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PROJECT PLANNING OF MIXED-USE BUILDING OF X MALL and APARTMENT SEMARANG

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ABSTRACT

The X Mall and Apartment Semarang Development Project is a mixed-use building project owned by PT. Sri Ratu with service providers, namely PT. Mitralanggeng Jaya Konstruksi. This building stands on an area of 24,173 m^2 and has a building area of 101,437.45 m^2. Good project planning is needed to ensure the project runs on time, quality, and cost. The aspects discussed in this study are the organizational structure, site layout, traffic management, implementation strategy and method, implementation schedule, quality planning, OHS plan, project scheduling, and budget plans. The data used to prepare this project planning includes shop drawings, technical specifications, and the Basic Unit Price Analysis of 2022 Semarang. Microsoft Excel 2021 is used to prepare cost estimates, and Microsoft Project Planning 2021 is used to prepare the implementation schedule. After preparing the project planning, the results are (1) organizational structure with a projectized organization type, (2) on the site layout, there are 3 tower cranes used to optimize work, (3) implementation strategy using the bottom-up method and using the zoning method in its implementation, (4) quality planning based on the quality plan and quality target, for OHS using HIRARC, (5) the duration of the work is 366 working days, (6) with the implementation costs needed to carry out the construction of the Mixed-Use Building of X Mall & Apartment Semarang is Rp. 207,280,106,745.16.

Keywords : project planning; mixed-use; bottom-up

1. INTRODUCTION

Mixed-use buildings, which combine residential, commercial, and industrial spaces, are increasingly popular in urban areas for their vibrant and sustainable contributions to city life. These buildings vary in size and design, from small to large-scale developments with various amenities. Successful construction of mixed-use buildings relies on meeting time, quality, and cost indicators. In Semarang, the development of mixed-use facilities like X Mall and Apartment Semarang aims to cater to the city's growing needs for housing, work, and recreation. Effective management and planning are crucial for ensuring the project of X Mall & Apartment Semarang's timely completion, quality, and cost efficiency.

2. METHODE

In the context of project planning for research, specifying the scope and focus is crucial. This research focuses on the building's structural components, excluding elements like architectural, mechanical, electrical, and plumbing systems. The preparation of project planning for a construction project requires various data to support the research. The data in this research include Technical Plan Specifications, BOQ documents, Shop Drawings, and Standard Prices for Goods and Services, Semarang 2022. The steps in processing this data can be seen through the flow chart of the project planning stages for the construction of the Mixed-Use Building of X Mall and Apartment Semarang project in Figure 1. It is expected that the results of the preparation of the Mixed-Use Building of X Mall and Apartment Semarang Project Planning are appropriate and able to resolve all problems that occur in the field.

After collecting the data, the next step is to analyze and process the data for the preparation of project planning, here is a complete explanation of the steps.

The preparation of the project description contains general information data on the project that is the object of the thesis preparation.

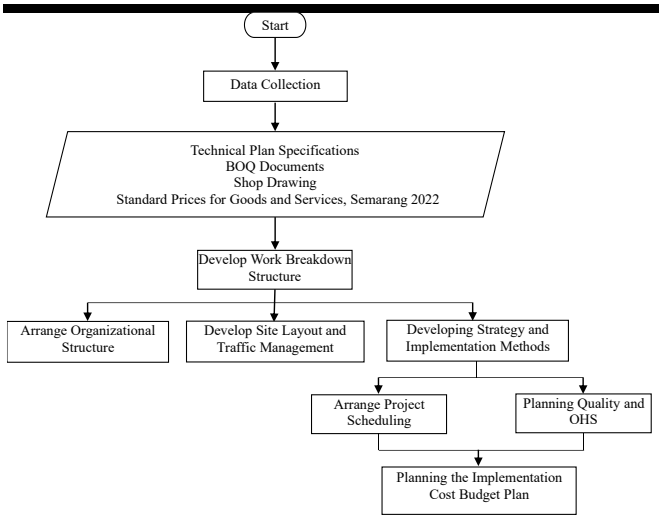

Figure 1. Project Planning Flowchart

The WBS is preparation to break down or divide work into smaller parts (sub-activities) so that work can be structured and easily understood. This aims to ensure that the stages of work can be carried out sequentially and can be controlled properly. The next step is to compile a list of personnel based on the work breakdown structure. Then with the work items and the list of existing personnel, the project organizational structure is formed.

Preparation of site layout and traffic management aims to place supporting project facilities and create exit and entry routes for project vehicles. In making site layout and traffic management, data such as location maps, field photos, plan drawings, and traffic plans around the project are required, which are obtained through contractors, the internet, and personal documents.

Preparation of implementation methods and strategies will provide an overview of how the work is done, how much it costs, and how long it takes to complete the work. This research uses the Bottom-up method where the project is carried out from the bottom up.

Preparation of project quality aims to maintain the quality of the building produced during the construction period. In compiling project quality, work plan documents and requirements are needed. Quality inspections are carried out routinely when materials and materials arrive, then the results of the project work that has been applied.

The preparation of an OHS plan is useful for minimizing work accidents that can occur in the construction project area from the beginning to the end of construction so that safe and healthy working conditions can be created. The first thing in compiling an OHS plan is to identify every risk that might occur in each work item in the project, and then create emergency response methods as risk control.

Preparation of the project schedule requires a target duration of work on each work item. Scheduling is made using the help of Microsoft Project 2021 and Microsoft Excel 2021 software. The data used to make scheduling are plan drawings, technical specifications, and implementation method strategies.

Preparation of the implementation budget plan aims to determine the budget amount for a building and wages, as well as other costs related to the implementation of the project. The cost budget plan is prepared using the MS Excel application with the stages of determining work items and then calculating each volume of work, selecting the base unit price of wages and materials, and then multiplying the calculation of the volume of work by the base unit price of wages and materials.

3. RESULT and DISCUSSION

Project Description

The X Mall and Apartment Semarang project is a development project owned by PT. Sri Ratu. The building, with a land area of 24.173 m^2, applies the mixed-use building concept by combining malls, apartments, hotels, ballrooms, and offices. The X Mall and Apartment Semarang project is located at Pemuda Street No. 25-29 Semarang City, Central Java Province, Indonesia. This infrastructure development project in the residential sector consists of 3 towers: 3 ground floors + 2 floors for malls, 10 floors for hotels, and 19 floors for apartments + 1 roof apartment.

Figure 2. Building Visualization

Below is the project description of the X Mall and Apartment Semarang project:

1. Project name : X Mall, Hotel, and Apartment Semarang
2. Project Location : Pemuda Street No. 25-29 Central Semarang, Semarang City, Central Java, Indonesia
3. Project Owner : PT. Sri Ratu Land Properties
4. Building Functions : Mall, Hotel, and Apartment

5. Construction Management : PT. Tethagra Catur Matra
6. Main Contractor : PT. Mitralanggeng Jaya Konstruksi
7. Foundation Contractor : PT. Pakubumi Semesta
8. Planning Consultant : PT. Cipta Prima Sejahtera
9. QS Consultant : PT. Graha Estimatika Pradana
10. Architectural Consultant : PT. Airmas Asri
11. MEP Consultant : PT. Skemanusa Consultama Teknik
12. Property Consultant : PT. Cushman & Wakefield
13. Building Type : Multi-storey Building
14. Structure Type : Reinforced Concrete
15. Land Area : 24,173 m^2
16. Building area : 101,437.45 m^2
17. Building Height : 34 m for the Mall and 74.2 m for the Apartment
18. Number of floors : 3 Ground Floors + 2 Mall Floors, 10 Hotel Floors and 19 Apartment Floors + 1 Roof Apartment

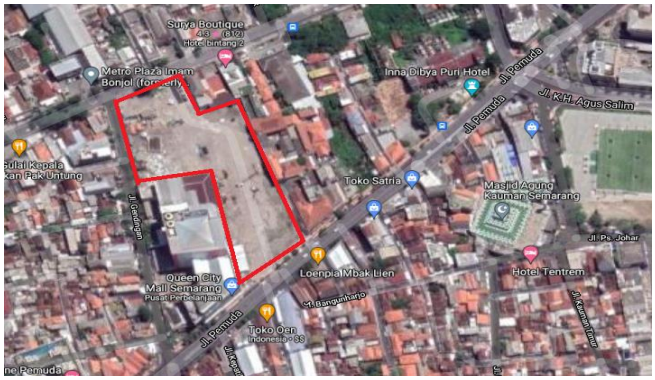

Figure 3. Project Location

Work Breakdown Structure

Work Breakdown Structure (WBS) is the basis for planning, executing, and managing a project. The WBS aims to break down or divide work into smaller parts (sub-activities) so that work can be structured and easily understood. To facilitate the process of planning, implementing, and controlling projects, existing work items must be arranged and grouped from the activity carried out earlier to the recent activity. The work breakdown structure requires shop drawing data as a reference.

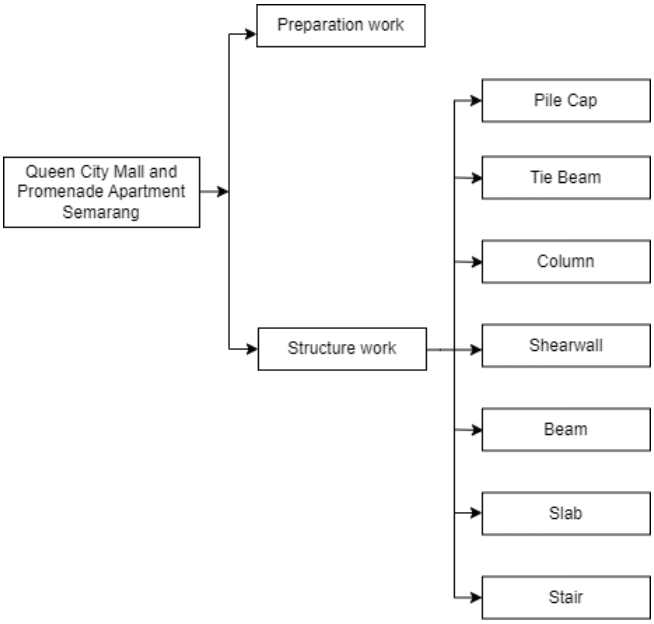

Figure 4. Work Breakdown Structure

Project Organizational Structure

In making the design of the organizational structure of this project, the author uses a projectized organization structure. If there is a problem in running the project, decision-making in solving the problem can be done quickly. So that the issue can be resolved as soon as possible, the following is the organizational structure of the X Mall and Apartment Semarang Project.

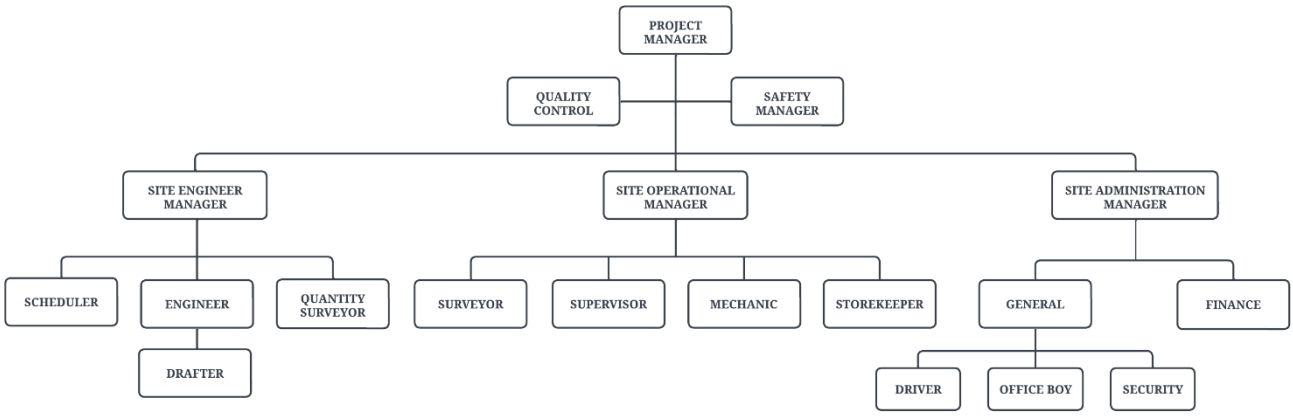

Figure 5. Structural Organization

Site Layout Project

One of the most essential things in project planning is preparing project facility layouts or site layouts. In designing a site layout, important things need to be prepared, namely supporting facilities. With excellent and correct site layout planning, it can optimize land used so that it can increase the productivity of project performance.

During construction, a project requires project-supporting facilities such as the board of directors' office, security post, material and equipment storage warehouse, toilets, etc. It is recommended that these supporting facilities be made using materials that are easy to work with, durable, comfortable, and easy to assemble and disassemble to shorten the time and be economical. The type of supporting facilities depends on the size of the work or the project implementation period. This also affects the size and number of supporting buildings in the project. Due to the non-permanent nature of supporting facility buildings, selecting efficient and easy-to-dismantle building materials is necessary to save on project costs. Therefore the placement of a good site layout can provide smoothness and comfort in the construction work process.

The site layout plan uses three tower crane units, with a jib length of 70 meters for TC 1 and TC 3 and 50 meters for TC 2. The site layout plan and supporting facilities for the X Mall and Apartment Semarang construction projects can be seen in the following figure.

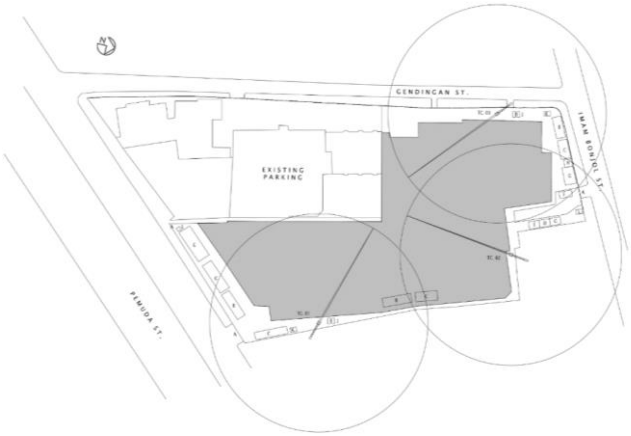

Figure 6. Site Layout Project

Explanation:

A. Project area entrance
B. Reinforcement fabrication
C. Formwork fabrication
D. Equipment warehouse
E. Material warehouse
F. Washing bay
G. Keet direction
H. OHS room
I. Tower crane
J. Passenger hoist
K. Toilet
L. Pos security

Project Traffic Management

Traffic management arrangements are necessary for smooth traffic processes in the project area and the area around the project. Everyday activities include vehicles transporting materials for project needs and other supporting vehicles, so proper and appropriate traffic management arrangements are needed. This will affect comfort and efficiency in work to increase project productivity.

The location of the X Mall and Apartment Semarang project is located in the city center area, making the paths around the project quite congested. Therefore it is necessary to plan traffic management. This helps in facilitating the process of mobilizing materials and tools for project needs.

For material vehicles that will enter the project area, vehicles can enter the project area through the entrance to Pemuda and Imam Bonjol Street, Central Semarang. Before entering the project area, the vehicle will be inspected at the guard post. After the vehicle has undergone a series of inspection processes, the vehicle is welcome to enter the construction area.

Project Implementation Strategy and Method

Effective implementation strategies and methods are crucial for translating construction plans into a physical structure. Good coordination and responsibility among the contractor, supervisory consultant, and field supervisor ensure efficient resource management and successful project completion. A well-planned approach that balances cost, quality, and time is key to achieving optimal results in construction projects.

In this development project, the Bottom-Up method is used. The work is continued from the lowest to the highest elevation. The lower structure work includes pile cap work, and tie beam work. For the upper structure, work includes column and shear wall work, beam work, slab work, and stair work.

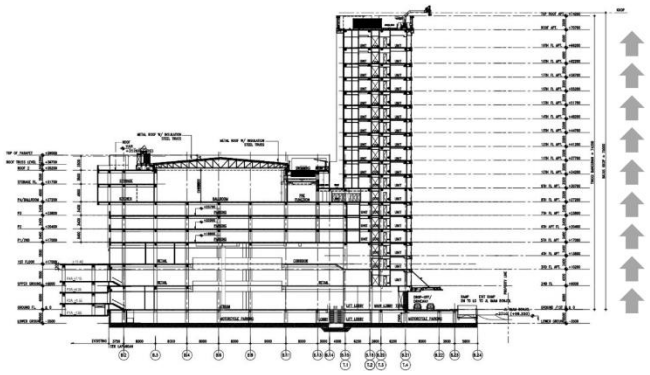

Figure 7. Bottom-Up Method

The Zoning method for this project is divided into 3 work zones to facilitate the implementation and control of work in the field. The determination of the 3 zones is based on the work area or range of the Tower Crane heavy equipment. In its distribution, zone 1 consists of mall and hotel areas, zone 2 consists of mall and apartment areas, and the last is zone 3 consists of mall and ramp areas.

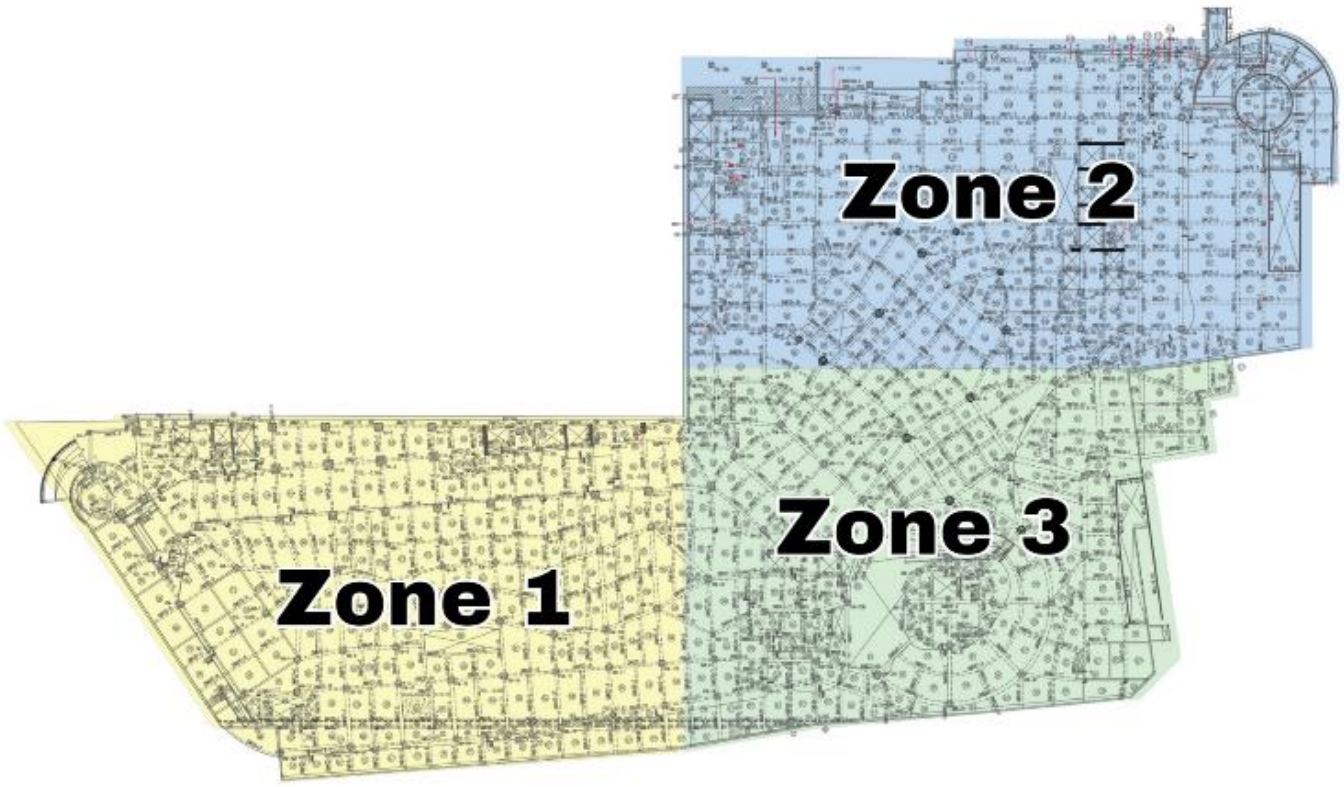

Figure 8. Zone Method

The implementation method for the construction of this project has been regulated in the technical requirements for each work. All scopes of work must follow the implementation method, so the implementation contractor must follow the implementation method that has been regulated in the conditions given by the consultant and project owner. Choosing the implementation method requires consideration of cost, quality, and time. The costs required

will also differ, where the work is similar but with different implementation methods. With the implementation method, it can be described how the project starts until the project ends.

Project Quality Plan

A Quality Plan is a technique or operating activity that is used so that the desired quality of work can be achieved. Quality control activities include monitoring, minimizing known problems, and reducing unnecessary deviations. For example, in casting work, the quality of concrete must comply with the specifications agreed by both parties, owner and contractor, so to find out whether it is following the agreed specifications, a concrete quality test must be carried out, namely by testing the slump test, and if the results do not meet specification requirements, the contractor, in this case as the project executor, has the right to reject the rejected concrete with the approval of the owner.

Preparation of project quality according to Shop Drawings and Technical Specifications or Requirements Work Plans. In general, the Work Plan of these Terms contains the scope of work to be carried out, the methods used in carrying out the work, and acceptable quality/type of material/workforce. One way to develop a project quality plan/management that can be used is to carry out Quality Control.

In this project, the quality control carried out includes reinforcing bar inspection, formwork inspection, concrete quality inspection, steel reinforcement quality inspection, ensuring that work is carried out in accordance with SOP, and preparing quality targets.

Standard Operating Procedure (SOP) is a requirement that must be met in doing something so that it is as planned. Making this SOP is done by making a checklist/flow chart to evaluate the stages of work implementation so that what is produced is as planned.

In addition to the SOP, it is also necessary to prepare a quality target that contains the targets to be addressed so that the work carried out is in accordance with what has been planned in the technical specifications. Quality targets are made to ensure that the quality uniformity the implementing contractor must achieve is in accordance with the technical specifications required by the owner. Generally, the quality control seen first is work parameters such as technical specifications contained in the contract before work begins.

Occupational Health and Safety Plan

Occupational Health and Safety (OHS) concerns the health, safety, and welfare of people engaged in work. It encompasses various activities to identify and manage workplace hazards, promote safe work practices, and prevent work-related injuries and illnesses.

The primary goal of OHS is to create and maintain a safe and healthy work environment that allows workers to perform their tasks without undue risk of injury or illness. This includes identifying potential hazards in the workplace, developing and implementing safety policies and procedures, providing appropriate training and education to workers, and ensuring that workers have access to necessary safety equipment and resources.

OHS also involves monitoring and evaluating the effectiveness of safety programs, investigating accidents and incidents, and continuously improving the overall safety culture within an organization. The field of OHS is essential to maintaining the well-being of workers and promoting economic growth by reducing the costs associated with workplace injuries and illnesses.

In implementing OHS at the project site, it is necessary to prepare a construction safety plan document that applies a construction safety management system in the work environment based on the scope of work and conditions in the field. This document is an effort, thought, and implementation to guarantee the integrity and perfection of the physical and spiritual workforce from work accidents due to fire, explosion, pollution, work-related illnesses, etc.

The OHS regulations implemented in the X Mall and Apartment Semarang project are Government Regulation No. 50 of 2012 concerning Implementing Occupational Safety and Health Management Systems.

Safety Plan, that used in this project is HIRARC, is a document that has a function to identify safety issues in the process of operation and execution of work, which includes risk identification, risk assessment, and steps to maintain the level of work safety from risks that may occur in the field. One way to assess hazard identification and risk control is to make a Risk Assessment Matrix or Safety Plan.

The first thing to do is to identify each activity against the risks that may occur by assessing it according to the criteria of the risk that might occur. Can use the table of the frequency of occurrence of OHS risks in construction and a table of severity, loss, or impact damage due to Construction OHS risks, sourced from Regulation of the Ministry of Public Works and Housing (MPWH) No. 10 of 2021. Based on its table, the value of the Risk Level can be calculated. The Construction OHS Risk Level results from multiplying the value of the construction OHS risk probability (P) with the resulting severity value (S). The following is the formula for the Risk Level (RL):

$$\mathbf{RL = P \times S}$$

Where:

RL = Risk Level

P = Construction OHS Risks Probability Value

S = Severity Value

The results of calculating the Construction OHS Risk Level can be explained in the following Risk Assessment Matrix table.

Table 1. Risk Assessment Matrix

	Severity				
Probability	**1**	**2**	**3**	**4**	**5**
1	**1**	**2**	**3**	**4**	**5**
2	**2**	**4**	**6**	**8**	**10**
3	**3**	**6**	**9**	**12**	**15**
4	**4**	**8**	**12**	**16**	**20**
5	**5**	**10**	**15**	**20**	**25**

Source: Occupational Health, Safety, and Environment Plan Document

Where:

1 = Risk level is very small
2 to 4 = Risk level is small
5 to 8 = Risk level is medium
10 to 15 = Risk level is high
16 to 25 = Risk level is very high

Based on the several assessment processes above, a construction OHS level determination form and a hazard identification, risk assessment, and risk control form can be created.

Project Scheduling Plan

Scheduling in construction projects is very important in determining the project's success. Delays in work will result in various losses, namely additional production costs, fines that must be paid, and so on. Time management aims to ensure that the project can be completed on time, even faster than the contract plan, while paying attention to the quality and costs incurred.

Things that need to be considered in preparing the schedule are the duration, sequence of work, weight, and productivity. In calculating and preparing the implementation schedule for the X Mall and Apartment Semarang project using the Ms. Project 2021 software which will produce Bar charts and Network Planning. The initial step that must be taken is to determine the duration of each job and determine the dependency relationship of the job/predecessor.

In scheduling the X Mall and Apartment Semarang project, a work schedule will be implemented from Monday to Saturday with details of working hours from 8 am to 5 pm, with break time from 12 pm to 1 pm.

From the planning results for the duration of the X Mall and Apartment Semarang project implementation, it was found that the project would be completed within 366 working days.

The critical path is obtained after scheduling is processed using the Microsoft Project application. The critical path is the path that has the longest duration through the network. The significance of the critical path is that if activities located on the critical path are postponed or postponed, the overall project completion time will automatically be delayed.

S Curve

The S-curve is a mathematical graph that depicts the cumulative data of a project, such as the cost or duration of work time used or the percentage (%) of the work's completion. The s curve also tracks the progress of a project in general use. This curve is used to measure the progress of project work, evaluate performance, and as a material consideration for making cash flow estimates. S curve can be made with the formula:

$$work\ weight = \frac{price\ of\ work}{total\ price\ of\ work} \times 100\%$$

The network planning results are then applied in the form of an S curve and produce a weekly period of 53 weeks. On an S-curve, the vertical axis represents the cumulative amount of costs, labour hours, or percentage of work completed, while the horizontal axis represents calendar time.

Implementation Budget Plan

The project implementation cost budget plan determines the cost requirements for carrying out the project. The project implementation cost budget plan is the actual cost used by the field contractor during the project until completion, calculated from the labor, materials, and equipment needed.

The implementation cost budget plan can be calculated if the calculation of Unit Price Analysis and the volume of each work item has been determined. The implementation budget plan is obtained from the multiplication between the Unit Price Analysis and the volume of work.

The following is the calculation result table of the implementation cost budget plan for the X Mall and Apartment Semarang project. The total of the implementation cost budget plan is Rp. 207,280,106,745.16, which includes 10% VAT.

Table 2. Recap of the Implementation Cost Budget Plan

NO	WORK ITEMS	TOTAL PRICE	WEIGHT (%)
1	LOWER GROUND FLOOR	Rp 25,057,490,972.51	13.298
2	GROUND FLOOR / 1ST APARTMENT FLOOR	Rp 19,142,875,830.02	10.159
3	UPPER GROUND FLOOR / 2ND APARTMENT FLOOR	Rp 17,841,358,125.93	9.468
4	1ST MALL / 3RD & 4TH APARTMENT FLOOR	Rp 17,583,420,765.84	9.331
5	PODIUM 1 / 2ND MALL / 5TH APARTMENT FLOOR	Rp 16,595,137,644.43	8.807
6	PODIUM 2 / 6TH APARTMENT FLOOR	Rp 10,719,449,443.54	5.689
7	PODIUM 3 / 7TH APARTMENT FLOOR	Rp 13,139,985,075.38	6.973
8	PODIUM 4 / 8TH APARTMENT FLOOR	Rp 13,203,883,806.53	7.007

9	PODIUM 5 / 9TH APARTMENT FLOOR	Rp 10,418,458,899.98	5.529
10	PODIUM 6 / 10TH APARTMENT FLOOR	Rp 8,276,137,172.19	4.392
11	PODIUM 7 / 11TH APARTMENT FLOOR	Rp 7,610,533,551.21	4.039
12	PODIUM 8 / 12TH APARTMENT FLOOR	Rp 7,955,015,126.99	4.222
13	PODIUM 9 / 13TH APARTMENT FLOOR	Rp 7,963,297,514.39	4.226
14	PODIUM 10 / 14TH APARTMENT FLOOR	Rp 5,646,802,193.98	2.997
15	15TH APARTMENT FLOOR	Rp 1,236,563,470.79	0.656
16	16TH APARTMENT FLOOR	Rp 1,228,728,580.22	0.652
17	17TH APARTMENT FLOOR	Rp 1,278,434,131.66	0.678
18	18TH APARTMENT FLOOR	Rp 1,298,956,920.35	0.689
19	19TH APARTMENT FLOOR	Rp 1,394,665,177.51	0.740
20	APARTMENT ROOF	Rp 741,598,487.02	0.394
21	APARTMENT ROOF TOP	Rp 103,667,786.96	0.055
SUBTOTAL		Rp 88,436,460,677.42	100.000
VAT 10%		Rp 18,843,646,067.74	
GRANDTOTAL		Rp 207,280,106,745.16	

4. CONCLUSION

Based on the result and discussion above, it can be concluded as follows:

1. The organizational structure in the Project Mixed-Use Building of X Mall & Apartment Semarang uses the Projectized Organization method because the project manager holds the highest authority in a construction project. Therefore this organizational system is the most appropriate choice for a construction project.
2. In making the site layout in this thesis, 3 tower cranes are used because the main building is large enough that it cannot be reached using 1 tower crane. Therefore, three tower cranes are used with a jib length of 70 meters each. As well as the provision of other buildings such as contractor directors, consultant directors, subcontractor directors, warehouses, rebar fabrication areas, formwork fabrication areas, and others. Traffic management on the project discussed in this thesis explains the mobilization of vehicles going in and out of the project area and the casting area.
3. The strategy used in this project is the zoning method, and the method used to construct X Mall & Apartment Semarang in this thesis is the conventional bottom-up method in its implementation.
4. The quality plan for the X Mall & Apartment Semarang project is by standard operating procedures and quality targets to achieve the set quality targets. For construction projects to achieve the target of zero accidents during the implementation process, correct OHS policies, correct OHS implementation, OHS training, OHS equipment and signs, and procedures for handling accident victims are needed.
5. The duration needed for the construction of X Mall & Apartment Semarang if using the organizational structure, site layout, bottom-up method, and quality plan according to (standard operating procedure and quality), and OHS then has a duration of 366 calendar days.
6. The budget plan using the bottom-up implementation method costs Rp. 207,280,106,745.16

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