on a 10-story office building construction project in Gresik caused time deviations of up to 91 days from the original schedule. The impact of this delay not only affects the completion of the elevator work, but also has an impact on the overall project schedule because other work has to wait until the elevator is completed. This finding emphasizes the importance of careful planning and more effective coordination between the elevator contractor and the construction team so that delays can be minimized. As a contribution to future research, this research recommends further exploration of the impact of separate contracting methods on the risk of project delays in various other types of construction work. In addition, future research could develop technology-based risk mitigation strategies or more adaptive project management systems to improve time and cost efficiency in similar construction projects.

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