



**DEPARTMENT OF BUILDING
UNIVERSITI TEKNOLOGI MARA
(PERAK)**

RENOVATION WORK OF CHEESE LAB

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(PERAK)**

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It is recommended that the report of this practical training provided

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entitled

RENOVATION OF CHEESE LAB

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

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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 ZR Bina Jaya Enterprise for duration of 19 weeks starting from 1 September 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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ABSTRACT

This case study report shows on the meaning of the renovation work and the importance the renovation work nowadays. It also includes the objectives of the renovation project and the advantages of the renovation project. This report talks about the process of the renovation work which include concrete work, finishing work, and cabinet work. Its also describe the process of electrical services fitting installation. In addition, the mechanical work process is shows as plumbing work related. The tools and machinery related to this project is describing the function itself and the purpose of the tools and machinery in construction. This case study gives the overview of problems appeared during the project progress and how to avoid it. Lastly, the report tells the conclusion of the renovation project for overall.

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CHAPTER 1: INTRODUCTION



Figure 1: Example of Renovation Work

Renovation and maintenance of buildings are inextricably linked to the term Facility Management. Facility Management is described as a service that provides investment recoverability through cost-effective management, as measured by Life Cycle Costs, or by rent revenues in the case of leasing a building to specific tenants in a rationally used building (Macek & Dobiáš, 2014). There is a wealth of information regarding a building's technical and economic state that is known or available throughout reconstruction and maintenance, such as weights, accuracy, dangers, and time period (Macek & Dobiáš, 2014). Before beginning the building renovation project, there are a few practical considerations to consider, including passporting (capturing the existing state), identifying optimal maintenance cycles and item restoration, quantifying annual expenditures, and evaluating the building's economic balance. On the other hand, from the standpoint of the user, numerous advantages include the ability to work with data in various specifications, access to a large number of users, and the ability to account for the time required to analyze the model's outputs (Macek & Dobiáš, 2014). The sentence defines how the introductory content will appear, based on the preceding sentence.

Building passportization is critical in this regard when planning future restorations. If there is a problem with the building's passporization, the techno-economic estimates may suffer. (Macek & Dobiáš, 2014).

Renovation of an existing structure is a profitable segment of the construction business since it provides financial diversification for investors (Pope et al., 2016). Renovation projects have been used by the construction sector as a means of diversification in order to stay profitable during a down economy (Pope et al., 2016). Although historically significant building renovations are in high demand, structural engineers frequently face costly design issues. (Pope et al., 2016). Planning, facilities management, project needs, site considerations, and project design are some of the requirements that must be met (Pope et al., 2016).

Construction operations in the fields of maintenance, renovation, and transformation are expanding as a result of the ageing distribution of the building stock and accompanying refurbishment needs (Thuvander et al., 2012). When it comes to reducing total energy use, renovation is generally preferable to demolition and new construction. Buildings' real lives beyond their expected service lives, according to research (Thuvander et al., 2012). In terms of decision-making, planning, and execution, renovation procedures are more complicated and uncertain than new building processes (Thuvander et al., 2012). A lack of understanding of the existing building's traits and flaws can result in the loss of incalculable values, such as high-value materials, technological, or artistic elements being replaced by industrial, low-quality products with a shorter life period (Thuvander et al., 2012). Furthermore, there is a risk that architectural, cultural, and social values will be overlooked in favour of energy and economic performance metrics (Thuvander et al., 2012). More knowledge is needed to make systematic, synthesised decisions in renovation projects that balance various desires, needs, and values with respect to a number of important aspects such as energy, environmental, technical, and economic performance, as well as social, cultural, and architectural aspects (Thuvander et al., 2012). Renovation is approached from a broad perspective, encompassing both residential and commercial structures that are privately owned and

managed as well as those that are owned and controlled by municipalities (Thuvander et al., 2012).

Building renovations are becoming more popular and receiving more attention in many European countries, both in practise and study (Jensen et al., 2018). As a result, there are seven features that distinguish the process of rehabilitation from the process of new construction (Jensen et al., 2018). The fact that there is an existing building and often existing users is critical in the renovation process, and one must do a pre-evaluation of the facility's state and usage history, which can serve as a starting point and a baseline for a post-evaluation (Jensen et al., 2018). The renovation design will be determined by the needs, budget, and available space. Based on prior experience in that space, the major objective or goal of this renovation (Ramlo, 2007).

The building sector's performance must undergo significant adjustments as a result of the refurbishment (Gelfand & Duncan, 2011). Modernizations that include the replacement of whole building systems and/or envelopes are almost as uncommon as new construction. (Gelfand & Duncan, 2011). Lighting modifications, heating upgrades, occupancy controls, and basic envelope improvements are all options that can reduce energy usage and expenditures almost immediately (Gelfand & Duncan, 2011). Providing the groundwork for long-term tenant systems is a critical first step in achieving long-term sustainability. (Gelfand & Duncan, 2011). Finally, without having to rethink each project component, each refurbishment may contribute to overall sustainability goals (Gelfand & Duncan, 2011).

1.1 Objectives

1. To study the construction process of renovation work.
2. To identify the equipment and plant involve in renovation.
3. To understand the problems during the renovation work.

1.2 Scope of study

The study happens at the Chocolate Lab in the Headquarters of Malaysian Palm and Oil Board (MPOB), Bandar Baru Bangi, Selangor. The site is located in Chocolate Lab, Bakery Lab, and Cheese Lab which is inside the Chemical and Technology Building. Basically, the study focusses on the renovation process which is the transformation of old lab design become the new lab design. The materials including cement, sand, aggregates, brick, timber, water, and others. While the machineries including some small tools and heavy machineries such as shovel, trolley, ladder, and drill machine. In terms of labour, the quantity of main labours is totally 12 including management team. From the position of project manager until the manpower or general worker.

1.3 Research method

There are a few methods I use to collect data and information on this project. Many ways can be done to collect data and any information related to the project such as observation and document reviews.

The methods I usually used to collect data about the project / site are:

1. Observation – The observation method is the most common types of research method. This kind of method really help in collecting data on the process of construction method. Sometimes it can be helpful on the duration of the process and also the condition before and after construction. In this situation, I use my pictures to describe the ongoing process of civil work, mechanical work, and electrical work. The observation method needs to cover many aspects especially on the measurement which is comparing between drawing and actual work.

2. Interviews / Discussion – The interviews basically in not a formal way. The interviews session more between site supervisor and me at site. The interviews content usually discussing the design and the problems appeared on the design before the construction work start. At the same time, the project will be check and discuss by the project manager which is related to the project problems and project progress. The discussion is one of the important methods where the learning process comes from here.

3. Document reviews – This method gives time on me to study the document related to the projects in terms of cost, duration, materials, and worktime. Everything inside the documents had been plan earlier on the work progress. The document content such as drawing plan, company profile, daily report, and standard operating procedures gives the overview of the project where gives the advantages on the project management. The document sometimes doesn't give the exact information in terms of duration of work and as-built drawing. By reviews the document, it will help me to collect information more and more during the ongoing project.

CHAPTER 2: COMPANY BACKGROUND



Figure 2: Logo of the company

ZR Bina Jaya Sdn Bhd history back then start in the early of year 2000. The company name usually come from under the name of ZR Bina Jaya Enterprise which located in a small office that placed at Section 7, Bandar Baru Bangi. The business starts as trading industry that included stickers, banners, and sign board printing. In the year of 2002 which is the new beginning and make a big step and get involved in Civil Construction Work. ZR Bina Jaya Enterprise became one of the major names in the Bumiputera Contractor in Malaysia with the dedicated and innovated employees. The company going through many experiences in construction such as renovating bungalows, hospitals, offices. The project literally through the open tender by the Malaysian's government. ZR Bina Jaya Enterprise achieve the G3 level of contractor and get involved in the Mechanical and Electrical Works (M&E) and doing a collaboration with other contractors to accomplish projects that had won in the government tenders.

An almost 10 years of operating, ZR Bina Jaya Enterprise become wider in the scope of work that can establish a G7 contractor company with the name of ZR Bina Jaya Sdn. Bhd and officially established on 23rd February 2015 until today. The company journey still continues on looking forward to getting involve in massive projects of construction, structural, mechanical, electrical, sewerages and even the traffic management. Not just by that, the company also having a vision to become a project consulting that provides integrated facilities management locally and internationally.

Zr Bina Jaya Enterprise had its own vision which is to become a world-class diversified contractor in delivering products & services under the scope of Civil and Structural (C&S), Mechanical & Electrical (M&E), Information & Communications Technology (ICT) with high quality of works and full of integrity. On the other hand, the Zr Bina Jaya Enterprise has its own missions which are to demonstrate the ability in consistently provide products & services that meet customer and applicable statutory & regulatory requirements, to monitor and review all the relevant external and internal issue periodically, to determine an interested parties which are relevant to the quality of the management system. In addition, the company will take a serious action in upgrading the staff's capability and competency in delivering services and continually improve the quality management system that applicable and also effectively compliance to our scope of organization.

To be clearer, ZR Bina Jaya Sdn. Bhd. focusing on construction works which is related to civil works. Design and built on house renovation, hospital, flat roof maintenance, roof parking and etc. Therefore, ZR Bina Jaya team believe in becoming true partners to the client and sharing a sense of ownership in helping to complete the projects. Besides that, this company also perform in minor repairs to damaged surface of highways, roadways, and footpaths. At the same time, the company also re-paint the signs and guideposts and undertake general roadside maintenance such as grass cutting. There are also include water resource development facilities, water supply projects, water plants, wastewater plants, water distribution, wastewater conveyance facilities and sewerages.

In mechanical, electrical, and plumbing works which are significant to the construction works. As a many experienced company, ZR Bina Jaya Sdn. Bhd. design and also installed of major mechanical equipment that includes air – conditioning system, cooling tower, chiller AHU units and fire protection system. For electrical work, it is the same in designing and installation of High Voltage (HV) and Low Voltage (LV) of electrical equipment. In addition, the installation of power generation, transformer, power distribution, and interior electrical facilities.

2.1 Completed Projects

ZR Bina Jaya Enterprise received and handled many governments projects that have been completed under main contractors or sub-contractors as shown in Table 1.

Table 1: Completed Projects

Project's Name	Contractor's Grade	Price (RM)	Duration	Started	Finished
Street lighting installation work new and related work on Jalan Bangi Lama, Bangi, Hulu Langat.	Grade 1	190,043.00	5 weeks	25.10.2018	05.12.2018
Proposed upgrading of 2 blocks student residence at Mohamad Rashid College, Universiti Putra Malaysia, Serdang, Selangor Darul Ehsan.	Grade 6	7,186,184.11	44 weeks	15.09.2018	15.06.2019
Construction of cold room in pre-clinical research building, MPOB headquarters, Bandar Baru Bangi.	Grade 1	187,885.00	16 weeks	10.08.2017	09.12.2017
Opening, supplying, and installing hot water piping system and cold water on level 4, plumbing hot water and cold water on level 3 and cold water piping in corridors core C to core B, sterile unit, forensics unit, main pharmacy stores, and pharmacy supply wad, level central clinical block basement UKM medicine.	Grade 3	695,450.00	20 weeks	27.09.2017	31.02.2018

2.2 Ongoing Projects

ZR Bina Jaya currently handling many governments projects that have been completed under main contractors or sub-contractors as shown in Table 2.

Table 2: Ongoing Projects

Project's Name	Contractor's Grade	Price (RM)	Duration	Started	Finished
Central and separate air conditioning system maintenance works at MPOB Bandar Baru Bangi headquarters building. Package A: Administration building, Biology building, Chemistry & Technology building, ABBC building, Tissue Culture Building, MPOB Seremban branch office and all separate buildings at MPOB headquarters.	Grade 1	145,800.00	100 weeks	01.09.2020	31.08.2022
Sungai Muntoh solid waste disposal site operation and maintenance services, Jelevu, Negeri Sembilan	Grade 3	2,949,300.00	104 weeks	01.11.2020	31.10.2025
Kerja-kerja pembaikan dan baik pulih kejuruteraan awam dan struktur (c&s) di bangunan Pusat Konvensyen Antarabangsa Putrajaya (PICC), Presint 5, Wilayah Persekutuan Putrajaya	Grade 6	8,010,810.00	80 weeks	02.12.2020	01.06.2022
Tender for operating services and air conditioning system maintenance and ventilation, alarm system and fire extinguishers and others the mechanical equipment relevant for a period of three (3) year at the UKM Medical Centre	Grade 6	5,768,638.00	104 weeks	01.06.2019	31.05.2022
Proposal to build and complete a building of My Farm Outlet, marketing support service room and others related above part LOT PT 77735, Jalan Jurutera, Puchong, Petaling, Petaling district, Selangor Darul Ehsan	Grade 6	6,620,915.69	112 weeks	19.08.2019	18.10.2021

2.3 Organisation Charts

At ZR Bina Jaya Enterprise, there are only one department that responsible for overall construction project. The board director was responsible in lead the company through up and down. In other term, the board director is the head of this company organisation and become the head of the body of the company. The organisation in this company divided into three departments where management team, operation team and technical team. For management team include administration and tender & contract. For operation team include architect, project manager, and senior engineer. For technical team, it includes junior engineer, junior assistant architect and site supervisor.

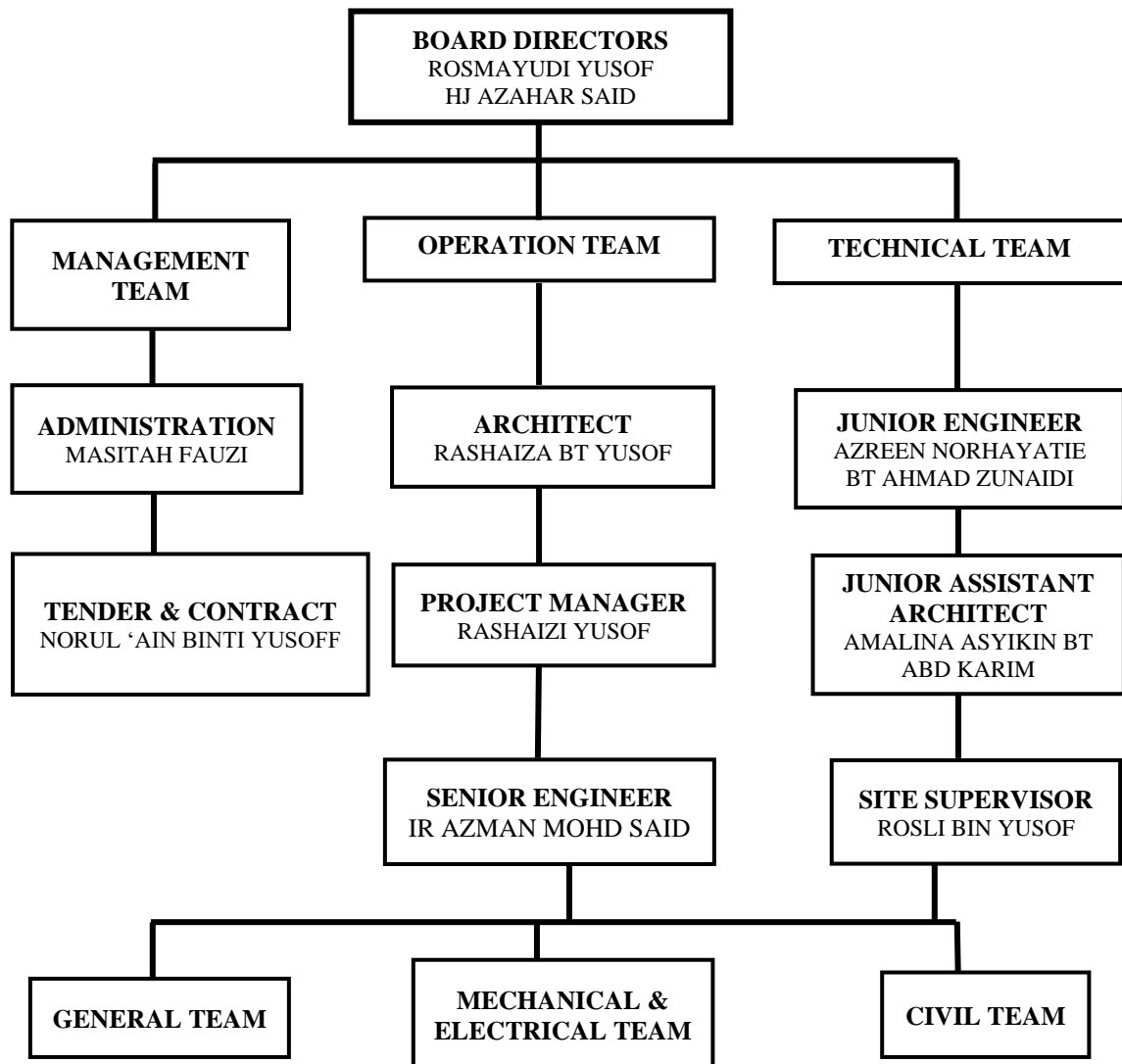


Figure 3: Organization Charts

CHAPTER 3: CASE STUDY

Introduction to Case Study

This case study describes about the project on the renovation of cheese lab, level 2 at chemical and technology building, MPOB headquarters which is located at Bandar Baru Bangi. The project is related to the renovation concept and interior design on the lab purposes. The project was expected to be done 3 months after starting the project. The official date of receiving site is on 1 September 2021 and the end of the project is on. In terms of management, this project is handled by the project manager and assistant project manager which are Miss Azreen Norhayatie binti Ahmad Zunaidi and Muhamad Ardiyali bin Salim. In handling of quantity surveyor, Madam Nik Akmar is responsible to handling it and in handling material officer, Miss Nurazila is responsible to handle it.

Site Organization Chart

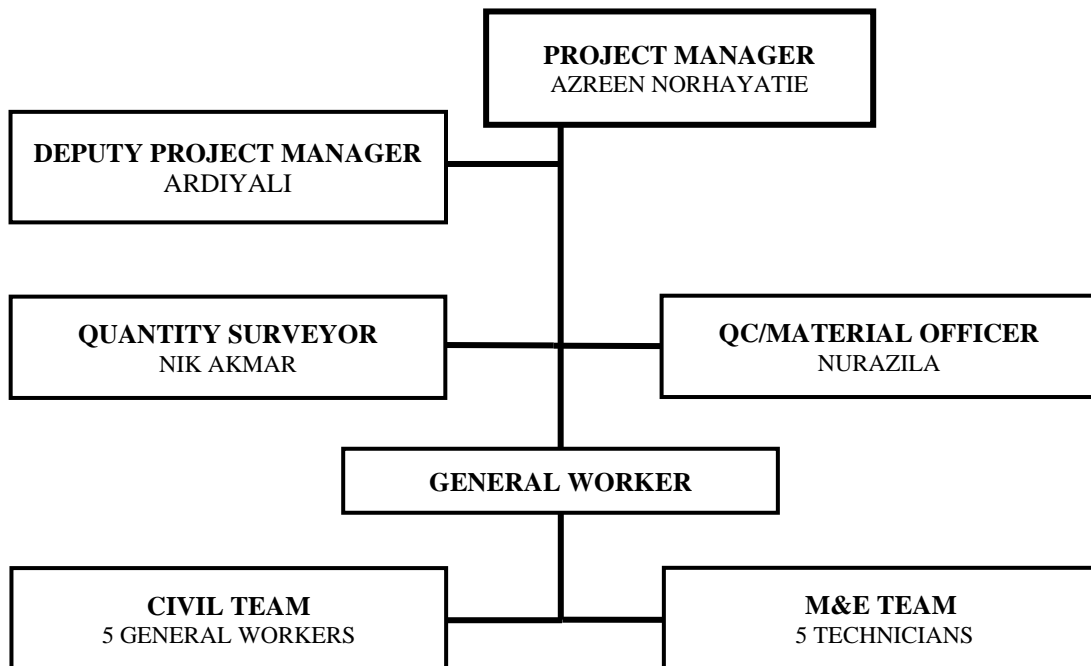


Figure 4: Site Organization Chart

Based on the contract, the project involves 3 parties which are the main contractor is Fadhlhin Engineering, the sub-contractor is ZR Bina Jaya Enterprise, and the owner is Malaysian Palm and Oil Board (MPOB). In the signed contract, it stated that the cost budget around RM 280,000.00 including provisional sums. The project delays because of the COVID-19 Pandemic. However, after the COVID-19 cases slowly decrease, the construction industries and the project can start with the preliminaries work.

3.1 To study the construction process of renovation work.

The renovation processes will start from the condition assessment. It is described as to get a detailed assessment of the condition of the building. From the inspection, the surveyor can provide building report which is to identifying essential repairs of further investigation needed. The report helps to identify the construction technique in terms of design, civil works, and mechanical works. By the time, the survey work gives attention to any specific issues appeared. The details survey needs to do and some preparation such as drawings need to remodel if requested.



Figure 5: Example of Ongoing Renovation Project

The renovation starts with the divert process of the existing items or equipment to others safe working place. The area needs to be emptied by users and other properties following the drawing before starting any renovation work. If the renovation required any demolition work, it is important to secure the surrounding area, the existing building condition, and the environment. For example, doors, windows, and corridor must be cover up with safety net or plastic. In terms of damaged property, the building and public liability insurance cover required to protect against damage, fire, and any danger due to construction work.



Figure 6: Example of Complete Renovation Project

There are a few lists of initial work that might include the renovation work. For example, securing the site, identifying for materials and plant storage, identifying the other available options if the site has restricted access, checking the existing services systems and other services connections, ensuring the water and electrical supply, identifying any work that required stabilize the structure, creating building weather-tight, demolition work required to strip the structure back, identifying and solving the problems appeared during the work progress, and treatment to any building defects.

3.1.1 Preliminaries



Figure 7: Site Inspection by main contractor, sub-contractor, and client

The preliminaries work is the first thing must be done when the letter of award has gotten. The preliminaries work contained job scope, insurance, shop drawing, Laws, Regulations and Requirements, limited workers, adjacent property, protection to existing buildings, damage to existing roads and buildings, protection to the public, materials sample, electric and water supply, and barrier wall.

The items below are more information regarding preliminaries work: -

1. Preparation of materials and tools
2. Preparation of manpower
3. Preparation of transportation
4. Preparation of water and electric supply
5. Insurance
6. Shop drawing
7. Protection to existing buildings, adjacent property and public

8. Preparation of documents

The preliminaries are one of the most important sections which state in the bill of quantities. The items include there describing the information of project, requirement, service, and facility that need to be prepared. As a result, the contractors can get all important details of construction project before they start working on it. Furthermore, the preliminaries state the goal or objectives of the project together with the completion date and budget. The preliminaries also help in planning stages of the project so that the project in a proper planning and reduce risk and problems in future.

Example Of Preliminaries Work



Figure 8: Site Location

NAME LIST OF SITE PERSONNEL		
BIL	NAME	POSITION
1	AZREEN NORHARYATIE BINTI AHMAD ZUNAI DI	PROJECT MANAGER (CIVIL)
2	MUHAMAD ARDIYALI BIN SALIM	DEPUTY PROJECT MANAGER (M&E)
3	MOHAMMAD HAZWAN BIN MOHAMED HANAFIAH	TECHNICIAN
4	DZIKRI AMIN BIN ROSMAYUDI	TECHNICIAN
5	AZAM BIN SHAFIE	TECHNICIAN
6	MUHAMMAD NAJMI BIN BASERI	TECHNICIAN
7	ROSLI BIN YUSOF	TECHNICIAN
8	SHAHJAHAN	GENERAL WORKER (CIVIL)
9	TOWHIDUL ISLAM	GENERAL WORKER (CIVIL)
10	AKTER HOSSAIN	GENERAL WORKER (CIVIL)
11	KOFIL UDDIN	GENERAL WORKER (CIVIL)
12	NASIR	GENERAL WORKER (CIVIL)

Table 3: List of Worker

LIST OF MACHINARRIES		
NO	ITEM	QUANTITY
1	HACKING MACHINE 1500W	2
2	HAMMER 1.5KG	2
3	SINGLE WHEEL TROLLEY	1
4	DRILL MACHINE	2
5	5 STEP LADDER	1
6	3 STEP LADDER	2
7	SPADE / SHOVEL	4

Table 4: List of Tools and Machinery

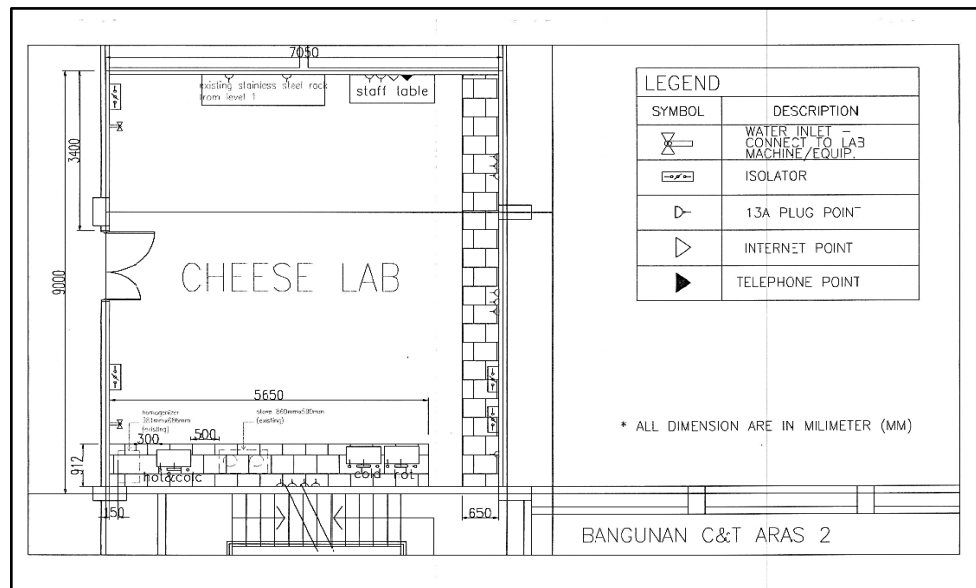


Figure 9: Layout of Cheese Lab

3.1.2 Civil Works

After the preliminaries had been done, the civil works and electrical works can start. Apart from that, there are a few disposals works. From the schedule of works, the work begins with the disposal works. The disposal works more focus on the old properties such as cabinets and lab bench. The existing of the old properties will be removed and disposed. The work process takes on about 5 days in planning and the actual site work is following the work schedule. In terms of workers, its used 3 workers to complete this work by using one hammer and one wheelbarrow. The old properties will be carried out into the Waste Disposal Bin (RORO Bin).

a) Process of Disposal Works

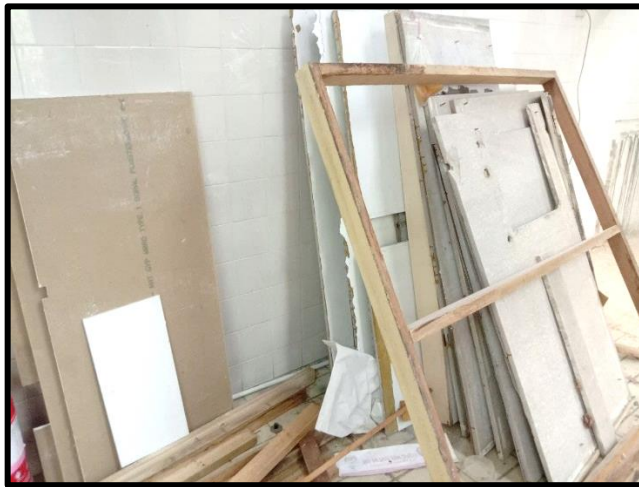


Figure 10: Example of Disposal Work

1. Choose the unwanted and unused furniture in the lab area
2. Demolish the old furniture, old lab bench, and exist wall partition including door using suitable tools
3. Bring up all the disposal materials to the outside of the lab using the special route that had been made for the worker.
4. Collect all the disposal materials and put in inside the RORO Bin
5. Repeat steps on the number 3 and 4 until all the disposal materials have been cleared.

After the disposal works had been done, the next work for civil works can start. According to the drawing specification, measuring works for the built of concrete bench need to be done first. The concrete bench built at different place, one at the right side of the door and one at the left side of the door. It was built using reinforcement steel (8mm) and concrete.

Before lean the concrete, the formwork needs to be build first following the length, width, and height specification. The Bill of Quantities list general but as requested by the client, the client requested to build up the concrete bench height is (900mm). The concrete bench built based on the standard method of concrete work. The concrete bench work starts with the measuring work, then continue with the formwork. The steel bar will be insert into the wall using driller as to create a structure of the concrete. The concrete mix is based on the mix of 4 materials which are cement, sand, aggregate and water. After the concrete is fully mix, the concrete can be poured in the formwork that had been made earlier. Pour slowly the concrete as to make sure the concrete has less bubble and fully fill the formwork.

The concrete bench takes 10 days to complete fully with accessories. In addition, the concrete bench builds up together with finishes which is black homogeneous tiles with the size of (600mm X 600mm) on top of the concrete bench. The below section of the concrete bench must be inserting the wooden cabinet. In terms of wooden cabinet design and material, the client can refer the catalog given by the fabricators. The wooden cabinet was customized for the door element, shelf level, and drawer compartment. However, before installing the finishes, there are some works need to fulfill. For example, pipe fittings and sink fittings need to be correct measured and installed. This is very important part because if the measurement of the fittings is wrong, the contractor cannot continue finishes work.

b) Process of Build Up Concrete Bench



Figure 11: Example of Concrete Bench

1. Measure the area for the place of concrete bench and mark the length and the width of the concrete bench area followed the drawing.
2. Clear the area surface of concrete bench from dirt and any others obstacle
3. Build up the formwork using the wood forms followed the shape that had been draw in the drawing. Attach forms to the stakes with nails. The formwork must in a good condition and must be checking if any leaking on the formwork.
4. After the formwork is ready, mixing the concrete materials (cement, sand, stone, water) in one safe area. The shovel use to mix the concrete smoothly and the wheelbarrow use to carry the concrete mix at the correct place.
5. After that, the steel bar needs to be insert in the formwork and working as reinforcement.
6. Pour the wet concrete into the formwork until the concrete reach the thickness level of concrete bench specifications.
7. After the pouring process, use a screed to screed the top of the concrete. The function of screeding is to help compacting and consolidate the concrete and begins on smoothing and levelling process.
8. To give the good and smooth surface, the worker must create a smooth surface and finish.
9. Let the concrete rest until the surface begins to firm up. Once the concrete hardens, clean up the surface using suitable broom.

After the concrete work is done, the finishes are ready to install including with wooden cabinet. Before the finishing work is done, the client must do a site inspection together with the project manager and site supervisor. The inspection must fulfill the specifications in the Bill of Quantities. The specifications include the area of the concrete bench, the size of the concrete bench. Once the client approved the concrete work, the finishing work can be done. The tiles finish type is homogeneous, and the size is (600mm x 600mm). The color, shape, and design are also approved by the client.

c) Process of Tiles Finishes Installation



Figure 12: Tiles Finishes Work Had Been Done

1. Preparing all the tools and materials needed before installing the tiles finishes.
2. Clean the surface of the area that need to place tiles finishes.
3. Calculate the area that need to install the tiles finishes.
4. Measure and marking the length of the tiles to get the perfect cutting
5. Use the lever to handle the tile and position it clearly
6. Use cutter to cut the marked area and cut the edges smoothly.
7. Lay tiles smoothly and carefully on the surface of the concrete bench based on the tile layout
8. Repeat step 4 to 7 to complete the tiles finishes installation process.

d) Process Of Wooden Cabinet Installation



Figure 13: The wooden cabinet installation work had been done

1. Checking and inspect each piece of cabinets to confirm received the correct products sizes, color, and design
2. Inspect the cabinets parts if it has any damage in terms of cabinet box, shelves, and doors
3. Before installing the cabinets, identify first any horizontal bumps in the wall and any vertical bumps in the wall
4. Place a mark on the wall which to marking the exact area to install the cabinets
5. Check the measurements for the space of the dishwasher, sink, and stove openings. Don't forget to check the cabinet doors in a proper access direction
6. Mark and label the position of each upper cabinet along the concrete bench
7. Double check the layout of the cabinets position and level
8. Locate the wall studs and set the ledger on the wall
9. Prepare all suitable tools and machinery for the installation process
10. Install and attach cabinets together following the guidebook
11. Adjust the position of the cabinets to check the alignment of the cabinets
12. After that, drill holes in the cabinets door of your handles and pulls.
13. Lastly, install finishing molding, crown, scribe, and toe kick.

After the civil works part had been complete, the client must inspect first the work that had been done. It is because to give the satisfaction and good looking for the client and user. Its also give the outlook of the defects work and any misplaced finishes.

3.1.3 Mechanical & Electrical Works



Figure 14: Sample of Mechanical and Electrical Work

Mechanical and Electrical Work (M&E) is one of the important works in renovation. It is because this part related to building services in the building. As well as improve the design of the lab, the building services must be checking first that have to make sure all the services can be use again or need to replace with new one. The Bill of Quantities stated the mechanical and electrical works have a few items. Some of the items are install lighting fitting, install isolator, install switch socket outlet, install telephone system, remove the unused switch socket outlet and wire. This part needs a few skilled workers to understand the status, the method statement of work, and the tools used. Below are the electrical services work stated in the Bill of Quantities: -

a. Fluorescent Lamp

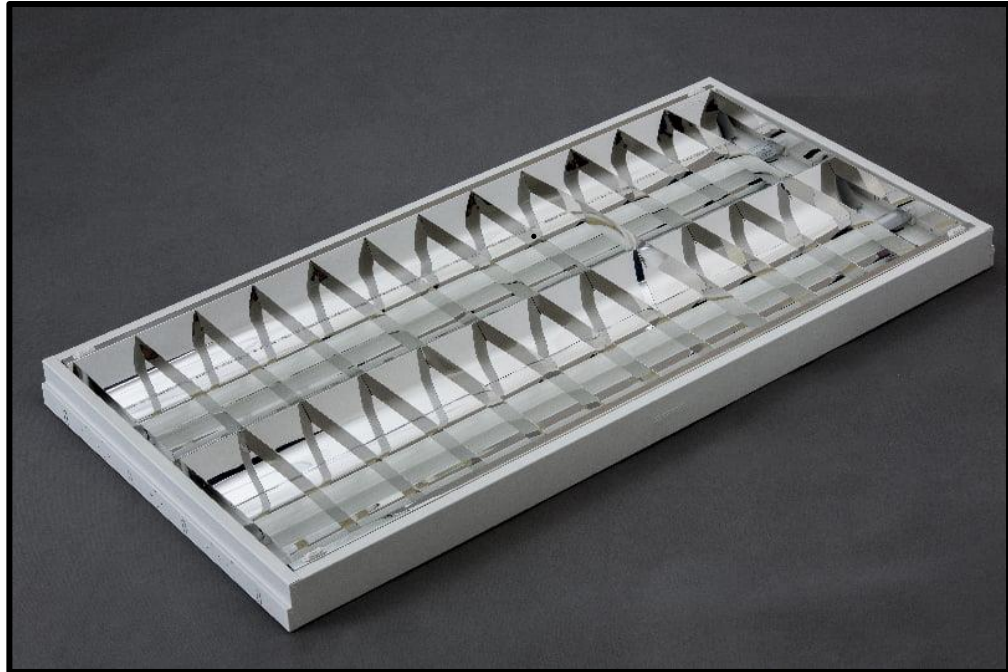


Figure 15: Fluorescent Lamp

To begin the work, there are a few requirements needed or fulfil. The first thing is to supply the correct material which is lamp set from the shop. Finding the correct material and deal with supplier on how much need the lamp set. As requested, the lamp material is 2 X 18-watt LED T8 fluorescent fitting size 2" X 4" and the type of lamp is metal reflector with switch fitting. All fluorescent luminaries must include with polyester resin filled low loss (6w) ballast, starter, power factor correction and tube. Lastly, the light point wiring need to be supply, deliver, and install a new one including switch for each lamp and using 1.5mm PVC cable in PVC conduit (conceal) in a ring circuit.

b. Emergency Lamp



Figure 16: Emergency Lamp

Emergency lamp installation work will be done after the fluorescent lamp had been installed. The new emergency lamp must be installed at the correct position based on the layout which is at top of the door.

c. Switch Socket Outlet (S/S/O)



Figure 17: Switch Socket Outlet

For the switch socket outlet, the contractor shall supply, deliver, and install the new 13 amps S/S/O point. As a precaution, before supply the products, the products must be available in the market and verified by the JKR, SIRIM, and Energy Commission. To install the switch socket outlet (S/S/O), make sure getting the material approval from the client as a confirmation.

d. Telephone System



Figure 18: Telephone Line / System

Telephone system is a phone system that comprises multiple telephones used in an interconnected fashion that allows for advanced telephony features. A phone system can up to a complex private branch exchange (PBX) system used by the lab. The installation of the telephone system is done indirectly together with switch socket outlet wiring installation. Furthermore, the phone systems can function over the Public Switched Telephone Network (PSTN) and over the Internet (VoIP). The specifications of the telephone system are using 0/63mm telephone cable in a conduit or trunking including RJ45 socket telephone and all the fittings must include to complete the system. The telephone socket including wiring that not been used must be removed smoothly. If the telephone socket can be use again, the socket can be installed at the suitable place, but if the socket is not using anymore, it must throw away.

e. Isolator



Figure 19: Isolator

Isolator is one of the components required in the mechanical and electrical work. Isolator can be known as a device used for isolating a circuit or equipment from a source of power. The device operated manually by the user to use it. In other meaning, the isolator function to cut out a portion of a substation when a fault occurred. The use of isolator speciality on the heavy machine. The contractor should supply, deliver, and install the new isolator type 32 amp/ 3 phase isolator point using 6mm X 5 cables in a PVC conduit (exposed) which completely connect from the Distribution Board (DB). This type of isolator total is 3 set. Apart from that, another isolator set need to be install as per requirements, the isolator set type is 63 amp / 3 phase isolator point using 6mm X 5 PVC cable in a PVC conduit (exposed) including commando plug unit / fitting and other accessories that completely from the Distribution Board.

f. Cable and Distribution Board

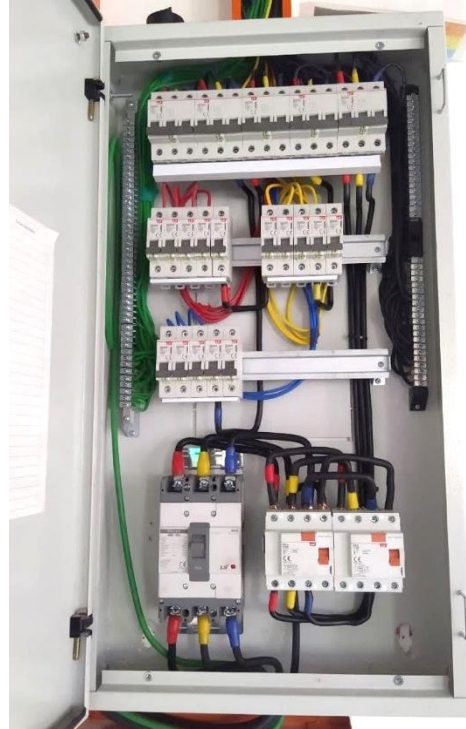


Figure 20: Distribution Board

The distribution board is a component of an electricity supply system that divides an electrical power feed into subsidiary circuits while providing protective fuse for each circuit in a common enclosure. For the distribution board work, it has a special work which is supply, deliver and install a new distribution board in main switch board in the electric room (100 Amp/ 3 phase MCCB (50KA), New Distribution Board, Neutral Bar, Earthing).

Next, the contractor should supply, deliver, and install PVC cable 25mm/5 core (R, Y, B, N, E) in the trunking including others work that can complete others wiring system. For the continues work, the PVC cable type 35mm/4 core and 25mm/1 core must be lay in the trunking which connect from the existing busbar to the Distribution Board include others work.

After all the mechanical and electrical work had been done, the next process is testing and commissioning all the services installed that have been installed. The purposes are to identify any error M&E work in terms of installation process and errors in connection.

3.2 To identify the equipment and plant involve in renovation

Tools and equipment are the important things in renovation process. Both things help a lot in the work progress to decrease the duration time and fastened the work. Some of the works need a large tools or equipment and it called plant and machineries. The work progress become faster than hand tools when using machineries. To explain the function or purposes of the tools and equipment, every single equipment has its own function and procedure to use.

In this lab renovation, there are some tools and equipment used for some works:

1. Shovel



Figure 21: Shovel

This tool used to dig commonly soil as well as granular materials such as dirt, gravel, grain, and others from one place to another place. Sometimes this tool used to dig holes or trenches. In this project, the shovel used to lift materials (cement, sand, aggregate, soil)

2. Heavy Duty Bucket Pail



Figure 22: Bucket

This bucket usually made from PVC material. The function of this tool which is to carrying water or any small particle materials (sand, cement, aggregate) to another place needed.

3. Cone



Figure 23: Cone

This tool used to tell everyone or surrounding on nearby that safety hazards are present. The hazards often associated with construction sites or any project that on progress. In other words, the safety cones tell public to be aware nearby the cones.

4. Barricade Tape



Figure 24: Barricade Tape

The barricade tape also can be called as brightly colored tape which incorporating a two-tone pattern of alternating red-white stripes. The barricade tape also displays the words 'CAUTION' or 'DANGER'. The used of this tape is to warn or catch the attention of passerby of an area of the construction work. This will help passerby to be aware of possible hazards can happen.

5. Roll-On Roll-Off (RORO) Bin



Figure 25: RORO Bin

The RORO Bin is a large open-topped waster container. It is designed together with special lorry that can easy loading the RORO Bin. The bin will be put at one safe place that easy to access by worker and lorry. The container can be used for disposing of large quantities of bulky waste. For example, construction work or demolition work.

6. Canvas Sheet Roll



Figure 26: Canvas Sheet Roll

The canvas sheet roll highly available in market. The canvas sheet roll comes in different size and different color. The canvas color commonly comes in blue and white color or blue and orange. The use of the canvas is used on work sites as cover for building materials and equipment and it's also cover along the way of renovation walkway. The canvas is good because of its waterproof condition and lightweight material.

7. Steel Tape Measure

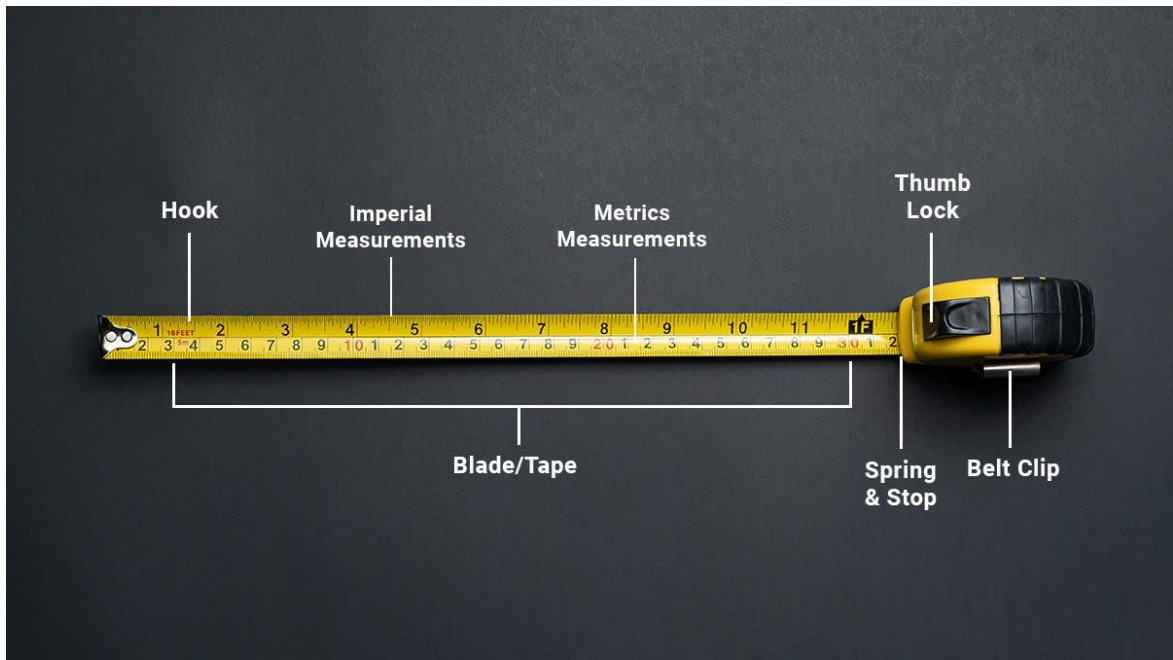


Figure 27: Measuring Tape

The steel tape measure is a flexible ruler and used to measure distance. The tape measure completely with linear-measurement markings, pocket protective case, stopper button, belt clip, end hook and hand stripe. The design allows for a measure of great length to be easily carried in pocket as its small.

8. Ladder



Figure 28: Ladder

A ladder is a vertical set of steps. The ladder is made from aluminum material and the maximum height is 2m. The function of ladder is allowing vertical access to a higher level from a lower level. Apart from that, the ladder is helpful when installing electrical fittings (lamp, fan, socket, air-conditioner indoor unit and others).

9. Paint Roller



Figure 29: Paint Roller

A paint roller is a paint tool used for painting large surfaces rapidly. The paint roller consists of a roller cover which work as absorbs the paint and transfers it to the roller cover. While the roller frame attaches to the roller cover. There is a handle section at the roller which is used by the painter to handle it. The handle section can be added long handle for the use of height surfaces. The roller cover is a cylindrical core with a pile fabric. The roller frame can be reused but the roller covers usually disposed after use.

10. Hammer



Figure 30: Hammer

Hammer is a basic hand tool casually used to knock or drive nails into wood. Sometimes it can be used for shaping metal or can use to crush rock. The back side of the hammer which is to remove any unused nails or damaged nails.

11. Glove



Figure 31: Glove

Glove can be defined as personal protective equipment worn during work projects that cover and protect the hands from the wrist to the fingers. It is used to safe the user's hand and fingers from any unnecessary wounds. The glove will be wearing every time when doing works at site.

12. Safety Shoes



Figure 32: Safety Shoes

The safety shoes are the same as glove which function as personal protective equipment worn during work projects that cover or protect feet from foot injuries and prevent exhaustion. The safety shoes usually wear by the general workers that are exposed to hazards or danger. Furthermore, any authorities or anyone who related to projects must be worn safety shoes as a safety equipment.

13. Trowel



Figure 33: Trowel

Trowel is a hand tool that used for digging, applying, smoothing, or moving small amounts of viscous material. The type of trowel used in construction call as masonry trowel. This hand tool is very useful for worker when doing bricklaying work.

13. Hand Drill Machine



Figure 34: Portable Hand Drill Machine

Drill is defined as a machine which is used to make a circular hole. In other words, the tool used to drill the holes of different size and other related operations using drill bit. The drill machine is very important to general worker as its fast the work process and less use of energy.

All tools and machinery are very important in lab renovation because its give big impact and many benefits to all parties including general worker, project manager and client satisfaction. Not just by that, the tools and machinery will be more convenient nowadays and easy to handle.

3.3 To understand the problems during the renovation work

In this project, several problems occur during the work progress. The problems appeared suddenly and cannot be expected early before the project start. It can happen anytime either site work problems or management problems. Project managers are tasked to keep the site running smoothly, safely, within schedule and on budget. This is the big challenge for the project managers to handle it.

3.3.1 Lack of Document Preparation

Based on the project, the first problem is the document preparation. In terms of document preparation, the list of documents that need to be prepare is a lot. The document preparation has its own due date to give the complete progress for the project.



Figure 35: Document Signed

Below is the list of documents that the contractor must prepare: -

Project Documentation

1. Letter of Award
2. Levy Form of CIDB
3. Performance Bond
4. Social Security Organisation (PERKESO)
5. Project Costing
6. Interim Payment Certificate (including invoice to client)
7. Quotation or Purchase Order from Suppliers
8. Invoice
9. Minute of Meeting
10. Incoming and Outgoing Mail

Project Progress File

1. Schedule of Work
2. List of Drawing
3. Monthly Report
4. Material Approval Form
5. Site Diary

6. Inspection Form
7. Request For Inspection
8. Notice of defect delivery
9. Inspection Test Plan
10. Site Request Information Form
11. Site Request Information Register
12. Concession / Waiver Form
13. Non-Conformance Products & Services

The project manager will responsibility for all of this document preparation. If the document does not prepare well, it will cause the delay of the project and not running smoothly. Therefore, the project manager working hard to prepare the document needed so that the project can avoid delay in terms of document preparation.

3.3.2 Change in Design of Lab

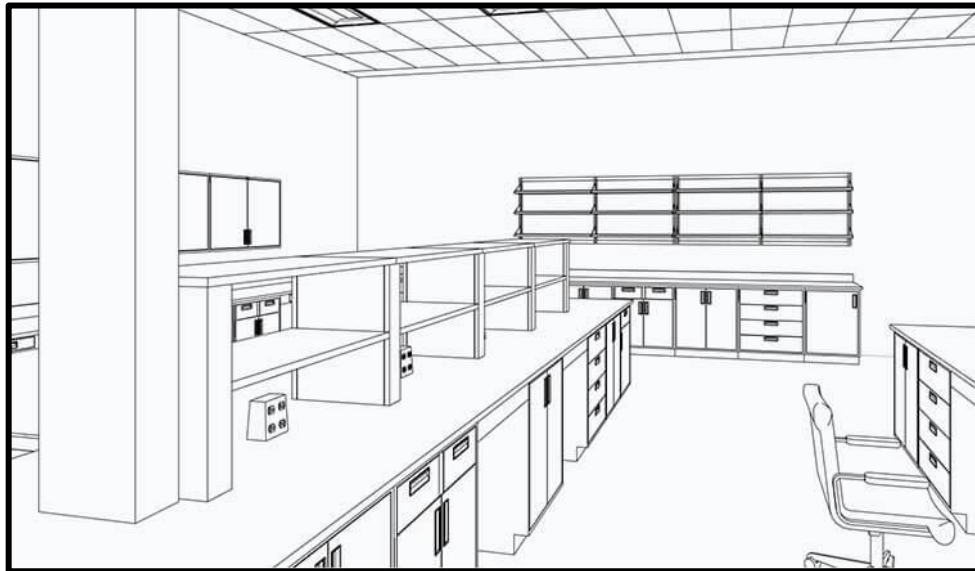


Figure 36: Sample Design of Lab Renovation

Next, the problem is the design of the lab is changes differently from the exact drawing. Before renovation start, the design and the drawing were prepared earlier, but

there are some requests in terms of design from the client and accept by the contractor. At first, it will not be easy for the contractor to do the request from the client because of some problems appeared if the design change. Therefore, client and contractor agreed to change the design as long as the cost not over than in the contract and less material waste. The action was taken by both parties to achieve the design that was request during the progress. Besides that, colour of wall, colour of the cabinet, and colour of tiles also was selected by the client. From the original drawing, the design changed a lot but still remain the same cost.

3.3.3 Material Chosen Approval



Figure 37: Sample of Material

In addition, the material chosen for the finishes and others turned from the original material. The material request is not the same as stated in the Bill of Quantities. For example, the client request to build concrete bench using clay brick instead of sand brick. The clay brick will spend high cost better than the sand brick. The cost of the brick can be reducing by buying the cheap material. The material chosen is very important estimate the

costing of the project. So, the correct material is very important when choosing the right material instead of wrong material and expensive.

3.3.4 The duration of the project become slower

When the above problems appeared, the next problem will come out which is the duration of the project. The estimate of the project complete is within 3 months, but the reality or the outcome is not the same as the estimate time. The duration of work change drastically depends on several factor. Based on the observation, the project overcome many problems during the planning stage, design stage, and construction stage. For example, unclear customer requirements, inappropriate design, vague information, careless measurements, additional works, not fulfil the specifications, and material prices increase. From the overview of the project, there are so many problems that can extend the project duration. Sometimes it may be the fault of the client and some it may be the fault of the contractor. Both parties avoid the duration of the project because it can loss both parties.



Figure 38: Costing of Project

3.3.5 The costing spends on the materials

Based on the statement above, the costing of the renovation also increase. It is because the factor that can affect the cost of the project. The costing of the project basically comes from many sources and factors. As a safety precaution, the costing was predicted or estimated by the quantity surveyor earlier before the renovation work start. The client really wants to choose the best quality of any products and the contractor really want to choose cheap products and quality products for the client satisfaction. The outcome for this action gives more benefits and profits all parties.

3.3.6 Additional Work Request from The Client

Based on the contract, the items in the BQ stated only for a few works including demolish and inserting furniture. However, the client request to add some additional work such as hacking and painting. For the additional work, it must have an agreement of contractor, sub-contractor, and client. For example, hacking existing finishes and replace new finishing that does not include in Bill of Quantities. In this case, the additional work will be insert as the provisional sums. But the provisional sums have its own limit which state there in the Bill of Quantities. For example, in this case the provisional sums limit is RM 30,000.00.

3.3.7 Less prepared of Safety Equipment

Last but not least, all the works must be done with safety equipment and does not endanger the public. All the works must be supervised by the supervisor. The site safety supervisor as a person who technically inspect all the site works done in a safety place. Public must be aware of the renovation work where the safety sign notice. Wearing safety helmet, safety gloves, and safety boots to gives a perfect safety to general workers.

4.0 CONCLUSION

As a conclusion, renovation work is not easy as expected before. Renovation work give more beautiful result. Beautiful result needs a good skilled worker and management. By going through this project, slowly but surely learning on the definition of the renovation as well as objectives of the renovation project. Besides that, the process of renovation work needs a complex method as to study the existing building design and services. Without any touch to the existing building, the challenges increase to the contractor. To help more on the process of renovation work, the tools and machinery were needs in faster the work in terms of civil, mechanical, and electrical work. The function of tools gives the benefits on costing, duration, and work method. Along the construction, there will have many problems that appeared as it gives the big challenges to project manager to solve it. However, the renovation work emphasizes the details work interior and perfect connection from the existing building design.

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