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Study of Electrical System Analysis of Instructor Dormitory Type 54 of West Sumatera Shipping Polytechnic

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Abstract: Electrical installation is a vital component in supporting the function and operation of a building, especially in residential facilities such as dormitories. Installations that do not meet standards can cause various problems such as power outages, overloading, and potential fire hazards. This study aims to analyze the electrical system in the Type 54 Dormitory Instructor of the West Sumatra Shipping Polytechnic based on the Indonesian National Standard (SNI) and General Requirements for Electrical Installations (PUIL) 2011. The results of the analysis show that the total installed power is 106,992 Watts using a 3-phase MCCB 224-320A with an incoming cable size from LVMDP NYY 4 x 120 mm². The incoming electrical power from PLN is 82.5 kVA (125A). DP.PLT 1 total load is 35,664 Watts using a 3-phase MCCB 100A with a cable size of NYY 4 x 25 mm². DP.PLT 2 total load of 35,664 Watts using 3-phase 100A MCCB with NYY cable size 4 x 25 mm². DP.PLT 3 total load of 35,664 Watts using 3-phase 100A MCCB with NYY cable size 4 x 25 mm². Although the installation has been running, the results of the study show that the electrical system has not fully met the criteria for reliability, safety, and energy efficiency. Therefore, evaluation and improvement of the system are needed to ensure safe and sustainable operational continuity.

Keywords: Electrical installation, electrical system, dormitory, PUIL 2011, safety rating, lighting intensity, BTUH.

INTRODUCTION

An electrical installation is a very basic thing of a building that has reliable electricity is the main requirement, the most important thing in a building is its electrical installation, all electrical calculations such as the number of cables, the number of light points, power distribution must be clear and reliable. Electrical installation is a very basic thing of a residential building or other buildings, so that the building can become a building that has the function as we want. installation of electrical installations must also be considered so that in its use later it does not endanger its users. Therefore, the installation of electrical installations must be really considered and must be in accordance with existing standards. In Indonesia itself, the design of electrical installations has been regulated in the General Requirements for Electrical Installations (PUIL) in 2011. In these regulations, it has been clearly regulated how to install electrical installations properly and correctly, the Indonesian National Standard (SNI) and does not pay attention to the provisions of security and modern technology and also aesthetic beauty.

The electrical system is a vital part of the operation of a building, including in residential facilities such as dormitories or dormitories. The West Sumatra Maritime Polytechnic has several dormitory facilities for students and employees who need a reliable, efficient, and safe electrical system. However, problems such as blackouts, overloading, or even potential fire hazards due to improper electrical installations are often found. Therefore, it is important to conduct an electrical system analysis study to assess the reliability and safety of the existing system, as well as identify potential improvements.

The author will conduct an analysis of the building's electrical system in accordance with the Indonesian National Standard (SNI) and also the General Requirements for Electrical Installations (PUIL). In relation to the multi-storey building already having an existing installation, the author raises a thesis entitled "STUDY OF ELECTRICAL SYSTEM ANALYSIS OF INSTRUCTOR DORMITORY TYPE 54 POLYTECHNIC PELAYARAN SUMATERA BARAT" which this analysis can be useful for multi-storey buildings and the occupants concerned to find out in terms of security and other electrical systems.

METHOD

The type of research conducted is a quantitative type of data collection by calculating the number of lights and sockets, capacity and number of ACs in a room, aiming to describe the analysis of the electrical system in the Instructor Dormitory Type 54 of the West Sumatra Maritime Polytechnic. The object of this research is the electrical system in the building, taking into account the specifications of the number of lighting lamps, AC capacity, sockets, MCB, MCCB, input power capacity (TDL) and recapitulation of electrical installations in a room. The research was conducted at the West Sumatra Maritime Polytechnic located on Jalan Syeh Burhanuddin Number 1, Padang Pariaman Regency, West Sumatra Province 25572.

The steps of this research are as follows:

1. Literature study, which is a way of examining, exploring, and reviewing theorems that support the solution of the problem being studied. These theorems are obtained from scientific journals, previous research results, and from reference books that support this research. In addition, literature studies are conducted to obtain the desired data.
2. Observation, namely collecting data needed for research obtained such as: room size and room function, placement of electronic equipment (load) and type of air conditioning (BTUH).
3. Discussion, namely conducting consultations and guidance with the supervising lecturer. Analysis, namely calculating the total load of each piece of equipment used in the room.

Data Analysis Techniques

The electricity source comes from PT. PLN (Persero) electricity with 3-phase electricity, through the main panel (MDP) and distributed through the SDP panel on each floor (Rivai 2022).

Calculation of Lighting Intensity

Illumination Intensity Formula

$$N = \frac{E \times A}{\emptyset \times \eta} \quad (1)$$

Where:

N = Number of light installation points

E = Lighting intensity according to the standard in the table, in lux units.

A = Area of the room.
η = Efficiency (0.8)
Ø = Luminous Flux (lumens).

Safety Current Rating

To be able to determine the safety current rating, we must first calculate the nominal current flowing in the circuit. The safety current rating, for lighting installations is greater than or equal to the nominal current (Budiawan Hendratno & Rahmad 2020).

To find the safety setting, we must first determine the nominal current (ln) flowing through the load:

Safety Current Rating Formula

$$In = \frac{P}{\sqrt{3} \times v \cos\varphi} \quad (2)$$

IRating Formula

$$Irating = k \times i \quad (3)$$

Where:

IRating = Rated current of the protective device (Ampere)
I = Normal load current or working current (Ampere)
K = Safety factor, usually the value is 1.25

Safety current setting requirements:

1. There is no safety element that disconnects the circuit during normal conditions.
2. If a fault occurs, the safety device that must operate is the one closest to the fault point, while the circuit that is not affected by the fault must still be able to operate.
3. If the nearest protection from the fault point cannot work, then the protective protection must work.

Air Conditioning Calculation

To be able to determine the air conditioning calculation based on the air conditioning capacity (BTUH) in a room, we can use the following formula:

BTUH Formula

$$BTUH = 500 \; xpxl \quad (3.)$$

Where:

P = Length (m)
l = Width (m)
500 = Standard BTUH value
1 PK = 736 watt

RESULTS AND DISCUSSION

Calculation of Lighting Intensity

In determining the lighting intensity of a room, data is needed, room size, type of lamp based on light flux and 80% efficiency, then it can be determined as follows:

Calculation of Lighting Intensity

DL 1 x 18 watts = 8 units x 1200 Im = 9600 Im

Luminous Flux = 9600 Im, area 54 (m^2)

Illumination Intensity Formula:

$$N = \frac{E \times A}{\emptyset \times \eta}$$

So:

$$E = \frac{N \times \emptyset \times \eta}{A} = \frac{8 \times 1200 \times 0{,}8}{54} = 142 \text{luxury}$$

Based on the standard light intensity of 100 lux.

Based on the previous calculation method, the lighting intensity in other rooms is obtained as in tables as follows:

Table 1. Results of calculating the lighting intensity of the 1st floor

No	Room	Size (m²)	Luminous Flux (Im)	Number of lights	Lighting intensity (luxury)
1	Flat 1	54	9,600	8	142
2	Flat 2	54	9,600	8	142
3	Flat 3	54	9,600	8	142
4	Flat 4	54	9,600	8	142
5	Flat 5	54	9,600	8	142
6	Flat 6	54	9,600	8	142
7	Flat 7	54	9,600	8	142
8	Flat 8	54	9,600	8	142
9	Flat 9	54	9,600	8	142
10	Flat 10	54	9,600	8	142
11	Corridor	162	10,400	8	51

Table 2. Results of calculating the lighting intensity of the 2nd floor

No	Room	Size (m²)	Luminous Flux (Im)	Number of lights	Lighting intensity (luxury)
1	Flat 1	54	9,600	8	142
2	Flat 2	54	9,600	8	142
3	Flat 3	54	9,600	8	142
4	Flat 4	54	9,600	8	142
5	Flat 5	54	9,600	8	142
6	Flat 6	54	9,600	8	142
7	Flat 7	54	9,600	8	142
8	Flat 8	54	9,600	8	142
9	Flat 9	54	9,600	8	142
10	Flat 10	54	9,600	8	142
11	Corridor	162	10,400	8	51

Table 3. Results of calculating the lighting intensity of the 3rd floor

No	Room	Size (m²)	Luminous Flux (Im)	Number of lights	Lighting intensity (luxury)
1	Flat 1	54	9,600	8	142
2	Flat 2	54	9,600	8	142
3	Flat 3	54	9,600	8	142
4	Flat 4	54	9,600	8	142
5	Flat 5	54	9,600	8	142
6	Flat 6	54	9,600	8	142
7	Flat 7	54	9,600	8	142
8	Flat 8	54	9,600	8	142
9	Flat 9	54	9,600	8	142
10	Flat 10	54	9,600	8	142
11	Corridor	162	10,400	8	51

Air Conditioning Calculation

Air conditioning calculation is the process of determining the needs of a Heating, Ventilation, and Air Conditioning (HVAC) system to create thermal comfort and indoor air quality. This process includes calculating cooling loads (sensible and latent), heating loads, and ventilation requirements, taking into account factors such as heat from the sun, equipment, lights, people, and outside air. The results of the calculations are used to determine the appropriate air conditioning capacity, usually in BTU/h or kW, so that the system operates efficiently and meets standards such as ASHRAE.

In the study, the air conditioning (AC) used was a split AC. Based on the equation of air conditioning capacity (BTUH) in a room is:

Flat 1 (3 Rooms)

Room size 1 = 4 x 3 = 12 m²
Room size 2 = 4 x 3 = 12 m²
Room size 3 = 5 x 6 = 30 m²

Air Conditioning Calculation

$$BTUH = 500 \ x \ P \ x \ I$$

Total room area = 54 m²
BTUH of room 1 = 4 x 3 x 500 = 6000 BTUH
BTUH room 2 = 4 x 3 x 500 = 6000 BTUH
BTUH room 3 = 5 x 6 x 500 = 15000 BTUH
The AC used in rooms 1 and 2 is ¾ PK (7000) BTUH
The AC used in room 3 is 1.5 PK (12000) BTUH
P1 = 0.75 PK x 736 = 552 Watt
P2 = 0.75 PK x 736 = 552 Watt
P3 = 1.5 PK x 736 = 1,104 Watts
P total = 2,208 Watts

Based on the results of the air conditioning calculations above, the air conditioning system used is a split type AC for three rooms in Flat 1 with a total area of 54 m². The cooling capacity is calculated using the formula BTUH = 500 × length × width of the room, so that the needs of each room are obtained: rooms 1 and 2 are 6,000 BTUH, and room 3 is 15,000 BTUH. The AC used in rooms 1 and 2 each has a capacity of ¾ PK or equivalent to 7,000 BTUH, and room 3 uses an AC with a capacity of 1.5 PK or 12,000 BTUH. The electrical power (P) of each unit is calculated based on the conversion of 1 PK = 736 Watts, so that the power is obtained: 552 Watts for each ¾ PK AC and 1,104 Watts for a 1.5 PK AC. The total power consumption of all AC units is 2,208 Watts. These results show that the selection of AC capacity is quite close to the cooling load requirements of each room, although there is still a slight difference between the requirements and the available capacity.

In the same way as before to determine the cooling capacity (BTUH) for other rooms, the results obtained are as in tables as follows:

Table 4. Results of calculating the cooling capacity (BTUH) of the 1st floor AC

No	Room	Area (m²)	air conditioning (PK)	BTUH	Power (Watt)
1	Flat 1 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
2	Flat 2 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
3	Flat 3 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
4	Flat 4 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
5	Flat 5 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
6	Flat 6	54	3 AC (¾, ¾ and 1.5)	27,000	2.208

No	Room	Area (m²)	air conditioning (PK)	BTUH	Power (Watt)
	(3 Rooms)				
7	Flat 7 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
8	Flat 8 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
9	Flat 9 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
10	Flat 10 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
TOTAL AC FLOOR 1					22,080 W

Table 5. Results of calculating the cooling capacity (BTUH) of the 2nd floor AC

No	Room	Area (m²)	air conditioning (PK)	BTUH	Power (Watt)
1	Flat 1 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
2	Flat 2 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
3	Flat 3 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
4	Flat 4 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
5	Flat 5 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
6	Flat 6 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
7	Flat 7 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
8	Flat 8 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
9	Flat 9 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
10	Flat 10 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
TOTAL AC FLOOR 2					22,080 W

Table 6. Results of calculating the cooling capacity (BTUH) of the 3rd floor AC

No	Room	Area (m²)	air conditioning (PK)	BTUH	Power (Watt)
1	Flat 1 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
2	Flat 2 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
3	Flat 3 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
4	Flat 4 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
5	Flat 5 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
6	Flat 6 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
7	Flat 7 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
8	Flat 8 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
9	Flat 9	54	3 AC (¾, ¾ and 1.5)	27,000	2.208

	(3 Rooms)				
10	Flat 10 (3 Rooms)	54	3 AC (¾, ¾ and 1.5)	27,000	2.208
TOTAL AC FLOOR 3					22,080 W
SUB TOTAL AC FLOOR 1, 2 & 3					66,240 W

Based on the calculation results using the BTUH equation in each room, the total number of indoor AC units installed on floors 1, 2, and 3 is 30 points. Of that number, the total power load required to operate the entire air conditioning system reaches 66,240 Watts. This shows that the cooling system used has been designed to cover all room cooling needs on all three floors.

Electrical System Calculation

Based on the calculation results, the distribution of the electrical system for each panel can be planned.

1) First floor lighting panel (DP-1) Total lighting usage for floor 1 group 1 is 3,552 Watts.

Electrical System Calculation

$$I = \frac{P}{V\ x \cos \emptyset} = \frac{3.552}{220\ x\ 0,8} = 20,1\ A$$

I ratting = (1.25 x 20.1) = 25.12 A.

So the safety device used is MCB 1P 25 A. Using the calculation method as above, the results obtained are as in tables asfollowing:

Table 7. Distribution of recapitulation of electrical installation loads on floor 1

No	Group	Burden	Total load	Power (W)	Current (A)	MCB (A)
1	1	Flat 1 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	 a. 8 b. 6 c. 3	3,552	20.1	25
2	2	Flat 2 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	 a. 8 b. 6 c. 3	3,552	20.1	25
3	3	Flat 3 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	 a. 8 b. 6 c. 3	3,552	20.1	25
4	4	Flat 4 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	 a. 8 b. 6 c. 3	3,552	20.1	25
5	5	Flat 5 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	 a. 8 b. 6 c. 3	3,552	20.1	25
6	6	Flat 6 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	 a. 8 b. 6 c. 3	3,552	20.1	25
7	7	Flat 7 a. DL 18 Watt b. Electric socket	 a. 8 b. 6	3,552	20.1	25

No	Group	Burden	Total load	Power (W)	Current (A)	MCB (A)
		c. Split AC ¾, ¾ and 1.5PK	c. 3			
8	8	Flat 8 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
9	9	Flat 9 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
10	10	Flat 10 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
11	11	Corridor DL TL Philips 1x 18 watt	8	144	0.8	2
TOTAL POWER DP 1						35,664 W
						44,580 VA

Table 8. Distribution of recapitulation of electrical installation loads on the 2nd floor

No	Group	Burden	Total load	Power (W)	Current (A)	MCB (A)
1	1	Flat 1 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
2	2	Flat 2 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
3	3	Flat 3 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
4	4	Flat 4 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
5	5	Flat 5 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
6	6	Flat 6 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
7	7	Flat 7 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
8	8	Flat 8 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
9	9	Flat 9 a. DL 18 Watt b. Electric socket	a. 8 b. 6	3,552	20.1	25

No	Group	Burden	Total load	Power (W)	Current (A)	MCB (A)
		c. Split AC ¾, ¾ and 1.5PK	c. 3			
10	10	Flat 10 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
11	11	Corridor DL TL Philips 1x 18 watt	8	144	0.8	2
TOTAL POWER DP 2						35,664 W
						44,580 VA

Table 9. Distribution of recapitulation of electrical installation loads on floor 3

No	Group	Burden	Total load	Power (W)	Current (A)	MCB (A)
1	1	Flat 1 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
2	2	Flat 2 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
3	3	Flat 3 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
4	4	Flat 4 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
5	5	Flat 5 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
6	6	Flat 6 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
7	7	Flat 7 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
8	8	Flat 8 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
9	9	Flat 9 a. DL 18 Watt	a. 8	3,552	20.1	25

No	Group	Burden	Total load	Power (W)	Current (A)	MCB (A)
		b. Electric socket c. Split AC ¾, ¾ and 1.5PK	b. 6 c. 3			
10	10	Flat 10 a. DL 18 Watt b. Electric socket c. Split AC ¾, ¾ and 1.5PK	a. 8 b. 6 c. 3	3,552	20.1	25
11	11	Corridor DL TL Philips 1x 18 watt	8	144	0.8	2
TOTAL POWER DP 1						35,664 W
						44,580 VA
SUB TOTAL POWER DP 1, DP 2 AND DP 3						106,992 W
						133,740 VA

Analysis

Based on the calculation results, on each panel, DP P.LT 1 = 35,664 Watts, DP P.LT 2 = 35,664 Watts and DP P.LT 2 = 35,664 Watts, so the total installed load is 106,992 Watts, for the total current as follows:

DP Calculation. P.LT 1

I total power = 35,664 watts

$$I = \frac{P}{\sqrt{3}\, x\, V\, x\, Cos\emptyset} = \frac{35.664}{1,732\, x\, 380\, x\, 0,8} = 67,7\ A$$

Rating current = 1.25 x 67.7 = 84.6 A

So the safety device used is MCCB 3P 100A using NYY 4 x 25 mm² cable.

DP Calculation. P.LT 2

I total power = 35,664 watts

$$I = \frac{P}{\sqrt{3}\, x\, V\, x\, Cos\emptyset} = \frac{35.664}{1,732\, x\, 380\, x\, 0,8} = 67,7\ A$$

Rating current = 1.25 x 67.7 = 84.6 A

So the safety device used is MCCB 3P 100A using NYY 4 x 25 mm² cable.

DP Calculation. P.LT 3

I total power = 35,664 watts

$$I = \frac{P}{\sqrt{3}\, x\, V\, x\, Cos\emptyset} = \frac{35.664}{1,732\, x\, 380\, x\, 0,8} = 67,7\ A$$

Rating current = 1.25 x 67.7 = 84.6 A.

So the safety device used is MCCB 3P 100A using NYY 4 x 25 mm² cable.

Based on the calculation results on each panel DP. P.LT 1 = 35,664 watts, DP. P.LT 2 = 35,664 watts, and DP. P.LT 3 = 35,664 watts. So the total load is 106,992 watts.

$$I = \frac{P}{\sqrt{3}\, x\, V\, x\, Cos\emptyset} = \frac{106.992}{1,732\, x\, 380\, x\, 0,8} = 203,2\ A$$

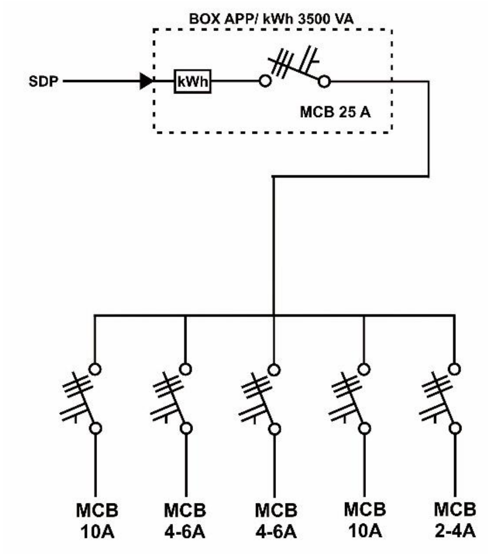
Rating current = 1.25 x 203.2 = 254 A.

So the safety device used is MCCB 3P 224-320A, with the cable size used being NYY 4 x 120 mm².

PLN's input power based on the basic electricity tariff is a total power of 106,992 Watts or . If LF (Load Factor) is taken from 60% then, 133,740 x 0.6 for power is 80,244 VA. Based on TDL is 82,500 VA (125A).$\frac{106.992}{0,8} = 133.740\ VA$

After we conducted calculations and analysis in the field, unexpected results were found in the data taken (existing) of the Flat Instructor Dormitory Type 54 building of the West Sumatra Maritime Polytechnic, including:

1. After calculating the total load on each DP P.LT 1, DP P.LT 2 and DP P.LT 3, it was found that the installation of the main protection (MCCB) 3P 420-600A with NYY 4 cable (1cx185 mm²) was inefficient. After calculating, it should be sufficient to use the main protection (MCCB) 224-320A with cableNYY 4 x 120mm².
2. After calculating the safety current rating (MCCB) for each DP P.LT 1, DP P.LT 2 and DP P.LT 3, it was found that the installation of the safety (MCCB) on each DP was inefficient, namely 160A with a 4 x 70 mm² NYY cable. After calculating, it should be sufficient to use a safety (MCCB) on each DP, namely 100A with a cableNYY 4 x 25mm².
3. On each APP/KWh meter in the flat, no safety device is installed, a 25A safety device (MCB) should be installed with a 3 x 2.5 mm² NYY cable according to the calculation results.
4. The installation of safety devices on a ¾ PK AC installation in a flat does not comply with the standard calculation of a 10A safety current (MCB), it should be sufficient to install a 4-6A safety device (MCB) with a 3 x 1.5 mm² NYM cable.
5. The installation of safety devices on flat socket installations does not comply with the standard calculation of 6A safety current (MCB), a 10A safety device (MCB) should be installed with a 3 x 1.5 mm² NYM cable.
6. The installation of protection on the flat lighting installation does not comply with the standard calculation of the 6A protection current (MCB), it should be sufficient to install a 2-4A protection (MCB) with a 2 x 1.5 mm² NYM cable.
7. The lighting intensity on each floor corridor does not meet the standard of 51 lux, it should meet the mandatory standard of 100 lux.



MCB	Beban	Daya
MCB 10A	AC 1,5 PK 1 unit	1104 Watt
MCB 4-6A	AC 3/4 PK 1 unit	552 Watt
MCB 4-6A	AC 3/4 PK 1 unit	552 Watt
MCB 10A	Stop Kontak 6 unit	1200 Watt
MCB 2-4A	Lampu 8 unit	144 Watt
Total Daya		3552 Watt

Figure 1. Single line flat electrical diagram

CONCLUSION

1. The total power installed on the Type 54 Dormitory Instructor of the West Sumatra Maritime Polytechnic is 106,992 Watts, if the (LF) Load Factor is taken as 60% for the power is 80,244 VA. Based on the incoming TDL PLN is 82.5 kVA (125A). Using 4 x 120 mm^2 NYY cable.
2. Total lighting load on each floor of the instructor dormitory type 54 DL TL corridor 18 Watt x 8 units x 3 floors = 432 watts
3. Total lighting load on each floor per room DL PL-C2P 18 Watt x 8 units x 10 rooms x 3 floors = 4,320 watts
4. Total load of 0.75 PK Split AC on each floor per room 552 Watt x 2 units x 10 rooms x 3 floors = 33,120 watts
5. Total load of 1.5 PK Split AC on each floor per room 1,104 Watt x 1 unit x 10 rooms x 3 floors = 33,120 watts
6. Total load of electrical outlets on each floor per room 200 Watt x 6 units x 10 rooms x 3 floors = 36,000 watts

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