3 Building Services Proposal

a. Air Conditioning & Mechanical Ventilation

The design of the air conditioning and mechanical ventilation shall be up to the standard required for a modern energy efficient benchmark. The design concept set to achieve the best energy efficiency and low impact to the environment, to be sustainable. The design of the ACMV system shall be simple, easy to install and ease of operation and maintenance.

In the design scope, it is separated according to the three typologies. First typology is the heritage building (main building). At the library area in this building shall be using centralised air conditioning system. AHU room located at the highlighted area in the floor plans as per Figure 83. There is ducting connected from the AHU to terminal unit and from terminal unit there is ducting to diffuser for air outlet. The AHU is connected to chiller plant. A cooling tower is needed in this system.

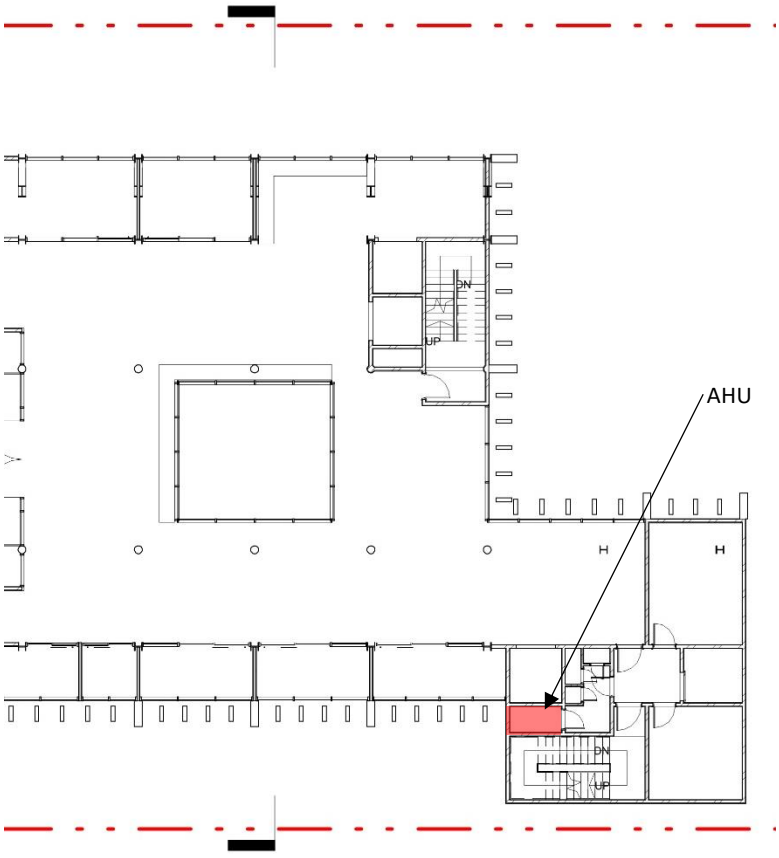


Figure 83: AHU location in main building part plan.

For the second typology which is the abandoned building (student accommodation) is using centralised air conditioning system. FCU will be placed into each unit which connected to the AHU as shown in Figure 84.

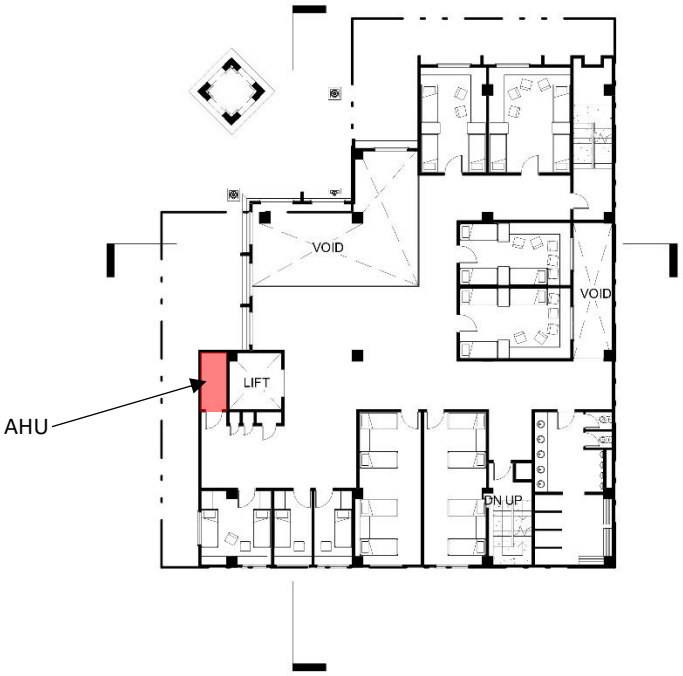


Figure 84: AHU location in student accommodation.

For the third typology which is the shophouse (classroom) is using split air conditioning system. There will be indoor and outdoor unit, compressor (outdoor) and wall hung or ceiling mount unit (indoor). The selection of split ac system must have invertor function to maximise energy saving.

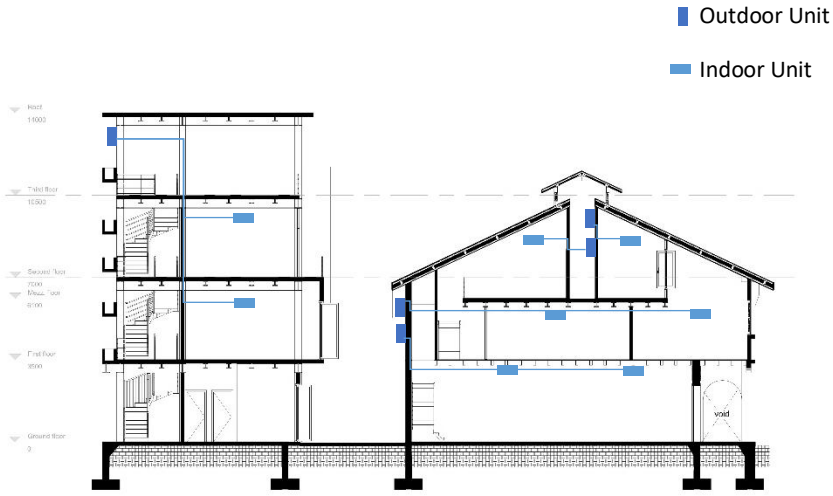


Figure 85: Split unit system applied in the shophouse (classroom).

b. Access Point & Security System

As the project is located at the urban setting, which is Taiping town. The main ingress and egress of all the buildings are directly connected to the main roads or the existing 5-foot walkway. This being the access point for drop off and loading/unloading can be easily access. The access point of TNB, refuse chamber and other services are directly connect to the existing back lane which have direct accessibility.

The Figure 86 shown the ingress and egress (drop off) of the developments are connected to the main roads and fire engine route cum services route.

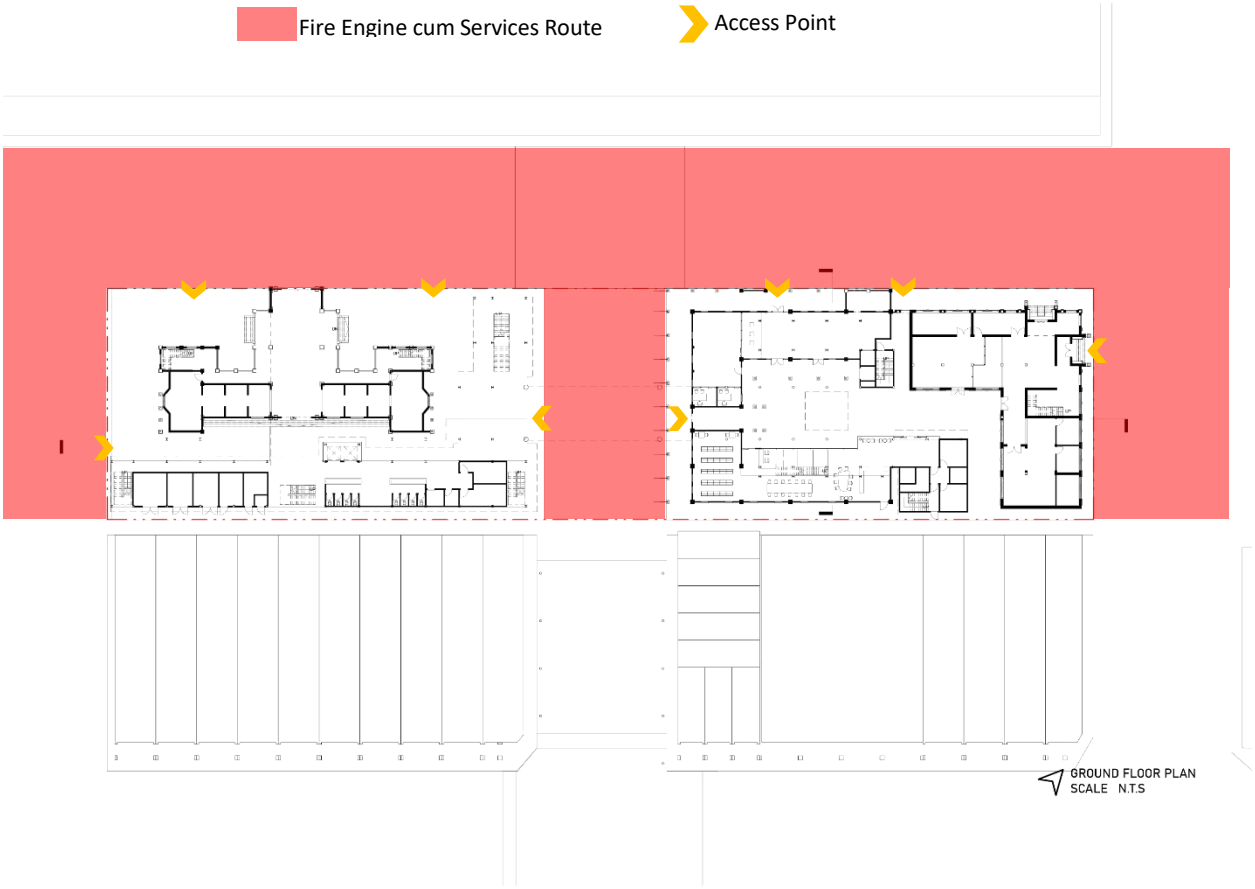


Figure 86: Access points and fire engine cum services access for main building.

As mentioned above, the setting is located at an urban town, hence there are multiple access points to the main building. In the proposed development, the security system shall be multiple dwelling entry and security systems. Designated access key card can be use in the lift to differential the access for university personnel, students and public. Combination of active security system such as motion detectors and CCTV around the main building to provide visual surveillance.

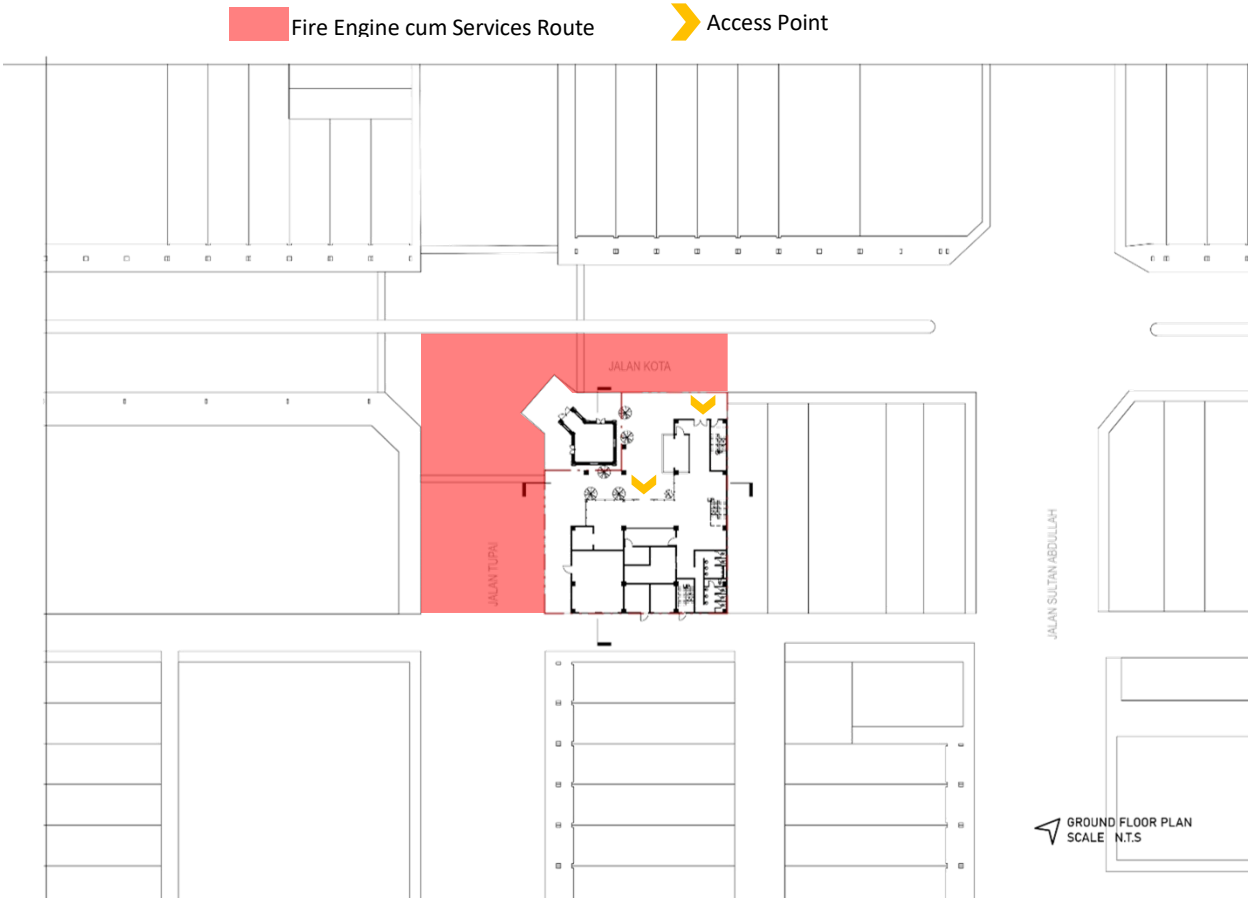


Figure 87: Access point and fire engine cum services route for student accommodation.

The student accommodation also located in the urban town setting but the access point to the student accommodation is limited to two access points. Designated key card access for the residents (students) used in the lift to access to the unit floors. The ground and first floor are partially open to the public where access gained through the provided two access points. Combination of active security system provided in the student accommodation building such as motion detectors and CCTV to provide visual surveillance.

Lastly, for the shophouse (classroom) where located all over the town. The main access point to the shophouse is through the 5-foot walkway. Operating time the ground floor of the shophouse is open to the public for accessibility (shortcuts). Meanwhile, student will have designated student card to access the classrooms provided at the first, second and third floor. Combination of active security system provided in the shophouse such as motion detectors and CCTV to provide visual surveillance.

c. Solid Waste System

The solid waste proposed are based in the purpose of each building accordingly. The size of the equipment use for the system are based on the calculation of waste generated by each type of building.

Calculation size of refuse chamber for:

A) Main Building:

B) Student Accommodation:

C) Shophouse:

A) Main Building

Spiral Waste Bin:

Type of building : Library, Administration, Management, Student Union

Collection frequency : 2 per week

Estimation of waste : Total area x 0.15m^3 / 300m^2

Total area : 6990m^2

Calculation : 6990 x 0.15 / 300

: 3.5m^3

Proposed spiral waste bin with the capacity of **4m^3** to manufacture details.

B) Student Accommodation

Spiral Waste Bin:

Type of building : Accommodation

Collection frequency : 2 per week

Estimation of waste : 0.01m^3 per unit

Total nos of unit : 45 units

Calculation : 45 x 0.01

: 0.45m^3

Proposed spiral waste bin with the capacity of **1m^3** to manufacture details.

3) Shophouse

Mobile Garbage Bin (MGB)

Type of building : Institution (classroom)

Collection frequency : 2 per week

Estimation of waste : Total area x 0.15m^3 / 300m^2

Total area : 353m^2

Calculation : 353 x 0.15 / 300

: 0.17m^3

Proposed mobile garbage bin (MGB) with the capacity of **1m^3** to manufacture details.

Figure 88: Proposed spiral waste bin model.

Figure 89: Proposed MGB type.

d. Green Building Index (GBI)

The Green Building Index (GBI) is Malaysia's industry recognized green building rating tool to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues and our responsibility to the future generations. The GBI rating tool provides an opportunity for developers and building owners to design and construct green, sustainable buildings that can provide energy savings, water savings, a healthier indoor environment, better connectivity to public transport and the adoption of recycling and greenery for their projects and reduce our impact on the environment.

In the selected project of **UNIVERSITY FOR ALL : KNOWLEDGE TRANSFER WITHIN THE COMMUNITY** building, the green building criteria include the following aspects:

- Energy Efficiency
- Indoor Environment Quality
- Sustainable Site Planning & Management
- Material & Resources
- Water Efficiency
- Innovation

With a targeted rating of Silver, the building must obtain the points of 66 to 75 out of 100. The following elements of each aspect need to be fulfilled to achieve the desired target.

1. Energy Efficiency

I. Building wall shall be using red brick, to reduce heat gain into the building.

II. Building glazing shall design to optimal size and type of glazing shall be double glazed window with low-e technology.

III. Building roof shall install roof insulation to prevent heat gain into the building.

IV. Building shading devices shall be installed to shade direct-sunlight onto the glazing of the building and able to maintain the OTTV value (OTTV ≤ 50).

V. Submit OTTV calculation using BEI software or other GBI approved software.

VI. Building shall install Energy Management Control System.

VII. All individual spaces of the building shall be installed with individual switches with clearly labelled and easily accessible by the building occupants.

VIII. Provide auto-sensor to control lighting with daylighting strategy, motion sensors to detect occupants use of spaces.

IX. Used of solar panels (Integrated Photovoltaic Panels) as renewable energy targeted to achieve 1.0% of maximum electricity demand or 10kWp supplied by the RE.

X. Improved EE performance to achieve Building Energy Intensity (BEI) ≤ 110 kWh/m².yr.

XI. Used of Energy Management Control System to monitor and trend log building system performance for ACMV system.

XII. 75% of building maintenance team shall participate in the commissioning of all building energy services.

XIII. A designated building maintenance office shall be allocated.

XIV. Provide evidence of documented plan for at least 3-year facility maintenance and preventive maintenance budget.

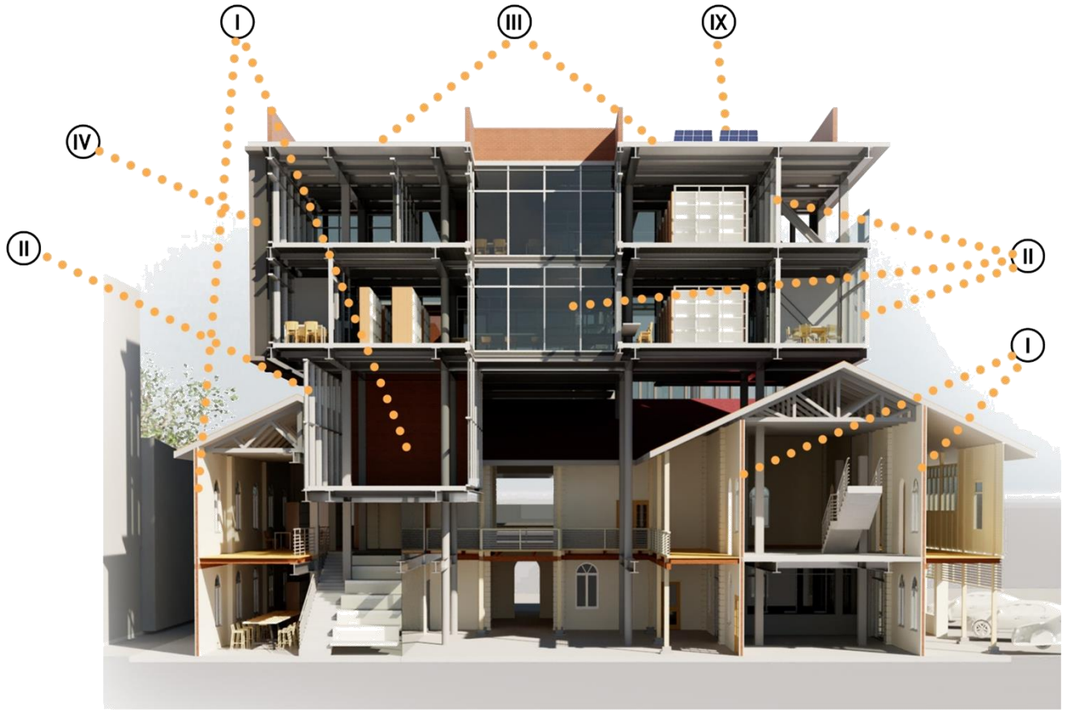


Figure 90: Indication of GBI (EE) applied in the building.

2. Indoor Environmental Quality

I. Provide maximum cross ventilation or stack effect in the building to meet the minimum requirements of ventilation rate of the local building code.

II. Prohibit smoking in the building and provide exterior designated smoking area.

III. Provide carbon dioxide monitoring and control system.

IV. Used of low VOC paint & coating, carpet & flooring and adhesive & sealant throughout the building. All the materials used shall comply to the requirements specified in international labelling scheme recognized by GBI.

V. Used or products with no added urea formaldehyde.

VI. Provide effective air change system.

VII. Provide good number of windows to allow natural daylighting. Provide atrium to allow daylighting.

VIII. Provide sun shading devices, blinds or screen of all glazing and atrium to reduce glare from direct sun.

IX. Internal lighting not to be over designed.

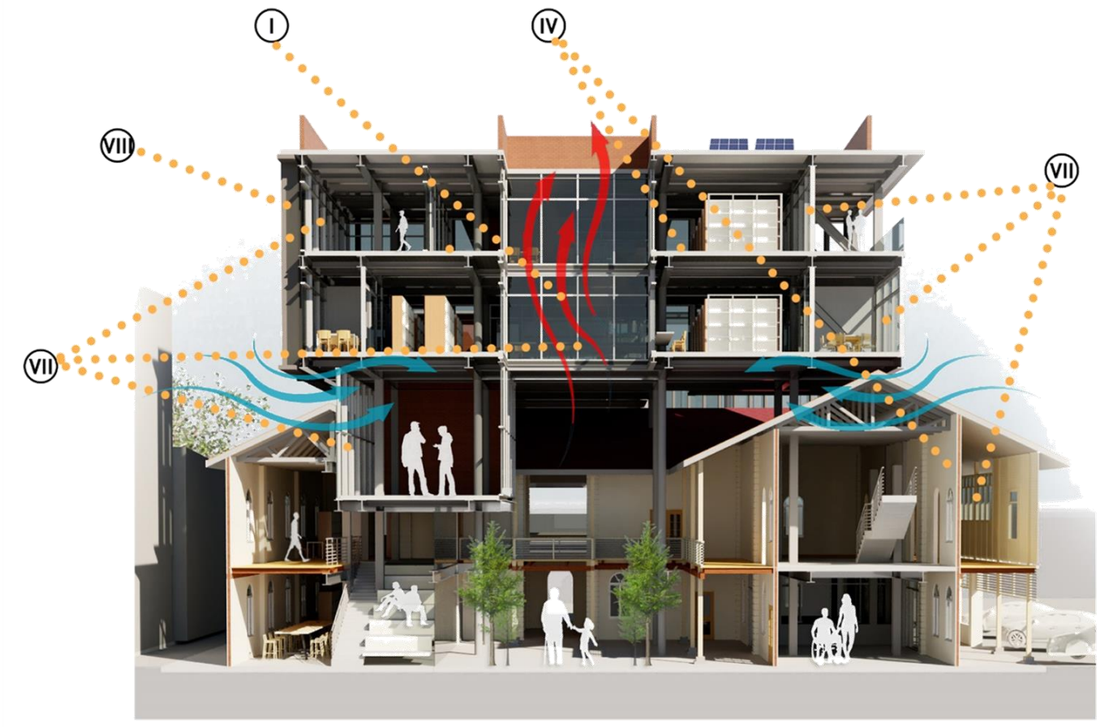


Figure 91: Indication of GBI (IDQ) applied in the building.

3. Sustainable Site Planning & Management

- Conduct a comprehensive Energy Efficiency Audit within the last 12 months.
- Use environmentally non-polluting methods and chemicals for cleaning of building exterior.
- Promote the use of public transportation and provide bus stop at certain area.
- Provide car parking lot in front of the development as required by the local planning guideline.
- Provide 50% of the site hardscape including sidewalks, courtyards, plazas, and parking lots.
- Use of green roof and roofing material with a Solar Reflectance Index (SRI) equal or greater than the value required in the standard table.
- Provide a Building User Manual which documents passive and active features that include in the buildings.

4. Materials & Resources

- Reuse building materials and products to reduce demand for virgin materials and reduce creation of waste.
- Introduce IBS construction method to reduce on site construction which will generate extra waste.
- Using certified wood-based materials and products in the retrofit works.
- Provide a waste management plan for storage, collection & disposal of recyclables.
- Promote pre-cast construction method to reduce waste generated by production on site.
- Use of environmentally friendly refrigerants and clean agents which Malaysia's commitment to the Montreal & Kyoto protocols.

5. Water Efficiency

- Targeted 15% reduction in potable water consumption by using rainwater harvesting for irrigation system on site.
- Targeted 10% wastewater to be treated and recycled leading to reduction in potable water consumption.
- Using the harvested water for landscape irrigation up to 100%.
- Use of water efficient sanitary devices to reduce annual potable water consumption by ≥ 50%.
- Link all water meters to EMS to facilitate early detection of water leakage.

6. Innovation

- Use of Industrialised Building System (IBS) for the retrofit component.
- Provide waterless urinals to all male toilets.
- Provide advanced air filtration technology.
- Condensate water recovery (accounting for at least 50% of total AHUs/FCUs) for use as cooling tower make-up water.
- Support and encourage the integrating required for Green Building Index rated buildings.
- Engage Green Building Index Facilitator to assist in the schematic design stage.

e. Vertical Transportation

The design of vertical transportation is generally divided into three categories, public, private, and service/fire lift. Vertical transportation is to transport human from the ground to whichever floor they wished to go. The number of lifts for each building type are various due to the number of rooms and occupants per floor are different. This development proposed to use KONE as the lift system. The result after using KONE online calculation of lifts required for each type of building are as the following:

Main Building:

KONE

Configuration Detail Summary

Your Configuration ID: C-464442

Please note that the Planner tool and outputs are for preliminary design purposes and not for construction. Before committing to any construction decisions, please contact your local KONE representative to verify the configuration.

KONE *Dedicated to People Flow™*

Elevator					
Product Name	KONE S MonoSpace®	Main Regulation Complementary Regulation	EN81-20	Group size	1 Elevator
Load	1000 kg / 13 persons	Speed	1.6 m/s	Car Height	2700 mm
Car Size (w x d)	1100 mm x 2000 mm	Door Height	2100 mm	Door Width	900 mm
Door Type	Center Opening	Entrance Type	Frame	Maintenance Access Panel (MAP) Type	Mounted on Wall
Building					
Landings	5	Door Openings		Distance between floors	
	5		Front door		3500 mm
	4		Front door		3500 mm
	3		Front door		3500 mm
	2		Front door		3500 mm
	1		Front door		
				Total travel	14000 mm
Min. Req. Headroom Height	4700 mm	Shaft size (w x d)	1950 mm x 2350 mm	Pit Depth	1450 mm

Figure 92: KONE lift configuration detail summary (Main Building).

KONE

Elevator Technical Specification

Your Configuration ID: C-464442

GENERAL INFORMATION	
Product Name	KONE S MonoSpace®
Main Regulation	EN81-20
Group size	1 Elevator
Speed	1.6 m/s
Load	1000 kg / 13 persons
Total travel	14000 mm
Landings	5
Number of entrances	5
MACHINE ROOM	
Machine location	Inside shaft
SHAFT SPECIFICATION	
Shaft size (w x d)	1950 mm x 2350 mm
Min. Req. Headroom Height	4700 mm
Pit Depth	1450 mm
ELEVATOR LANDINGS	
Door Type	Center Opening
Door Width	900 mm
Door Height	2100 mm
Entrance Type	Frame
Maintenance Access Panel (MAP) Type	Mounted on Wall
CAR	
Car type	Single entry
Car Size (w x d)	1100 mm x 2000 mm
Car Height	2700 mm

Please note that the Planner tool and outputs are for preliminary design purposes and not for construction. Before committing to any construction decisions, please contact your local KONE representative to verify the configuration.

KONE Dedicated to People Flow™

Figure 93: Technical Specification generated by KONE (Main Building).

As shown in Figure 93, the technical specification provided a guideline for the lift design in the building. In the main building, the total number of lifts provided are five as shown in Figure 94.

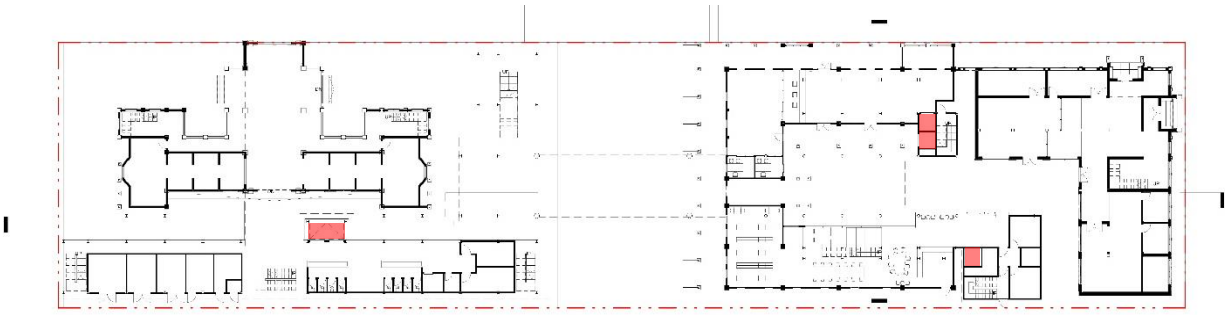


Figure 94: Indication of lifts location on the main building ground floor plan.

Accommodation Building:

Number of units per floor : 7 units per floor (4 person per unit)

Total floors : 5 stories

Required Handling Capacity (Residential): 7%

Total number of people x Required Handling Capacity

= 140 x 7%

= 9.8 (Estimated capacity of 10 people within the standard 5 mins handling capacity.

KONE

Configuration Detail Summary

Your Configuration ID: C-464521

Please note that the Planner tool and outputs are for preliminary design purposes and not for construction. Before committing to any construction decisions, please contact your local KONE representative to verify the configuration.

KONE *Dedicated to People Flow™*

Elevator					
Product Name	KONE S MonoSpace®	Main Regulation Complementary Regulation	EN81-20	Group size	1 Elevator
Load	1000 kg / 13 persons	Speed	1.75 m/s	Car Height	2700 mm
Car Size (w x d)	1100 mm x 2000 mm	Door Height	2100 mm	Door Width	900 mm
Door Type	Center Opening	Entrance Type	Frame	Maintenance Access Panel (MAP) Type	Mounted on Wall
Building					
Landings	8	Door Openings		Distance between floors	
	8		Front door		3000 mm
	7		Front door		3000 mm
	6		Front door		3000 mm
	5		Front door		3000 mm
	4		Front door		3000 mm
	3		Front door		3000 mm
	2		Front door		3000 mm
	1		Front door		
				Total travel	21000 mm
Min. Req. Headroom Height	4800 mm	Shaft size (w x d)	1950 mm x 2350 mm	Pit Depth	1500 mm

Figure 95: Configuration Summary by KONE Lift (Accommodation Building).

KONE

Elevator Technical Specification

Your Configuration ID: C-464521

GENERAL INFORMATION	
Product Name	KONE S MonoSpace®
Main Regulation	EN81-20
Group size	1 Elevator
Speed	1.75 m/s
Load	1000 kg / 13 persons
Total travel	21000 mm
Landings	8
Number of entrances	8
MACHINE ROOM	
Machine location	Inside shaft
SHAFT SPECIFICATION	
Shaft size (w x d)	1950 mm x 2350 mm
Min. Req. Headroom Height	4800 mm
Pit Depth	1500 mm
ELEVATOR LANDINGS	
Door Type	Center Opening
Door Width	900 mm
Door Height	2100 mm
Entrance Type	Frame
Maintenance Access Panel (MAP) Type	Mounted on Wall
CAR	
Car type	Single entry
Car Size (w x d)	1100 mm x 2000 mm
Car Height	2700 mm

Please note that the Planner tool and outputs are for preliminary design purposes and not for construction. Before committing to any construction decisions, please contact your local KONE representative to verify the configuration.

KONE Dedicated to People Flow™

Figure 96: Technical Specification generated by KONE (Accommodation Building).

The configuration data is based on the estimated capacity calculated before. For the accommodation building, there is one lift provided as shown in Figure 97.

Figure 97: Indication of lift location on the accommodation ground floor plan.

f. Fire Prevention and Safety

The design of fire prevention is when fire occurs, occupants in the building are able to escape in a safe and easy manner. According to the designated Purpose Group under UBBL By-Law 134, 138 (Fifth Schedule), the proposed development is categorised into three classification for different areas as shown in Figure 98 & 99.

Number of Purpose Group	Descriptive Title	Purposes for which compartments is intended to be used
III	Other Residential	Student Accommodation
IV	Office	University Management
VII	Places of Assembly	Library, Student Union, Classrooms

Figure 98: Proposed development's purpose group classification.

Purpose Group (1)	Height of Building (2)	Limits of Dimensions	
		Floor area of storey in building or compartment (in m^2) (3)	Cubic capacity of building or compartment (in m^3) (4)
III (other residential)	Not exceeding 28m	3000	8500
IV (office)	Not exceeding 28m	3000	8500

Figure 99: Dimensions of buildings and compartments according to UBBL By-Law 136.

Maximum travel distance in the UBBL By-Law 165(4), 166(2), 167(1), 170(b) (Seventh Schedule) required specific travel distance during fire event. Figure 100 shown the proposed development which travel distance needed.

Purpose Group	**Limit when alternative exits are available**		
	(1) Dead-End Limit	(2) Un-Sprinklered	(3) Sprinklered
III. Other Residential (Student Accommodation)	10	30	45
IV. Office (University Management)	15	45	60
VII. Places of Assembly (Library, Student Union, Classroom)	NR	45	61

Figure 100: Travel distance required in the proposed development.

Purpose Group Identification

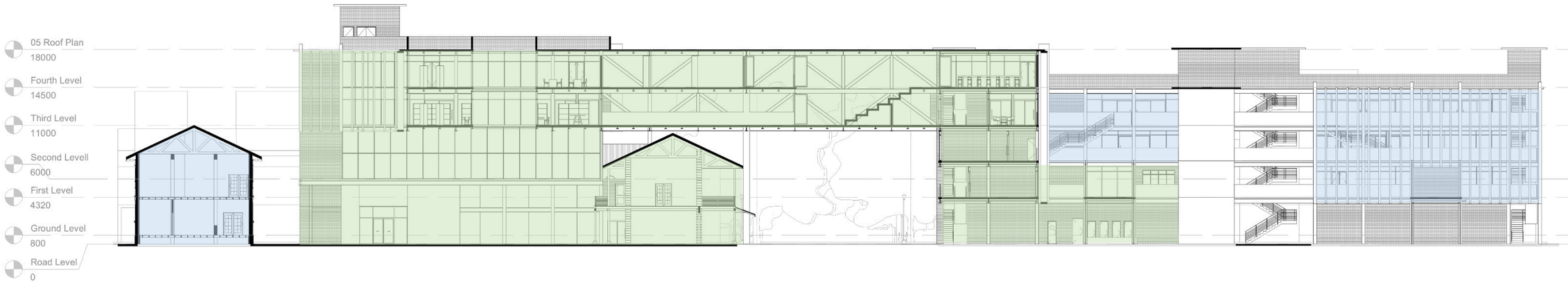


Figure 101: Section AA of Main Building indicating the purpose groups.

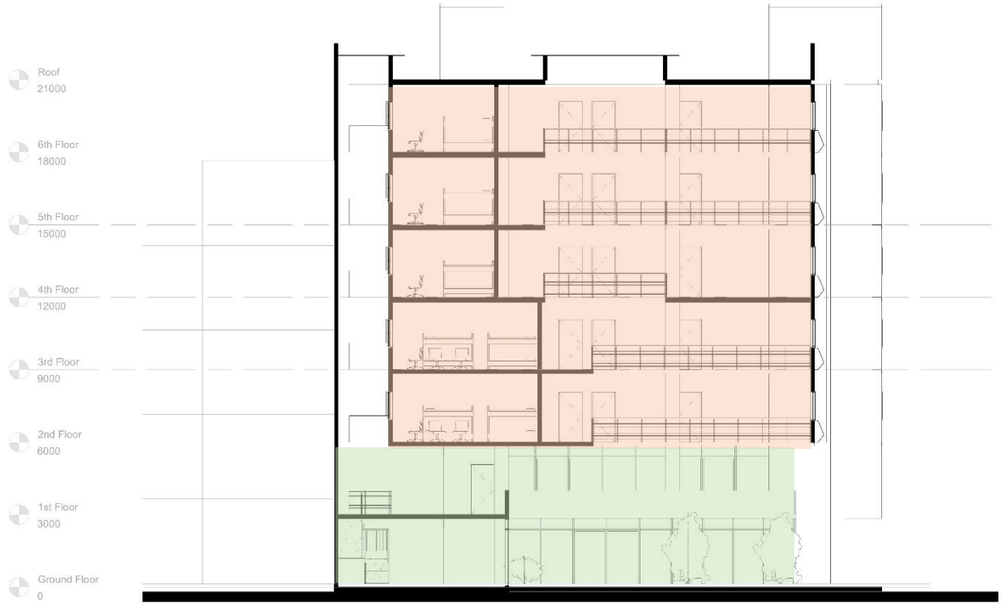


Figure 102: Section AA of Student Accommodation indicating the purpose group.

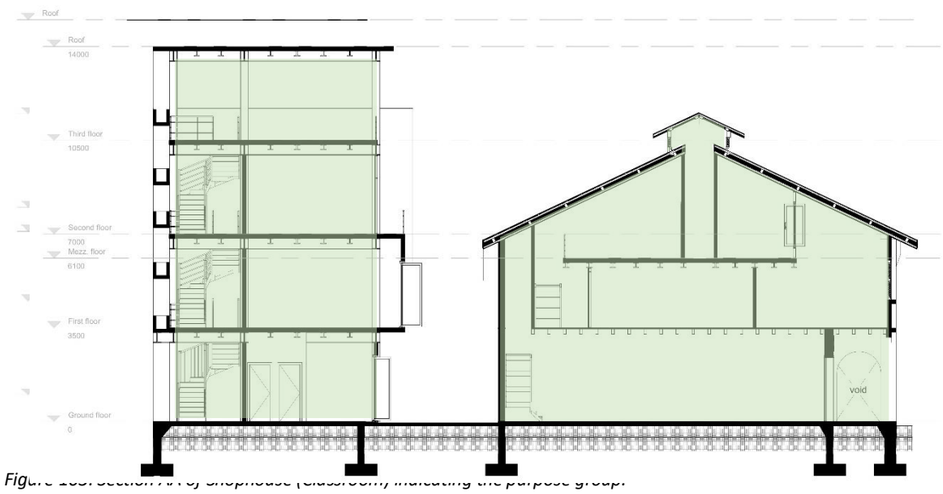


Figure 103: Section AA of Shophouse (classroom) indicating the purpose group.

Fire Escape Travel Distance

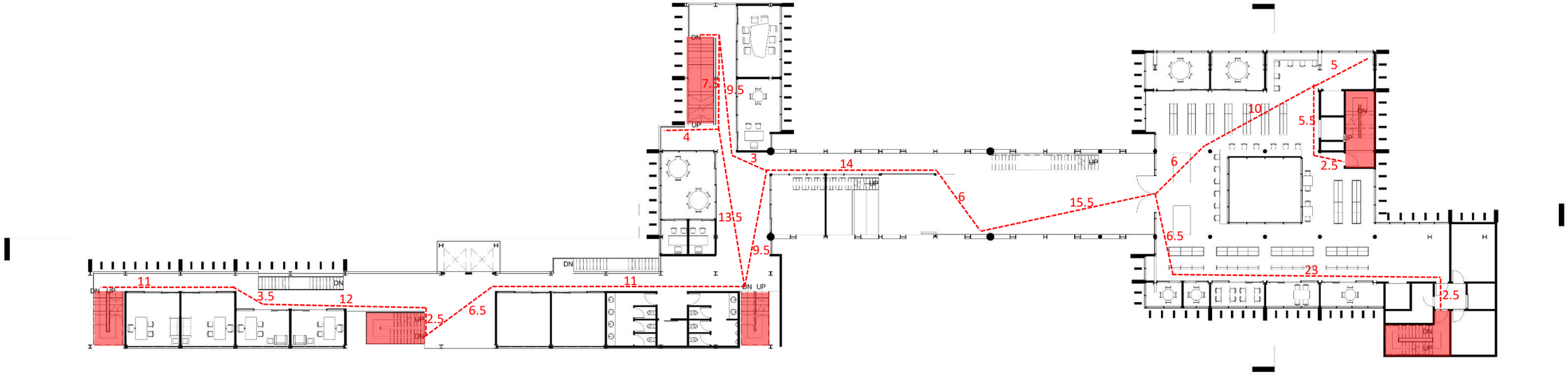


Figure 104: Fire escape travel distance in the main building.

Figure 106: Fire escape travel distance in the student accommodation.

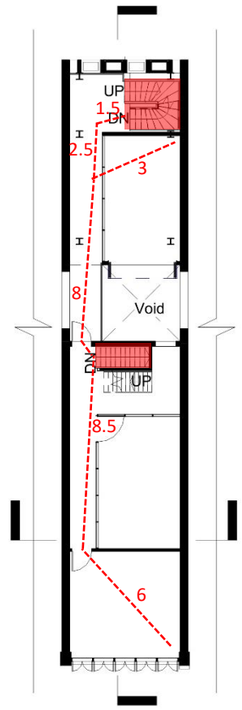


Figure 105: Fire escape travel distance in the shophouse (classroom).

Fire Fighter Provision for the development: University for All-Knwloedge Transfer within the Community.

Access for fire brigade is in accordance to By-Law 140, the building volume between 84,000 to 112,000 cubic m shall provide theree fourth perimeter fire appliance access. The minimum width of the fire appliance access shall be 6m and the overhead clearance shall be minimum 4.5m for fire brigade access.

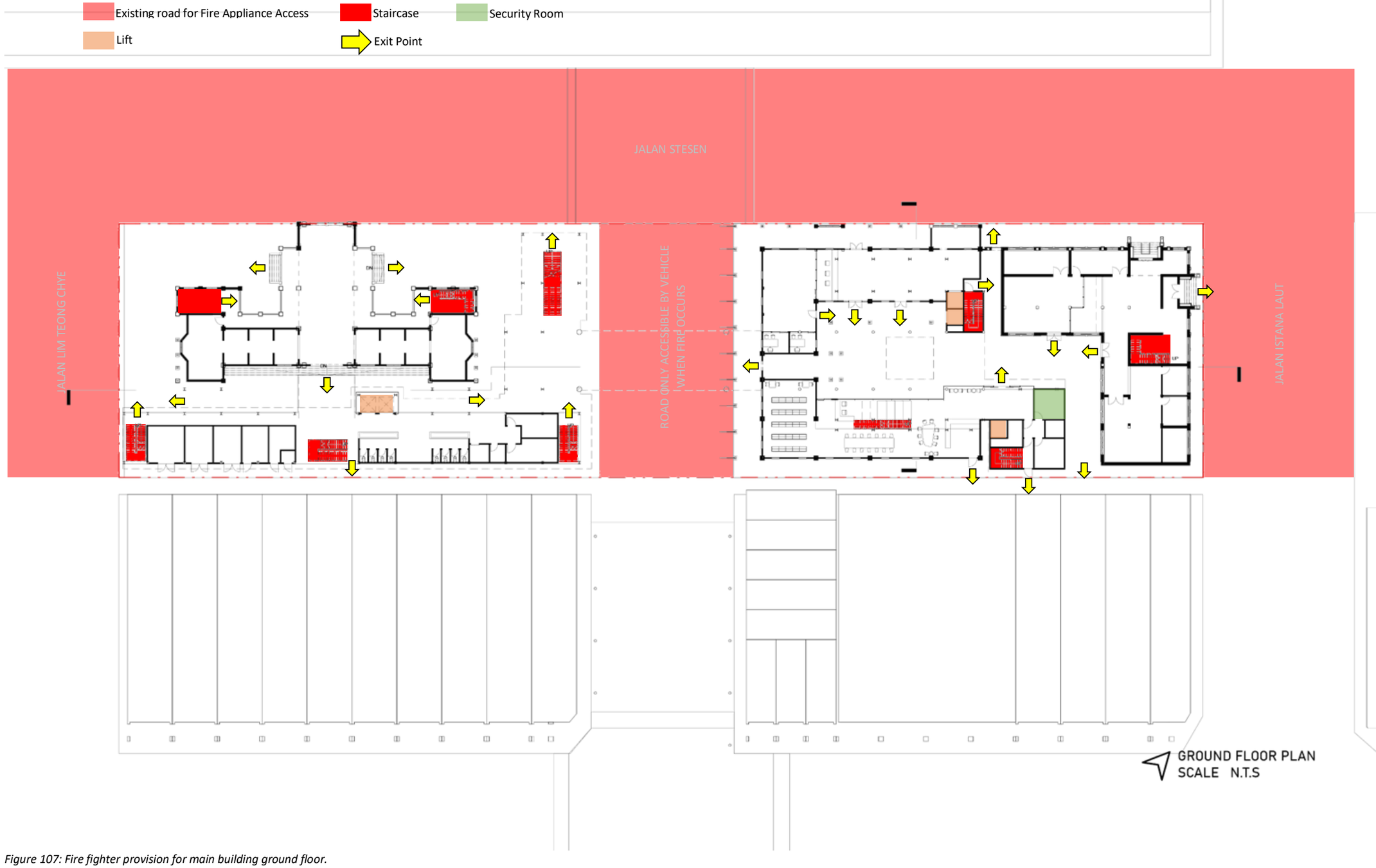


Figure 107: Fire fighter provision for main building ground floor.

Figure 108: Fire fighter provision for main building 1st & 2nd floor.

Figure 109: Fire fighter provision for main building 3rd & 4th floor.

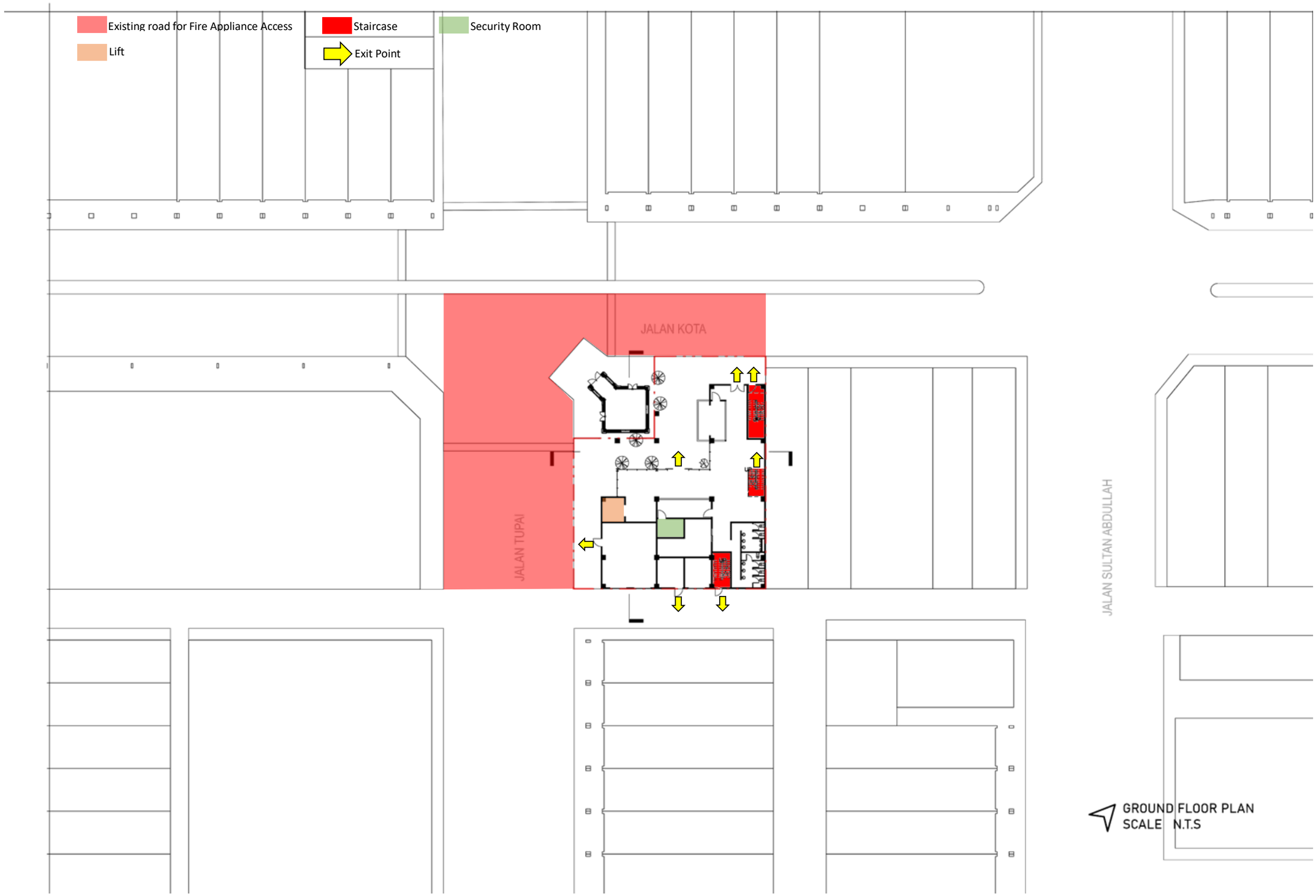


Figure 110: Fire fighter provision for student accommodation ground floor.

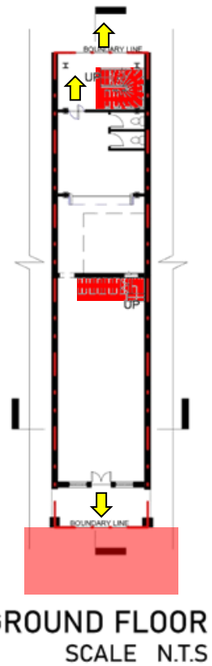
Figure 111: Fire fighter provision for student accommodation floors.

Open Corridor

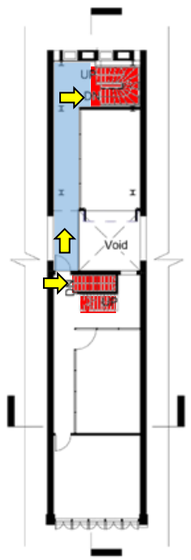
Existing road for Fire Appliance Access

Staircase

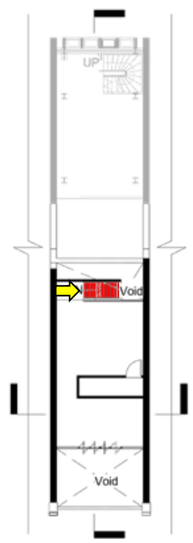
Exit Point



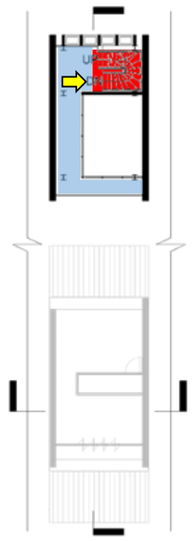
GROUND FLOOR
SCALE N.T.S



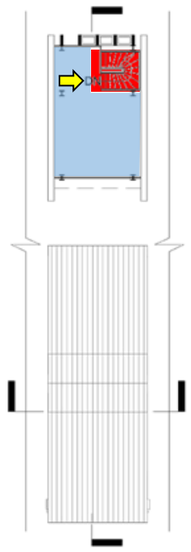
FIRST FLOOR
SCALE N.T.S



MEZZANINE FLOOR
SCALE N.T.S



SECOND FLOOR
SCALE N.T.S



THIRD FLOOR
SCALE N.T.S

Figure 112: Fire fighter provision for shophouse (classroom) all plans.

g. Electrical & Telecommunication

This is where the buildings have electricity and telecommunication. It consists of ELV, EL, TEL, PABX, and ICT. Usually, the design of electrical and telecommunication will be placed in one riser room for the ease of maintenance. Figure 113 & 114 shown the location of the riser room in the building.

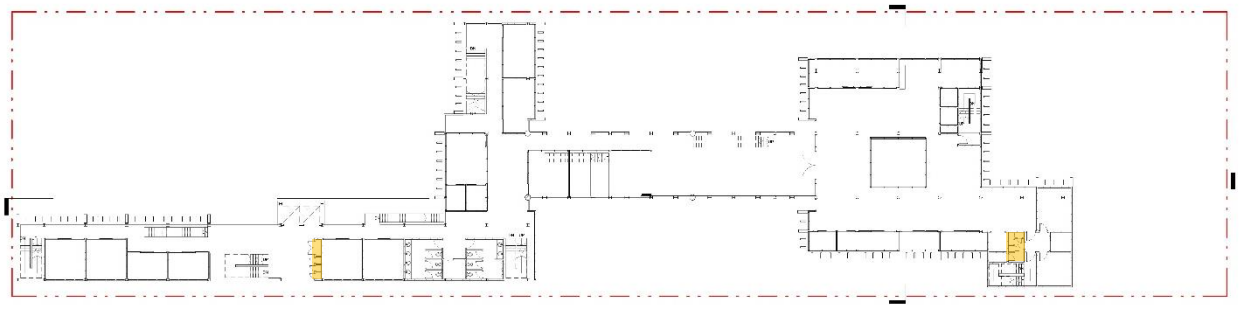


Figure 113: Riser room in Main Building.

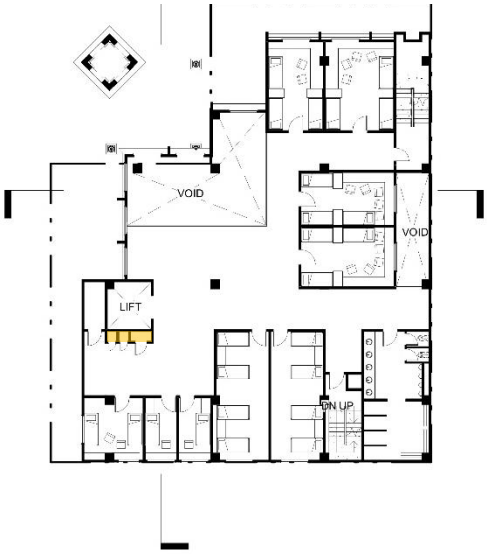


Figure 114: Riser room in Student Accommodation.

Location of all TNB related rooms.

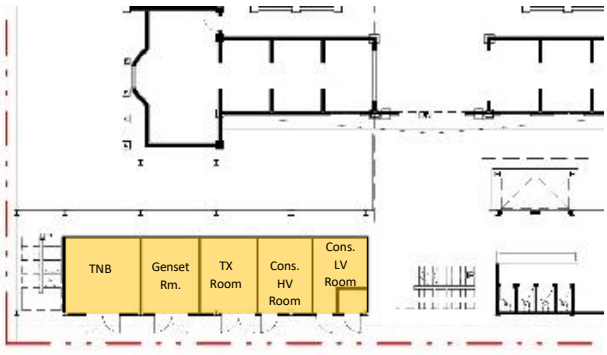


Figure 116: Part plan of main building ground floor plan.

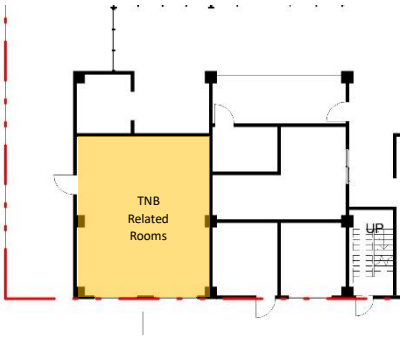


Figure 115: Part plan of student accommodation ground floor plan.

h. Building Maintenance System

The building maintenance system mainly to provide a system for workers to clean and do maintenance on the façade of the building. In the development, it is proposed to use the davit system. Using the davit system, it is due the easy setup which mobile sockets are easily wheeled into place and fit onto pedestals. All the buildings in the proposed development will be using the davit system as shown in Figure 117.

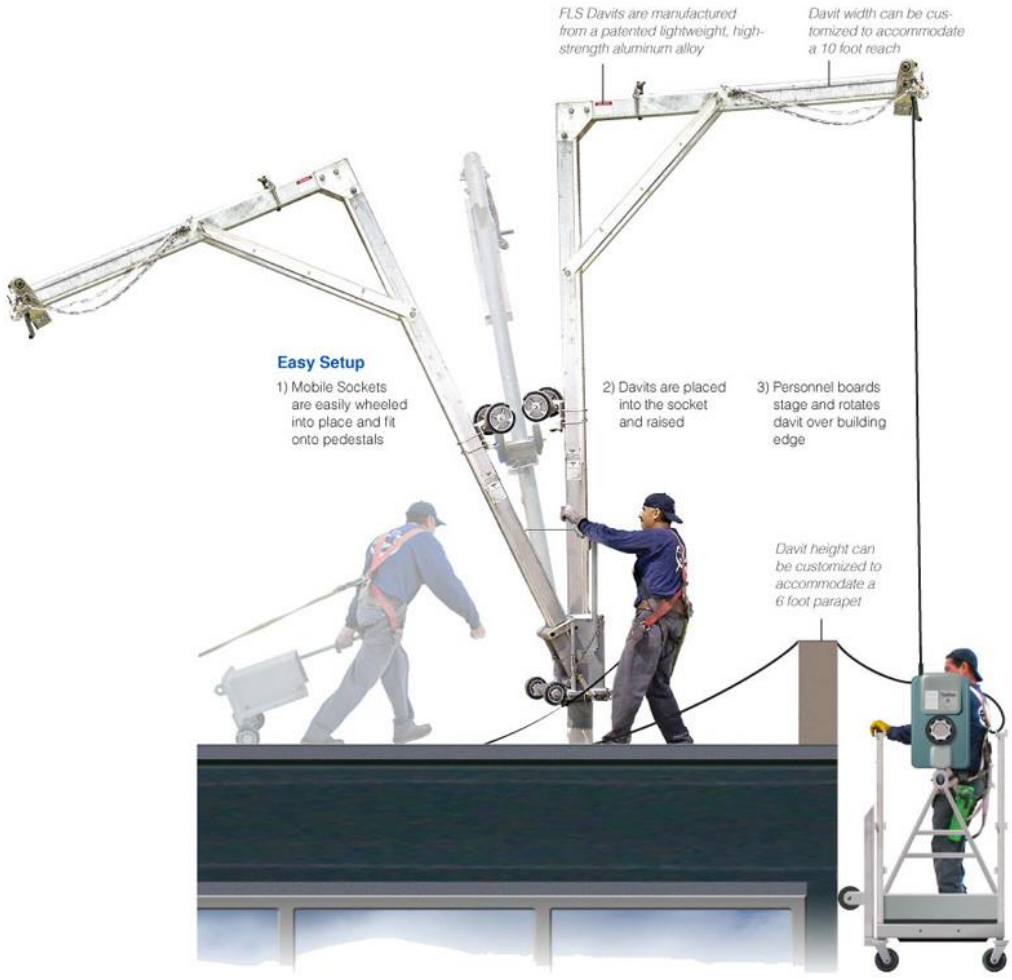


Figure 117: Proposed davit to be applied to the development. (Source: Flexible Lifeline System)

i. Drainage & Sewerage

The proposed sewerage system shall collect all domestic wastewater generated from the new development and pass through internal manhole before discharging to the public sewerage pipe. This is an important system in a building in order to transfer the sewage from the toilet to the STP or Oxidation Pond. For surface drainage, due the Taiping being the heaviest rainfall town, the surface drainage provided have enough capacity to accommodate the proposed development.

Calculation of PE

Type of Establishment	**University Student**
Targeted Number of Student	1000
Population Equivalent	1 per student
Calculation	1000 students x 1 per student
Total PE for University	**1000 PE**

Figure 118: PE calculation for the university spaces.

Type of Establishment	**Student Accommodation**
Maximum Number of Student	175
Population Equivalent	1 per residential student
Calculation	175 student x 1 per residential student
Total PE for University	**175 PE**

Figure 119: PE calculation for the student accommodation.

Total PE for the proposed development

= 1000 PE + 175 PE

=**1175 PE**

Figure 120, 121 & 122 shown the drainage and sewerage diagram for each type of proposed buildings.

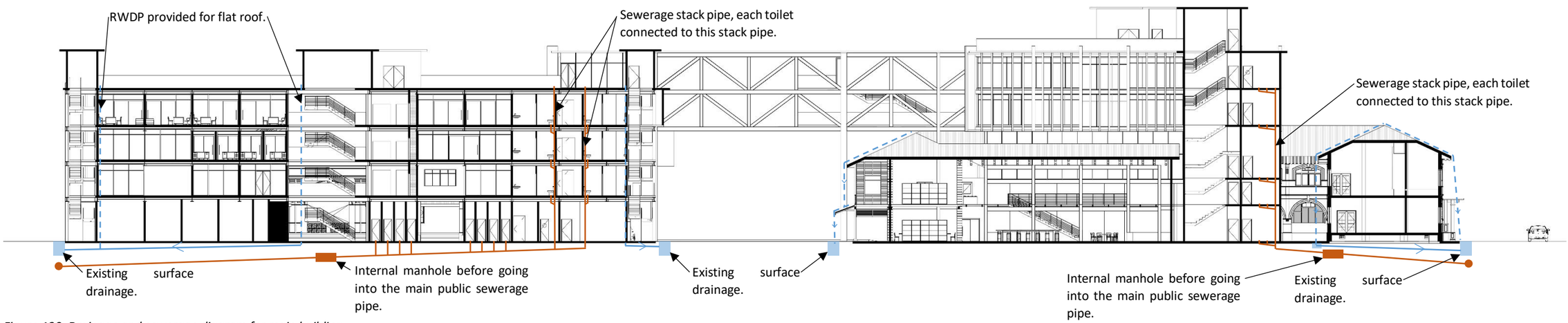


Figure 120: Drainage and sewerage diagram for main building.

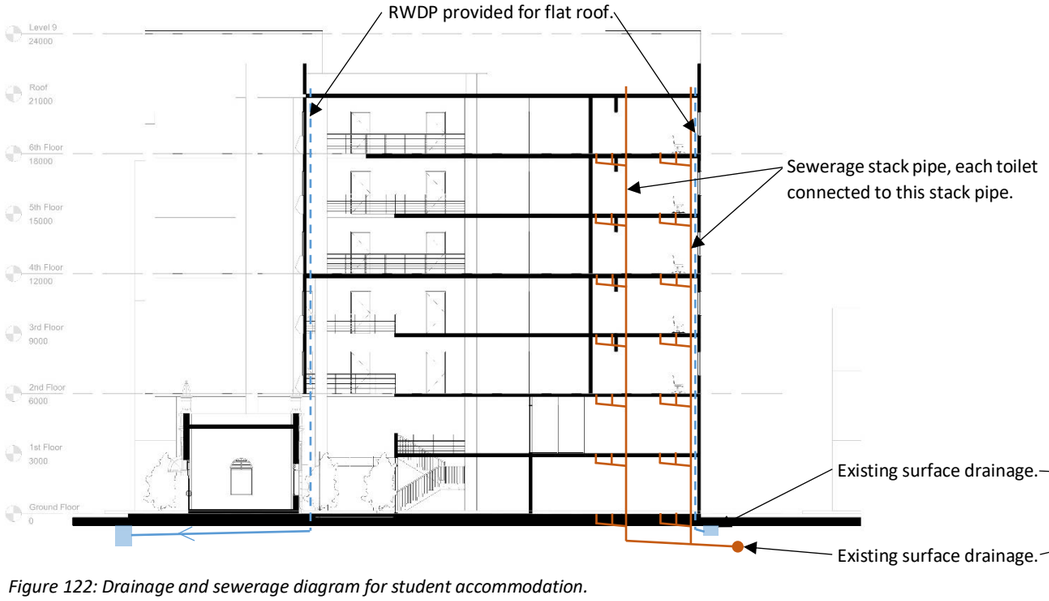


Figure 122: Drainage and sewerage diagram for student accommodation.

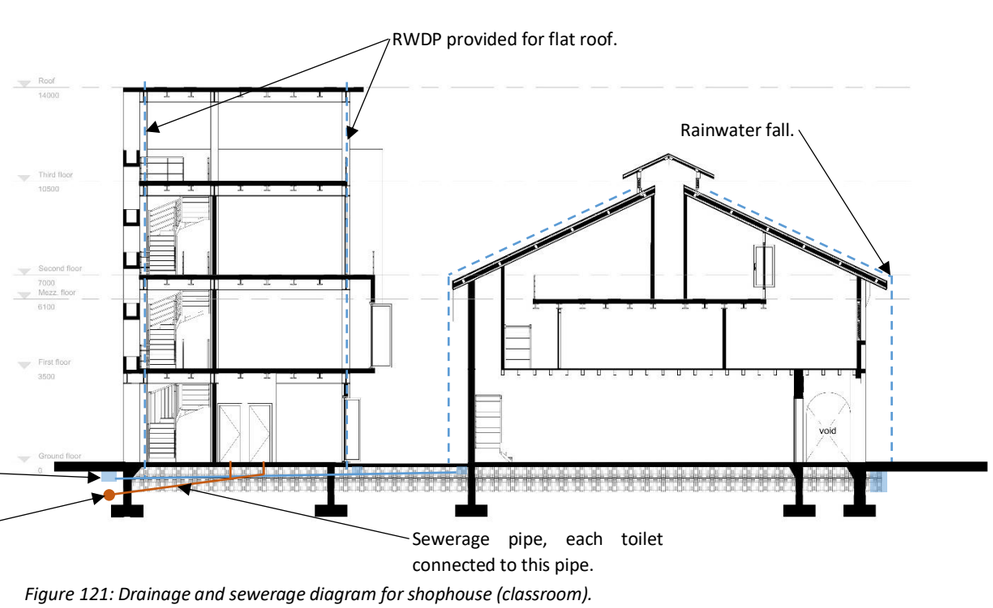


Figure 121: Drainage and sewerage diagram for shophouse (classroom).

j. Water Supply & Storage

Water supply being divided into two ways, main water supply is the potable water from the main water supply pipe. The secondary water supply is rainwater. Water storage also divided into two types; domestic cold-water tank is to store potable water while rainwater harvesting tank is to store collected rainwater.

Calculation of Water Demand

Type of Establishment	**University Facilities**
Targeted Number of Student	1000
Water Demand (Litres)	100 per student
Calculation	1000 student x 100 per student
Total WD for University (Litres)	**100,000 L**

Figure 123: Water demand calculation for University Facilities.

Type of Establishment	**Student Accommodation**
Maximum Number of Student	175
Water Demand (Litres)	250 per residential student
Calculation	175 student x 250 per residential student
Total WD for Student Accommodation (Litres)	**43,750 L**

Figure 124: Water demand calculation for Student Accommodation.

Total WD for the proposed development

= 100,000 L + 43,750 L

= **143,750 L**

The design of water supply is from the main water supply line, go through suction tank, pumped to the domestic cold-water tank located at the roof and then using gravity feed the water to each toilet. This design scope applied to the main building and student accommodation. The shophouse (classroom) is using the basic design, from the main water supply line, directly tap into each toilet usage and a small domestic cold-water tank for back up. The water supply and storage diagrams are as Figure 125,126 & 127.

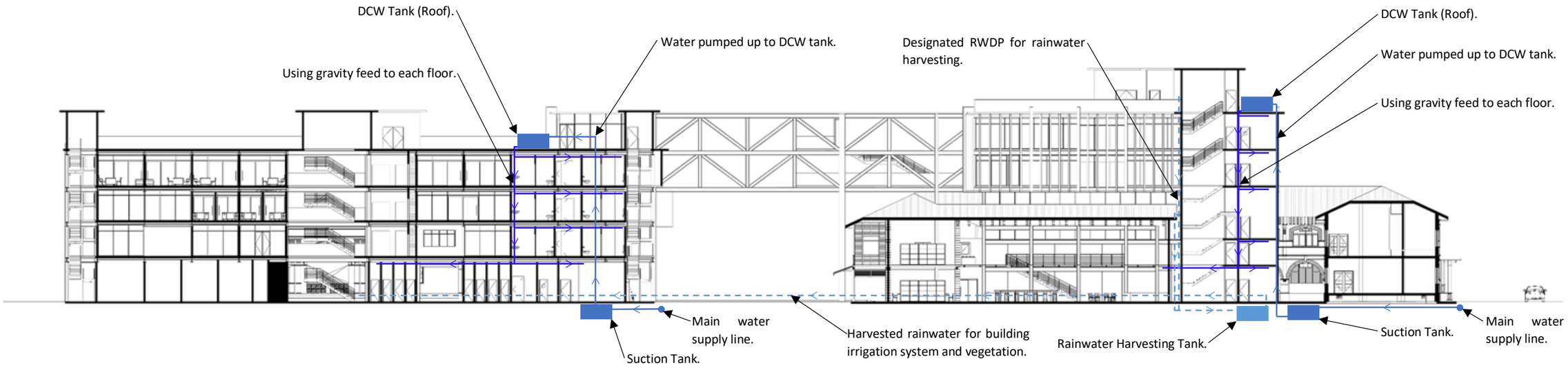


Figure 127: Water supply & storage diagram for main building.

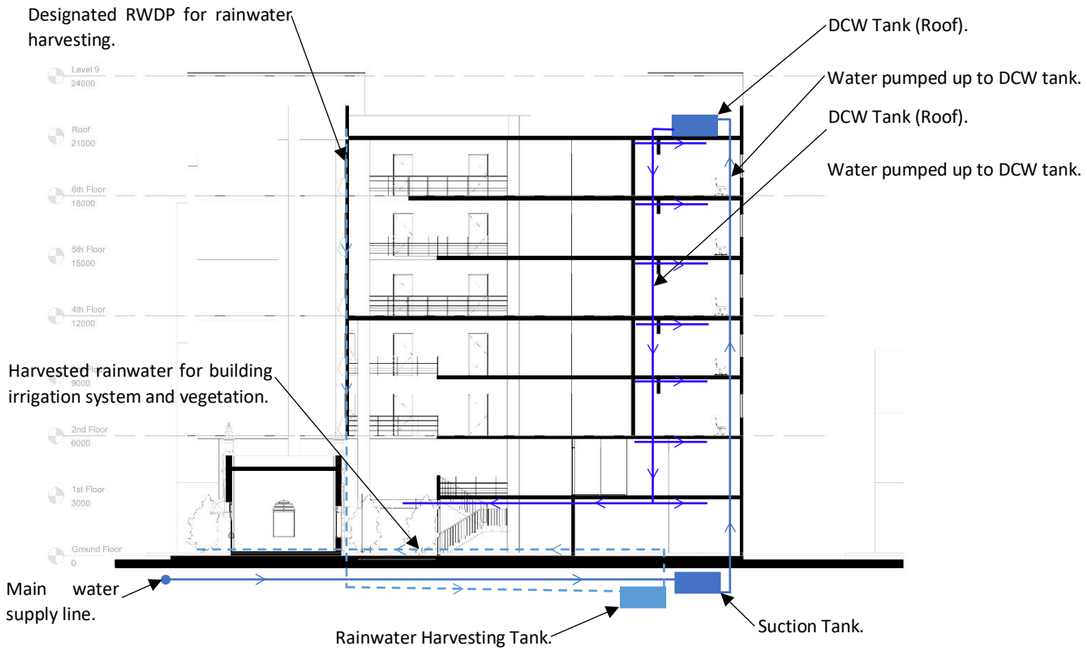


Figure 126: Water supply diagram for student accommodation.

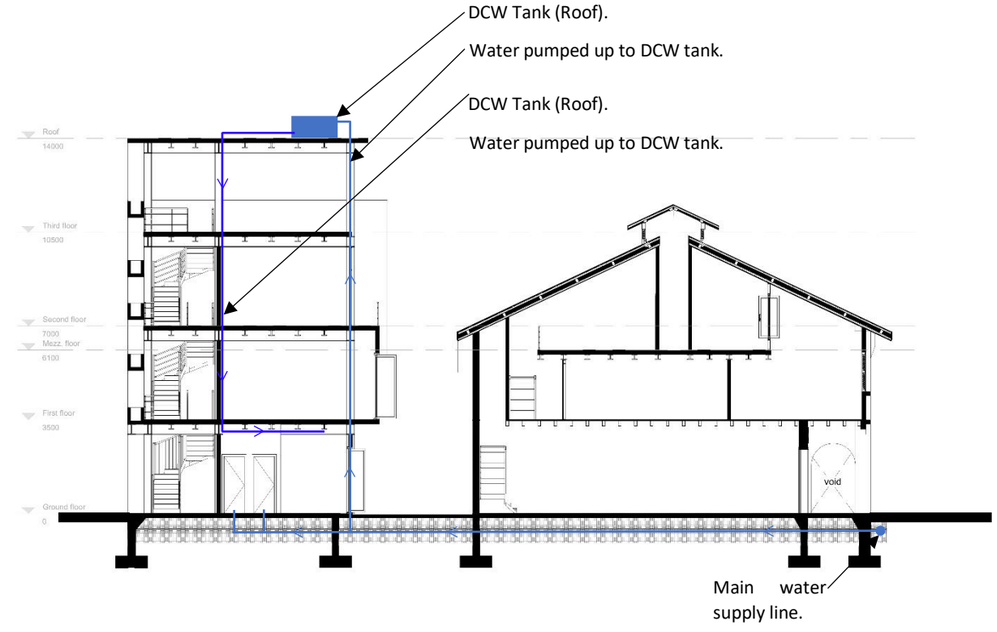


Figure 125: Water supply diagram for shophouse (classroom).