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Claim Extension of Time and Prolongation Cost Management Using The Last Planner System Method

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ABSTRACT

This study addresses the challenges faced by service providers in construction projects, particularly in dealing with changes in work that may affect the project's timeline and cost. Changes can introduce risks of loss, especially when claims for extension of time (EOT) and additional costs incurred due to prolongation are not properly approved by the Employer. Failure to submit a valid claim for EOT and prolongation costs can result in substantial financial losses for the service provider. The research aims to develop a method for effectively managing these risks by integrating the output of the Last Planner System (LPS) into the administrative support data for claims. This method is used to calculate delay events and create a structured, reliable claim evidence document. The findings suggest that using the LPS framework can help construction managers systematically document and justify delays and cost impacts, thereby improving the likelihood of claim approval. This approach can enhance the efficiency of claims management and reduce financial risks for service providers. The study's implications highlight the importance of proactive planning and proper documentation in managing construction project risks, emphasizing the need for robust administrative systems to support claims for delays and associated costs.

KEYWORDS construction claims, extension of time, prolongation costs, Last Planner System, delay events

INTRODUCTION

The causes of failure of the claim, when ranked, are due to the failure of the Contractor to establish a causal relationship, inadequate supporting documents for the claim, the terms of the contract that are not properly identified to support the claim, and the delay in submitting the claim (Ahmed, 2023; Kushwaha, 2017; Yusuwan et al., 2017, 2019, 2021).

The current development is one of the tools in the concept of Lean Construction, which is a collaborative method in planning involving the *"Last Planner"* or Front End, between the Contractor along with subcontractors, foremen, and vendors to produce reliable planning in its implementation. The method is called the *Last Planner System* (Govindasamy & Bekker, 2024; Heigermoser et al., 2019; Power et al., 2021; Salazar et al., 2020; Warid & Hamani, 2023).

Some of the outputs of the *Last Planner System*, such as Master Planning Baseline, Constraints Analysis, and Variance Analysis, can be used as supporting material for claim documents. *Constraint Analysis* is an obstacle that can be in the form of Contract, Design, Submittal, Material, Work Prerequisite, Equipment, Labor, Permitting, Inspection, Approval, and so on, depending on the characteristics of the project in question (Ahamed et al., 2023; Brout et al., 2022; Damadzic et al., 2022; Ikeziri et al., 2019; van Baal et al., 2018). To be able to perform *Constraint Analysis*, cooperation from all parties involved is required. If *Constraint Analysis* is not carried out, it will tend to be too reactive if something suddenly happens in the implementation of the project. *Variance Analysis* is an investigative analysis that is carried out to find out the reason for the deviation between the plan and the actual for each assignment.

Drafting a claim is not an easy task. The claim must be logically constructed, well-organized, and convincing in factual terms to prove that the plaintiff is innocent while the other party is guilty. The right to an extension of time is not only to list the events that caused the

delay, but rather the Contractor must show how the event caused the delay and how it affected the critical path. Claims for extension of time and additional costs are among the contractual claims that cannot always be provided by the Employer (Yusuwan et al., 2021). Therefore, in this study, the integration of the output *Last Planner System* will be analyzed so that it can serve as reliable document support data in the process of claiming extension of time and costs.

This study builds on previous research that highlighted the challenges in managing construction project claims, particularly in terms of establishing a causal relationship between events and ensuring that supporting documents are adequate (Yusuwan et al., 2017). Another key study by Yusuwan et al. (2021) emphasized the criticality of understanding the terms of the contract and submitting claims in a timely manner. The novelty of this research lies in the integration of the *Last Planner System* (LPS) to streamline the creation of claim documentation. By utilizing outputs from LPS, such as Master Planning Baseline, *Constraints Analysis*, and *Variance Analysis*, this study aims to create a structured approach for documenting claims, especially regarding delay events and additional costs. The research focuses on how the LPS framework can serve as a reliable tool to support claims for extension of time (*EOT*) and associated costs in construction projects, with particular attention given to the identification and analysis of constraints that lead to delays.

The purpose of this study is to find out how to form an organized claim evidence document by integrating the output *Last Planner System* in making reliable administrative support data for claims and the calculation of delay events.

RESEARCH METHODOLOGY

The research methodology used in this study employs qualitative methods with case studies based on actual project data. The analysis of the submission of extension and cost claims, integrated with the *Last Planner System*, can be outlined in the following stages:

1. **Evidence Collection**

   The first step involves collecting data related to the implementation of the *Last Planner System*, including *Master Planning Baseline*, *Daily Huddle*, *Weekly Work Meeting*, *Constraints Analysis*, and *Variance Analysis*. These tools help identify potential issues that arise during the project's implementation. Problems identified in *Milestone Planning*, *Daily Huddle*, *Weekly Work Meeting*, *Constraint Log*, and *Variant Analysis* can support each other in forming administrative documents such as:

   1. *Weekly Meeting Minutes*
   2. *Consignment Minutes*
   3. *Correspondence*
   4. *Baseline Schedule, a*nd so on.

   This evidence can then be used to calculate the duration of the delay event (*Delay Event*), which will serve as the basis for calculating the extension of time claim.

2. **Calculating Delay Claim Analysis based on Baseline Schedule**

   A *baseline schedule* is a schedule agreed upon in advance by the employer. This schedule is an extension of the *Master Schedule*. It can be created in *MS Project* and includes work activities, work breakdown structure (WBS), durations, and a full list of predecessor and successor activities up to the end date of the schedule, as specified in the Contract Document. The *baseline schedule* is then used as a reference to evaluate the schedule during project implementation.

   The delay conditions can be summarized in a worksheet called *Calculation of Delay Events*. All administrative documents are organized for each work item affected by the delay. The duration of the *Delay Event* is calculated by referring to the *Baseline Schedule* and the

liabilities of each party according to the contract. This allows for the identification of the delay duration, which is subsequently incorporated into the related *WBS Baseline Schedule*.

3. **Simulation of Prognosis Schedule based on the results of Delay Claim Analysis** Work items affected by the delay are then injected with the duration of the *Delay Event* into the relevant *WBS Baseline Schedule*, resulting in the creation of a *Prognosis Schedule*.

Based on the above description, the method stages for forming time and cost claim documents by integrating the implementation of the *Last Planner System* can be visualized with a flow chart, as shown in Figure 3.1.

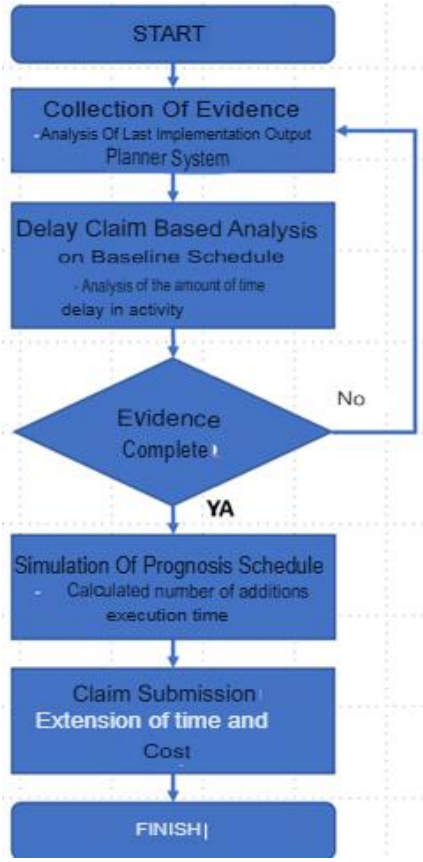

Figure 1. Flow chart for the preparation of claim documents

Last Planner System

The *Last Planner System* (LPS) is a method of collaboration and commitment that is integrated into planning between the main contractor, subcontractors, foremen, and vendors to produce reliable plans. In addition, LPS can reduce the variability of work when implementing planning into execution on the field. LPS is also one of the tools of *lean construction* that is useful as a construction management control system and an effort to streamline the construction process efficiently and continuously (Christoffersen et al., 2001; Ballard & Howell, 2003).

The implementation of LPS requires a team that is directly assigned to plan, execute, and control production management in the field, hereinafter referred to as the *Last Planner*. The *Last Planner* is different from the *First Planner*; typically, the *First Planner* only does planning without considering field aspects and suggestions or input from those working in the field. Meanwhile, the *Last Planner* has the authority to supervise and be directly involved in the work on a production unit. This LPS method shifts the paradigm from the *Push System*, which is a traditional method, to the *Pull System*.

Delay Claim Analysis

In the case of time extension claims, the Delay Claim Analysis method can be seen in table 1

Table 1. Delay Claim Analysis Method – The Principle of Schedule Impact Analysis

Technique Type	Based On	Method	Description
Retrospective Techniques	As-Planned Schedule	Adjusted As-Planned	After the fact, inserting delays into the as-planned to quantify global impact.
Retrospective Techniques	As-Planned Schedule	Impacted Updated (Veterans Administration)	After the fact, inserting delays into an updated as-planned to quantify impact.
Retrospective Techniques	As-Built Schedule	Adjusted As-Built	After the fact, insert delays into as-built to show 'critical path' and quantify global impact.
Retrospective Techniques	As-Built Schedule	Collapsed As-Built (But-for)	After the fact, delays are subtracted from as-built to quantify global impact.
Contemporaneous Techniques	As-Planned Schedule	Impacted Updated (Veterans Administration)	At the time of delay, inserting delays into an updated as-planned to quantify impact.
Contemporaneous Techniques	As-Built Schedule	Modification Impact Analysis (USACE)	At time of modification, schedule is updated and delay inserted to quantify singular impact.
Contemporaneous Techniques	As-Built Schedule	Time Impact Analysis	Recreate time of modification. Using updated schedule, insert delay and quantify singular impact.

In principle, each claim is unique and relates to different contract terms, the complexity of problems, procedures in the owner's organization, and so on. Owners tend to conduct a *Delay Claim Analysis* assessment using the basis that was agreed upon at the beginning, namely the *Baseline Schedule* (*As Planned Schedule*), considering that in making the baseline schedule, it is assumed that the Contractor has understood the scope of work and calculated the completion schedule that must be completed according to the contract time.

Delay Claim Analysis is generally carried out while the project is still running, so the method approach that can be used is the *Impacted Updated Approach*. This method takes into account the relationship of change or delay to past or ongoing events. This technique makes it possible to test the dynamic nature of the *Critical Path* from period to period as the project progresses.

Integration of the Last Planner System Method in the Claims Process

The *Last Planner System* has five interconnected stages (Ballard, 1997; Ballard, 2000; Ballard & Howell, 2003; Mossman, 2009). When applied systematically, these stages can bring many benefits to construction planning practices. The five stages are as follows:

1. *Master Plan* - to obtain a general plan and identify all work packages for the entire project, indicating the main activities, their duration, and order.
2. *Pull Planning* - divides the *master plan* into stages through a collaborative scheme between the main contractor, subcontractors, foremen, and vendors, aiming to develop a more detailed work plan and provide reliable objectives for the project team.
3. *Look Ahead Planning* – focusing management's attention on what should happen at some point in the future, and to encourage actions in the present that lead to the desired future.
4. *Weekly Work Plan* – i.e., a collaborative agreement with respect to production tasks for the following day or week through weekly meetings. Weekly meetings help plan the work to be done next week, keeping in mind the work that is being done now and in the knowledge of the work that has been prepared to be done. WWP meetings include weekly plans, safety issues, quality issues, resources, construction methods, and issues occurring in the field.

5. *Learning* – i.e., improving project planning with continuous assessment and learning from failures. *PPC* is a measure of the proportion of targets or achievements that are delivered on time. *PPC* can be calculated as the number of activities completed as planned divided by the number of planned activities, and presented in the form of a percentage (Koskela et al., 2010).

3 Case Studies

Problem Resume

This research began by studying the contract documents for the related project. The problem that arose was a change in the timeline for the implementation of work, which had been extended several times, up to 16 months. This extension needs to be mitigated through the submission of Claims for Extension of Time and Costs.

Contractual Analysis

Based on the contract, the Contractor should have carried out the work in accordance with the *FEED* (*Front End Engineering Design*) Drawing from the Planning Consultant. However, after conducting an actual soil investigation by Geotechnical Experts, it turned out that the soil conditions differed between the actual site and what was outlined in the contract.

In the contract document, there were only 2 *Drill Log* points to represent an area of 10 Ha. The experts then reviewed the site by conducting soil investigations at 20 *Drill Log* points in the 10 Ha area for *Design Review* purposes. With more complete data, a recalculation was carried out for the foundation and the upper structure (steel structure). The calculation results showed that a significant increase in the number of foundations was needed, and there was a change in the cross-sectional profile and connection details of the steel structure. The impact of delays due to the *Design Review* and because the *FEED* drawings could not be implemented resulted in the loss of effective implementation time of about 8 months.

Given that the design of foundations, substructures, and steel structures is on the critical path, other work could not proceed until this work was completed, which, of course, had a great impact on the overall completion time.

RESULTS AND DISCUSSION

Analysis of the Last Planner System Implementation

At the time of implementation, the project team collaborated on coordination, monitoring, and evaluation up to the *Front End* layer, involving the entire project team, foremen, vendors, and subcontractors.

Some of the implementations of the *Last Planner System* used during the project include:

1. **Master Planning Baseline**

   The implementation carried out includes:

   a. The use of *Building Information Modelling* (*BIM*) for Milestone Sets by providing progress visualization that is integrated with the implementation schedule plan.

      In the project implementation, *Milestone Target Planning* was carried out, which must be achieved every month based on the *Master Schedule*. The setting of these milestone targets was coordinated with the entire project team. With the use of *BIM Level 4D*, physical progress and the physical presentation of work items that must be achieved according to the details of the *Baseline Schedule* can be visualized.

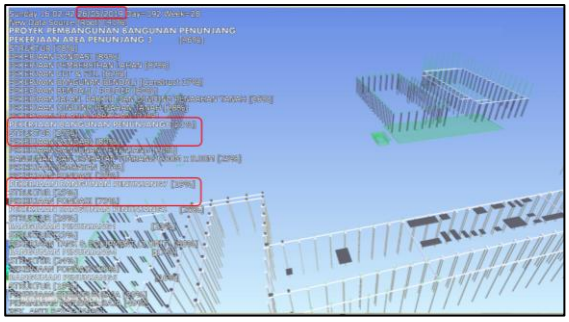

Figure 2. Evaluation of Plan Progress with BIM Level 4

Figure 2 shows that the Milestone Planning on May 26, 2019 should be the physical progress of the foundation in Supporting Building 8 by 80%, in Supporting Building 7 by 73% and so on. However, in the evaluation of the actual progress of the realization is far from the Milestone Planning. Because the foundation work is included in the Critical Path, the delay can result in a setback in the overall completion schedule. From this activity, the project team detailed the root cause of the problem through the coordination of Daily Huddle, Weekly Meeting and then Constraint Analysis and Variance Analysis to find out the details of the problems that occurred.

b. Detailing the Work Breakdown Schedule in the Baseline Schedule as an Implementation of Milestone Planning.
Daily Huddle, *Weekly Meeting*, *Constraint Analysis*, and *Variance Analysis* help project teams to analyze the obstacles that occur. Based on this analysis, the main obstacle lies in the delay in the approval of *DED* for the foundation and steel structure, the approval of *LPM* materials for *Hydrant Pumps* and *Machines*, and the approval of *Shop Drawing* from the *Owner*, which resulted in stagnant work in the earthworks and site development areas. This situation made it difficult for labor, vendors, and subcontractors to manage the continuity of work in the field. For this reason, the team reviewed what was estimated to be a potential problem and incorporated it into the *WBS* in the *Baseline Schedule* with the intention of facilitating analysis in the event of a *Delay Event* in the future.
The important work breakdowns that are included in the *Baseline Schedule* are *Detailed Engineering Drawing*, *Material Approval Sheet*, *Shop Drawing*, *Purchase Order*, *Fabrication*, *Delivery*, *Installation*, and *Test Commissioning*. In this case study, the *WBS* was made for foundation structure work, steel structure, machinery, *MEP*, wall and roof sandwich panels, *aluminum composite panels*, supporting buildings, site plans, landscapes, and equipment.
With the addition of the *WBS* to works that have critical paths, it will make it easier to calculate the *Delay Event* on the work item so that, at the time of the Test Schedule and *Delay Claim Analysis* with the *Owner*, the *Contractor* has strong claim evidence with a *Baseline Schedule* basis.

a. **Daily Huddle and Weekly Work Planning**
This implementation contains daily routine activities of the *Tool Box Meeting* and *Weekly Meeting*, involving workers, foremen, vendors, and subcontractors. From this activity, project management obtains valid information about the actual obstacles that occur, prepares a weekly work plan, and jointly evaluates the achievement of targets from the previous work plan.

b. **Constraint Analysis and Variance Analysis**
This activity is a continuation of activities that occur in the coordination of *Tool Box Meeting* and *Weekly Meeting*. The application of *Constraint Analysis* includes:

a. Performing *Sticky Notes* on the Daily Activity Board by all teams. *Sticky Notes* can contain work plans or obstacles that cause work interruptions.
b. Conducting *Constraint Analysis* evaluations that contain problems or obstacles that arise when the schedule is being planned and must be completed before the work begins.
c. Conducting *Variance Analysis* evaluations that contain problems that cause work to be delayed and not completed according to a pre-arranged schedule.

In general, the illustration of the application of the Last Planner System in the implementation of the project can be seen in figure 3.

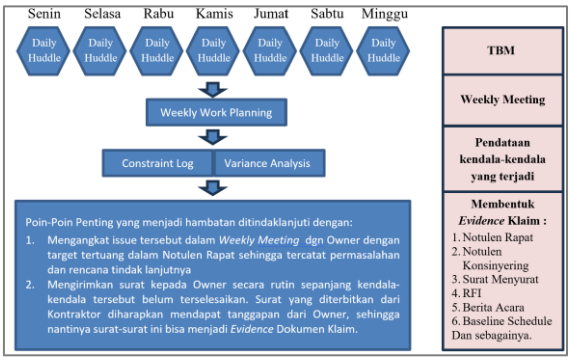

Figure 3. Illustration of the Application of the Last Planner System in Project Implementation

Analysis of Claim Document Evidence Data

The evidence documents used in submitting an extension of time and fee claim come from report documents, letters, RFIs, meeting minutes, consignments, material consent sheets, images and emails.
Based on contractual analysis, the data of supporting documents or Evidence Documents of Claims is quite adequate, refers to the terms of the contract and provides a clear picture of the causal relationship.

Integration of the Last Planner System Output into the Evidence Document

Referring to **Figure 4.1** *Illustration of the Application of the Last Planner System in Project Implementation*, the next stage is to map the integration of the *Last Planner System* output on the items that are the problems causing the change in implementation time.
Table 2 provides an overview of the *Last Planner System* activity carried out on each item that causes the *Delay Event*. Through the *Last Planner System* method, this is mitigated by preparing a *Baseline Schedule* with *WBS* that is relevant to the existing issues, so that later it will make it easier to calculate the *Delay Event*. Identification of potential problems will be much better achieved through coordination and collaboration with foremen, vendors, and subcontractors so that comprehensive data and information are obtained. Furthermore, the information we have received through this process will be placed in administrative documents such as Letters, *RFIs*, *Meeting Minutes*, *Consignment Minutes*, and so on, which will later become reliable *Claim Supporting Data*.

Table 2. Integration of the Last Planner System Output into the Evidence Document

Contract	Duration	Problem No.	Issue	Analysis Baseline Schedule	Collaboration	Planning	Evaluation	Letter	RFI	Meeting Notes	Consinyering Notes	Report	Baseline Schedule
Initial Contract	Nov 2018 – Feb 2020												

Extension of Time	Nov 2018 – Nov 2020	1	Delay in approval of Foundation Detail Engineering Drawing	Create WBS DED, LPM, Shop Drawing	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis	SURAT	RFI	MINUTES OF MEETING	NOTULEN KONSINYERING	Berita Acara	Baseline Schedule
		2	Delay in approval of Steel Structure Detail Engineering Drawing	Create WBS DED, LPM, Shop Drawing	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis						
		3	Delay in machine approval	Create WBS DED, LPM, Pre Com and Test Com	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis	SURAT	RFI	MINUTES OF MEETING	NOTULEN KONSINYERING	Berita Acara	Baseline Schedule
		4	Addition of pile quantity	Create WBS per job	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis						
		5	Addition of substructure volume	Create WBS per job	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis	SURAT	RFI	MINUTES OF MEETING	NOTULEN KONSINYERING	Berita Acara	Baseline Schedule
		6	Addition of equipment foundation	Create WBS per job	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis						
		7	Addition of pump foundation	Create WBS per job	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis	SURAT	RFI	MINUTES OF MEETING	NOTULEN KONSINYERING	Berita Acara	Baseline Schedule
		8	Pump specification change	Create WBS LPM, PO, Pre Com and Test Com	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis						
		9	Delay in relocation of existing owner's material	Create WBS for Relocation Scrap	Daily Huddle	Weekly Meeting	Constraint Analysis, Variance Analysis	SURAT	RFI	MINUTES OF MEETING	NOTULEN KONSINYERING	Berita Acara	Baseline Schedule

Delay Claim Analysis

In this case study, the calculation of *Delay Claim Analysis* uses the basis of the Owner's approved *Baseline Schedule*. Owners tend to conduct a *Delay Claim Analysis* assessment using the basis that has been agreed upon at the beginning, namely the *Baseline Schedule*, considering that in making the *baseline schedule*, it is assumed that the Contractor has understood the scope of work and calculated the completion schedule that must be completed according to the contract time.

In the calculation of the *Delay Analysis*, a review of the contract clauses that become the liability of the *Assignee* and *Service Provider* is also carried out so that the duration of the *Delay Event* that occurs is a fair calculation for both parties. In the contractual clause, the Contractor must give written notice a maximum of 14 days after an event affecting or likely to affect the work first occurs.

Event Delay can be calculated on the affected item, and then the duration of the *event delay* is injected into the *WBS Baseline Schedule*, so that the finish schedule calculation is obtained. The *Delay Event* calculation table can consist of:

1. The date and number of the associated document. Documents can be in the form of reports, letters, *RFIs*, *meeting minutes*, *consignment minutes*, and so on.
2. A brief explanation of the related documents.
3. Description of the position of correspondence in the Contractor or in the Owner.

4. The column for the duration of calculating the delay of documents that become the liability of the Contractor and Owner.
   For example, in **Table 4.2**, you can see how to calculate the *Delay Event* for the delay in *DED* approval of the Foundation and Steel Structure.

Table 3. One of the Cases of Calculation of Delay Event Delay in DED Approval of Steel Foundations and Structures

No	Date	Document Type	Document No.	Subject	Correspondence	Deviation	Liability Owner	Liability Contractor
1	21-Nov-18			Baseline Schedule				* If >14 days
2	5-Dec-18	Report	-	Factual Report on Soil Investigation Result	Contractor	14		
3	12-Dec-18	Letter	PP/G2/Teknik/518014/096	Submission of Review Results for Pile Cap Foundation Based on Soil Boring and Soil Investigation	Contractor	7		
4	17-Dec-18	Structural RFI	PP/G2/Teknik/518014/119	Submission of RFF Design Feed and BoQ Differences	Contractor	5		
5	19-Dec-18	Meeting Minutes	006/W/ENG/MOM/SITE/XII/2018	Evaluation and Clarification of RFF Structure Submission	Owner			
6	3-Jan-19	Meeting Minutes	013/W/GEN/MOM/SITE/I/2019	Design Review Output to be Submitted from Contractor to Owner	Owner			
7	10-Jan-19	Meeting Minutes	015/W/GEN/MOM/SITE/I/2019	Contractor Requests Coordination Meeting for Structural Design Review	Owner			
8	12-Jan-19	Letter	PP/G2/Teknik/518014/252	Request for Foundation Design Criteria Data	Contractor	2		
9	21-Jan-19	Coordination	019/W/ENG/MOM/SITE/I/2019	Discussion on Design Criteria with Planning Consultant	Owner			
10	21-Feb-19	Coordination	035/W/ENG/MOM/SITE/II/2019	Evaluation and Clarification of RFF Structure Submission	Owner			
11	5-Mar-19	Coordination	041/W/ENG/MOM/SITE/III/2019	Evaluation and Clarification of RFF	Owner			

				Structure Submission			
12	18-Mar-19	Coordination	052/W/ENG/MOM/BDG/III/2019	Evaluation and Clarification of DED Foundation and Steel Frame	Owner		
13	13-May-19	Coordination	074/W/ENG/MOM/JKT/V/2019	Coordination of DED Structure and Architecture with Owner Engineer	Owner	TOTAL DURATION : 173	TOTAL INJECTED : 180

In table 3, it can be seen that all related documents in the inventory are then analyzed for *Delay* calculations. Based on the date of the document, the factual report of the results of the soil investigation has been submitted by the Contractor on December 5, 2018 and the results of the Pile Foundation Review have been submitted to the Owner on December 12, 2018. However, the DED approval decision was only obtained on May 13, 2019, so the duration of *the delay* due to the delay in the approval of the DED for Steel Foundations and Structures was 173 days. With a duration of 7 days of shop drawing as stated in figure 4.3 *Baseline Schedule*, the total duration of *this event delay* is 180 days.

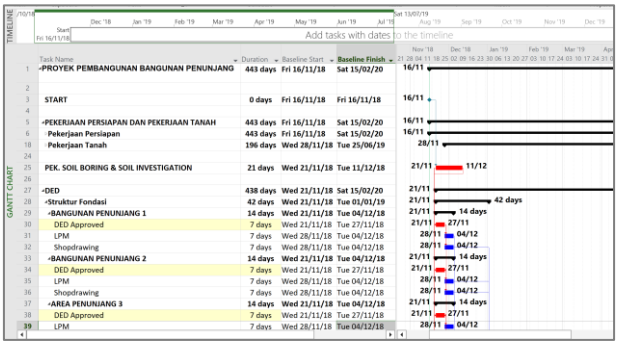

Figure 4. Baseline Schedule

Furthermore, the total duration of *this event delay* is *injected* into the WBS *Baseline Schedule* as seen in Figure 4. It can be seen that the finish schedule is pushed back after injecting the duration of the delay event into the Baseline Schedule.

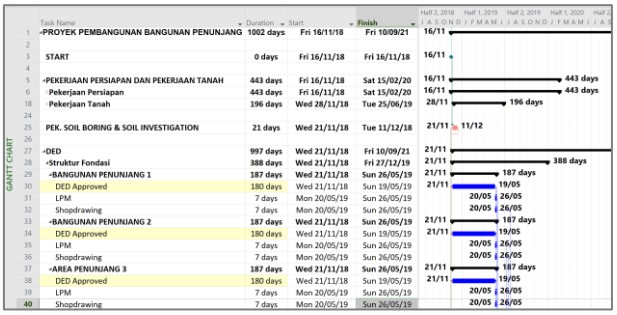

Figure 5. Inject Delay Event DED Delay for Foundation and Steel Structure on WBS Baseline Schedule

Analysis is carried out on all items of the Delay Event problem in Table 3, then the Finish Schedule of the entire work is obtained as can be seen in figure 5.

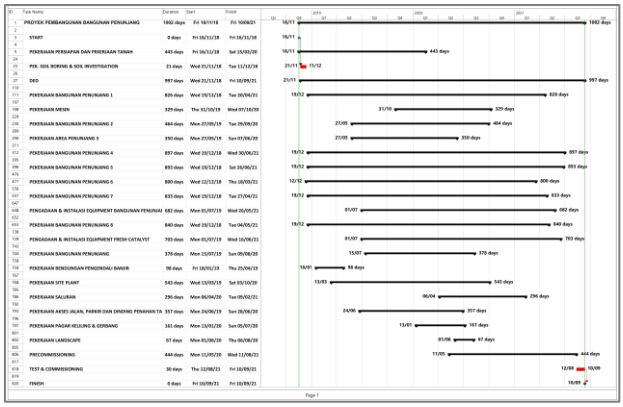

Figure 6. Finish Schedule

The results of the calculation of the duration of the extension of time based on the Baseline Schedule can better explain the causal relationship in the delay event. This can help the Contractor in the schedule test and evidence test carried out with the Owner.

4.5 Prolongation Cost Claim

Prolongation Cost claims are the impact of the cost claim opportunity after the extension of time claim is approved. Prolongation Cost claims are claims for costs incurred due to the extension of time which includes overhead costs (employee salary expenses, household expenses, transportation costs, mess costs, vehicle rental costs), heavy equipment and light equipment rental costs, provision costs for the extension of the implementation guarantee and the cost of extending CAR insurance, due to the existence of Extension Of Time. The key to success in this claim is if the delay in work or extension of the implementation time that occurs can be proven not from the fault of the Service Provider but caused by the Employer. This proof refers to the results of the Delay Claim Analysis based on all existing evidence documents. In this research case study, the Prolongation Cost claim is still in the process of evaluation from the Employer.

CONCLUSION

In conclusion, the integration of the *Last Planner System* (LPS) provides an effective method for creating well-organized and reliable claim documentation, specifically for *extension of time* (EOT) claims and *delay event* calculations. This study demonstrates how the outputs of the LPS, such as *Master Planning Baseline*, *Constraints Analysis*, and *Variance Analysis*, can be utilized to support administrative claim processes by identifying delays, calculating their impacts, and justifying requests for time extensions. The findings suggest that this approach can significantly enhance the reliability and transparency of the claims process in construction projects.

For future research, it would be beneficial to explore how this methodology can be adapted and applied across various types of construction projects, particularly those with different scales, complexities, and contract structures. Additionally, further studies could examine the integration of LPS with other project management tools to enhance the overall efficiency of claims management, while also considering the potential impact of external factors, such as changes in market conditions or unforeseen site conditions, on the timeliness of claims submission.

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