BLD62304103247 Building Science and Services

Assignment 1: Lighting and VAC Design for Comfort (20%)

Justification of benefits/savings/eco-impact, details/specifications of fixtures (5%)

3 No. of A4 Drawings- Old Design Plan, New Design Plan, Coloured Perspective View (10%)

Name: Tee Hui Qing

Student ID: 0334497

School: The Design School

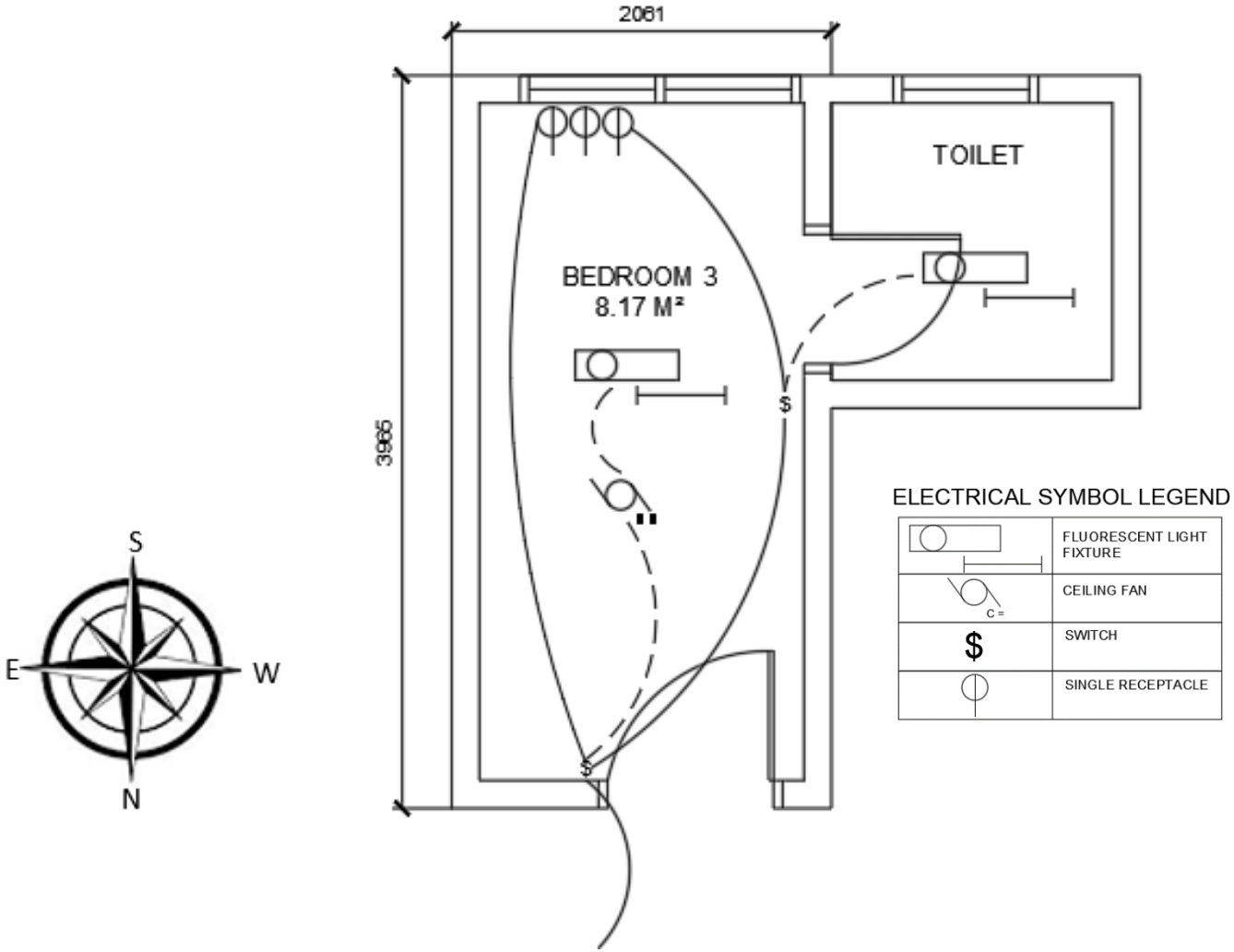
Programme: Bachelors of Arts (Honours) Interior Architecture

Batch: April 2020

Lecturer: Ms. Sharon

Chosen Room: Bedroom 3, First Floor

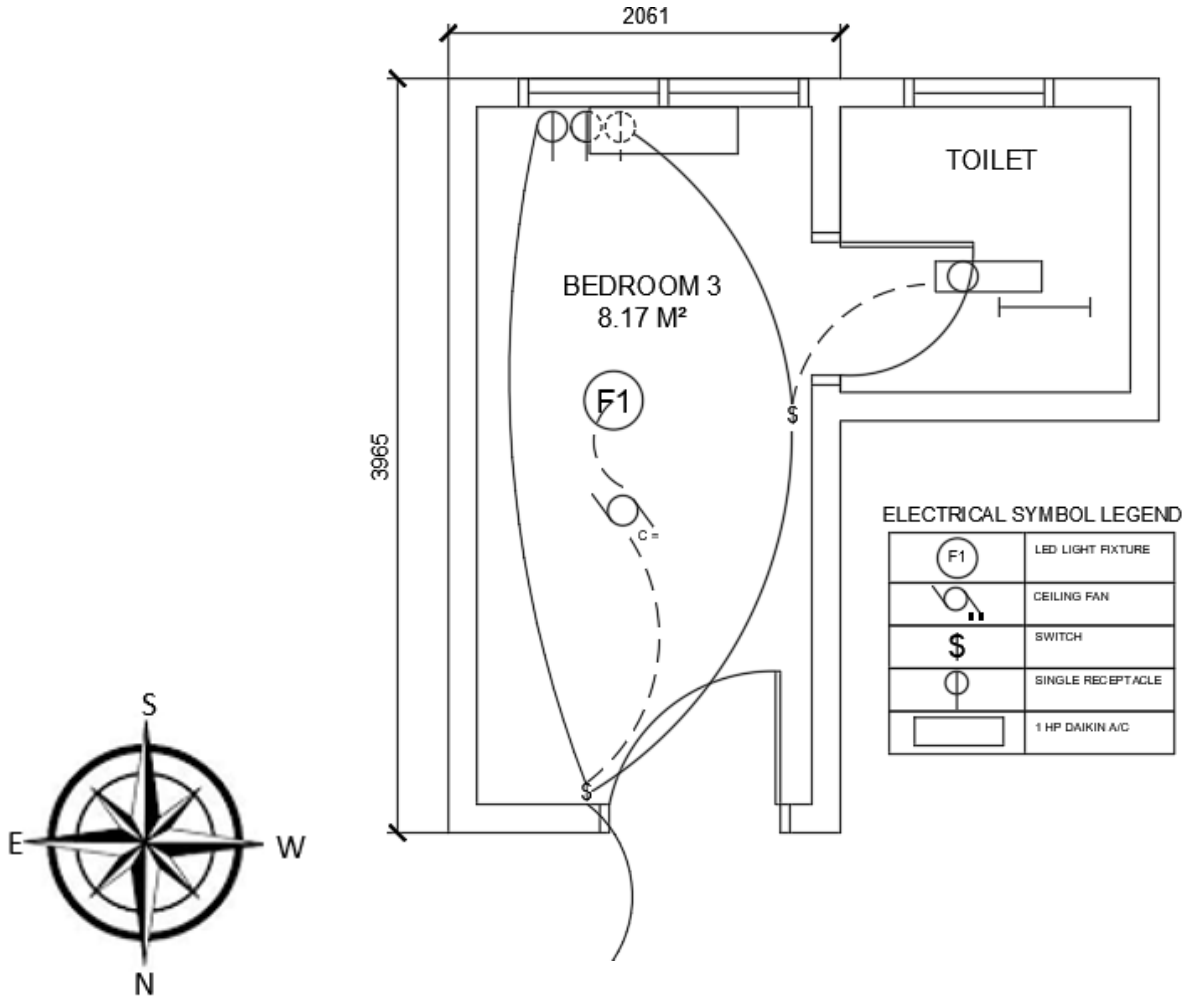
Old Electrical Wiring



Discomforts Identified in Bedroom 3

Lighting	Ventilation
1. Constant replacement of lighting becomes a hassle as the Fluorescent Tube Light's life span is not long 2. Insufficient Brightness to do drawings in the room at night	1. Windows in the South is not opened as the heat coming in is very uncomfortable/ prevent rain from splashing in when raining 2. Thus, the ventilation in the room is not good for long stay

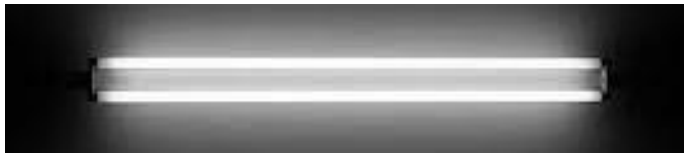
New Electrical Wiring



Changes made:

1) Fluorescent Tube Lighting to LED Tube Lighting
2) 1HP Daikin A/C Added to Improve Ventilation and Cooling of the room

Comparison between Fluorescent Tube Lighting (Existing) & LED Tube Lighting (Proposed)

Aspects	Fluorescent Tube Lighting (Existing)	LED Tube Lighting (Proposed)
Pictures (Turned Off)	 Figure 1a. Fluorescent Tube Light in bedroom 3  Figure 1b. Fluorescent Tube Light online	 Figure 2a. Sample LED Tube Lighting at living room  Figure 2b. LED Tube Lighting online
Pictures (Turned On)	 Figure 1c. Fluorescent Tube Light in bedroom 3  Figure 1d. Fluorescent Tube Light online	 Figure 2a. Sample LED Tube Lighting at living room  Figure 2b. LED Tube Lighting online
Specifications with Link attached (Philips Brand)	https://www.lighting.philips.com.my/prof/conventional-lamps-and-tubes/fluorescent-lamps-and-starters/tl-d/tl-d-lifemax-super-80/927982286536_EU/product	https://www.lighting.philips.com.my/consumer/p/led-linear-tube/8718699668365/specifications
Eco-friendliness	Produce primarily UV radiation as the bulb is coated with a layer of phosphor which glows when in contact with UV radiation. Could be a hazard if the UV radiation escapes from the bulb. Present waste disposal issues due to their reliance on mercury.	No UV rays. No mercury. Does not adversely affect temperature in the environment. Performs at 100% capacity and with 100 % efficiency until the end of their life.

Life Span	. Typical values range from 7000 hours to 15000 before a bulb requires replacement	Last longer than any light source commercially available on the market. Typical values range from 25000 hours to 200000 hours or more
Maintenance Costs	Requires regular ballast replacement	Zero Maintenance Cost
Warranty	Typically 1-2 years	Often 5 to 10 years
Cycling (Turning on/off)	Exhibit short delay when turning on	Respond rather instantaneously (no warm up or cool down period)
Heat Emissions	Roughly 15% of the emissions are lost due to heat dissipation and heat losses. Heat is used to generate light	Emit very little forward heat. Uses electrical energy to generate light.
Efficiency	Much lower efficiency (<30 lumens/watts). Non directional lighting as they emit light for 360 degrees (unnecessary illuminated spot at ceiling)	Most values for LED system efficiency fall above 50 lumens/watt. Naturally directional as they emit light for 180 degrees by default

Illuminance, Lux

$$\text{Illuminance, Lux} = \frac{\text{Lumen}}{\text{Area (m}^2\text{)}}$$

Area	Fluorescent Tube Lighting (Existing)	LED Tube Lighting (Proposed)
Floor	Illuminance, Lux= 35 lumen / 8.17 m² = 4.28	Illuminance, Lux= 71 lumen / 8.17 m² = 8.69
Working Table	Illuminance, Lux= 47 lumen / 0.81 m² = 58.02	Illuminance, Lux= 107 lumen / 0.81 m² = 132.1

Justification

From the comparison table made above, it's concluded that LED Tube Lighting emits higher illuminance (lux) value than Fluorescent Tube Lighting on all areas which means LED illuminates the room brighter than Fluorescent Tube Lighting.

PL
1

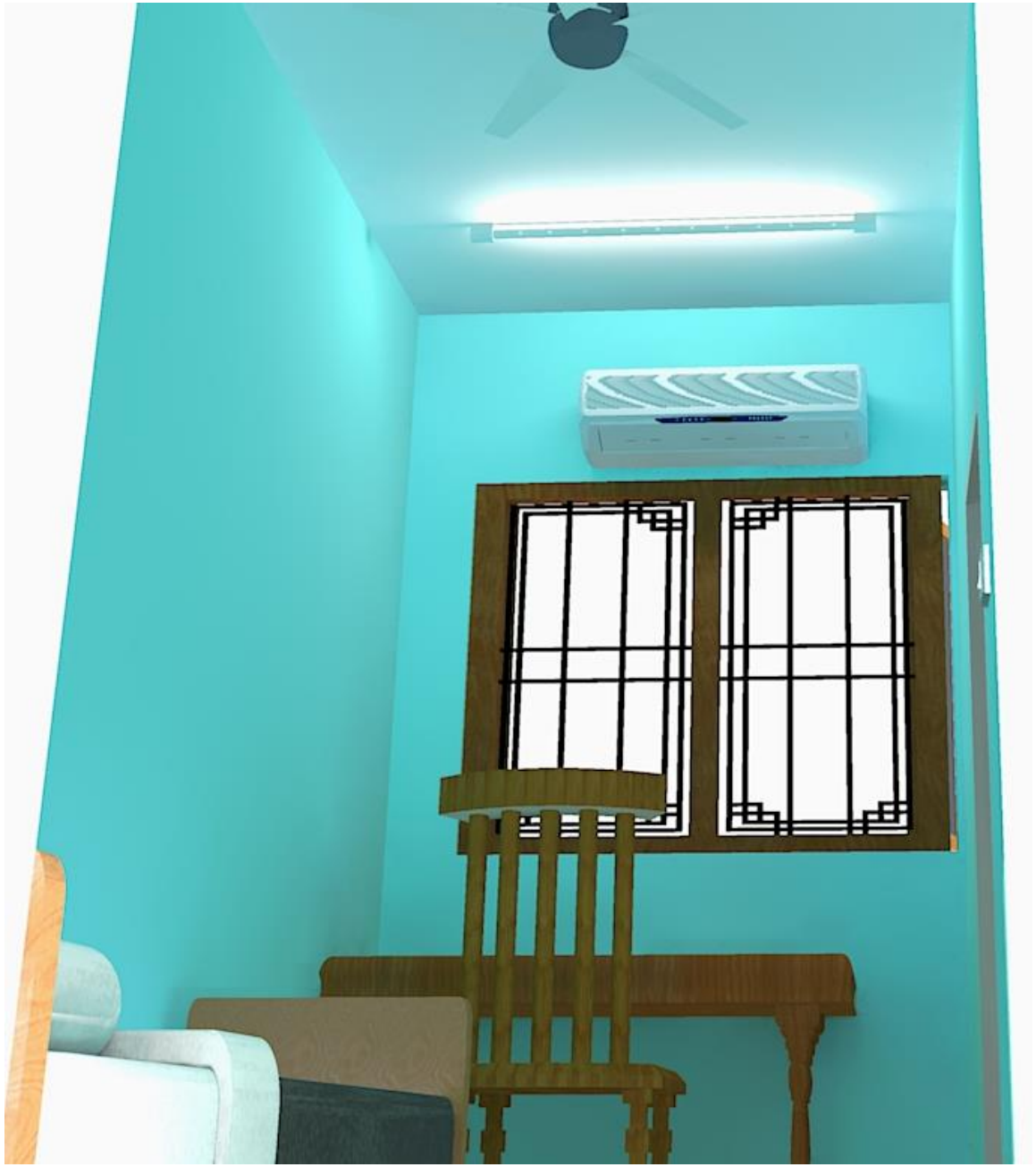
FLUORESCENT TUBE LIGHTING PLAN

SCALE 1:5

PL
2

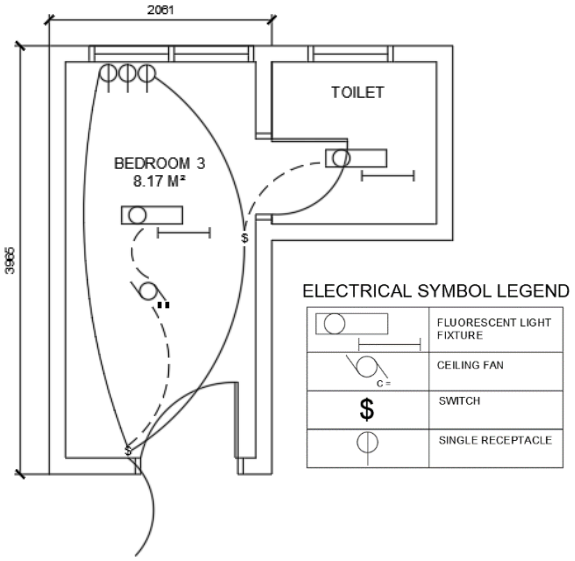
LED TUBE LIGHTING PLAN

SCALE 1:5



Coloured Room Perspective with new LED Lighting

Ventilation: Heat Load Calculation (Daikin A/C)



1. Floor Area BTU = 6.76 ft. X 13.1 ft. X 31.25= 2,767.375 BTU
2. Area for North Window= 1.524 m X 0.99 m X 164= 247.4366
3. Occupant BTU= 1 X 600= 600 BTU
4. Equipment BTU= 130 X 3.4 (Laptop)= 442 BTU
5. Lighting BTU= 1 X 36Watts X 4.25= 153 BTU
6. Total heat load BTU= 2,767.375 + 247.4366 + 600 + 442 + 153 = 4,209.8116 BTU
7. Total BTU/ Cooling Capacity= 4,209.8116/9800= 0.43 HP

Justification: By using the formula provided by Daikin, I have concluded to use 1 HP A/C for the room for better cooling.

DAIKIN 1HP AIR CONDITIONER

Specifications: R32 Inverter Wall Mounted SMARTO FTKH28AV1L (1 HP)
Brochure Link:
http://www.daikinmalaysia.com.my/daikin_catalogue/dmss/FTKH-0320-D-L.pdf

Bills of Quantities & Costings

Part A: Bill of Quantities For Lighting in the Room

No.	Descriptions	Unit	Quantity	Rate (RM)	Total (RM)	Reference/notes
L1	Philips LED Linear Tube 18W-36W G13 Cool daylight	nos	1	4.60	4.60	https://m.jllelectrical.com.my/index.php?ws=showproducts&products_id=2430474&cat=PHILIPS-LIGHTING&subcat=PHILIPS-BULB#openproducts

Total for Part A: RM4.60

Part B: Bill of Quantities for VAC Equipment

No.	Descriptions	Unit	Quantity	Rate (RM)	Total (RM)	Reference/notes
V1	Daikin Wall Mounted SMARTO Premium Inverter R32 FTKH28AV1L 1hp	nos	1	1855.00	1855.00	https://shopee.com.my/Daikin-Wall-Mounted-SMARTO-Premium-Inverter-R32-FTKH28AV1L-1hp-70-energy-saving-i.8703376.2290472020

Total for Part B: RM1855.00

Summary of Total Costs for Building Services for Lighting and VAC equipments

No.	Descriptions	Sub-Total (RM)
A	Total for Lighting	4.60
B	Total for VAC	1855.00

Grand Total: RM 1,859.60

Part C: Comparison between old lighting (Fluorescent Tube Lighting) and new lighting (LED Tube Lighting)

No.	Option	Cost of each fixture (RM)	Cost of installation (RM/Fixture)	Number of Fixture needed	Power rating/unit (kW)	Total Initial Cost (RM)	Total Annual Cost= Energy Cost (kWh)	Total Cost without lifespan (RM)	Including Lifespan (Times fixtures replaced in 10 years)
1	Fluorescent	7.30	5.00	1	0.036	12.30	34.37	46.67	5
2	LED	4.60	5.00	1	0.036	9.60	34.37	43.97	0

Giving the time frame:

Usage	12	Hours/day
Days	365	Days (1 Year)
Rate	0.218	Per 200 kWh

		For 10 years		
No.	**Option**	**Total Fixture & Installation Cost**	**Total Initial Cost**	**Total Operating Cost**
1	Fluorescent	61.5	343.7	RM405.20
2	LED	0	343.7	RM343.70

Justification:

In the long run (10 years as an example), LED Tube Lighting is proved to be less costing, energy saving and higher efficiency than Fluorescent Tube Lighting because it lasts longer (lower number of times of replacement needed) in the long run. Nowadays, since LED tube lightings are produced in bulk, they are relatively cheaper than the old times which LED used to be more expensive than Fluorescent Light.

Reference

1. LED Tube Lights Vs Fluorescent Tubes. (2017). Retrieved 3 June 2020, from https://www.memuk.org/technology/electronics/led-tube-lights-vs-fluorescent-tubes-44505#:~:text=By%20contrast%2C%20LED%20tube%20lights,and%20efficient%20source%20of%20light.&text=One%20of%20the%20biggest%20differences,use%20heat%20to%20create%20light.
2. Staff, S. (2020). Lighting Comparison: LED vs Fluorescent and CFL. Retrieved 3 June 2020, from https://www.stouchlighting.com/blog/fluorescent-vs-led-vs-cfl