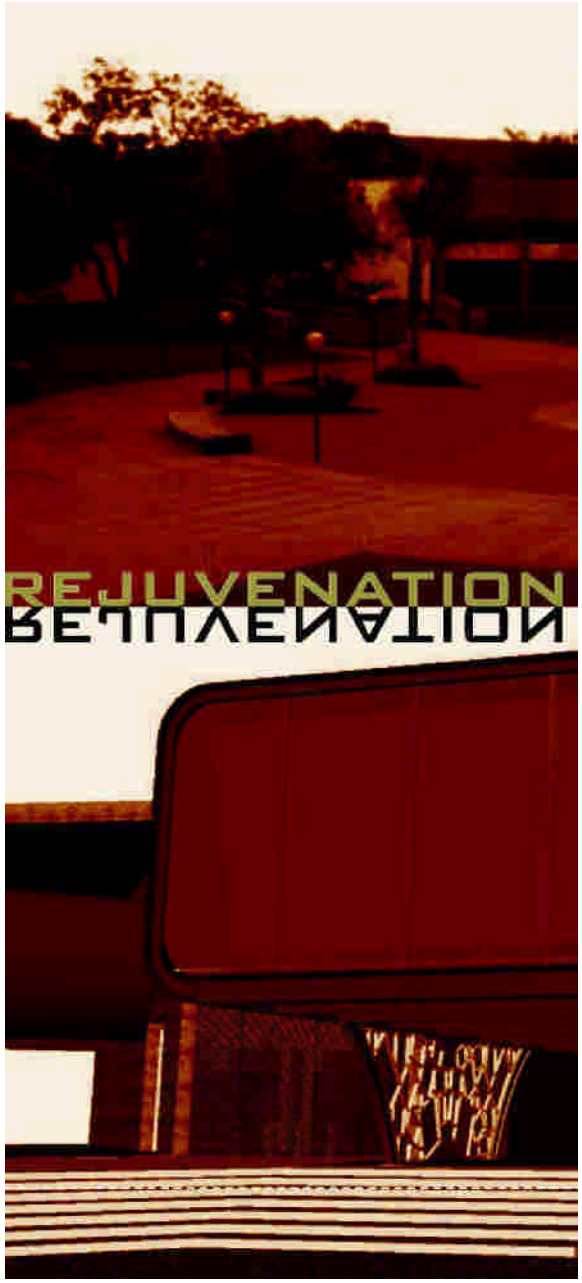

Chapter 5

Technical Report

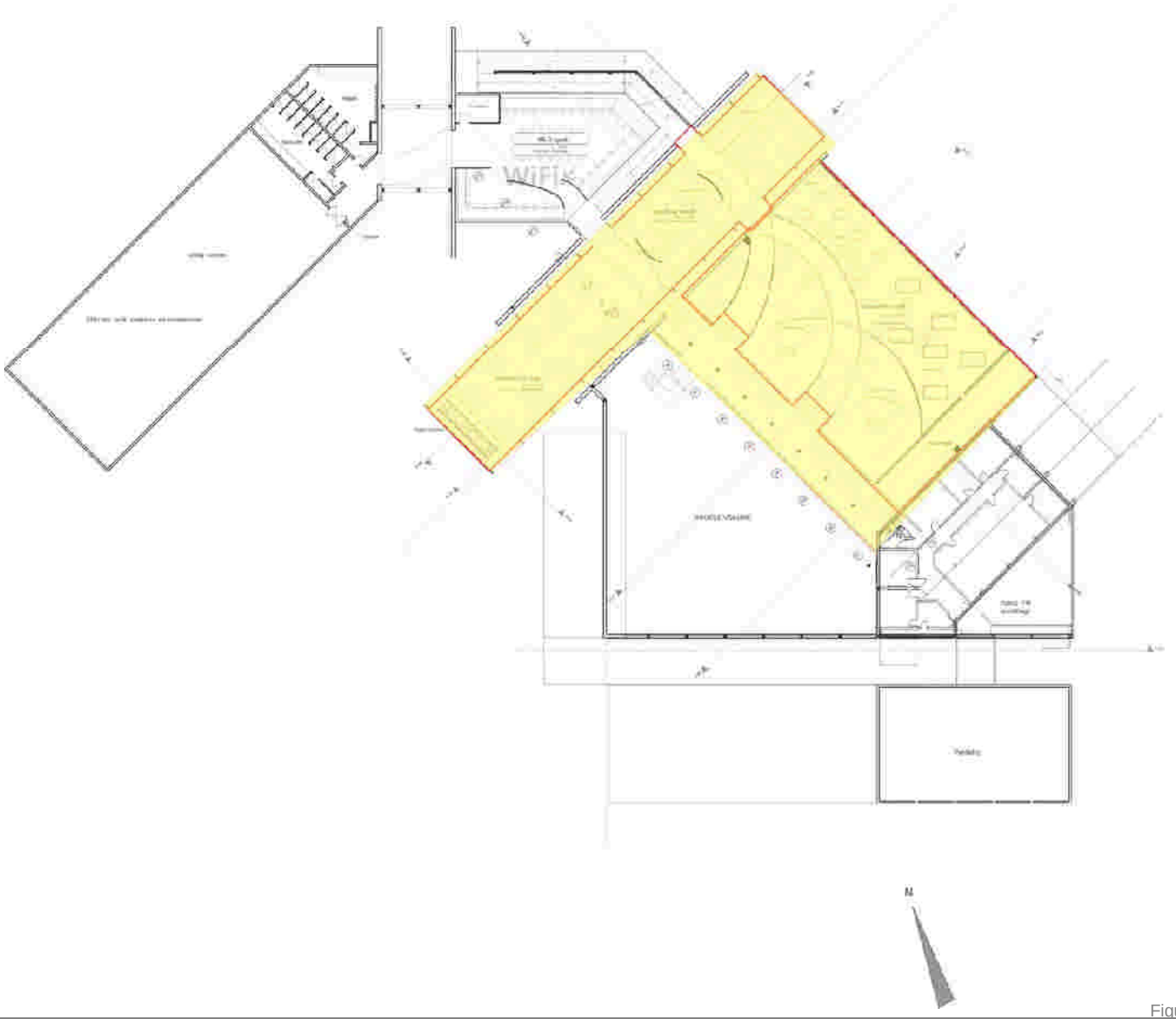

Figure 5.1
First floor plan – focus area

5.1 Introduction

The focus areas for technical resolution are the student recreation hall and the main Core Tube, both located on the first floor plan (Figure 5.1). The two locations are high traffic zones inside the student centre. The student recreation hall is an area designated for recreational activities such as pool, foosball, as well as electronic gaming. The main Core Tube provides a relaxed atmosphere for students to enjoy during breaks, as well as other facilities for students to utilise, such as the vending court.

5.2 Demolition

The existing building's primary structure is shown in Figure 5.2. It is made up of 240mm x 240mm reinforced concrete columns, which are clad by 203mm x 203mm coarse pigmented concrete blocks to create rough textured block pillars.

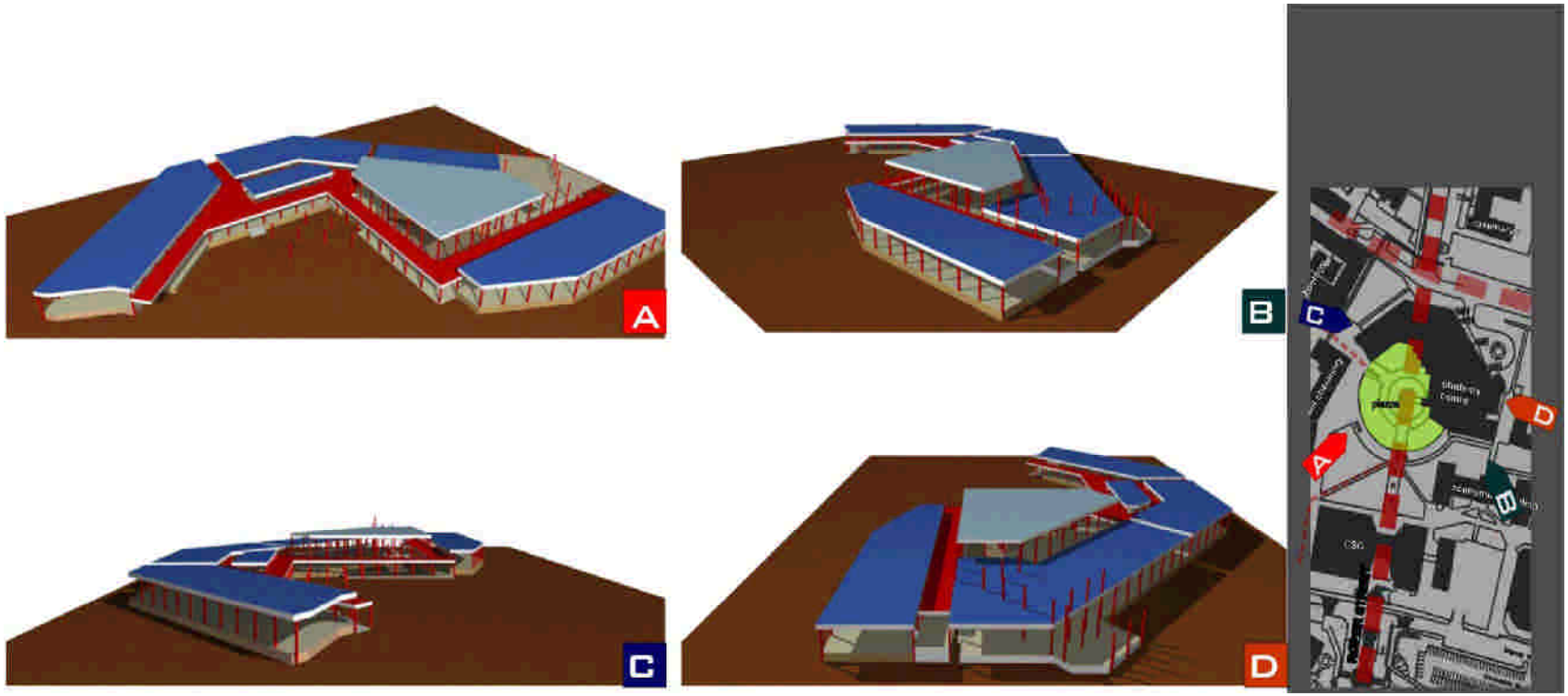

Figure 5.2
Existing structure

The floor slabs are all at 1050mm above the piazza floor, which is the datum point, except at the entrance of the eating area where it is level with the piazza floor.

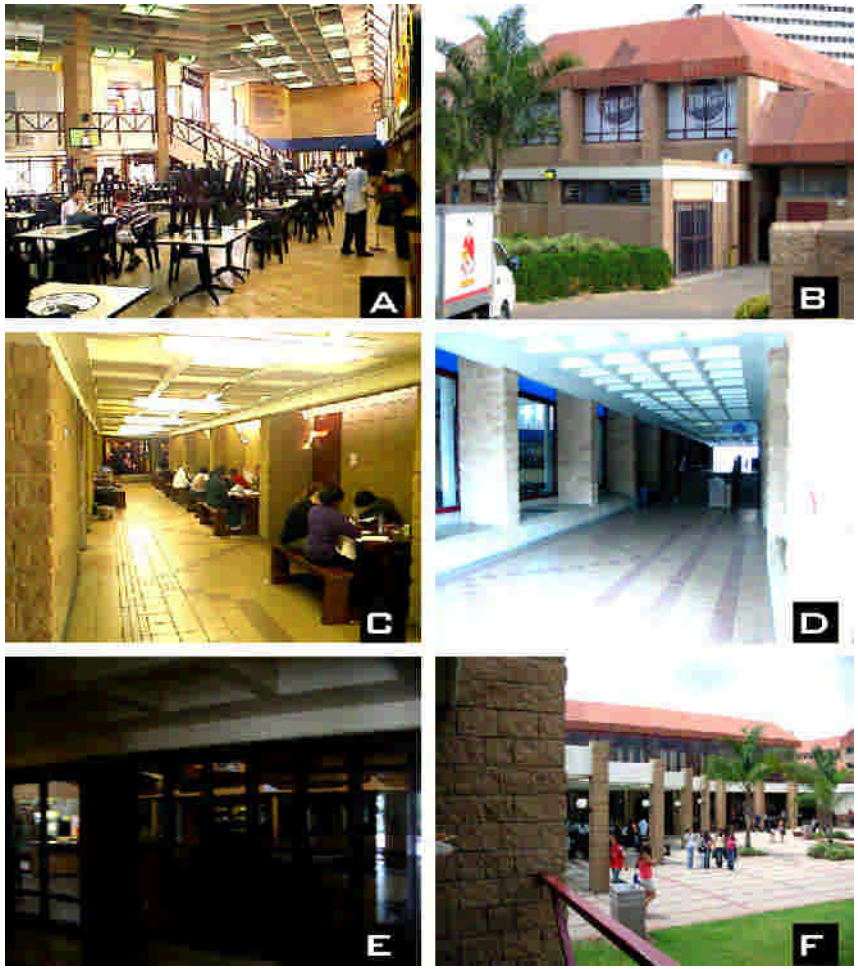

Figure 5.3
First floor plan – focus area

The existing building has 203mm x 102mm x 406mm non-bearing pigmented partition block walls for the secondary structure. Roof slabs are either 3600mm above datum or 4200mm above the datum point, except the roof slab of the double volume which is 9600mm above datum point. All the roof slabs are 600m deep coffer slabs with 500mm x 500mm x 450mm deep coffers.

The secondary roof structure is 3600mm x 2500mm x 100mm red pigmented profiled precast concrete panels. The tertiary structure is 110mm dry walls, as well as glass facades, all in varying locations throughout the building.

All concrete, blocks, tiles and roof panels from the secondary structure are to be demolished and used as rubble for raising the floor level in the main eating area to 1050mm above datum level. The aluminium shopfront is to be retained on the south eastern facade (image F, Figure 5.3)

5.3 Circulation

Figure 5.4
Concrete gateways with varying tubes

Main entrances to the building are identifiable by off-shutter concrete gateways with varying red tubes (Figure 5.4) . Movement through the building is articulated for users by the different finishes on the floors of the main circulation zones. Ramps are aligned to walkways where there are level changes.

Each main circulation route enters one side of the building and spills out onto the other side of the building. The building is designed to filter the capacity of people in transit between the west and east side of the Core Student Centre.

The first filter on each side of the new main transition route is an outdoor seating square, in other words, the piazza and the courtyard on the east. The second filter is the building then, depending on which side one is exiting the building, the outdoor seating areas become the third filter through which the capacity of people in transit begins to increase as they leave the building.

Access to upper levels is via a staircase in the food court. It is adjacent to the main entrance gateway. The staircase leads to a seating area overlooking the food court. A shorter flight of stairs leads to the recreation area. For mobility impaired people, the vertical circulation ramp leads up from under the Core Tube where its starts next to the student retail area.

The ramp is at a 1:15 gradient and has landings according to SABS400 regulations. The ramp's first floor landing is at the floor level of the Core Tube to allow people to enter the Core Tube. The next landing is at the floor level of the Wi-Fi centre and study centre, where the floor level is consistent to allow for comfortable movement.

5.4 Lighting

5.4.1 Recreation hall

The roof for the new recreation hall has a wide span of 20.3m and starts at 4200mm above the finished floor level. In the middle of the roof is a long clerestory window which allows natural light into the space, as it is a deep space. The space is designed to allow as much natural light as possible from above and around it. There is a row of mechanically operable windows below the fixing points of the roof sheeting on the south-western and north-eastern sides of the building. The windows allow for light and ventilation. On the north-eastern side, the windows are screened by the *bris soleil* wall so that not too much direct light enters the space.

Figure 5.5
Wide span roof and clerestory for lighting

All furniture and fittings are below 1800mm high and there are no solid partitions to separate the different zones. The partitions are well spaced steel cables that direct, or restrict movement without jeopardising the light quality or air movement. The north-facing facade has large windows that allow natural light to flood the space. A brick screen filters the light and also results in aesthetically pleasing shadow patterns on the floors inside.

Figure 5.6
Large windows and bris soleil

Artificial lighting in the space is provided by the large industrial light fittings specified in the materials 5.9 section. The use of CFL light bulbs in conjunction with the amount of natural light already flooding the space, aids in decreasing energy costs of the building. Artificial lighting is also used to enhance the atmosphere.

5.4.2 Main Tube

Natural light enters the tube from the north and south, as well as from above. The two ends of the tube are double glazed to prevent excessive heat gain and heat loss, and there is a large over-hang on the north face. In the roof of the tube are four large skylights in the concrete gateway in which the tube lies.

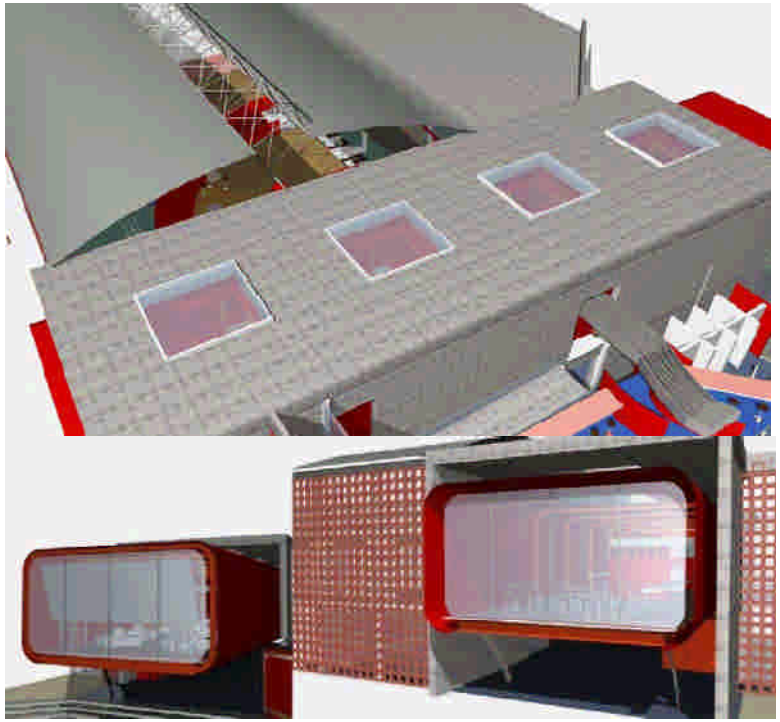

Figure 5.7
Core tube natural lighting

The tube then has its own skylights directly below to allow light to fall into the space. Ambient light from the piazza and reflected light off the student centre adds to the natural light that falls into the tube on the south facade. The same large industrial artificial lighting fittings are used in the tube, but are also supplemented with down-lighters at relevant points. This is because as the sun sets the shadow cast by the concrete gateway will make the space inside the tube relatively dark.

5.4.3 Solar control

The west and north-western facades of the building have large overhangs and the western facades have vertical expanded metal screens to prevent the sun from entering directly into the food court (Figure 5.8). The north facing facade has the bris soleil screen not only for aesthetic appeal, but especially for filtering direct light into the north facing facade.

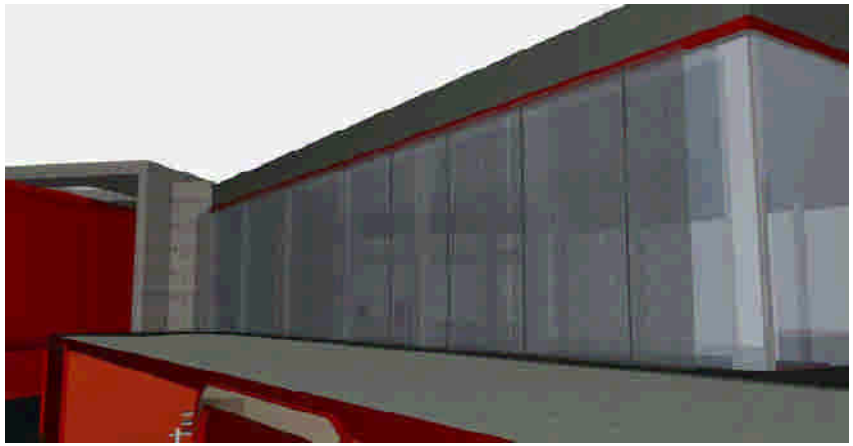

Figure 5.7a
Core tube natural lighting

5.5 Ventilation and Thermal Comfort

5.5.1 Recreation hall

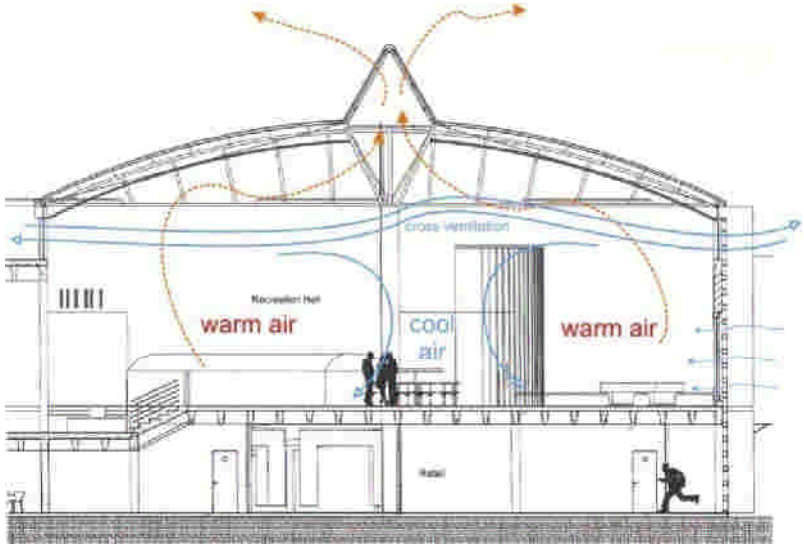

Figure 5.8
Recreation hall ventilation

The recreation hall has operable windows on both sides of the length of the space to allow for cross ventilation closer to the roof when warm air rises. The concave form of the roof allows for all the air that rises to be channelled towards the louvers. Due to the layout of the space being open plan, there is continuous movement of air because there are numerous openings in the building for the transition routes that allows air to move through the building as freely as the people do. There is no need for artificial ventilation in this space.

The walls on the northern facade of the building are about 270mm thick and there is a cavity between the wall and the *bris soleil*, so heat transfer from the outside to the inside will occur at a rate that will keep the space cool during the day and warmer at night.

5.5.2 Main Tube

Provision for natural ventilation has been made in the tube by way of using expanded metal as part of the external cladding at points such as the entrance, where the interior is protected from the weather and the finishes and furniture are not exposed to elements that will cause fabrics to fade and finishes to age faster.

Due to the long tubular nature of this space, if mechanical ventilation is not present, there would be areas where pockets of air would become stagnant. Ventilation ducts come from the roof slab of the canopy, through it, then into the tube. At the top of the ducts are Whirlybird extractors. In the event that there is not enough air movement outside for the Whirlybirds to function at their optimum performance, electrically powered fans will assist the extractors by drawing air into the ducts.

Not having too many openings where the expanded metal is used as external cladding is ideal so that the temperature variations within the tube are not as erratic as the temperatures outdoors. The walls of the tube are well insulated. The cavity between the cladding and the insulation also aids in the insulation of the tube against erratic temperature variations. Another result of the design is sound insulation. (See Figure 5.25 , Figure 5.26)

5.6 Services

5.6.1 Drainage

There are existing storm water sewer drainage systems along the Roper Street axis. These serve the existing building sufficiently. The ablutions in the student centre will drain to the existing sewer system that runs parallel to the storm water drain on the Roper Street axis as shown in Figure 5.9. The only significant change that would have an effect on the focus area is storm water drainage. Storm water will be directed to the drain on the Roper Street axis. All toilets will drain to the existing sewerage system, with the necessary SABS 0400 regulations adhered to.

5.6.2 Waste Management

Similar facilities in the building are grouped into locations that allow similar waste management methods to be administered to them locally. The food service areas are all on the southern side of the building. The large bin yard on the south side of the building is behind a screen wall and is accessed by a long ramp which emanates from close to the car park, where the loading bay is located for the refuse removal service. Retail has a lot more dry waste, which can be taken along the minor west to east transition spine and exits at the parking area on the east where a bin yard is present.

Figure 5.9
Services plan – ground floor

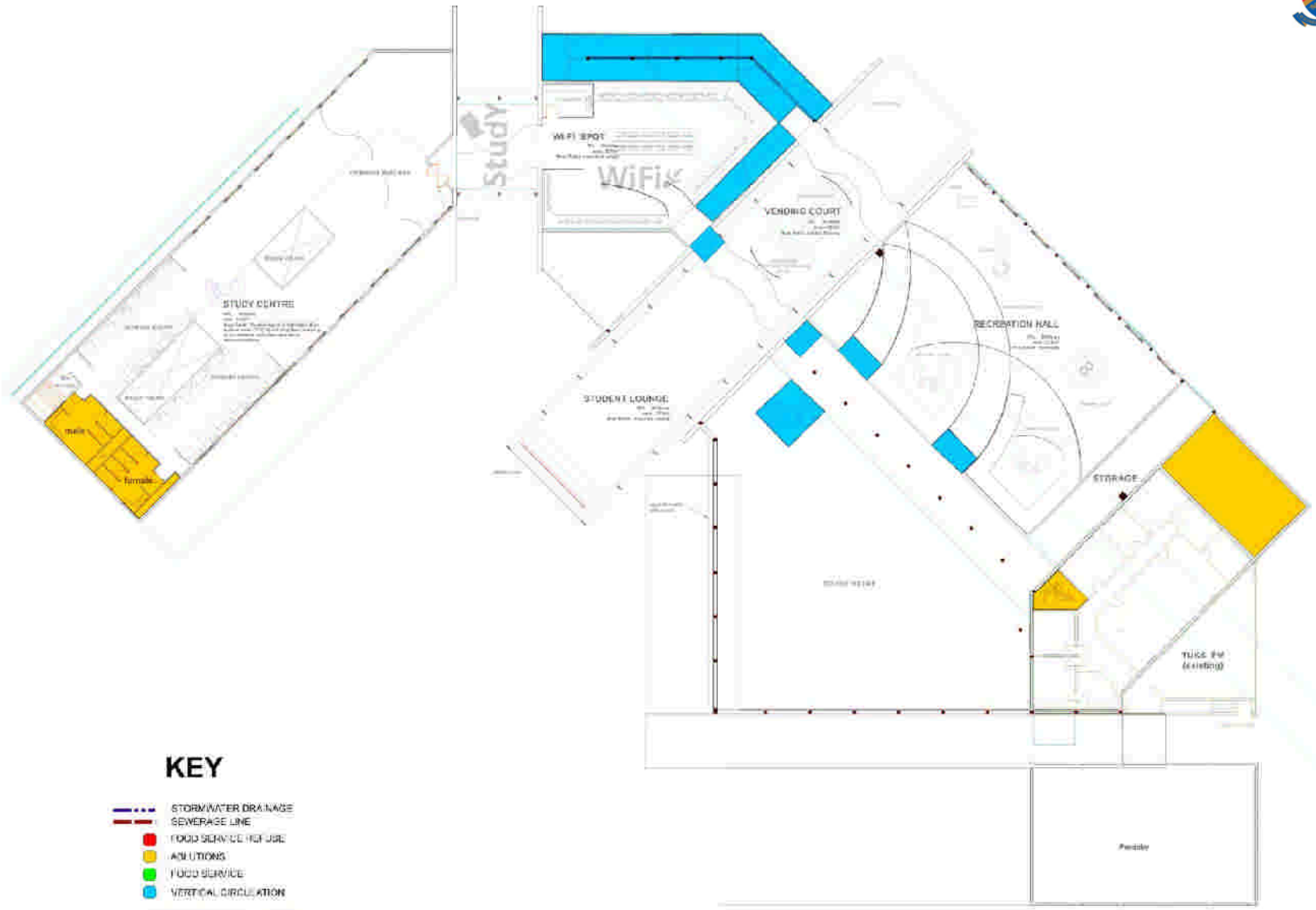

Figure 5.10
Services plan – first floor

5.6.3 Delivery

Food delivery is done from the loading bay on the eastern parking area. The convenience of all the major food service outlets being grouped to one side of the building allows for all food deliveries to happen from one parking bay. Delivery to retail shops and Minolta is from the loading bay on the north facade of the building. A bin yard has not been designed into this loading zone as it detracts from the northern facade.

5.7 Ergonomics and Inclusive Environments

Accessibility for those who are physically challenged has been considered in accordance with the SABS 0400. There is a 1:15 gradient ramp access to the floor height that is level throughout the ground floor. There is ramp access to the first floor, allowing those who are unable to use the staircase the ability to access and use the facilities that are available on that floor. The Flowcrete floor finish provides good traction for wheelchairs. The Flowcrete walkways have been designed to have different colours, but the same textures so that the visually impaired may be able to feel a change in texture in the event of them unknowingly walking onto a different zone.

The timber handrail that is used throughout the building has been designed with a 55mm diameter to allow for comfortable grip when ascending or descending the stairs or the ramps.

Transition routes and zones are defined primarily by their floor finish without the use of solid partitioning elements. The open plan nature of the spaces in the building allows the users to have good surveillance around themselves thus orientation is not a problem.

All the public spaces, as well as private zones, have WCs that accommodate the mobility impaired and are designed in accordance to SABS 0246 regulations.

5.8 Fire protection

SABS 0400 standards have been followed in relation to exit routes in the event of fire. Distances between fire escapes, as well as vertical circulation have been addressed. An automatic fire extinguishing system will be necessary due to the size of the building. It will be connected to the main water supply to the building.

Materials and finishes in the recreation hall have been consciously selected bearing in mind that it is a high traffic space used by students. Fire retardant insulation and fire treated floor finishes and cladding are used in the main tube as specified in the section *5.9 Materials.*

5.9 Materials

The materials discussed in this section were chosen specifically to communicate the brand. The intent is for the building to have an informal atmosphere with an industrial edge. These materials are prominent in the building and are repeated in various ways carrying the brand throughout the building.

5.9.1 Flowcrete Peran STB

Supplier: Flowcrete SA (Pty) Ltd

Flowcrete Peran STB is a resin based decorative floor finish applied to a power-floated screed, which has either a polished, textured or matte finish. In this design the floor has a textured finish where it is applied to the major transition routes. Colour differs relative to the space in which it is applied. Flowcrete Peran STB is ideal as it is hardwearing, decorative, high abrasion resistant, easy to clean and maintain, has remarkable wear and impact resistance, and installation is fast. The areas in which it is applied (Figure 5.22) is designed to have a textured finish in order to have clear definition as to where the main walkways are, as well as to assist visually impaired people to realise a change in zone due to the change in floor texture.

5.9.2 Polyflor Sports Vinyl

Supplier: Polyflor South Africa

Polyflor Sports Vinyl is a high performance vinyl sheeting usually used for flooring, but in this instance a 6,7mm sheeting is used and it is mainly used as a wall finish and only partially for flooring.

It is hardwearing, easy to clean, durable, non abrasive and high impact resistant. It is suitable for an area with possibilities of spillages, such as the Core Tube. This type of vinyl is chosen here mainly for aesthetic purposes. As a sports material is gives the space an impression of being informal.

Patterns can be printed onto the vinyl, thus the opportunity for a variety of prints on it which would work well with brand based architecture. The texture and the low reflectance of the material allow for light to be subdued and thus a play with lighting can add to the ambience of the student lounge and vending court. Different cuts of the material can create a pattern on the walls leading to the floor. Wherever the different cuts join, the joint is edged with a 65mm Polyflor Polyspan EJC65 expansion joint cover strip. Installation is strictly to manufacturer's specifications.

5.9.3 Expanded Metal -Vitex electroplated mild steel Flatex general mesh

Supplier: Vital Engineering and Angus McLeod (South Africa)

Vitex 11-3F M EP electro-plated mild steel Flatex general mesh comes in panels of 2400 x 1200mm as a standard, but it can be cut to a required size. The mesh is a 50 x 80mm mesh made up of 4,5 x 2,5mm strands with a mass of 2,77kg/m², and is spot welded to angle profiles.

The mesh is part of the language of the building. It is used for solar screening, balustrades and as wall screens to allow for ventilation.

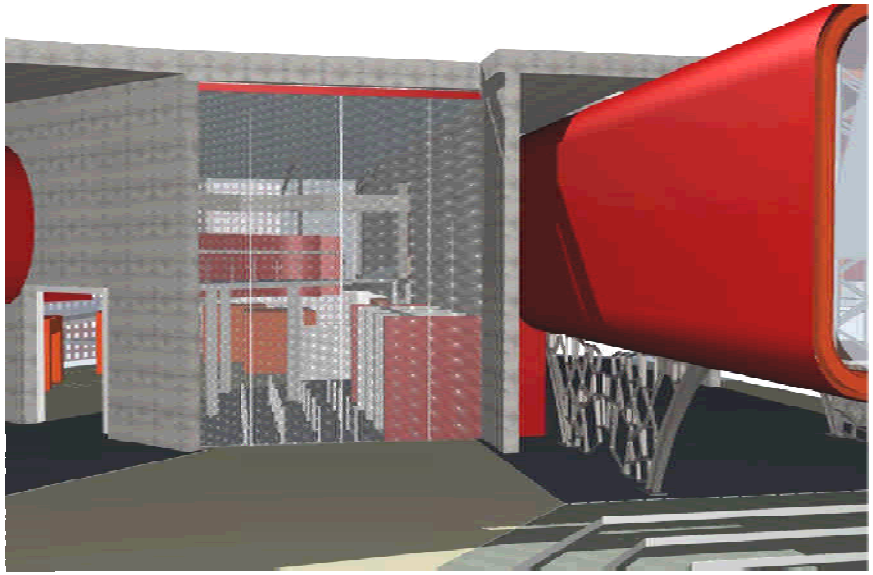

Figure 5.11
Expanded metal application

5.9.4 Aluminium flat sheet

Supplier: EuroSteel (South Africa)

Finish: fiery red colour anodising by Cuspal (South Africa)

The aluminium flat sheet is used as the tertiary structure, in other words, the skin of the Core Tube, the bridge linking the wi-fi centre and the study centre, as well as the food kiosks.

Aluminium is the chosen material because of its aesthetic qualities. Its lustre and malleability gives it a lightweight appearance

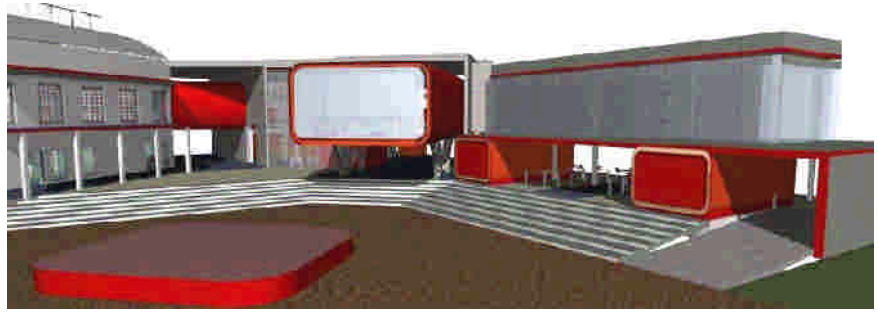

Figure 5.12
Aluminium sheet application

Fixing of the aluminium to steel requires consideration of galvanic corrosion, as well as expansion and contraction of aluminium. Nylon fixing sets are used to prevent the corrosion between the stainless steel bolt and the g.m.s framework with the aluminium. Expansion slits are designed into the detail of the fixing not only to add to the aesthetic of the use of aluminium, but also for the practical reason of allowing the aluminium sheet to “move” when expanding or contracting.

5.9.5 Nautical steel cables

I-SYS Rope 7 x 7 metallic rope with a diameter of 8mm, attached using eye internal thread in IK340 cable assembly to inside of screen frame.

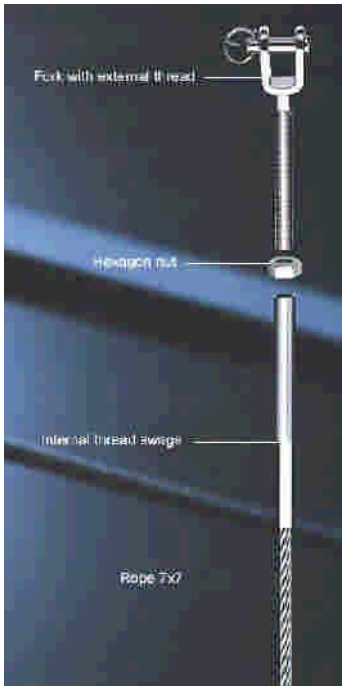

Figure 5.13
Nautical cable

Supplier: GKD – Buismet (South Africa)

The nautical steel cables are used as the infill in the frame of the partitioning system in the student recreation hall, as well as the seating partitions in the student lounge (Figure 5.20). The cables are arranged as a woven infill so as to allow for visual permeability, but prevent physical transition between the partitioned spaces.

5.9.6 Projector Screen

10mm LUMIN transScreen - optical matrix polymer foil applied to safety glass substrate for transparency.

Supplier: Lumin Technologies (Germany)

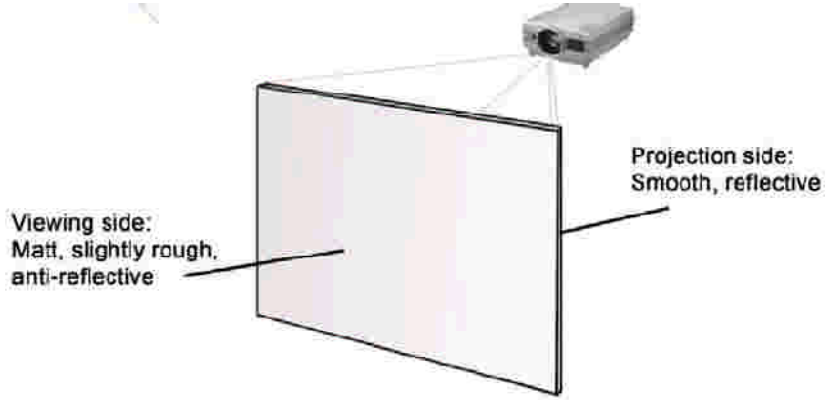

Figure 5.14
Lumin TranScreen

The projector screens are designed to maximum sizes of 1200mm x 3000mm, but pieces can be positioned next to each other on a frame to get a larger screen area. Figure 5.14 illustrates how the projection of images onto the screen surface works. A rear projection screen is a suitable option because the location of the projector allows for people to walk past the screen without obstructing everyone watching it. The LUMIN transScreen also becomes transparent when there is no image being projected onto it. The transparency of the screen, as well as the ease of shaping the substrate, allows the screen to be part of a partition as designed for the student lounge.

5.9.7 Roofing

CM2005 roof sheeting

Supplier: World Roofing Technologies (South Africa)

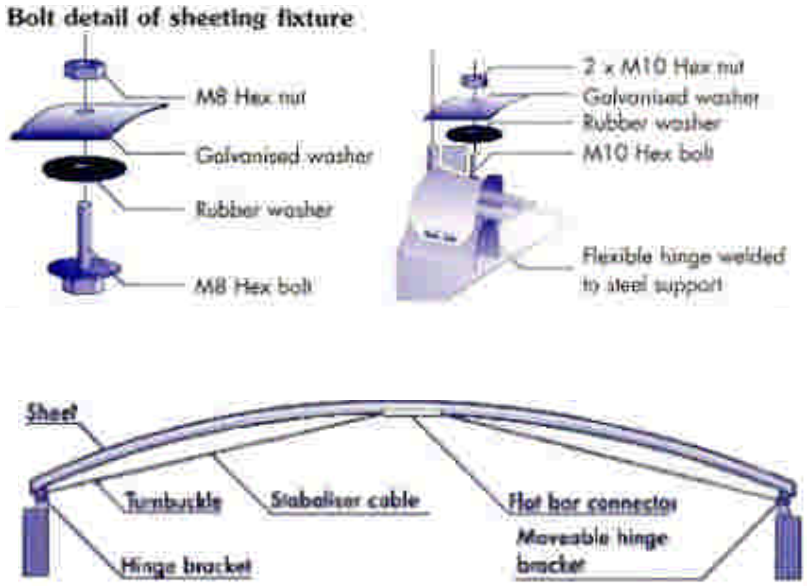

Figure 5.15
Bolt detail and bracing

The roofing system for the student recreation hall, as well as the study centre, consists of sheeting which is self-supporting over wide spans. It allows for large spaces to have covering without roof support systems that become obstructions or obstacles in the covered space. The roofing system allows for application of insulation and ceiling panels.

Lighting is suspended from the roof sheeting on lugs which are also used for false ceiling or insulation(Figure 5.16). The supporting strength of the sheeting lies in the profile of the sheeting, as well as its size as shown in Figure 5.17. Figure 5.16 shows the fixing of the sheeting to walls as would be in the student recreation hall, as well as the study centre.

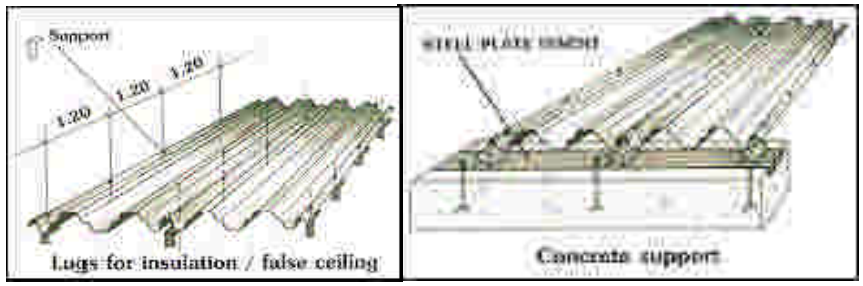

Figure 5.16
Sheet spacing and support fixing

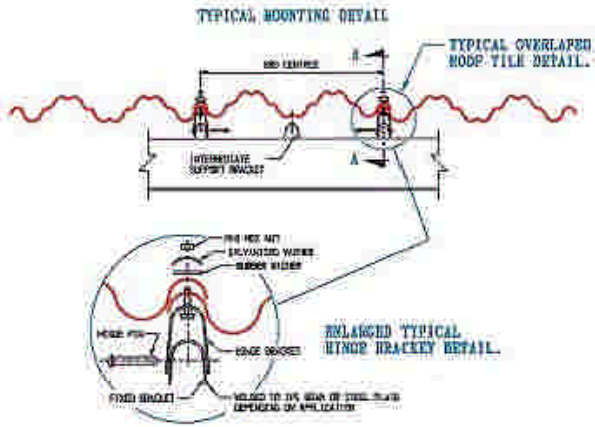

Figure 5.17
Mounting detail

5.10 Finishes and Fixtures

5.10.1 Balustrade and Handrail

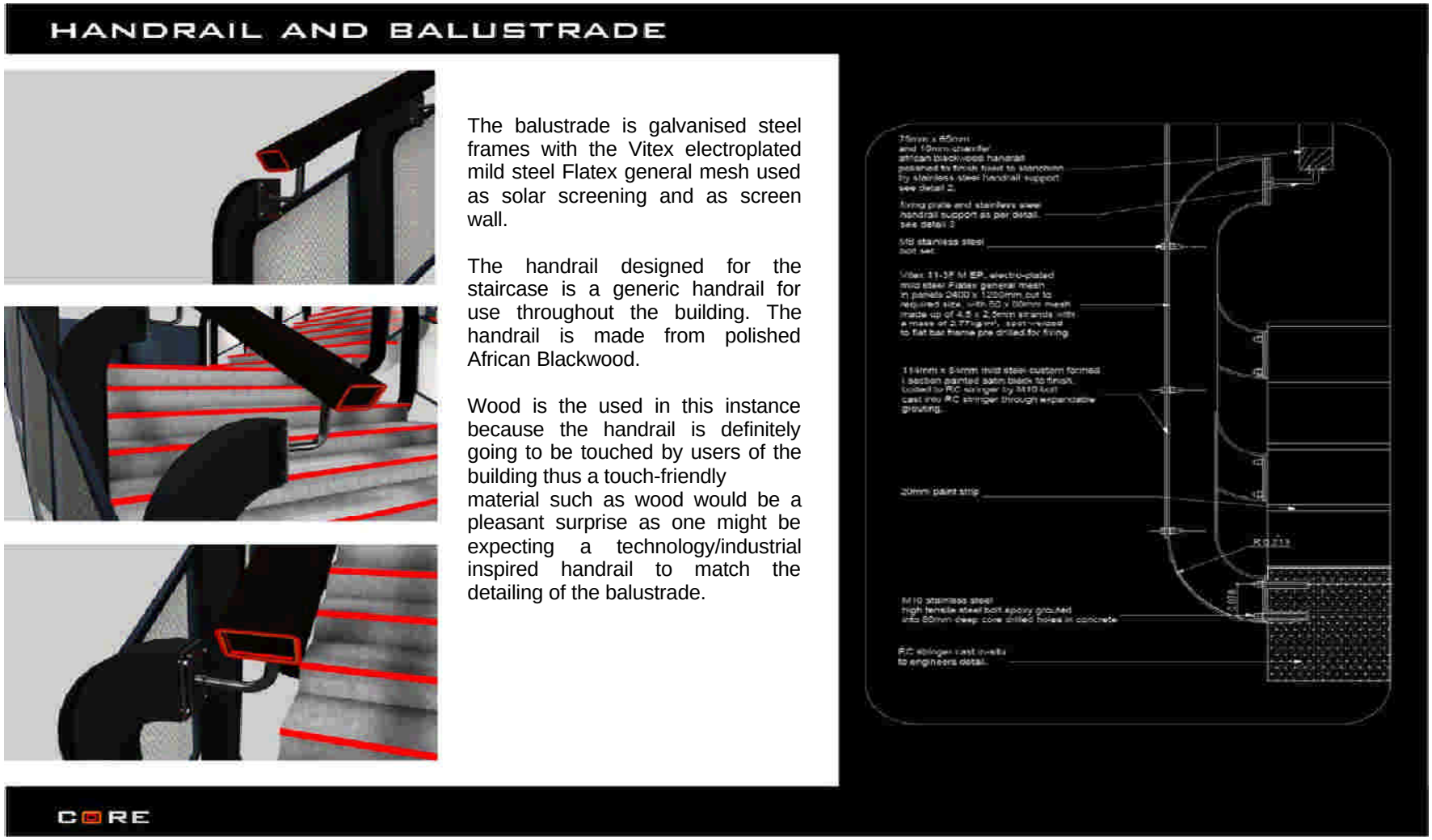

Figure 5.18
Handrail and Balustrade

5.10.2 Mobile Retail Unit

Figure 5.19
Mobile Retail unit

5.10.3 Recreation Hall Screen

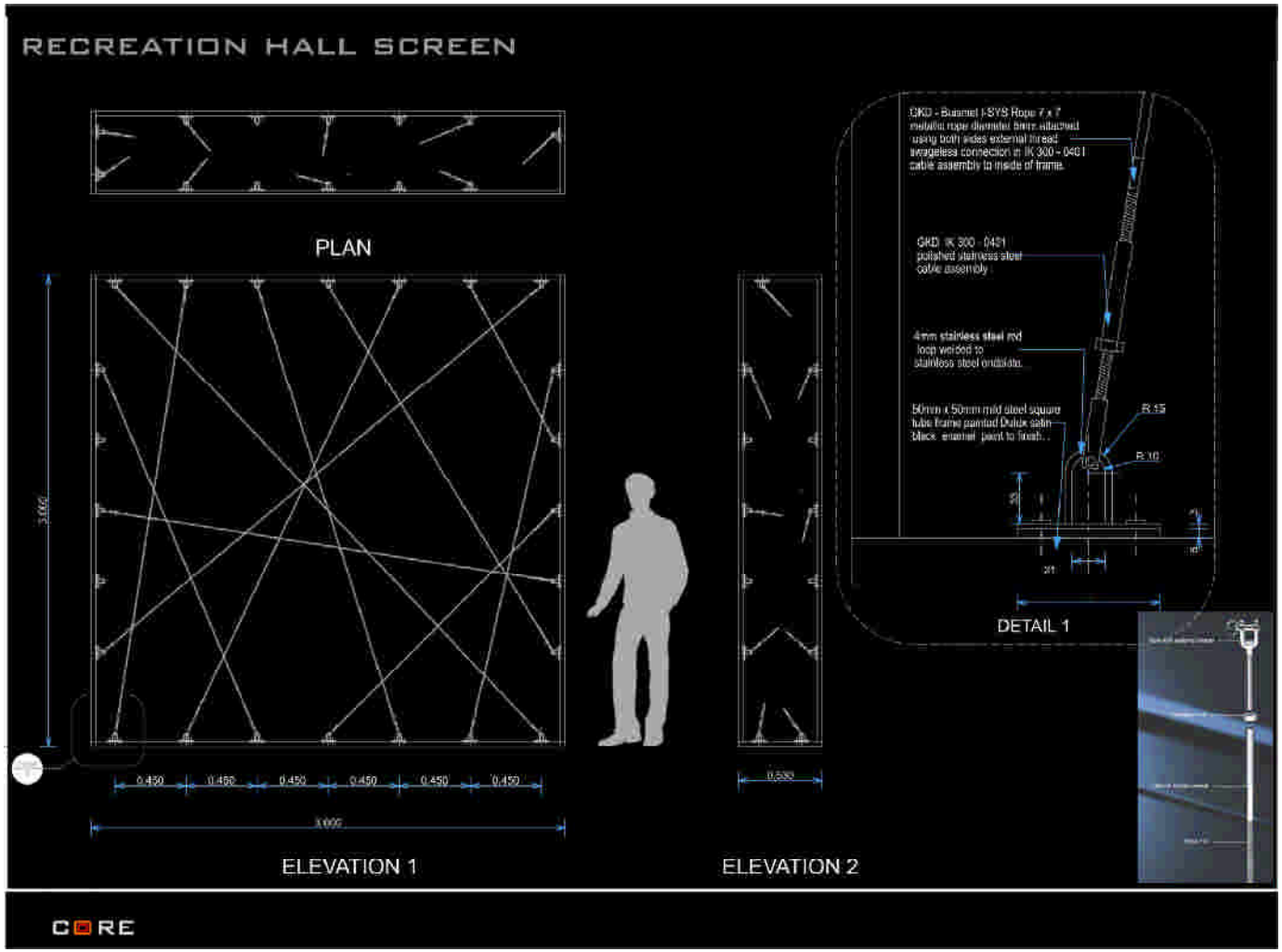

Figure 5.20
Recreation Hall Screen

5.10.4 Student Lounge Soft Furniture

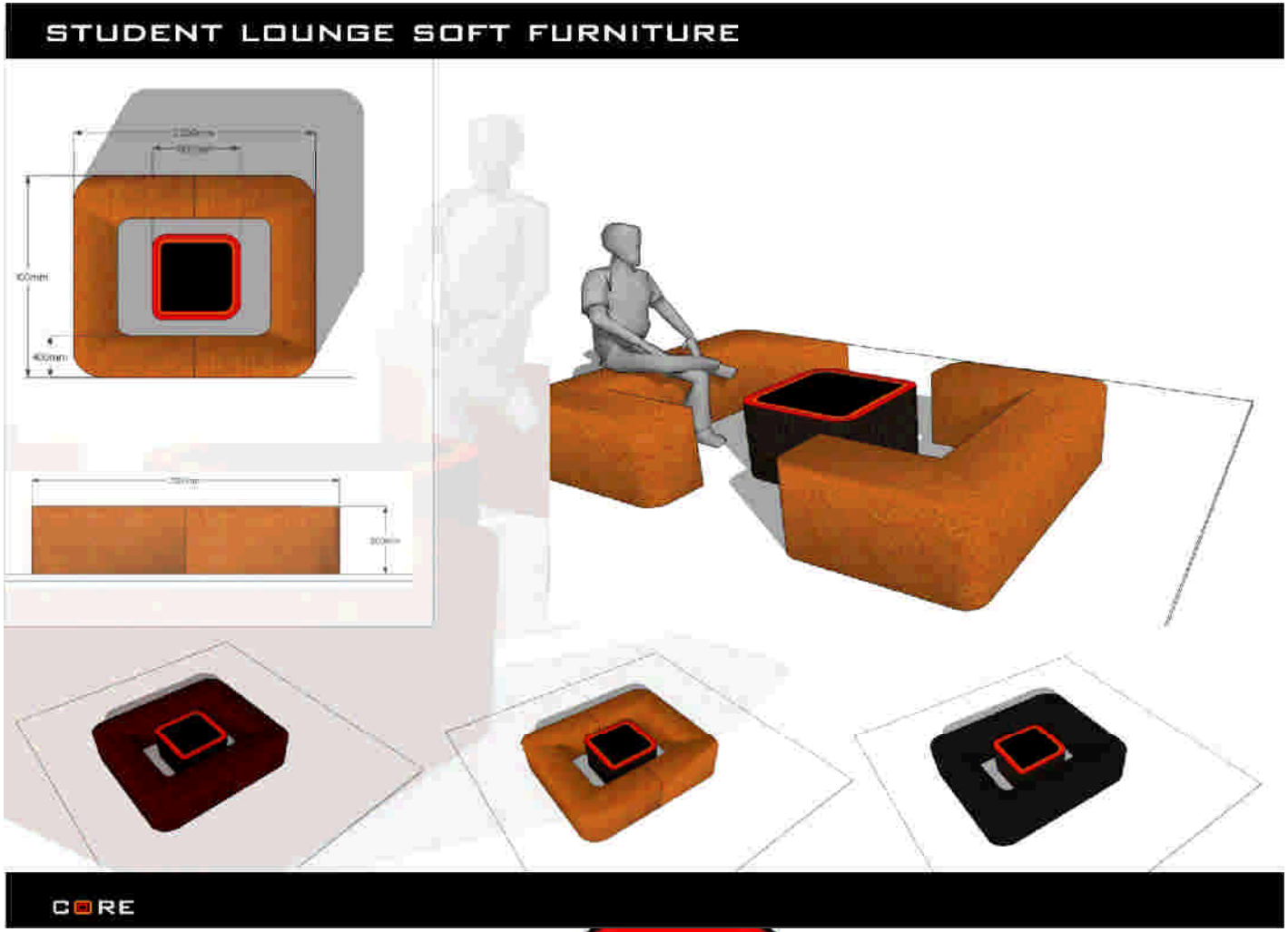

Figure 5.21 Student Lounge Soft Furniture