DEPARTMENT OF BUILDING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

CONSTRUCTION ACTIVITY DOCUMENTATION

Prepared by:

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2019296246

DEPARTMENT OF BUILDING

FACULTY OF ARCHITECTURE, PLANNING AND SURVEYING

UNIVERSITI TEKNOLOGI MARA

(PERAK)

AUGUST 2020

It is recommended that the report of this practical training provided

By

Mohammad Afif Bin Rizalman

2019296246

entitled

Construction Activity Documentation

be accepted in partial fulfillment of requirement has for obtaining Diploma in Building.

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(PERAK)

AUGUST 2020

STUDENT'S DECLARATION

I hereby declare that this report is my own work, except for extract and summaries for which the original references stated herein, prepared during a practical training session that I underwent at Helmas Jaya Enterprise for duration of 20 weeks starting from 23 August 2021 and ended on 7 January 2021. It is submitted as one of the prerequisite requirements of BGN310 and accepted as a partial fulfillment of the requirements for obtaining the Diploma in Building.

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I perceived this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way in order to attain the desired of career objectives.

Thank you so much.

ABSTRACT

Construction activity is closely been related to documentation as it becomes a crucial thing that provides important information regarding the outcomes of project activity and of course the final cost determination. This study has identified that the "Construction Activity Documentation" is considered necessary that helps the contractor and the management team to clarify the critical objectives to planning, scheduling and executing the entire project smoothly. This report has revealed a few important documents that is used widely in recording such datum by doing research, experiences during the internship and informal interview between Helmas Jaya Enterprise personnel. Therefore, the progress control, critical path method, site diary and completed work report are the vital details that have been discussed and analyzed for the purpose of learning for this report as well as exposure to the reality of the construction management. For that reason, the production, coordination and communication of construction project information have been a proper place. It directly enables the contractor to produce an effective contribution towards the project through establishing a full-fledged information system to encompass all types of construction projects, project organizations and contracts of a construction company which is seen as a strenuous task. As matter of fact, the documentation whether is a very small issue but as long as it provides information, it is necessary to whoever is responsible to record those details precisely. Every single piece of data is very important to assist the contractor to determine his project outcomes thus showing the importance of construction documentation.

CONTENTS **PAGE NO**

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1.0

INTRODUCTION

1.1 Background of Study

Construction is mostly thought of as arduous physical work because it contributes a high risk of danger in all construction activity includes construct, maintenance, repair of infrastructures, roads and service facilities which are essential to their use. In other words, it covers a bunch of work starting from planning, financing, design, execution, builds, also repairs, maintenance work and other associated activities that become a common aspect in the builder's industry. The construction industry is essential since rapid economic development has increased the demand for construction of infrastructure and facilities around the globe. It also bears the basic living conditions for the sustainability and development of human life on the moving sphere. To cope with an ever-increasing population, pressure on land and growing economic activity, construction projects are in increasing demand and activities are booming in many countries.

Figure 1.1: Illustration of Construction Activity.

Construction activity is closely been related to documentation as it becomes a crucial thing that provides important information regarding the outcomes of project activity and of course the final cost determination. Hence, all of the works need to be kept on track to make sure the current project is run smoothly by doing periodic monitoring and documentation that shall be stored appropriately for future reference. Documentation serves as a vital element of a successful project that acts as a "memory" of the project to be retrieved during and after the project is finished. It carries out a record of all the actual happenings on the site at any given time during the course of the project that turns out to be contemporaneous evidence to develop strong framework on which claim is built. This is why project documents are kept on a contemporaneous basis to provide a permanent record of detailed reconstruction, review, and analysis of events and actions of the project.

The loss or the destruction of project documents is the destruction of evidence and this will severely handicap the impacted party (which is oftentimes the contractor or the subcontractor) in presenting its case to the trier of fact. **(David Ross Associates LLC, 2014)**. Important records shall not be left in an office where they may view by all who enter the site. Variety of task required on site for the wellbeing and smooth running of any construction firm, regardless of its or the contract's size, so one of the most important and exacting is need to be keep up-to date and accurate records of what is happening on the site.

The accurate documentation is an essential part of the project. Some of the important documents and records are considerably necessary such as contractual agreement, job site diary, materials record, field report, site instruction, variation order and etc. All of the mentioned documents have their own vital use that provides critical information to ensure the outcomes of the project is successful. Thus, the documentation gave a sketch to make an assumption on what is the final result by concerning a few aspects such as track project cost and status. It is considered for every activity and expenditure shall be documented and keep in a log or else being written in the site diary to set the seal on the project to remains under budget. In addition, it also allows the contractor to see and analyze if adjustments should be made in order to set new profit or stay under budget depending on the current market cost.

At the same time, the project status can be determined by look over the proper documentation of every aspect of the project including on-site pictures, daily logs and field report to capture specific instances that help directly all participated audience to understand on how the project progress. Besides, the documentation of construction activity will be a strong foundation if there is going to have a dispute which significantly reduces the risk of a lawsuit. It is essential in construction projects nowadays to organized and gathered all evidence inside one file as a solid proof to solve the disputes that may arise in two conservative ways according to Troy Vernon Sutton. First thing first, the documentation provides a contemporaneous record of what was actually happening on a project at any given time during the course of the project and second is provides a contemporaneous record of the parties' positions regarding particular events at the time of the events.

Therefore, it will be extremely difficult for construction firms to achieve the required results without precise documentation. The experts have seen that effective document management is probably the most crucial part in project management to obtain the ultimate objectives of the project and acquire the full satisfaction of the client's demands for viable project both in terms of functionality and budget. So, every project's execution necessitated a document, the difference is the large scale's projects require hundreds of separate documents and forms but smaller projects tend to simplify and combine them. However, the aim of this report is to discover the specific documentation such as progress control, critical path method, site diary and completed work report.

Figure 1.2: Illustration of Project Documentation.

1.2 Objectives

In this report, the objectives are focused on the process to measure the variables such as identifying or describing the essential contents that comprise under the topic of "Construction Activity Documentation". The objectives become the ultimate guideline to summarize what is to be achieved by doing this case study based on the available resources. So, the objectives are defined clearly by oriented the collection, analysis, interpretation and utilization of vital data which create the objectives such as :-

1. To identify the method to analyze and report the development and implementation of some project procedures.
2. To explain the importance of site documentation in optimizing the allocation of necessary inputs to enhance the sustainability of a project.
3. To determine the process involved in preparing a good site documentation.

1.3 Scope of study

This study has been carried out in Manjung district of Perak where the site is located in Taman Desa Bayu, Manjung, Perak. Based on the project, this report would like to identify the method to analyse and report the development and implementation of some project procedures that focusing on progress control, critical path method, site diary and completed work report. Moreover, to explain the importance of site documentation and to determine the process involved in preparing a good site documentation. Zubair Ahmad Memon (2006) said that the project progress monitoring and control documentation is one of the most important tasks of construction project management. Every team member needs to know, in a timely and accurate manner, how is the project progressing, where they are currently in comparison to the initially set plans, whether deadlines are met, budgets are safely measured and followed. Besides, the document of introduction to site management by the Department of Training Workforce Development of Australia define that the site diary is of all the records which must kept in the site office, the one which will possibly have the most far-reaching consequences. The diary should be written up daily on the site, preferably in such a way that is cannot easily be erased or smudged.

Figure 1.3: The Right Elevation View at 38% progress.

Team Asana stated that the critical path is the longest sequence of tasks that must be finalized to conclude a project, from start to finish successfully in a project management. Since that, the total duration of a project can be determine also get a clear insight of the project's actual schedule by identifying the critical path. The tasks on the critical path are known as crucial activities because any delays in tasks will delay the rest of the project.

A work completed report is an official document that is issued at the end of a project or work by a project manager that be prepared after completion of the contract, which generally includes a description of the contract, design revisions and construction highlights in the form of a pictorial report. Project completion report becomes formal document of closing of a project that has been prepared even if the client or any participant does not put priority to produce it. Consequently, this report would reveal each objective specifically in detail inside the progress control, critical path method, site diary and completed work report in the case study section. Those critical documents have their own vital use that provides critical information to ensure the outcomes of the project is successful.

1.4 Method of study

According to Dillon, W. R. Madden, the unstructured informal interview is normally conducted as a preliminary step in the research process to generate ideas/hypothesis about the subject being investigated so that these might be tested later in the survey proper. For this case study, interviews are entirely informal and are not controlled by a specific set of detailed questions. These interviews amount to an informal conversation about the construction activity documentation within Encik Helmi, Encik Azhar, Puan Ain Sofea, Encik Azrul and the workers on the site. The aim is to find out how people think and how they react to related construction activity documents so that the ultimate survey questionnaire can be framed along the lines of thought that will be most natural to respondents. The respondents are talk freely about the documents and kept to the point on issues. They reveal everything that he/she feels and thinks about these points. The input has been recorded all remarks that may be relevant to be gained by further probing. By conducting the informal interviews, it has given the rough sketch for the contents to be evaluated.

Furthermore, the data is also been collected by doing a literature review through the books, journals and also internet by synthesizing research findings to show evidence, which is a critical component of creating theoretical frameworks and logical conceptual about the construction activity documentation. According to the Western Sydney University, literature review is done to gain an understanding of the existing research and debates relevant to a particular topic area of study and to present that knowledge in the form of a written report. Conducting literature review helps to build the knowledge also better understanding about important concepts, research methods and experimental techniques. Therefore, some of the information has been explored through the research on the internet, books and journals along the completion of this report. This method helps to identify the essential points of a discussed topic that would indicate how each source is being evaluated and related to the major debates on the topic.

CHAPTER 2.0

COMPANY BACKGROUND

2.1 Introduction of Company

Helmas Jaya Enterprise was established in 2002 and developed as a sole proprietorship company that specifically focuses on the job scope of construction and maintenance work of building, roads, drainage, bridge and others civil work. In 2003, Helmas Jaya Enterprise successfully has been registered with Pusat Khidmat Kontraktor (PKK) in class 'F' together with recognition "G1" by the Construction Industry Development Board Malaysia known as CIDB and Ministry of Finance Malaysia. Alongside the establishment of this company, its founder, En. Helmi bin Maskuri has committed in evolve a successful empire in construction field with an excellent reputation and maintaining to sustain its services in being a relevant company through the revolution years by years in the industry.

Towards the meaningful journey, Helmas Jaya Enterprise has been certified and rewarded for being the most trusted contractor by the GIATMARA Perak. Although beginning with a small capital cost, now the company is able to roll its capital up to RM100,000 successfully and always strive to present their clients with the best services. Helmas Jaya Enterprise is not just a construction company. They are a dedicated team striving to bring growth to the community, assist clients in realize their dreams to become reality and to be a company that is in a position to take up any challenge in the building industry that contribute in national growth. Besides, they are committed to perform the customers to the highest level of quality construction services at fair and reasonable market competitive prices. Thus, always to maintain the highest level of professionalism, integrity, honesty and fairness in their relationships with suppliers, subcontractors, professional associates and customers. Helmas Jaya Enterprise always believe to practice the best value of teamwork, integrity and professionalism as they believe that the best results are achieved through the good collaboration and conduct the company in a manner of which they are proud as individuals and as representatives of their company, community and industry.

2.2 Company Profile

Over the years, the company managed to conduct various challenging projects to gain so much experiences in design and build solutions, project management services, building trades and related engineering works with huge respected clients from government departments such as Manjung Municipal Council (MPM), Manjung Land and District Office, Public Works Department of Manjung (JKR) and GIATMARA Perak. Nowadays, Helmas Jaya Enterprise still involved actively in building an affordable housing and repairing damaged house structure for selected participant under the Program of Perumahan Rakyat (PPR) around Manjung district under the GIATMARA Perak, while also collaborating with JKR Manjung for road maintenance works across the Manjung district.

Helmas Jaya Enterprise has created a good competition among the others construction company and making their way to keep develop with various of previous experiences such as projects of roads maintenance including of maintenance works on street and road furniture, works of painting faded road lines by using 'All Weather Thermoplastic', road repair works as well as related works in Manjung district under JKR, project of renovating house and many more. Besides, Helmas Jaya also been involved in landscaping work with JKR under the project of tree pruning works in one of the tourist islands in Malaysia which is Pangkor Island recently.

Figure 2.1: Tree Pruning Work in Pangkor Island.

2.3 Company Organisation Chart

The success story of Helmas Jaya Enterprise continues with a vision of art technology, hard work and of course dedicated teams that have a highly professional attitude and innovation skills. The company organization works in form of a bureaucratic structure that uses specific standards and practices to govern every decision the company makes. This makes the Helmas Jaya Enterprise operates with a high degree of formality and organized. It is led by the general manager, Encik Helmi, who is responsible to improve efficiency while managing the overall operation of the company. Beside him, there is Encik Azhar, who plays the lead role in planning, executing, monitoring, controlling and closing out projects. Encik Azrul as a general foreman and Encik Herman as foreman cooperate together to lead the builder team by organizing and supervising the construction works while providing related reports on site for the project manager and client. For smooth administration, all administrative, clerical tasks and accounting on a daily basis would be handled by Puan Ainn and assisted by Puan Afidah. Thus, figure 2.2 below shows generally about backbone structure inside the company.

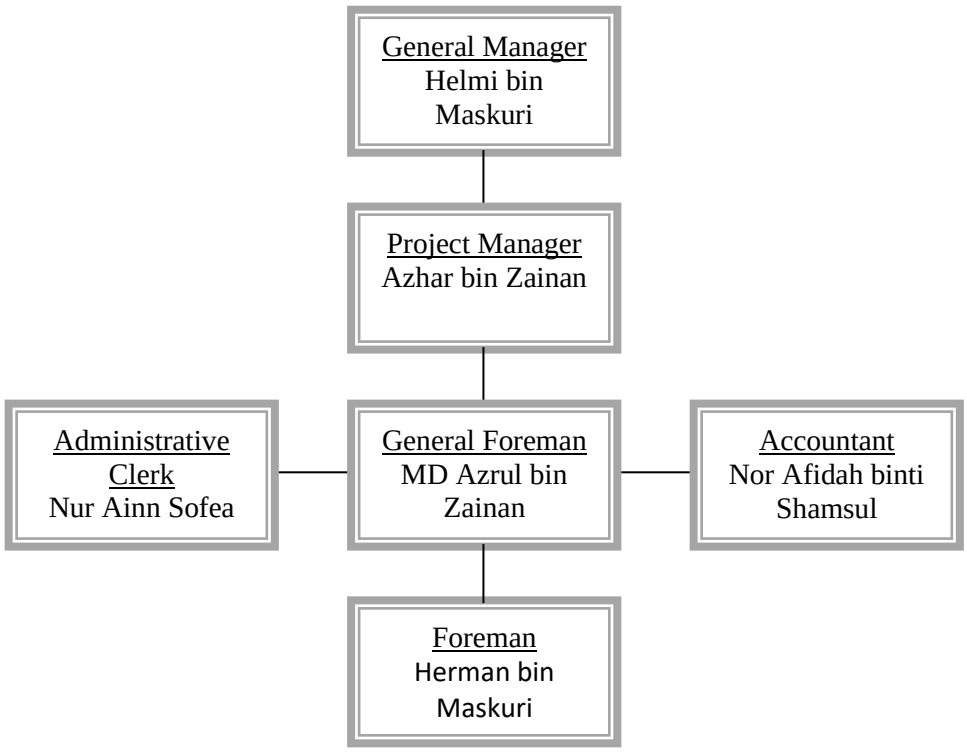


Figure 2.2: Organization Chart of Helmas Jaya Enterprise.

2.4 List of Project

2.4.1 Completed Projects

Table 2.1: List of completed projects.

No.	Project Title	Project Value (RM)	Start Date	Completion Date	Project Duration	Client
1.	Building a new house under Program Perumahan Rakyat Termiskin (PPRT).	50,000.00	12/12/2017	11/02/2018	2 Months	GIATMARA
2.	Repairing works under Program Perumahan Rakyat Termiskin (PPRT).	10,115.93	12/03/2018	26/03/2018	2 Weeks	GIATMARA
3.	Road maintenance in Kampung India, Kampung Kayan, Lekir.	20,000.00	01/10/2019	21/10/2019	3 Weeks	Land and District Office
4.	Building a new house under Program Perumahan Rakyat Termiskin (PPRT).	52,000.00	11/09/2019	10/11/2019	2 Months	GIATMARA
5.	Supply and perform maintenance and renovation work of administrative offices for GIATMARA Beruas branch.	12,757.00	20/07/2020	03/08/2020	2 Weeks	GIATMARA
6.	Tree pruning works as well as other related works in Pangkor Island.	76,500.00	14/09/2021	28/09/2021	2 Weeks	JKR

No.	Project Title	Project Value (RM)	Start Date	Completion Date	Project Duration	Client
7.	Building a new house under Program Perumahan Rakyat Termiskin (PPRT).	70,000.00	14/09/2021	12/11/2021	2 Months	GIATMARA
8.	Works of painting faded road lines by using 'All Weather Thermoplastic' in Manjung District.	58,970.00	21/09/2021	18/10/2021	1 Month	JKR
9.	Repairing works under Program Perumahan Rakyat Termiskin (PPRT).	12,550.00	14/10/2021	28/10/2021	2 Weeks	GIATMARA
10.	Repairing works under Program Perumahan Rakyat Termiskin (PPRT).	12,950.00	14/10/2021	28/10/2021	2 Weeks	GIATMARA
11.	Supply and perform maintenance and renovation work of administrative offices for GIATMARA Padang Rengas branch.	20,000.00	01/11/2021	14/11/2021	2 Weeks	GIATMARA
12.	Perform maintenance works on street and road furniture as well as related work in Manjung District.	166,050.00	20/09/2021	19/11/2021	2 Month	JKR

2.4.2 Project in Progress

Table 2.2: List of ongoing projects.

No.	Project Title	Project Value (RM)	Start Date	Completion Date	Project Duration	Client
1.	Demolish and rebuild an existing 2-storey house of Dato' Aris Adi Tan	250,000.00	12/07/2021	11/12/2021	6 Month	Dato' Aris

CHAPTER 3.0

CASE STUDY

3.1 Introduction of Case Study

Specifically, this study has been carried out during the project of demolishing and rebuilding an existing 2-storey house of Vice Admiral Dato' Aris Adi Tan bin Abdullah which located in Taman Desa Bayu in address of No.43 (Lot 6692), Lorong Desa Bayu 7/A, Taman Desa Bayu Dindings, Manjung, Perak. Taman Desa Bayu is a neighbourhood in Manjung that situated between the Taman Samudera and Taman Melati. Taman Desa Bayu's location is strategic because it is close to various facilities in terms of services, grocery stores, malls, hospitals and of course learning institutions such as SJK (C) Eng Ling, SK Seri Sitiawan, SK Seri Samudera, SJK (C) Ping Min Pundut, SMK Seri Samudera, SMK Dindings. Besides, It also close to AEON Manjung, TF Hypermarket, Tesco Seri Manjung, Seri Manjung Hospital, Pantai Hospital and can be easily accessed through Jalan Sitiawan, Jalan Dato Yu Neh Huat and Jalan Iskandar Shah.

The bungalow was built with an area of 1800 Sq. Ft. structure of old 1990 bungalow design and 10,000 Sq. Ft. land. As compared to the old design, the owner wanted to expand the capacity of the house so that he appointing Helmas Jaya Enterprise as the main contractor to construct his dream house. The project is about renovating an existing 2-storey house by adding a new structure such as 414.00 Sq. Ft. porch, 333.25 Sq. Ft. living room, 243.25 Sq. Ft. master bedroom, 143 Sq. Ft., 308.67 Sq. Ft. and 257.25 Sq. Ft bedrooms, 194.75 Sq. Ft. dry kitchen, 110 Sq. Ft. wet kitchen, 52.50 Sq. Ft. laundry, 2 terraces, 52.50 Sq. Ft. and 42 Sq. Ft. balconies, 160.11 Sq. Ft. family space, 65.00 Sq. Ft. bath 1, 33.00 Sq. Ft. Bath 2 and 3, 65.00 Sq. Ft. Bath 4, 93.33 Sq. Ft. Bath 5 and 123.50 Sq. Ft. prayer room. Preliminary works commenced on 05 July 2021 by pulverizing the unnecessary structures such as a few walls and floor, uninstalling all windows, doors, sanitary appliances, existing roof and storing the building materials on the site.

Figure 3.1: Dato’ Aris Adi Tan bin Abdullah House (Before).

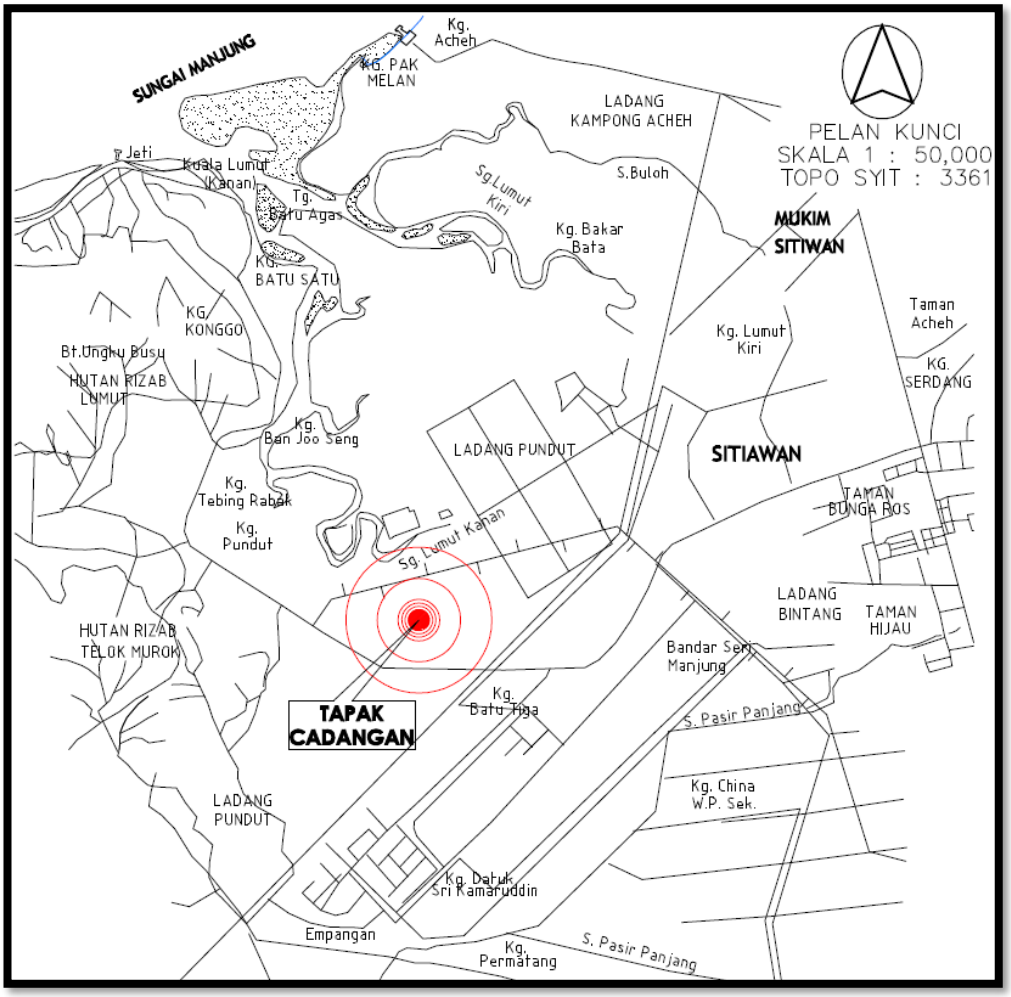


Figure 3.2: Key Plan (Scale 1 : 50,000).

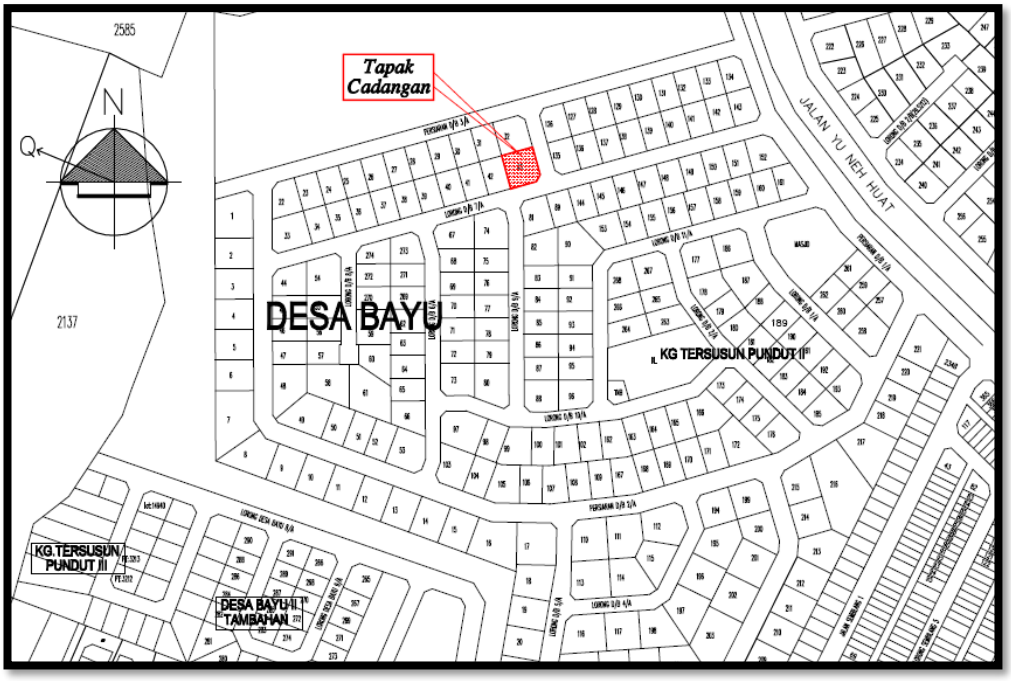


Figure 3.3: Location Plan (Scale: 8 chain to an inch).

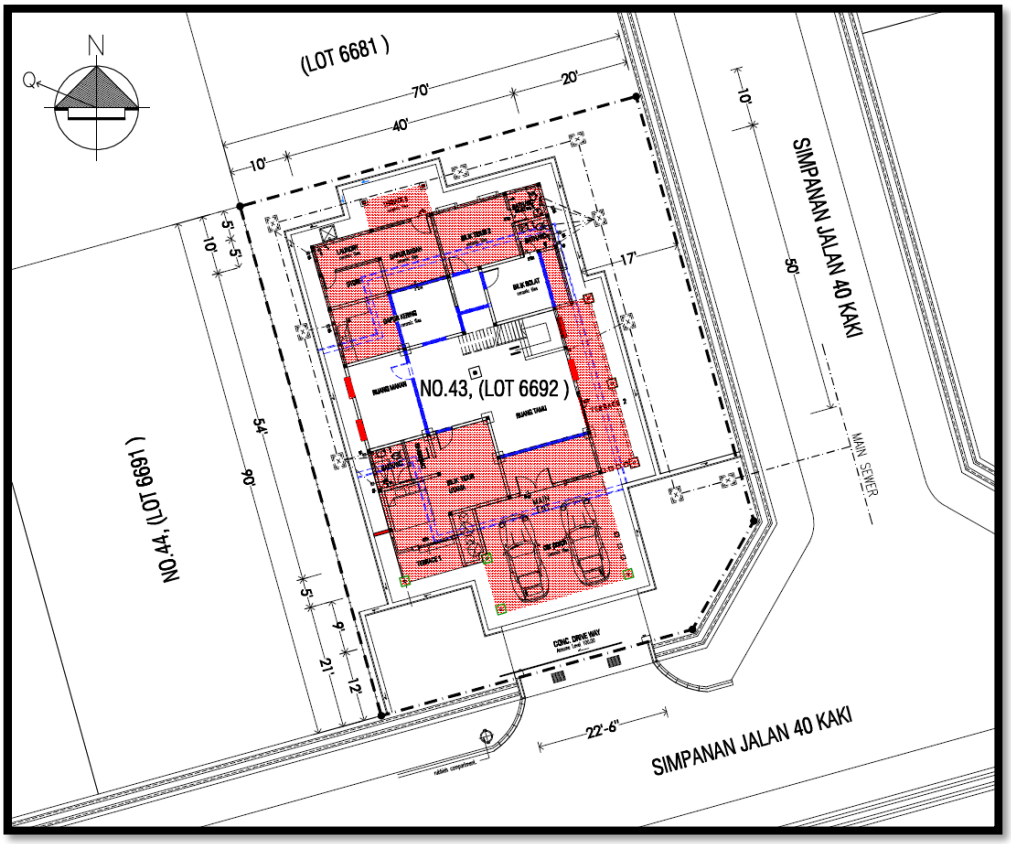


Figure 3.4: Site Plan (Scale: 1/16” to 1’0”).

The Renovation project has cost around RM250,000.00 with the consent of both sides, between the contractor, Helmas Jaya Enterprise and the client, Dato' Aris Adi Tan bin Abdullah. This project has involved consultants from YC Lee Architect, Perunding Dar Handasah as the engineer and Helmas Jaya Enterprise as the contractor. The execution of the project is well and smooth starting from the preliminary work until the excavation of additional foundations for new structures. For some reason, the project has encountered a big challenge as the worst is the restriction of Movement Control Order due to the spread of pandemics. The regulation forces the project to stop immediately that makes the whole works to be delayed. Regardless of fact that the Movement Control Order affects the duration of completion, the project has successfully restarted and the construction has achieved at least 65% of progress on December, 2021.

Table 3.1: List of consultants.

No.	List of consultants	Address	Registeration No.	Telephone No.
1.	YC Lee Architect	No. 39 Barrack Road, 34000 Taiping, Perak.	A/L 378	012-4155228
2.	Perunding Dar Handasah	No. D-3a-12, Greentown Square, Jalan Dato' Seri Ahmad Said, 30450 Ipoh, Perak.	IP0317038-V	017-4479590
3.	Helmas Jaya Enterprise	149-A, Persiaran PM/2, Pusat Bandar, 32040 Seri Manjung, Perak.	0120030414-PK082414	012-6799062

3.2 Subtopic (Based on objective 1)

In the construction industry, project documentation is the process of recording the key project details and producing the documents that are required to implement it successfully. In other words, it alludes to the plans, specifications, materials record, progress record and other relevant data which sets forward in detail to determine the scope of work to be performed for a construction project development. It becomes holistic practice with the goal of conveying projects on time and stay under budget. Not only that, these particular things are one of the essential tools in project management which consist a complex discipline that necessitate to identify many vital data. The needs are to work within the story line by sustaining and retaining an accessible, accurate repository of all project documents. Despite the complexities, it is possible to identify every single information to select the critical ones by having an accurate documentation.

Figure 3.5: Example of Construction Documents.

Moreover, it is very imperative for the construction company to play the crucial part in recognizing the basic site information elements because it helps directly the project management to produce an adaptable and scalable information document. The documents enable the contractor to optimize, improve and have a good control over vital project information flows, ultimately resulting in better project performance. Therefore, each participant in the construction process has responsibility for transmitting information considerably which involved an effective coordination, control and dissemination to produce a big impact for the project outcomes.

For that reason, the production, coordination and communication of construction project information have been a proper place to enable it to make an effective contribution towards a successful project. It is lucid from the above discussion that establishing a full-fledged information system to encompass all types of construction projects, project organizations and contracts of construction company is seen as a strenuous task. Thus, it seems like in this developing era, there are some methods that have been determined to record all the necessary data into a conventional format that can be easily understood and accessible. So, this section would identify the method to analyze and report the development and implementation of some project procedures.

3.2.1 Progress Control

In construction activity, there must be a progress to be achieved in a project, a structured outline is needed to be conceived for all participants to follow. The measure of control achieved is indicated by a check of the estimated goals against actual performance. Nevertheless, system of control is essential for project management but on what types of control are used is a decision from the management to select personnel who is responsible for maintaining the control procedures. Effective control is vital to ensure that all stages of the overall plan are monitored. So, when needed a change, immediate necessary changes can be made with a minimum of disruption while still sustaining the control over the original objectives. Normally, the planning to control is implemented and administered by the project manager or whoever has been given responsibility as long as keep on track to the specific control policy that has been determined.

The control over all aspects of the operation of a project includes initiating, planning, scheduling, monitoring and controlling. Those particular things are to ensure the process of construction activities going smoothly. Project controls are iterative procedures since it helps to measure the status of the project, prevising likely the result based on those measurements when a problem occurred. It is because a project may deal with numerous parameters in terms of quality, work scope and others where the project control is mainly emphasizing the discipline to supervise any risk that will affect the project performance.

A master planning is made for the purpose to provide the management with a broad view of the contract as a whole that can be used as a management control tool to check actual progress against the anticipated progress at the time of preparing or updating the program. It does not always portray sufficient detail for everyday purposes, so the short-term programs are often prepared to assist and operate the progress into a finer detail that can be effectively used as a control document. Generally, the short-term plan is programmed to check the progress frequently over the dates for the operations envisaged in the main program. Therefore, the acceptable variation can be altered to construct novel ideas to make an improvement while the project is stay in progress. The period involved depends upon a few circumstances that may be shorter or longer according to the order. Progress is controlled and to be maintained for the benefit of overall programming after work has begun on site also work ahead to be kept under constant review.

Progress control is commonly interrelated with other control systems such as those for cost, resources and quality. They have been in one network of the operation that necessitates adequate control. Where the cost control such the process of controlling the expenditure on a project from inception to completion. The most important part is to ensure that the actual cost of the project does not exceed the estimated cost, which indispensable of all costs of resources are recorded and check for precision. The project manager is responsible to manage the cost as the person on site who is the most familiar with details of the work across the board. Besides, the resources control basically involved materials, plant and equipment that has been recorded on the appropriate forms and advice forwarded to head office at regular intervals.

The control in the form of recording is also requisite in the return or transfer of material on site while also sustained the plant and equipment on site and in position to be used when needed. A step is taken to ensure they are available for use by all participated party as to avoid costly duplication while ensure that the right type of plant is obtained and used economically. Meanwhile, the quality of a project is still in place as expected by the designer and client which has been produced exactly according to the specification in the contract document. Nonetheless, damaged goods are likely returned to the supplier when necessary to avoid faulty work rejected.

CARTA KEMAJUAN

Projek Meroboh dan Membina Semula pada Rumah 2 Tingkat Sedia ada di No. 43 (LOT 6692), Lorong Desa Bayu 7/A, Taman Desa Bayu Dindings, 32040 Seri Manjung, Perak.

Tugasan	Tempoh (Minggu)	Julai															Catatan
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
SUBSTRUCTURE **1. Excavation/Installation/ Concreting**																		
• Menggali tapak asas	1	———																
• Grid line allignment	1				——	———												
• Memasang formwork	1							———										
• Lean concrete 2"	2										———							
• Memasang rebar	1													———				
• Kerja konkrit tapak asas	2																	Ditangguhkan (PKP)

Di cadangkan ———— Sebenar .....

Figure 3.6: Example of Progress Control Schedule.

3.2.2 Critical Path Method (CPM)

The critical path method or also known as (CPM) is a technique where the contractor identifying the tasks that are necessary for project completion and determine scheduling flexibilities. A critical path in project management is the longest sequence of activities that must be finished on time in order for the entire project to be complete. Any delays in critical tasks will delay the rest of the project. Critical Path Method are basically time-oriented methods in the sense that lead to determination of a time schedule for the project. The significant for these approaches is that the time estimates for the different activities in Critical Path Method were assumed to be deterministic. Generally, these techniques are referred as project scheduling techniques.

In Critical Path Method, activities are shown as a network of precedence relationship using activity on node network construction which consist of single estimate of activity time and deterministic activity times. This method is often used for production management to construct the works based on the jobs of repetitive in nature where the activity time estimates can be predicted with considerable certainty due to the existence of past experience. The key concept used by Critical Path Method is that a small set of activities, which make up the longest path through the activity network control the entire project. If these "critical" activities could be identified and assigned to responsible persons, management resources could be optimally used by concentrating on the few activities which determine the fate of the entire project.

Thus, non-critical activities can be replanned, rescheduled and resources for them can be reallocated flexibly, without affecting the whole project. Critical Path Method mainly involved four general steps starting from the planning phase. The planning phase is started by splitting the project into essential activities and are analyzed by the department or section. The relationship of each activity with respect to other activities are defined and established and the corresponding responsibilities. Therefore, the possibility of overlooking any task necessary for the completion of the project is reduced substantially.

Then, the planning phase will be followed by the scheduling phase where the ultimate objective of the scheduling phase is to prepare a time chart showing the start and finish times for each activity as well as its relationship to other activities of the project. Moreover, the schedule must pinpoint the critical path activities which require special attention if the project is to be completed in time. For non-critical activities, the schedule must show the amount of slack or float times which can be used advantageously when such activities are delayed or when limited resources are to be utilized effectively. Since the connection between the planning phase and the scheduling phase are establish, the allocation of resources is performed to achieve the desired objective. A resource is a physical variable such as labor, finance, equipment and space which will impose a limitation on time for the project. When resources are limited and conflicting, demands are made for the same type of resources a systematic method for allocation of resources become essential.

The final phase in project management is controlling. Critical path methods facilitate the application of the principle of management by expectation to identify areas that are critical to the completion of the project. By having progress reports from time to time and updating the network continuously, a better financial as well as technical control over the project is exercised. Here the contractor is required to think through a project logically and with sufficient detail to establish firm, clear project objectives, activities, and specifications. This minimizes the chance of overlooking necessary activities and goals of a project. Critical Path Method provides a realistic and disciplined method for determining how to attain the project objectives and for communicating and documenting the project plans clearly and concisely.

The application of Critical Path Method helps the contractor to estimate the earliest and latest time for each activity to be completed without delay, predict the completion day for construction of the building and obtain the probability that the project will be completed within the predicted completion day. All the particular things are done by mapping out every crucial task that is necessary to complete a project. It includes identifying the amount of time required to finish each activity and the dependencies of each activity on any others. Critical Path Method has set a realistic deadline for a project and enable the contractor to track its progress along the way in a pictorial diagram.

JADUAL KERJA

Projek Meroboh dan Membina Semula pada Rumah 2 Tingkat Sedia ada di No. 43 (LOT 6692), Lorong Desa Bayu 7/A, Taman Desa Bayu Dindings, 32040 Seri Manjung, Perak.

Tugasan	Tempoh (Minggu)	Jul				Ogos				Sep				Oct				Nov				Dis			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
PRELIMINARIES																									
• Order bahan binaan	2																								
• Susun atur tapak	2																								
• Mohon bekalan air & elektrik sementara	1																								
• Setting out & side rail	1																								
FABRICATING WORK																									
• Formwork	2																								
• Rebar	3																								
SUBSTRUCTURE																									
1. Excavation/Installation/ Concreting																									
• Menggali tapak asas	1																								
• Grid line allignment	1																								
• Memasang formwork	1																								
• Lean concrete 2"	2																								
• Memasang rebar	1																								
• Kerja konkrit tapak asas	2																								
2. Dismantling works/ Re-fill earth																									
• Membuka papan formwork	1																								
• Kerja menimbus kembali tanah	1																								
3. Membina Grd Beam																									
levelling	1																								
• Pasang formwork	1																								
• Pasang rebar	1																								
• Tie up/Support formwork	1																								
• Kerja concreting Grd Beam	2																								
4. Membina Grd Floor Slab																									
• Mengisi tanah/pasir/ hardcore	1																								
• Menghampar Plastic Sheet	1																								
• Menghampar BRC	1																								
• Concrete pouring to slab	3																								
SUPER STRUCTURE																									
1. Membina Column																									
• Grid line allignment/ Levelling	1																								
• Pasang rebar	1																								
• Pasang formwork	1																								
• Checking verticallity and tie-up formwork	1																								
• Concrete pouring to column	2																								

Figure 3.7: Example of Work Schedule.

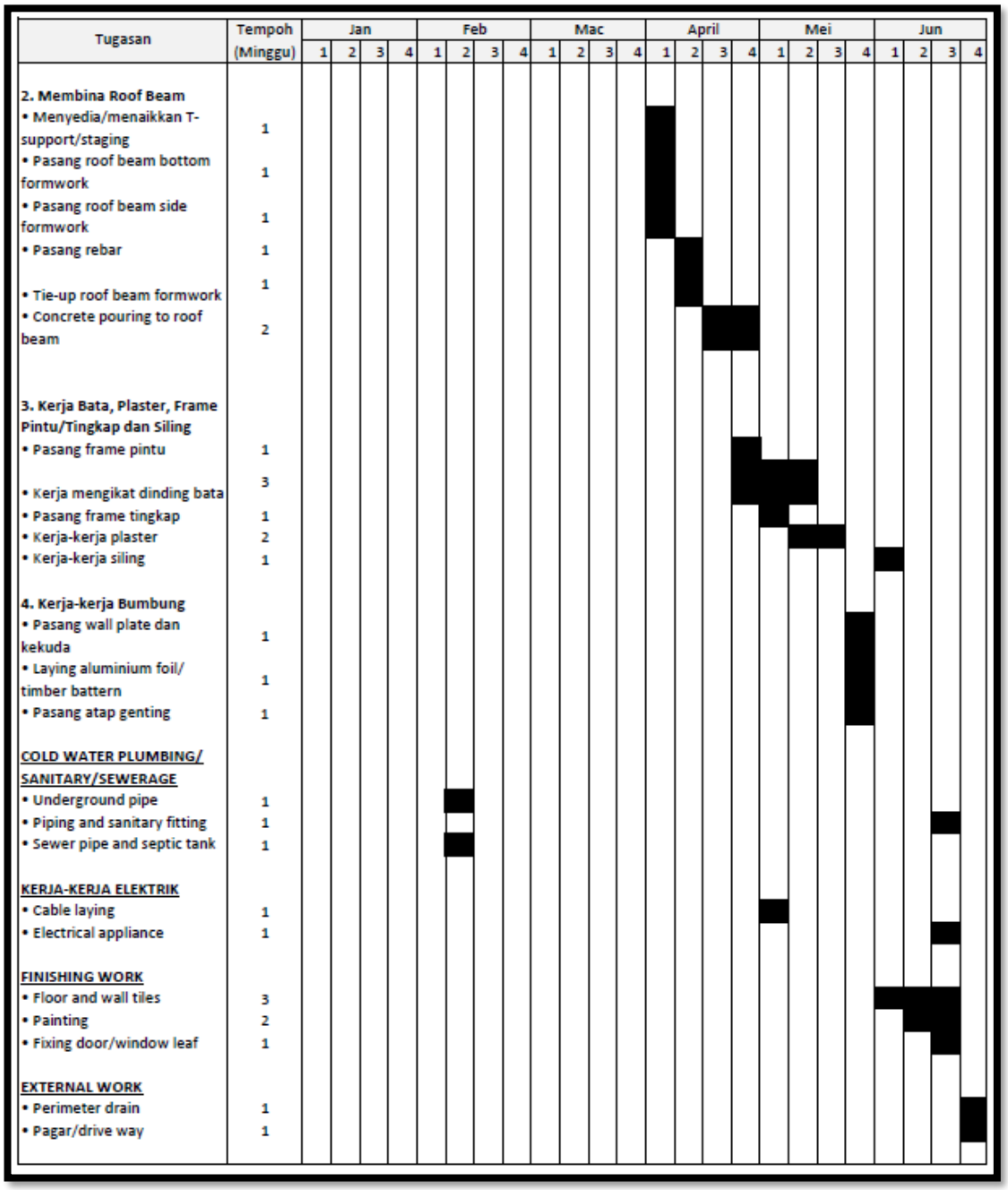


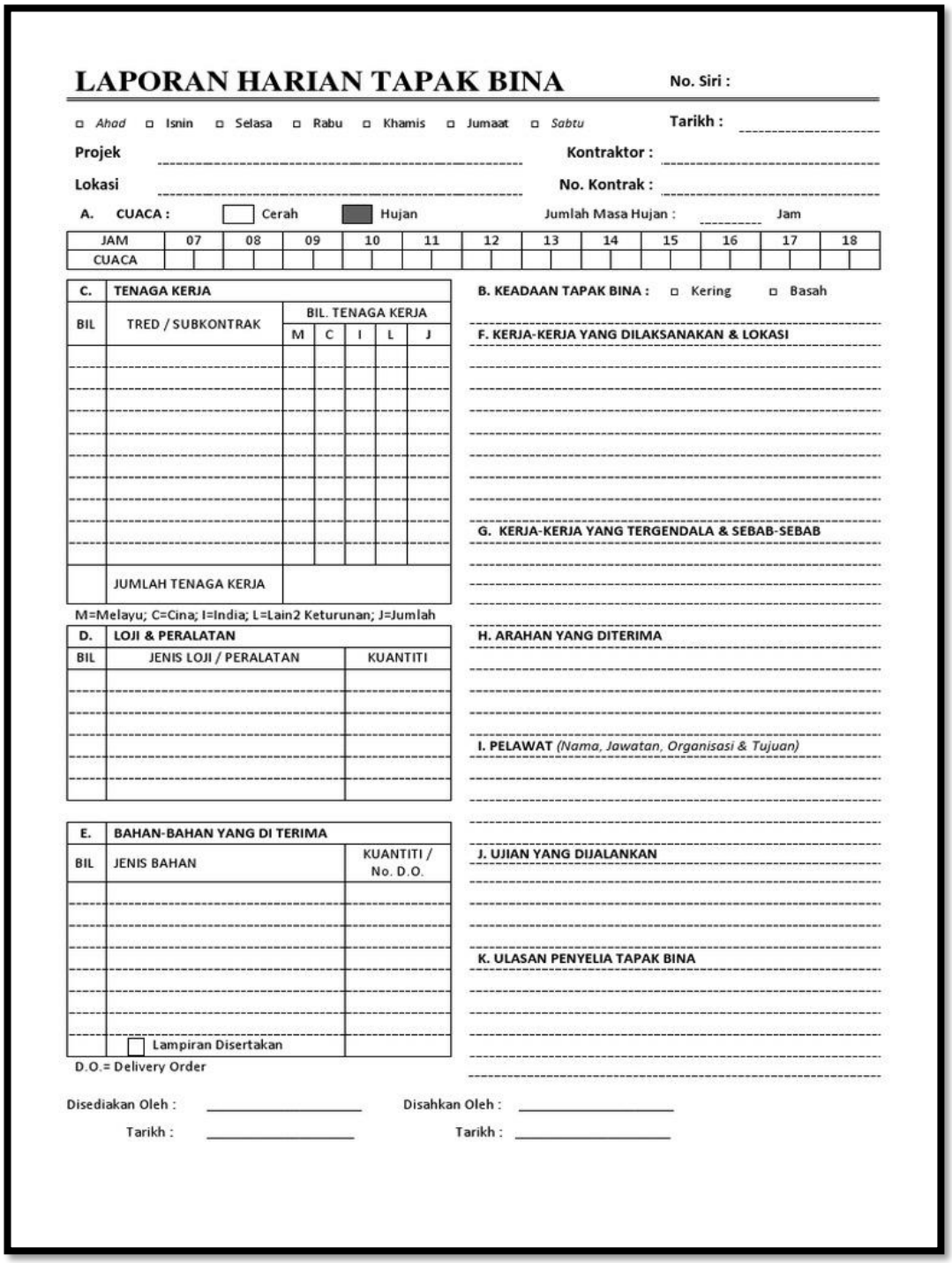
Figure 3.8: Example of Work Schedule.

Thus, Critical Path Method give a lot of advantages to the entire company which enable to figure out the activities that can run parallel to each other. It helps the project manager in identifying the most critical elements of the project while gives a practical and disciplined etiquette that helps in determining how to reach the desired objectives. It seems effective in project management because its capability to strengthen team's perception if it is applied properly. It shows the activities and their outcomes as a network diagram that gives a fair and concise procedure of documenting of project. Critical Path Method becomes an explicit and clear approach of structuring project plans, schedules, time, and cost performance that are extensively used in the industry.

3.2.3 Site Diary

Every single day on the site during the construction for sure involving many works, discussions and any occurrence in the entirety of a project's construction lifetime. It is impossible to anyone on the construction site to remember very detail on what is happening on the site such as weather, work summary, number of labors, expenses and others related information without a proper record to summarize the resources used on a specific day. Construction activity is important to be tracked daily including all activities that could affect the sustainability and the quality of the project. The accurate important data would be strong evidence and the detail can be analyzed anytime to enable the managing party to make a rough sketch to use the resources ideally. As a matter of fact, all the detail generally based on what is happening on the site that has been documented through the formatted form.

Basically, the formatted form is familiar in the construction industry especially on behalf of the builders that known as site diary. Site diary is used for the purpose of documenting all the essential data regarding the daily construction activities progress where the information such as weather, work summary, number of labors, expenses and others related information. The site diary becomes a document that proves exactly by the factual of hand written on the form reporting on site activities that help the company organized. Only the authorized personnel may perform such recording work. Usually, the site diary is stored in the construction site office on a scheduled basis but also it would be a copied headquarters as an administrative record.



LAPORAN HARIAN TAPAK BINA

No. Siri :

□ *Ahad* □ Isnin □ Selasa □ Rabu □ Khamis □ Jumaat □ *Sabtu* Tarikh : _____

Projek _____ Kontraktor : _____

Lokasi _____ No. Kontrak : _____

A. CUACA : ☐ Cerah ■ Hujan Jumlah Masa Hujan : _____ Jam

JAM	07	08	09	10	11	12	13	14	15	16	17	18
CUACA												

C.	TENAGA KERJA					
BIL	TRED / SUBKONTRAK	BIL. TENAGA KERJA				
		M	C	I	L	J
	JUMLAH TENAGA KERJA					

M=Melayu; C=Cina; I=India; L=Lain2 Keturunan; J=Jumlah

D.	LOJI & PERALATAN	
BIL	JENIS LOJI / PERALATAN	KUANTITI

E.	BAHAN-BAHAN YANG DI TERIMA	
BIL	JENIS BAHAN	KUANTITI / No. D.O.
	☐ Lampiran Disertakan	

D.O.= Delivery Order

B. KEADAAN TAPAK BINA : □ Kering □ Basah

F. KERJA-KERJA YANG DILAKSANAKAN & LOKASI

G. KERJA-KERJA YANG TERGENDALA & SEBAB-SEBAB

H. ARAHAN YANG DITERIMA

I. PELAWAT *(Nama, Jawatan, Organisasi & Tujuan)*

J. UJIAN YANG DIJALANKAN

K. ULASAN PENYELIA TAPAK BINA

Disediakan Oleh : _____ Disahkan Oleh : _____

Tarikh : _____ Tarikh : _____

Figure 3.9: Example of Site Diary Form.

Many documents in the construction industry are reactive meaning that they are used and completed in response to an event occurring. Site diaries are proactive which means they are completed every day regardless of circumstance in order to stay ahead of future events. So, the most important and exacting of site diary is keeping up to date, clear and legible for those who want to examine such records. Therefore, this becomes the task of the project manager or whoever is in charge to make entries in the diary at the end of each working day or else as soon as possible to avoid the forgotten incident for such vital data. Making daily entries of site diaries can be gotten to a bore and disappointment, particularly beneath the pressure of work. Despite that, the discipline to make an entry is extremely needed to be maintained because it would be demonstrated well worth after doing a post-mortem when the work has wrapped up.

Besides, the use of the site diary has its own way to be recorded according to the format and form. It may be that the contractor will stipulate their own printed form with their company's name but an ordinary single page per day diary is available from any source especially from the internet where contains an editable form that can be downloaded anytime anywhere. Not only that, alongside the age of advanced technology where there has innovation through the revolution in the construction industry has created a new system of site diaries bringing the reformation in job recording at the construction sites.

Previously, the site diary is recorded manually but now everything is led into a better change where in this era only requires to key in the data through the computer. With this kind of innovation, the cost burden of transportation, communication and time can be saved on a tremendous scale significant. It is also modular and replicable to suit needs with the efficient, reliable and extremely user-friendly database system to ensure the security and integrity of information storage which is essential. However, there are still a few construction companies are using the basic format of handwritten recording until now. There is no coercion and it is up to their own perspective as long as the vital information is kept in the diary. At the end of the week, all the data would be summarized into a weekly site report which becomes the complementary record to the daily log.

Every diary whether in printed form, application system or directly in an identical log is recording most of the datum such as the personnel on site each day in hours worked and work engaged on, sub trade labor force divided into trades in hours worked and work engaged on, an estimate of site progress for each day by stating the types and approximate quantities of materials used where applicable, any movement of subcontract labor to or from the site during the day, any shortage of resources or stoppages by stating the causes, weather conditions with special emphasis on any disrupting element such as excess wind, extreme temperatures, rain etc., visitors to the site including reason for visit and record of comments or instructions from architect, engineer, consultants, client etc, record of discussion held with the consultants and any instructions given (note that only architect has the authority to issue formal instructions).

Furthermore, the site diary also record the item of dates on which information was requested from the architect and when the information was received including record of any delays in receiving the vital data from the architect or client, notes on general progress of the work mentioning areas where the building has advanced rapidly, any further comments which have a bearing on the works in hand or any accident that occurred on site with action taken and cause based on the requirements of safety work legislation. Instead of that, the item to be recorded may vary according to the form since every contractor has their own approach on what information they wanted to be in the site diary. Significantly, the following items which have been discussed is most likely that contain in site diary although there is various method in recording such important detail that relates to the development and implementation of some project procedures.

The absence of the construction site diary which is one of the references and supporting documents will make it difficult for the contractor department to analyse the data because the site diary act as a great tool of proving what work was done and which task and problems were outstanding on particular days during the construction. The site diary, as well as evidence for involved organization, is a good practice in this profession to sustain and enhance the performance of the company to produce a quality project.

Weekly site report

(Original copies to be returned weekly by mail with progress reports)

CONTRACT: _____ CONTRACT no: _____

Weather and lost time: _____ Date: _____

Visitors to site: _____

Important instructions received: _____

(Name the instructing party)

No. of workers on site:

SUBCONTRACTORS:

DEMOLITION		PLUMBER		PLASTERER, FIBRO	
EXCAVATOR		ROOFER, METAL		TILER, VITREOUS	
REINFORCING FIXER		ROOFER, A/CEMENT		TILER, VINYL	
CONCRETOR		ELECTRICIAN		PAVIOR	
DRAINER		MECHANICAL		PAINTER	
STRUCTURAL STEEL		GLAZIER		CLEANER, BRICK	
BRICKLAYER		PLASTERER, HAND		CLEANER	
CARPENTER		SPRINKLERS			
FORMWORKER		SUSP. CEILINGS			

Other trades: _____

Number of tests taken: _____ Number of items delivered: _____ Number of items used: _____

PLANT ON SITE (MECHANICAL)	HOURS WORKED	DOWNTIME	PLANT HIRED FROM (COMPANY)

SITE REPORT (PROGRESS/DELAYS)

Project manager's signature:

Figure 3.10: Example of Weekly Site Report Form.

3.2.4 Completed Work Report

A work completed report is an official document that is issued at the end of a project or work by a project manager or whoever responsible to prepare after completion of the project. Generally, it includes a description of the contract, design revisions and construction highlights in the form of a written or pictorial report. A project completion report becomes a formal document after a completion of a project that need to be prepared even if the client or any participant does not put priority to produce it. Significantly, the report can be reference document especially for organization's learning and research. There are such methods to write the report in many ways which is depended on the contractor's creativity and innovative thoughts to be in the report. Some completed report is written in the format such a report with a title page outlining the project title, its starting and ending date together with name of the supporting as well as implementation agencies. In that format, the responsible contractor would give an overview of the project which is write in summary statement that the project is complete as the beginning of the overview.

It is further describing the project in the background such as the problems encountered by the project and specifies the goals and objectives of the project in the overview. In addition, a section in the report would be added to highlight the issues, challenges and difficulties during constructing the project as a risk summary. The challenges become valuable lessons where there is precious chance to provides new learning for the contractor and his organization or may be the outsiders. Thus, the report would be close with the conclusion by the project manager regarding the outcomes of the project together with the lesson whether the result is good or not at the end of the report.

Despite that, some of the completed work reports are in a pictorial format where the front page consists of project title and the detail of project including the name of the contractor's company, the address of the site, the client, the dates as per contract or else according to the own contractor's preference format of printed report. The completed work report becomes an insight of necessary execution of related works that are reported in the picture of before, during and a complete view that taken at the same vantage point. The photographs are to be maintained as a part of the project documents which must be fully identified and should be clearly noted for claiming.

3.3 Subtopic (Based on objective 2)

Construction management, in expansion to a work that requires expertise in building, pivots on one basic component through documentation. Every piece of work requires documentation, from accounting to management, contracts likewise the building documents. Lucid documentation illuminate's expectations, establish official agreements, records building elements, protects all parties involved in the construction process where the most important is to ensure the client is satisfied with the end product. Hence, this section would explain the importance of site documentation in optimizing the allocation of necessary inputs to enhance the sustainability of a project. As said before, the construction documentation is very critical and strongly proves the actual condition that happened on the site in a combined piece of paper. The paper then is kept under a combination of a secure document filing or in the storage of computerized system that can be easily accessible anytime. Project documents archives on a contemporaneous basis provide a permanent record that permits the detailed reconstruction, survey and investigation of events and execution of the project. There will be a big trouble if no existence of evidence that occurred in the same period of construction activities to prove a claim, which brings the contractor a little chance of outcome.

Moreover, it is conventional practice when the participant in construction is involved in a relationship between the client and consultant or rather likely cooperate with a contractor. So, the investment from the client in a project is a big thing for the contractor always be professional to keep the relationship transparent between each other. Contractor needs to inform every single detail on what they do and executes towards the project. Therefore, the existence of documentation is essential because based on the documents, the client is informed for they know every detail about time logs of each labor and their works, all the material and plant to been used properly, to know every single problem encountered at the site and other occurrences. Besides, the documentation of construction activity will be a strong foundation if there is going to have a dispute. It is essential in construction management nowadays to organized and gathered all evidence inside one file as a solid proof to solve the disputes and reduces the risk of a lawsuit that may arise between client.

Apparently, other perspectives indicate that the documentation gave a sketch to the contractor to create a reasonable assumption for the conclusive outcomes by concerning a few aspects such as tracking current expenditure and project progress. Based on the records, a contractor and his management team or else a specialist department will determine whether to implement the original plan or come with a novel effective formula regarding the current situation of the project. It is because the existence of recorded documents developed an insight that is full of information related to the project which is critically needed to elaborate the contents inside the documents.

The documentation also allows the contractor to have a space to analyze if adjustments should be made in order to set new profit or stay under budget depending on the current market cost. Thus, it helps the contractor to achieve the ultimate objective that generates benefit for every participant neither the client nor the contractor. Indeed, it is highly recommended for every activity and expenditure shall be documented and kept in a log, being written in an accessible record or else in a sophisticated software system to seal the detail that contributes to the project to develop successful outcomes.

In addition, the construction documentation is not only offering essential information but also becomes a reliable document that can be used for future references which are very useful for the whole construction organization. The existing records will provide related detail that can be used as a tool of information provider for the contractor’s management team to study every single data by capturing the previous result and conclude a relevant conclusion based on the data summary. In fact, the previous documentation really helps the contractor for well prepared to deal with various upcoming challenges for the new project because all the efforts taken in formulating the documentation will be paid off when the decisions for the entire project are based on accurate facts. These pragmatic practices reveal that accurate documentation is an essential part of the project. Every document in the construction industry plays their own vital role that provides critical information to ensure the outcomes of the project is successful.

3.4 Subtopic (Based on objective 3)

Successful construction documentation requires the estimations and calculations that are record accurately to ensure it accessibility. Every single information should to be sustained by applying a good practice to produce precise documentation. Thus, it is to provide a clear document that can be read and understood by anyone outside the project when questions arise or trouble dispute. So, the available documents can be retrieved as vital resources for the use of the construction project office in solving the unexpected problems. It is suggested that original field notes to be keep in a shape that can be recorded and retained as a basis documentation. Based on the experience, field notes are taken on a scratch paper to inform the project manager in such informal method which should not be considered as acceptable documentation. Hence, the transcription of field notes must be recreated into a formatted form to avoid the conceivable outcomes of error and the unnecessary cost of duplication.

Moreover, the documentation is often recorded by handwritten according to the old conventional method. Therefore, every record should be written in a such way that is neat, comprehensible and adequate to be easily understood. If the original entries are later determined to be in error, they must not be deleted by erasing whether using correction fluid or taped over. Alternatively, a line should be drawn straight through the mistaken entry and corrections entered directly above with the date of the correction and the signature of the person that making the change. This is crucial practice on how the rectification is performed usually when to correct a mistake in recording data. This is because deletions will destroy the legal standing of notes. On the other hand, the responsible personnel is urged to ensure the notes are recorded correctly and complete with all relevant datum. They are not encouraged to procrastinate in recording related data during the observation on the site to prevent from being misrecorded which led to losing a piece of detail. The loss of data is the destruction of evidence. Instead, the assigned labour should record the detail simultaneously on the current time that he monitored because the most important and exacting of documentation is keeping up to date, clear and legible.

CHAPTER 4.0

CONCLUSION

The construction industry often encounters a problem such as cost overruns or delays for most of the work, which signifies that the construction companies are under exceptional pressure to convey well-organized projects to the global market. The challenge is to work effectively around the globe to complete construction on time and on budget while eliminating waste and injury. Therefore, by revolution through the years has made the construction industry develop beyond the expectation and more ahead with the meticulous way in controlling the resources as well as establish better quality outcomes. The experts finally have found an effective recipe to formulate an innovative way better than the old conventional approach successfully. It consists of a combination of written and graphic format, producing a specific formatted document that helps to translate concisely the building design of a project from the realm of conceptualization to the arduous physical work. This report specifically evaluated what is on common documentation to record the construction activity such its vital datum. Obviously, construction companies are likely to summarize all the essential information through a combination of a secure document filing or else in the storage of a computerized system that can be easily accessible anytime. As matter of fact, the documentation whether is a very small issue but as long as it provides information, it is necessary to whoever is responsible to record those details precisely. Every single piece of data is very important to assist the contractor to determine his project outcomes thus showing the importance of construction documentation.

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