



TAYLOR'S UNIVERSITY

Wisdom • Integrity • Excellence

SCHOOL OF ARCHITECTURE, BUILDING & DESIGN

BACHELOR OF ARTS (HONOURS) INTERIOR ARCHITECTURE

BUILDING SCIENCE (BLD62803)

ASSIGNMENT 1: GREEN ISSUE AWARENESS (1B GREEN INITIATIVE)

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DUE DATE: 8TH MAY 2019

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1.1 INTRODUCTION TO SITE



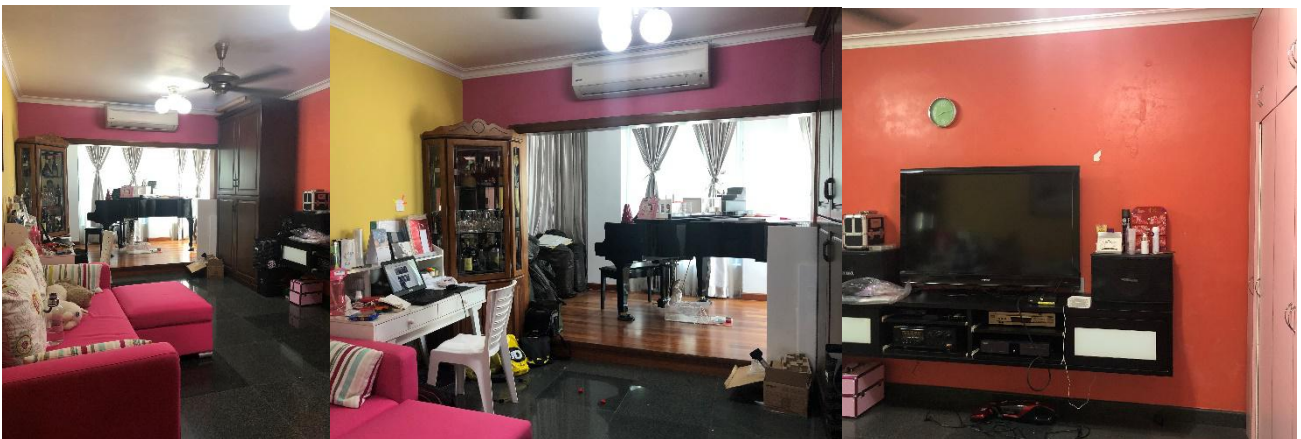
📍 **No.2, Jalan Bidai U8/13C Bukit Jelutong, 40150 Shah Alam, Selangor**

This site is my own house, which is a corner lot bungalow house with 2 floors. This house was built for more than 15 years and I have stayed in this house for 15 years. It had been renovated multiple times throughout the years. This house consists of 6 bedrooms, 7 toilets, 1 karaoke room, 1 gym room, 3 kitchens and 2 living rooms. The land is about 8650 sq ft and the built up area is about 4500 sq ft. Total air conditioner is 11 units and ceiling fan is 12 units. There is also garden on both side of the house and a carpark area for capacity of maximum 4 cars.

1.2 INTRODUCTION TO PROJECT

This project introduces me to green issue awareness and I was told to initiate, plan and execute a green initiative of chosen space or spaces by recording the process in report form. I have decided to focus on 3 spaces which are my parents' bedroom, karaoke room and first floor resting area. The karaoke room is where I sleep and do my work every day but it does not have a toilet. Therefore, I always use the bathroom in my parents' bedroom. Sometimes I sleep with my parents too. One more space is the resting area on first floor, where I sometimes sit there and watch drama using my phone, it is the walkway to every room on first floor.

Karaoke room pictures:



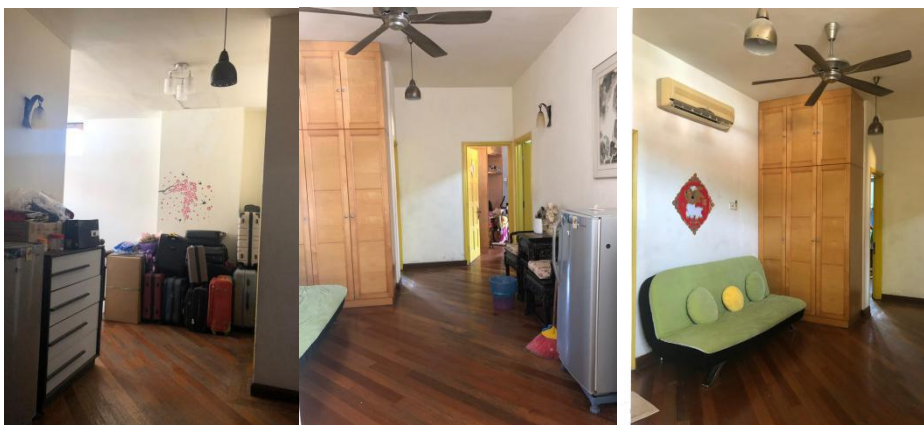
Bathroom pictures:



Parents' bedroom pictures:



First floor rest area pictures:



1.3 SPACE AUDITING

1

ENERGY EFFICIENCY (EE)

DESIGN & PERFORMANCE | COMMISSIONING | MONITORING, IMPROVEMENT & MAINTENANCE

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
DESIGN & PERFORMANCE					
EE1	MINIMUM EE PERFORMANCE (MANDATORY COMPLIANCE)				
	Establish minimum energy efficiency (EE) performance to reduce energy consumption in buildings, thus reducing CO ₂ emission to the atmosphere. Meet the following minimum EE requirements as stipulated in MS 1525:		2	0	
	a. OTTV ≤ 50, RTTV ≤ 25, Roof U-Value ≤ 0.4 (Light weight) or ≤ 0.6 (Heavy weight). Submit calculations (use of the BEIT software or other GBI approved software is acceptable), AND	1			N/A
	b. Provision of Energy Management Control system where Air-conditioned space ≥ 4000 m ² .	1			N/A. Air conditioned space is less than 4000 m ²
EE2	LIGHTING ZONING				
	Provide flexible lighting controls to optimise energy savings:-				
	All individual or enclosed spaces to be individually switched; and the size of individually switched lighting zones shall not exceed 30m ² for 90% of the NLA; with switching clearly labelled and easily accessible by building occupants.	1	3	2	Bedroom, dressing area, bathroom, karaoke room and piano area are all separated and need to be individually switched on. However, switches are not label clearly.
	Provide auto-sensor controlled lighting in conjunction with daylighting strategy for all perimeter zones and daylight areas, if any	1			Light brightness are all fixed, no auto-sensor controlled lighting being used.
	Provide motion or occupancy sensors or equivalent to complement lighting zoning equivalent to at least 25% NLA. For guestroom, master switch or access card switch or equiv to switch off all lights, fan, tv and airconditioning when room is not occupied will qualify as occupancy sensor.	1			Rest area includes a combination of motion sensor lights and normal lights. When there are occupants, normal lights will be used. Sensor lights will be switch on during night time, where light is only needed to lead occupants to the places they want to go. (Ref to D1.1)
EE3	ELECTRICAL SUB-METERING & TENANT SUB-METERING				
	Monitor energy consumption of key building services as well as all tenancy areas:-		2	0	
	Provide sub-metering for all energy use ≥ 100kVa.	1			N/A . No sub-metering provided. My house only has a circuit breaker panel located downstairs. (Ref to D1.2)
	Provide separate sub-metering for lighting and/or power at each floor or tenancy.	1			N/A . No sub-metering provided.
EE4	RENEWABLE ENERGY				
	Encourage use of renewable energy:-				
	Where 0.25 % of the Maximum electricity Demand (M.D.) or total electricity consumption, or 2 kWp (PV or equiv) whichever is the greater is generated by renewable energy, OR	1	5	2	I did some research on TNB renewable energy and saw they are targeting 20% of country's power generation are from RE by 2025. However, the current consumption is stated to be 2% only. Below are some calculations to justify my result.
	Where 0.5 % of the M.D. or total electricity consumption, or 5 kWp (PV or equiv) whichever is the greater is generated by renewable energy, OR	2			32,385 - Malaysia population (2018) 12,638.589 kWh - total energy consumption (Sept 2018)
	Where 1.0 % of the M.D. or total electricity consumption, or 10 kWp (PV or equiv) whichever is the greater is generated by renewable energy, OR	3			2% x 12,638.539 kWh = 252.77 kWh are from renewable resources. (252.77 / 32385) x100 = 0.78%
	Where 1.5 % of the M.D. or total electricity consumption, or 20 kWp (PV or equiv) whichever is the greater is generated by renewable energy, OR	4			0.78% of energy are renewable.
	Where 2.0 % of the M.D. or total electricity consumption, or 40 kWp (PV or equiv) whichever is the greater is generated by renewable energy.	5			

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
EE5	ADVANCED OR IMPROVED EE PERFORMANCE				
	Exceed Energy Efficiency (EE) performance better than the baseline minimum to reduce energy consumption in the building. Achieve Building Energy Intensity (BEI) as defined by GBI for the following corresponding credit points. The default operating hours for Hotel is 24/7. Non-electricity fuel energy is excluded in the BEI calculation. BEI values listed below apply to Hotel consisting of minimal supporting facilities such as budget type hotel, hotel rated 3-Star & below, and service apartments. BEI values apply to Hotel rated 4-Star & above and where not less than 25% of its GFA (excluding carpark area) comprises Back-of-the-House (BOTH) facility and other high energy intensity facilities such as F&B outlets, convention halls, ballroom/s, function rooms, etc.		15	0	
	BEI ₁ ≤ 200, BEI ₂ ≤ 290, OR	2			N/A. My house is neither a hotel nor service apartment therefore all the facilities cannot be found and rate.
	BEI ₁ ≤ 190, BEI ₂ ≤ 270, OR	3			
	BEI ₁ ≤ 175, BEI ₂ ≤ 250, OR	5			
	BEI ₁ ≤ 160, BEI ₂ ≤ 233, OR	8			
	BEI ₁ ≤ 150, BEI ₂ ≤ 212, OR	10			
	BEI ₁ ≤ 135, BEI ₂ ≤ 195, OR	12			
	BEI ₁ ≤ 120, BEI ₂ ≤ 175	15			
DESIGN & PERFORMANCE					
EE5	ADVANCED OR IMPROVED EE PERFORMANCE				
	I) Demonstrate Energy savings over the last 3 years from Existing Building historical BEI baseline, to improve by: ≥ 20% AND with resultant BEI ₁ ≤ 267 or BEI ₂ ≤ 387	2	15	0	N/A
	≥ 25% AND with resultant BEI ₁ ≤ 228 or BEI ₂ ≤ 324	3			
	≥ 30% AND with resultant BEI ₁ ≤ 200 or BEI ₂ ≤ 290	5			
	≥ 40% AND with resultant BEI ₁ ≤ 190 or BEI ₂ ≤ 270	8			
	≥ 50% AND with resultant BEI ₁ ≤ 175 or BEI ₂ ≤ 250	10			
	≥ 60% AND with resultant BEI ₁ ≤ 160 or BEI ₂ ≤ 233	12			
	≥ 70% AND with resultant BEI ₁ ≤ 150 or BEI ₂ ≤ 212	15			
COMISSIONING					
EE6	ENHANCED COMMISSIONING/RE-COMMISSIONING/RETRO COMMISSIONING OF BUILDING ENERGY SYSTEMS				
	Ensure building's energy related systems are properly commissioned so as to realise their full potential. Appoint a GBI recognised Commissioning Specialist (CxS) to perform the commissioning for all the building's energy related systems in accordance with ASHRAE Commissioning Guideline or other GBI approved equivalent standard by:- a) Implement improvements to ensure building's major energy using systems are repaired, operated and maintained effectively to optimize energy performance. b) Develop a commissioning or ongoing commissioning plan for the building's major energy-using systems. c) Provide training for management staff to build awareness and skills in a broad range of sustainable building operations topics, including energy efficiency and building, equipment and systems operations and maintenance. d) Update the building operating plan as necessary to reflect any changes in the occupancy schedule, equipment runtime schedule, design set points and lighting levels.	4	4	1	Air-conditioners are being repaired in a timely manner to be use effectively. Other electrical appliances such as light bulbs and fans are being replaced immediately once broken.
EE7	ON-GOING POST OCCUPANCY COMMISSIONING				
	Carry out up-to-date on-going post occupancy commissioning for all tenancy areas after fit-out changes are completed, if any.		2	0	
	a) Professional Engineer shall review all tenancy fit-out plans to ensure original design intent is not compromised and sign off the completed works.	1			N/A
	b) CxS shall carry out re-commissioning of the building's energy related systems for the affected tenancy areas.	1			



ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
	MONITORING, IMPROVEMENT & MAINTENANCE				
EE8	EE MONITORING & IMPROVEMENT				
	1. Use Energy Management System (or have a dedicated Energy Management Team) to monitor and analyse energy consumption including reading of sub-meters.	1	2	0	N/A
	2. Fully commission and activate Maximum Demand Limiting programme (where EMS is not provided and air-conditioned area is < 4,000m ² , the dedicated Energy Management Team to demonstrate EE operational strategy), AND	1			
	Compile, summarise and submit BEI, Fuel and Water Consumption of the building to GBI on an annual basis during the 3-years validity period or earlier whenever requested by GBI. Submissions shall include monthly energy and waterbills.				
EE9	SUSTAINABLE MAINTENANCE				
	Ensure the building's energy related systems will continue to perform as intended with proper and sustainable maintenance:-		3	0	N/A. No maintenance team or office being design.
	a) At least 75% of permanent building maintenance team to participate in the commissioning of all building energy services.	1			
	b) Provide for a designated building maintenance office that is fully equipped with facilities (including tools and instrumentation) and inventory storage,	1			
	c) Provide evidence of documented plan for at least 3-year facility maintenance and preventive maintenance budget (inclusive of staffing and outsourced contracts).	1			
	EE SUB-TOTAL	38	38	5	


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INDOOR ENVIRONMENTAL QUALITY (EQ)

AIR QUALITY | THERMAL COMFORT | LIGHTING, VISUAL & ACOUSTIC COMFORT | VERIFICATION

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
AIR QUALITY					
EQ1	MINIMUM IAQ PERFORMANCE				
	Establish minimum indoor air quality (IAQ) performance to enhance indoor air quality in building, thus contributing to the comfort and well-being of the occupants:-		1	0	
	Meet the minimum requirements of ventilation rate in ASHRAE 62.1 or the local building code whichever is the more stringent.	1			N/A
EQ2	ENVIRONMENTAL TOBACCO SMOKE (ETS) CONTROL				
	Minimize exposure of building occupants, indoor surfaces, and ventilation air distribution systems to Environmental Tobacco Smoke (ETS):-		1	0.8	
	a) Prohibit smoking in the building and locate any exterior designated smoking areas away from entries, outdoor air intakes and operable windows OR	1			Nobody smokes in my house except when my relatives come and stay over and we had set a rule that no one can smoke in the house.
	b) Prohibit smoking in the building except in designated smoking rooms and establish negative pressure in the smoking rooms together with provision of effective air filtration system.	1			My relatives can only smoke outside the house with windows closed.
EQ3	CARBON DIOXIDE MONITORING AND CONTROL				
	Provide response monitoring of carbon dioxide levels to ensure delivery of minimum outside air requirements:-				
	Install carbon dioxide (CO ₂) monitoring and control system with at least one (1) CO ₂ sensor at all main return points on each floor to facilitate continuous monitoring and adjustment of outside air ventilation rates to each floor, and ensure independent control of ventilation rates to maintain CO ₂ level ≤ 1,000 ppm.	1	1	0	N/A
EQ4	INDOOR AIR POLLUTANTS				
	Reduce detrimental impact on occupant health from finishes that emit internal air pollutants:				
	Use low VOC paint and coating throughout the building. Paints and Coatings to comply with requirements specified in international labelling schemes recognized by GBI, AND	1			The interior of my house uses Nippon Super Matex paint, which is a vinyl acrylic copolymer emulsion paint. It is not low VOC. (Ref to D1.3)
	Use low VOC carpet or flooring throughout the building. Carpets to comply with requirements specified in international labelling schemes recognized by GBI. Other types of flooring to comply with requirements under FloorScore developed by Science Certification System or equivalent, AND		2	0.5	No carpet being used and normal adhesive and sealant is used for the flooring.
	Use low VOC adhesive and sealant or no adhesive or sealant used.				
	Use products with no added urea formaldehyde. These include: 1) Composite wood and agrifiber products defined as: particleboard, medium density fiberboard (MDF) plywood, wheatboard, strawboard, panel substrates and door cores, AND 2) Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies, AND 3) Insulation foam, AND 4) Draperies	1			I believed curtains in my house do not contain urea formaldehyde because it does not give out any odour. Maybe it is being washed off as the curtains are being used and washed frequently over the years.

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
EQ5	MOULD PREVENTION				
	<p>Design system(s) which reduce the risk of mould growth and its associated detrimental impact on occupant health:</p> <p>Where it is demonstrated that the mechanical air-conditioned ventilation system will maintain a positive indoor air pressure relative to the exterior and can actively control indoor air humidity to be no more than 70% RH without the use of active control that will consume additional energy.</p> <p>Ensure that excessive moisture in building is controlled during the retrofit Design, Construction and Operation stages by the consideration and the control of the following:</p> <ol style="list-style-type: none"> 1) Rainwater leakage through roof and walls 2) Infiltration of moist air 3) Diffusion of moisture through walls, roof and floors 4) Groundwater intrusion into basements and crawl spaces through walls and floors 5) Leaking or burst pipes 6) Indoor moisture sources 7) Construction moisture, OR <p>The building is fully naturally ventilated</p>	1	1	1	<p>Rainwater leakage is controlled by having gutters on roof and pipes attached to walls. Water will flow through and land on or into the ground. (Ref to D1.4)</p> <p>Indoor moisture sources are limited, only my parents' room has a small plant with water.</p> 
THERMAL COMFORT					
EQ6	THERMAL COMFORT: CONTROLLABILITY OF SYSTEMS				
	<p>Provide a high level of thermal comfort system control by individual occupants or by specific groups in multi-occupant spaces to promote the productivity, comfort and well-being of building occupants:-</p> <p>Provide individual comfort controls for $\geq 50\%$ of the building occupants to enable adjustments to suit individual task needs and preferences.</p> <p>AND</p> <p>Provide comfort system controls for all shared multi-occupant spaces to enable adjustments to suit group needs and preferences.</p> <p><i>Conditions for thermal comfort include the primary factors of air temperature, radiant temperature, air speed and humidity. Comfort system control for this purpose is defined as the provision of control over at least one of these primary factors in the occupants' local environment.</i></p>	2	2	2	<p>Occupants can control the systems easily. Lights, fans or air-conditioners in the rooms can be adjust and switch on individually depends on the occupants preferences. The access is also easy reach.</p>
EQ7	AIR CHANGE EFFECTIVENESS				
	<p>Provide effective delivery of clean air through reduced mixing with indoor pollutants in order to promote a healthy indoor environment. Demonstrate that the Air Change Effectiveness (ACE) meets the following criteria for at least 50% of the NLA (excluding Guestroom Floors and Back-of-the-House Areas):</p> <p>The ventilation systems are designed to achieve an ACE of ≥ 0.95 when measured in accordance with ASHRAE 129: Measuring air change effectiveness where ACE is to be measured in the breathing zone (nominally 1.0 m from finished floor level). Displacement ventilation or task-air ventilation are deemed to meet ACE requirement without need for design simulation and measurement upon completion.</p>	1	1	0.5	<p>There is an Amway air purifier in my parents' bedroom which can filter the air and gives out clean air.(Ref to D1.5)</p> 
LIGHTING, VISUAL & ACOUSTIC COMFORT					
EQ8	DAYLIGHTING				
	<p>Provide good levels of daylighting for building occupants:-</p> <p>Demonstrate that $\geq 30\%$ of the NLA has a daylight factor in the range of 1.0 - 3.5%, OR</p> <p>Demonstrate that $\geq 50\%$ of the NLA has a daylight factor in the range of 1.0 - 3.5%.</p> <p>Ballrooms and function rooms which require 'black out' conditions are exempted from Daylighting NLA computation.</p>	1	2	2	<p>The karaoke room can only provide sufficient daylight for the piano area and I always have to switch on lights when I am doing work.</p> <p>The rest area and my parents' room provide daylight more than 50% of the NLA where lights do not have to be switch on at all during daytime, excluding raining weather.</p>

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
EQ9	DAYLIGHT GLARE CONTROL				
	<p>Reduce discomfort of glare from natural light. Where blinds or screens are fitted on all glazing and atrium as a base building, incorporate provisions to meet the following criteria;</p> <p>a) Eliminate glare from all direct sun penetration and keep horizontal workspace lux level below 2000; AND</p> <p>b) Eliminate glare from diffuse sky radiation for occupant workspace at viewing angles of 15° to 60° from the horizontal at eye level (typically 1.2m from floor level); AND</p> <p>c) Control with an automatic monitoring system (for atrium and windows with incident direct sun light only - not applicable for fixed blinds/screens); AND</p> <p>d) Equip with a manual override function accessible by occupants (not applicable for fixed blinds/screens)</p>	1	1	1	<p>The windows in the rooms all have two layers of curtain. One is sheer curtain and one is the thick one. The sheer curtain meets the manual override function criteria where is easy accessible by occupants.</p> 
EQ10	ELECTRIC LIGHTING LEVELS				
	Baseline building lighting not to be over designed:-		1	0.8	Karaoke room, rest area and my parents' bedroom lightings all are below the luminance level specified in MS1525. (Ref to D1.6) However, some parts are lack of lightings.
	Demonstrate that lighting designs for different spaces of the building maintain luminance levels of no more than specified in MS1525 for 90% of NLA.	1			
EQ11	HIGH FREQUENCY BALLASTS				
	Increase workplace amenity by avoiding low frequency flicker that may be associated with fluorescent lighting:-		1	0	N/A
	Install high frequency ballasts for at least 90% of all fluorescent luminaires used.	1			
LIGHTING, VISUAL & ACOUSTIC COMFORT					
EQ12	EXTERNAL VIEWS				
	Reduce eyestrain for building occupants by allowing long distance views and provision of visual connection to the outdoor.		2	2	Both rooms have visual connection to the outdoor by providing greenery landscape view which can reduce eyestrain. (Ref to D1.7)
	Reduce eyestrain for building occupants by allowing long distance views and provision of visual connection to the outdoor. Ballrooms and function rooms which require 'black out' conditions are exempted from this NLA computation.				
	Demonstrate that ≥ 60% of the NLA has a direct line of sight through vision glazing at a height of 1.2m from floor level.	1			
	Demonstrate that ≥ 75% of the NLA has a direct line of sight through vision glazing at a height of 1.2m from floor level.	2			
EQ13	INTERNAL NOISE LEVELS				
	<p>Maintain internal noise levels at an appropriate level. Demonstrate that 90% of the NLA do not exceed the following ambient internal noise levels:-</p> <p>Within the entire baseline building general office, space noise from the building services does not exceed 40dB(A)eq.</p> <p>OR</p> <p>Within the baseline building office space, the sound level does not exceed 45dB(A)eq for open plan and not exceed 40dB(A)eq for closed offices.</p> <p><i>Note that internal noise level thresholds for areas other than office shall not exceed values stipulated in ASHRAE Standard or other GBI approved Standards, Code of Practice or Design Guides; e.g. CIBSE Guide.</i></p>	1	1	0	The average the noise level is around 66dB(A)eq when the air-conditioner and fan is turned on. It is a bit noisy when doing work in the room. (Ref to D1.8)


ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
	VERIFICATION				
EQ14	IAQ BEFORE/DURING OCCUPANCY				
	<p>Reduce indoor air quality problems resulting from the construction process (or inherent conditions) in order to improve and sustain the comfort and well-being of building occupants. Develop and implement an Indoor Air Quality (IAQ) Management Plan to effect this requirement as follows:-</p> <p>a) Perform a building flush out by supplying outdoor air to provide not less than 10 airchanges/hour for at least 30 minutes operation and continuous minimum 1 ACH for the next 14 days.</p> <p>OR</p> <p>b) If low VOC materials and low formaldehyde composite wood are used, then building flush out can be performed by supplying outdoor air to provide not less than 10 airchanges/hour for at least 15 minutes operation or not less than 6 airchanges/hour for at least 30 minutes operation and continuous 1ACH for the next 7 days.</p> <p>OR</p> <p>c) Conduct IAQ testing to demonstrate maximum concentrations for pollutants are not exceeded according to the Indoor Air Quality Code of Malaysia.</p>	1	2	0	N/A . No Indoor Air Quality Management Plan available.
	<p>Permanent Air Purging System: Where a permanent air flushing system of at least 10 airchanges/hour operation is installed and operated at least once a year during occupancy stage.</p>	1			N/A . No Air purging system available.
EQ15	OCCUPANCY COMFORT SURVEY: VERIFICATION				
	<p>Provide for the assessment of comfort of the building occupants:-</p> <p>Conduct an occupancy comfort survey of building occupants. This survey should collect anonymous responses about thermal comfort, visual comfort and acoustic comfort in a building. It should include an assessment of overall satisfaction with thermal, visual and acoustic performance and identification of thermal-related, visual-related and acoustic-related problems.</p> <p>AND</p> <p>Develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with the overall comfort in the building. This plan should include measurement of relevant environmental variables in problem areas.</p> <p><i>The relevant environmental variables include 1) Temperature, relative humidity, air speed and mean radiant temperature, 2) Lighting level and glare problem, 3) Background noise level, 4) Odour problem, CO₂ level, VOCs, and particulate concentration.</i></p>	2	2	1	For this part, I asked my family members (father, mother, eldest brother and second brother) verbally and they all complaint about the temperature and noise level in common. The temperature is very high during noon in my parents' room where air-conditioner must be switched on to feel comfortable. The noise level is too loud during night time when they sleep, and they can be easily awake due the sound of the door when it is being used. For the lighting and humidity part, there are no arguments on them.
	EQ SUB-TOTAL	21	21	11.6	

3

SUSTAINABLE SITE PLANNING & MANAGEMENT (SM)

FACILITY MANAGEMENT | TRANSPORTATION | REDUCE HEAT ISLAND EFFECT

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
FACILITY MANAGEMENT					
SM1	GBI RATED DESIGN & CONSTRUCTION				
	If the building has been previously GBI (or other GBI approved Green Rating system) rated under any category, OR within the last 12 months a comprehensive Energy Efficiency Audit has been conducted.	1	1	0	N/A
SM2	BUILDING EXTERIOR MANAGEMENT				
	Employ environmentally sensitive building exterior management plan to reduce pollution.		1	1	
	Use environmentally non-polluting methods and chemicals for cleaning of building exterior including maintenance equipment, chemicals, paint and sealants.	1			My house exterior does not have to be clean, the rainwater will clean it naturally. Except for the windows which are clean using soap and water.
SM3	INTEGRATED PEST MANAGEMENT, EROSION CONTROL & LANDSCAPE MGT				
	Employ environmentally sensitive management to preserve the site's natural components. Minimise harmful chemical use, energy waste, water waste, air pollution, solid waste and/or chemical runoff such as gasoline and oil. The following operational elements must be addressed:		1	0.5	
	a) Use of least toxic chemical pesticides, minimum use of chemicals and use only in targeted locations and only for targeted species. Conduct routine inspection and monitoring AND	1			My dad and uncle always take care of the gardens during weekends. They will water it and add soils to it or even plant new grass and flowers. This can prevent erosion as they always look over it.
	b) Erosion and sedimentation control for ongoing landscape operations including measures that prevent erosion and sedimentation, prevent air pollution from dust or particulate matter and restore eroded areas.				
TRANSPORTATION					
SM4	GREEN VEHICLE PRIORITY - LOW EMITTING & FUEL EFFICIENT VEHICLES				
	Encourage use of green vehicles:-		1	1	
	Provide preferred parking for low-emitting and fuel-efficient vehicles for 5% of the total car parking lots. <i>"Preferred parking" refers to the parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped or parking passes provided at a discounted price).</i>	1			My house has one green vehicle which is Volvo. It is always parked nearest to the entrance to allow charging as there is plug available at the entrance area. (Ref to D1.9)
SM5	PARKING CAPACITY				
	Discourage over-provision of car parking capacity:-		1	0	
	Size parking capacity not to exceed the minimum local zoning requirements, AND provide preferred parking for carpools or vanpools for 5% of the total provided parking spaces.	1			My house has more than 4 cars which exceed the number of parking capacity allowed. Extra cars are always parked outside. (Ref to D1.10)

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
	REDUCE HEAT ISLAND EFFECT				
SM6	GREENERY & ROOF				
	Reduce heat island (thermal gradient difference between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat:-				
	A) Hardscape & Greenery Application: 1) Provide any combination of the following strategies for 50% of the site hardscape (including sidewalks, courtyards, plazas and parking lots): a) Shade (within 5 years of occupancy); b) Paving materials with a Solar Reflectance Index (SRI) of at least 29; c) Open grid pavement system;	2	4	2	My garden on both sides each have pebbles sidewalk beside the grass. The parking area is rite next to the garden. (Ref to D1.11)
	B) Roof Application: 1) Use roofing material with a Solar Reflectance Index (SRI) equal to or greater than the value in the table below for a minimum of 75% of the roof surface; OR 2) Install a vegetated roof for at least 50% of the roof area; OR 3) Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria: <i>(Area of SRI Roof / 0.75) + (Area of vegetated roof / 0.5) ≥ Total Roof Area Roof Type Slope SRI</i> <i>Low-Sloped Roof < 2:12 78</i> <i>Steep-Sloped Roof > 2:12 29</i>	2			N/A . The roofing of my house is clay shingles. There is no vegetation application on the roof. 
SM7	BUILDING USER MANUAL				
	Document Green building design features and strategies for user information and guide to sustain performance during occupancy:-				
	Provide a Building User Manual which documents passive and active features that should not be downgraded (including housekeeping SOP).	1	1	0	N/A
SM SUB-TOTAL		10	10	4.5	

4

MATERIALS & RESOURCES (MR)

REUSED & RECYCLED MATERIALS | SUSTAINABLE MATERIALS & RESOURCES AND POLICY | WASTE MANAGEMENT | GREEN PRODUCTS

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
REUSED AND RECYCLED MATERIALS					
MR1	MATERIALS REUSE AND SELECTION				
	Reuse building materials and products to reduce demand for virgin materials and reduce creation of waste. This serves to reduce environmental impact associated with extraction and processing of virgin resources. Integrate building design and its buildability with selection of reused building materials, taking into account their embodied energy, durability, carbon content and life cycle costs:-		1	0	
	Where reused products/materials constitutes $\geq 20\%$ of the project's total retrofit material cost value.	1			N/A. I asked my dad about this as he is the one that designed our house and he said that none of them are reused building materials. All are brand new.
MR2	RECYCLED CONTENT MATERIALS				
	Increase demand for building products that incorporate recycled content materials in their production:- <i>(Recycled content shall be defined in accordance with the International Organization of Standards Document)</i>		1	0	
	Where use of materials with recycled content is such that the sum of post-consumer recycled plus one-half of the pre-consumer content constitutes $\geq 20\%$ (based on cost) of project's total retrofit material cost value.	1			N/A
SUSTAINABLE MATERIALS & RESOURCES AND POLICY					
MR3	SUSTAINABLE TIMBER				
	Encourage environmentally responsible forest management:-				
	Where $\geq 75\%$ of wood-based materials and products used in the retrofit works are certified. <i>These components include, but are not limited to, structural framing and general dimensional framing, flooring, sub-flooring, wood doors and finishes. To include wood materials permanently installed and also temporarily purchased for the project. Compliance with Malaysian Timber Certification Scheme or Forest Stewardship Council requirements.</i>	1	1	0.7	My house flooring is mainly timber and are very sustainable as it has been laid for 15 years and still in great condition but there are scratches that cannot be avoided. I cannot confirm whether it is certified as it is too old but I assumed that it is because of its sustainability. (Ref to D1.12)
MR4	SUSTAINABLE PURCHASING POLICY				
	Develop a Sustainable Purchasing policy that must cover product purchases within the building and management's control.	1	1	0	N/A
WASTE MANAGEMENT					
MR5	STORAGE, COLLECTION & DISPOSAL OF RECYCLABLES				
	Facilitate reduction of waste generated during retrofit construction and during building occupancy that is hauled and disposed of in landfills:-				
	Provide recycling facilities/infrastructure for sorting and separate collection of recyclable waste for recycling (consumables - glass, paper, metal, equipment, addition & alteration construction wastes).	1	3	2	N/A
	Promote and encourage waste minimization and recycling among occupants, tenants and visitors through various avenues.	1			My house used to be having a lot of food wastage as large amount of food is being cooked. It has been reduced since last 3 years and only sufficient amount of food is cooked.
	Promote waste sorting, collecting, quantifying, monitoring and recycling of a large range of waste generated in-house.	1			Large recycled bins are placed outside my house. (Ref to D1.13)
GREEN PRODUCTS					
MR6	REFRIGERANTS & CLEAN AGENTS				
	Use environmentally-friendly Refrigerants and Clean Agents exceeding Malaysia's commitment to the Montreal & Kyoto protocols:-				
	Use zero Ozone Depleting Potential (ODP) products: non-CFC and non-HCFC refrigerants AND fire suppression clean agents;	1	2	0	N/A
	Use non-synthetic (natural) refrigerants AND fire suppression clean agents with zero ODP and negligible Global Warming Potential of ≤ 10 .	1			N/A
MR SUB-TOTAL		9	9	2.7	

5

WATER EFFICIENCY (WE)

WATER HARVESTING & RECYCLING | INCREASED EFFICIENCY

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
WATER HARVESTING & RECYCLING					
WE1	RAINWATER HARVESTING				
	Encourage rainwater harvesting that will lead to reduction in potable water consumption:-				
	Rainwater harvesting that leads to $\geq 5\%$ reduction in potable water consumption, OR	1	3	0	N/A . No rainwater harvesting system being applied.
	Rainwater harvesting that leads to $\geq 15\%$ reduction in potable water consumption, OR	2			N/A
	Rainwater harvesting that leads to $\geq 30\%$ reduction in potable water consumption.	3			N/A
WE2	WATER RECYCLING				
	Encourage water recycling that will lead to reduction in potable water consumption:-				
	Treat and recycle $\geq 10\%$ wastewater leading to reduction in potable water consumption, OR	1	2	0	N/A
	Treat and recycle $\geq 30\%$ wastewater leading to reduction in potable water consumption.	2			N/A
INCREASED EFFICIENCY					
WE3	WATER EFFICIENT - IRRIGATION/LANDSCAPING				
	Reduce potable water consumption for landscape irrigation by:				
	a) 50%	1	2	0.5	I gave this 0.5 is because the rainwater captured by the gutters are being send down through a pipe and the pipe leads to the garden area, where I think it helps to water the plants where no extra water is needed. (Ref to D1.14)
	b) 100%	2			
WE4	WATER EFFICIENT FITTINGS				
	Encourage reduction in potable water consumption through use of efficient devices:-				
	I) With reference to Utility calculations;				
	a) Reduce annual potable water consumption by $\geq 20\%$, OR	1	3	1	Dual flush is being used in the toilet now, which was a normal flush years before. It has helped to reduce the amount of water consumption use to flush by limiting the amount of water. Small pump limits the amount to 3L and big pump limits the amount to 6L. Small pumps are usually used for liquid waste and big pumps are used for solid waste. It can help to reduce the consumption of water as big pumps can be avoided when flushing liquid waste. (Ref to D1.15)
	b) Reduce annual potable water consumption by $\geq 30\%$, OR	2			
	c) Reduce annual potable water consumption by $\geq 50\%$.	3			
	OR				
	II) From existing 3-year average water consumption record, reduce annual potable water use by:				
	a) $\geq 20\%$	1			
	b) $\geq 30\%$	2			
	c) $\geq 50\%$	3			
WE5	METERING & LEAK DETECTION SYSTEM				
	Encourage the design of systems that monitors and manages water consumption:-				
	Use of sub-meters to monitor and manage major water usage for cooling towers, irrigation, kitchens and tenancy use.	1	2	0	N/A . No sub-meters are use in my house.
	Link all water sub-meters to EMS to facilitate early detection of water leakage.	1			
WE SUB-TOTAL		12	12	1.5	

6

INNOVATION (IN)

INNOVATION & ENVIRONMENTAL INITIATIVES | GREEN BUILDING INDEX FACILITATOR

ITEM	AREA OF ASSESSMENT	DETAIL POINTS ALLOCATED	MAX POINTS	SCORE	JUSTIFICATION
IN 1	INNOVATION & ENVIRONMENTAL INITIATIVES				
	<p>Provide design team and project the opportunity to be awarded points for exceptional performance above the requirements set by GBI rating system:-</p> <p>1 point for each approved innovation and environmental design initiative up to a maximum of 9 points, such as (refer to GBI website for updates and details);</p> <ul style="list-style-type: none"> • Condensate water recovery (accounting for at least 50% of total AHUs/FCUs); • Thermal / PCM / Thermal Mass storage system (accounting for at least 25% of total required capacity); • Solar thermal technology / Solar Airconditioners (generating at least 10% of total required capacity); • Heat pipe technology (for at least 75% of PAHUs for purpose of RH control/improvement); • Auto-condenser tube cleaning system (for 100% of chilled water system); • Advanced air filtration technology (serving at least 50% of the NLA); • Refrigerant leak detection and recovery facility; • Fire System Water Recycling during regular testing; • Car park mechanical ventilation fans provided with VSD and controlled by CO₂/CO sensors. 	9	9	0	N/A . No innovation initiatives are being use in my house. Everything is old and some technology is not introduced yet when the house was built. However, air purifier machine is being add on and placed in my parents room, but it does not meet the requirement of serving at least 50% of the NLA. So, it is not applicable for this criteria.
IN 2	GREEN BUILDING INDEX FACILITATOR				
	To support and encourage the integration required for Green Building Index rated buildings and to streamline the application and certification process:-		1	0	N/A . No GBI certificate obtained, which makes sense because it is a very old house where green buildings are not influencing the community yet.
	Engage the services of a Green Building Index Facilitator to assist in obtaining Green Building Index certification.	1			
IN SUB-TOTAL		10	10	0	

1.4 RESULTS & REFLECTION

DETAIL ASSESSMENT CRITERIA

SUMMARY OF FINAL SCORE

PART	ITEM	MAXIMUM POINTS	SCORE
1	Energy Efficiency (EE)	38	5
2	Indoor Environmental Quality (EQ)	21	11.6
3	Sustainable Site Planning & Management (SM)	10	4.5
4	Material & Resources (MR)	9	2.7
5	Water Efficiency (WE)	12	1.5
6	Innovation (IN)	10	0
TOTAL SCORE		100	25.3

GREEN BUILDING INDEX CLASSIFICATION:

POINTS	GBI RATING
86 to 100 points	Platinum
76 to 85 points	Gold
66 to 75 points	Silver
50 to 65 points	Certified
Total Points: 25.3	Not Certified

Strong areas:

After completing the checklist, I was quite impressed by the scores. I knew that my house would not be certified as a green building but I was not expecting that some of it gained full marks for the for the particular criteria. Below are the strong areas listed upon my investigation.

- Lighting zoning. The lightings were zoned according to private or enclosed rooms and some dividers. They lux level are sufficient and not overly designed.
- Thermal comfort. Every spaces and enclosed areas will provide an air-conditioner and a fan. Users can access easily and adjust depending on their preferences.
- Daylighting. My house have a lot of windows that allow natural light to penetrate in and reduce the use of artificial lights. We usually only turn on lights after 6pm. Every rooms and every spaces have windows.
- External view. Bukit Jelutong has a lot of greenery and my house at the corner lot has a very good view to the Shah Alam National Botanical Park.
- Green vehicle priority. My house has a hybrid car and is always parked nearest to the entrance to charge as the plug point is located near the entrance.
- Greenery. Gardens surrounding my house with flowers and plants planted nicely. Some vegetables are also planted at the back part of the garden.
- Air quality. I would say my house air quality is good as it is surrounded by a lot of vegetation. There is no weird odour or irritation towards the sensory.
- Waste management. The wastes in my house will be separated into 4 different colours large bins and will be place outside once a week for garbage collectors to collect it.

Weak areas:

There are a lot of weak areas that need to be improved in order to heighten the green effect of my house. Below are the weak areas listed upon my investigation.

-Energy efficiency. Only two motion sensor light bulbs were installed in my entire house. More installation can be done at staircase walkway, toilets or kitchens to save more energy.

-Renewable energy. My house does not have a source of renewable energy except the source of electricity from TNB. I think an installation of solar panel would save a lot of energy.

-Timely maintenance. As for our house, we will only repair something once its broken. For example, if the air-conditioner is only giving out hot air, that is when we realised and call for maintenance. It will be expensive if we booked a maintenance person to look over our house in a timely manner and it is not that necessarily too.

-Smoke control. When my relatives come and visit, and when they smoke, I can smell it from the living room. I cannot do anything about this as it would be really costly to install an effective filtration system and would be very funny to build a smoking room as none of our family smokes.

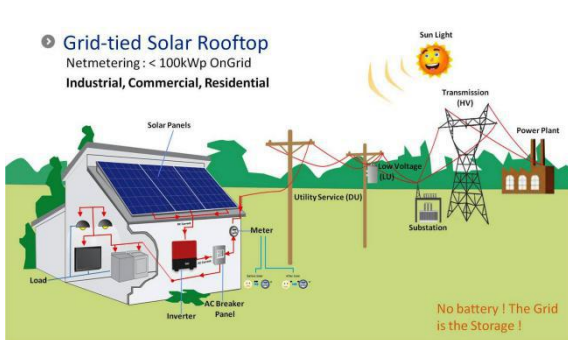
-Noise level. The noise level in my house is quite loud and noisy. I think soundproof materials could be apply to the walls of the rooms to decrease the level of noise. Soundproof door is also an effective way.

-Water fittings. The water fittings (shower head, faucet) in my parents' bathroom has a high flow rate of water, I think installation of aerators would help to reduce the flow and save more water.

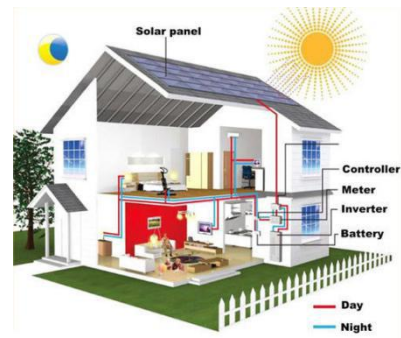
1.5 DESIGN PROPOSAL

Solar panel installation to the roof

Malaysia's location has an advantage of solar power, it can receive between 4000 to 5000 Wh per day. I am proposing a solar power system because I think it is very environmentally friendly and energy efficient. The cost of electricity continued to rise over the years and I was thinking why not just invest on a solar power system that can generate own electricity that is sufficient for the house. I had search online about it and basically it has two types of system. One is grid-tied system and one is off-grid system .

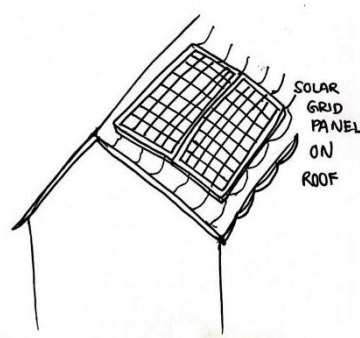
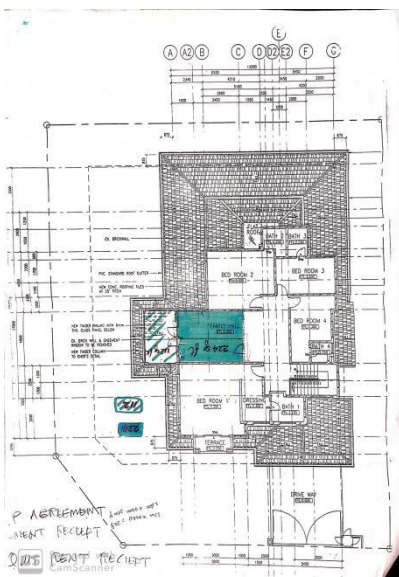


Grid-tied system is the most common and cheaper option among residential solar system. This system allows you to use your generated energy and if the energy generated are more than what your home needs, the excess electricity will go back to the utility grid and you will be credited for the electricity that sent back.



Off-grid system is a standalone solar power system, it operates independently from the electricity grid. It provides all the energy that your home needs and is very costly to install it.

For my house installation, I would choose the Grid-tied system as there are already power lines at this area and a connecting system installation will be easier and efficient despite of having a standalone system which is much more expensive.



The number of panels depend on the amount of energy that my house need to generate.

The roof area of my house is about 303.18 m², calculated from the plan that I had. It is a very big space to allow rows of solar panels to be installed.

Sound proofing wall design

As I mentioned on the weaknesses, the internal noise level is high where it proves that the soundproof system in my house is really poor. Having a karaoke room, we cannot sing it too loudly at night and has to really volume down to not disturb other people outside. I was thinking to design the wall of the karaoke room to a soundproof, economical friendly and aesthetically pleasing look by wisely choosing the sustainable material. Therefore, after searching on the materials, I have decided to use acoustic panels.

Soundproof Cow for Eco-Friendly Soundproofing

Soundproof Cow is committed to joining the fight against environmental pollution and waste and to offering ecofriendly products. You can find Soundproof Cow products made from 80% recycled materials. These insulating, soundproofing products are so safe you can install them by hand without gloves. Of course, we wouldn't offer these products if they didn't meet Soundproof Cow's high standards when it comes to absorbing and blocking sound. You can use these products with confidence that you're doing your part for the environment while enjoying high-grade sound blocking power. Some of our most popular eco-friendly soundproofing solutions include:

- **Quiet Batt™ 30 Soundproofing Installation:** Quiet Batt™ 30 Soundproofing Insulation, made from 80% recycled cotton, is non-toxic, itch-free and has a Class A flammability rating. Its high-density material blocks both airborne noise and impact noise, and you can easily install it in walls, ceilings, attics or wherever you need reliable sound control.

- **Echo Absorber™ Acoustic Cotton:** Like the Quiet Batt insulation, Echo Absorber™ cotton panels are made with 80% recycled cotton. They're VOC, fiberglass and formaldehyde free. These flexible panels and baffles can go just about anywhere, from offices to gun ranges. Our most cost-effective soundproofing materials are mold and flame-resistant, lightweight and offer superior sound control.

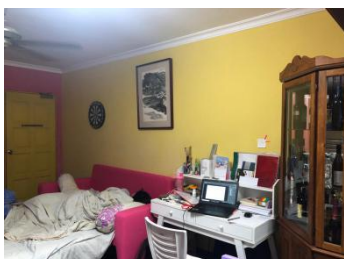
This is a firm called Soundproof cow that I found and they are providing eco-friendly soundproofing panels, where the materials are made of recycled material, free of VOC, fiberglass and formaldehyde.

Their acoustic panels quiet the space by absorbing noise, it increase the privacy too as people outside cannot hear what is inside. No more worries are needed when singing loudly at night.

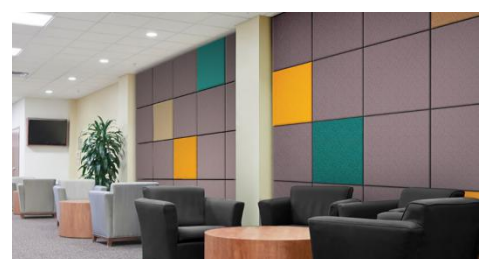


Hexagonal fabric wrapped acoustic panel being mounted to the wall. I played with the colours and arrangements to create a nice pleasing wall design.

Picture before:



Inspirations:



1.6 CONCLUSION

After completing this assignment, I had learned a lot about Green Buildings advantages and how important it is to the environment and people. This project increased my awareness of Green Buildings that are happening around me. I became aware of the design whenever I went to a place that is fully naturally ventilated and I am supporting it as it really can save up a lot of energy. For example, Sunway Geo is designed in a way that I still feel comfortable in the building. It is not hot and not too cold either. It is very interesting to understand and observe how the criterias are being applied to the design of a green building.

Moreover, when I audit the space of my very own house, I was breaking up my head because some of the criteria required complicated calculations. Although it is hard, but I had fun going around my house and observing every single thing. I am not amazed by the result as my house is an old house and I knew it would not be certified. I was hoping that my house can reach at least to the certified level but sadly no.

In conclusion, I hope that we, the young designers nowadays can take actions on heightening the green effect in the space or buildings that we are going to design. It is very important for us to take care of the environment and prevent it from dying. I suggest that more green building competitions or campaigns can be held to motivate the people. Lastly, I hope to see more and more green buildings being establish in the future. Let's together make a change to this world !

1.7 APPENDIX

D1.1



D1.2



D1.3

NIPPON PAINT TECHNICAL DATA SHEET

Updated Aug'16

SUPER MATEX

Super MATEX is a vinyl acrylic copolymer emulsion paint. It is specially formulated for economical needs.

Product Features:

- Fungus resistance
- Smooth matt finish

Paint Type	Product Type	Finishing	Recommended Substrate	Pack Size
Water based	Interior	Flat Matt	Masonry, brick, plastering substrate and fibre board.	7 Litres, 18 Litres

Composition

Pigments : Mainly Titanium Dioxide, Iron Oxide, Carbon Black, Organic Pigments and Mineral Extender
 Binder : Vinyl Acrylic Copolymer
 Thinner : Water

Technical Data

Drying Time : Touch Dry : 15 minutes (Dependent on temperature and humidity)
 Hard Dry : 1 hour (Dependent on temperature and humidity)
 Recoating Time : 2 hours (Dependent on temperature and humidity)
 Dry Film Thickness : Around 30 µm per coat (based on substrate condition)
 No. of Coats : 2 coats
 Theoretical Coverage : 10 – 12 m² per litre per coat (Actual coverage is dependent on substrate condition, application method, application condition and finishing appearance)
 Volume Solid : ~ 33%
 Shelf Life : Up to 36 months in tight sealed container

D1.4

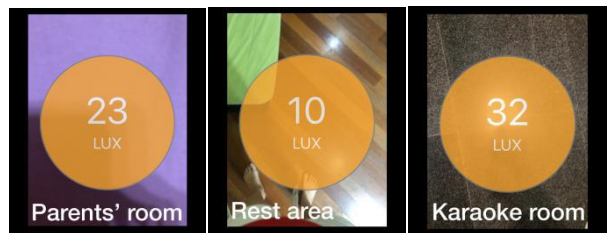


D1.5

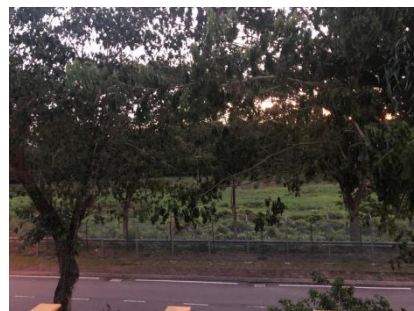


D1.6

HOMES		
Living rooms general	50	50
Casual reading	150	150
Sewing daringsudies desk and protuged	300	300
Bedroom general	50	50
Bedlead kitchen	150	150
Kitchen working areas		
Bathrooms	100	100
Halls and landings	150	150
Stairs	100	100
Workshops	300	200
Garages	50	50



D1.7



D1.8



D1.12



D1.9



D1.13



D1.10



D1.14



D1.11



D1.15



1.8 REFERENCES

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