

6

- 6.1 Body-Space Theory
- 6.2 Event-driven Space Theory
- 6.3 African Space Theory
- 6.4 Case Study - The Sans Souci
- 6.5 How the Theory Informed the Design

TECHNICAL DEVELOPMENT

0.6 Technical Development

This chapter highlights the continuation of concepts through the technical development process. This chapter is the continuation of the design development chapter, in proving the design. It explores the systems and materiality necessary for the project's feasibility and success.

6.1 Technical Design Informants

6.1.1 Stereotomic to Tectonic

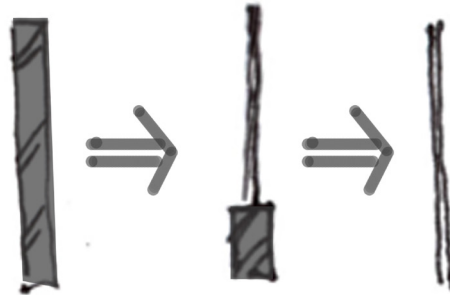
Along the west to east axis the structures transition from the stereotomic Prinschurch building to the tectonic expression of the "Sheds" - visually progressing the massing and materiality of the structures from heavy to light, see (Figures 120 & 121).

6.1.2 Event-driven Space Theory

In keeping with the theory on event-driven space, space and the city should be perceived as movement, time and flux. Considering the city as such helps to counteract social exclusivity, maximise interaction, and recover the social and collective spatial landscape of the city (Da Costa & Van Rensburg 2008b:51).

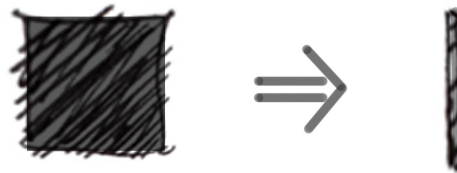
6.1.3 Time Taking over the Industrial Site

The industrial site in question demonstrates that time has already started taking over through "wilderness" elements that have begun to grow in the in-between spaces of the buildings, see (Fig. 122).



Column Transition - Stereotomic to Tectonic

FIGURE 120 - STEREOTOMIC TO TECTONIC PROGRESSION (AUTHOR 2015)



Solid (Stereotomic)

Light (Tectonic)

FIGURE 121 - SOLID TO LIGHT WEST / EAST AXIS (AUTHOR 2015)

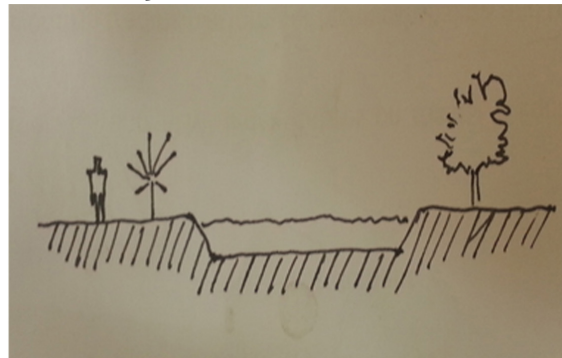


FIGURE 122 - SITE PHOTO - TIME TAKING OVER THE INDUSTRIAL SITE (AUTHOR 2015)

6.2 Technical Design Concepts

6.2.1 "Wilderness" 6.2.2 Palimpsest layering

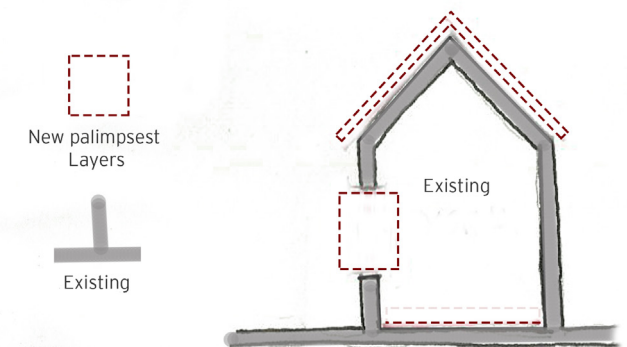
The theory on event-driven space also informed the concept of "wilderness", specifically regarding the experiential and temporal perception of space (see above 6.1.2). To connect the architecture in time and to fit into the proposed industrial landscape, which has already been touched by time, change and decay is celebrated. By allowing in "wilderness" elements, the changes in the time and seasons are made manifest. Planting, water elements and weathering of materials are used. This last element also forms part of the heritage response relating to the palimpsest layering of new interventions/ layers over the original fabric (see figures 122 & 123).



'Wilderness' Element of time

FIGURE 123 - "WILDERNESS" ELEMENT OF TIME (AUTHOR 2015)

The design focuses on creating layers of permanence and temporality, dependant on each other and with the strategy of juxtaposing the old and new by working with linearity. All additions would be done with tectonic and modular components as it should be able to be reversed. This juxtaposing of the tectonic nature in old vs. new underlines the intangible heritage of the site and continues to add to the palimpsest. As these layers are peeled away the space can be reinterpreted and adapted for other programmes at a future stage. Thus, the site embraces the dynamics of change in a resilient manner, having a transformative capability, an observer seeing not just what the buildings in the precinct were, but also what they could become in future, depending on contextual development and requirements.



Heritage Intent: Forming palimpsests layers over the existing.

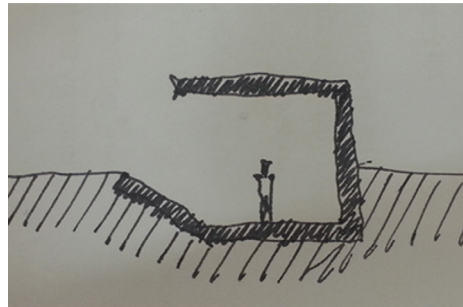
FIGURE 124 - HERITAGE INTENT (AUTHOR 2015)

6.2.3 Solid Elements of the Ground

Such “solid” elements, relating to earth and groundedness, represent comfort and security and will be used in the creator programmes accommodation.

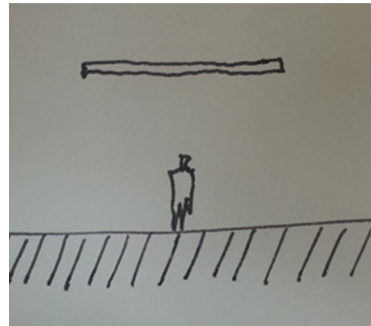
6.2.4 Light Elements of the Sky

These light elements will guide the users through the scheme, forming various levels of shading and shelter and demarcating various programmes and spaces within the scheme.



Earth Solid Element

FIGURE 125 - EARTH SOLID ELEMENT (AUTHOR 2015)



Sky Light Element

FIGURE 126 - SKY LIGHT ELEMENT (AUTHOR 2015)

6.2 Technical Design Concepts

6.3.1 Guiding the User

A light, free-standing pergola structure is to guide the movement of users through the site. The pergola is used to accentuate movement routes through the site, designate space, and announce new entrances.

6.3.2 Containing the Programmes

The programmes that are supported by everyday rituals and courtyard space are contained within these spaces.

6.3.3 Water Systems

The bodies of water, such as the wetland system, form a part of the site experience. The water towers and water catchment pond shows the process of water intended for recycling / reuse. The hidden parts of the water system, such as the basement storage tanks, filters, traps and purification systems are not displayed to the public.

6.3.4 "Wilderness", Routes and Open Space

The open space can be broken up into routes, squares and "wilderness" areas, such as garden spaces, which soften the rough industrial site, show changes in time and the seasons, and positively impacts the human experience of the site in the sense that human beings have an appreciation of other life forms, as explained by the concept of biophilia.

6.3.5 Existing Structure

The existing structure is designed with a concrete column and beam primary structure, with a concrete ring beam around the perimeter of the Karpis 2 building. Facebrick walls are used as infill in the column grid structure. The structure has three levels: ground floor, first floor and a smaller second floor. The three storey building blocks visual and physical movement from Prinschurch to the hidden courtyard spaces behind.

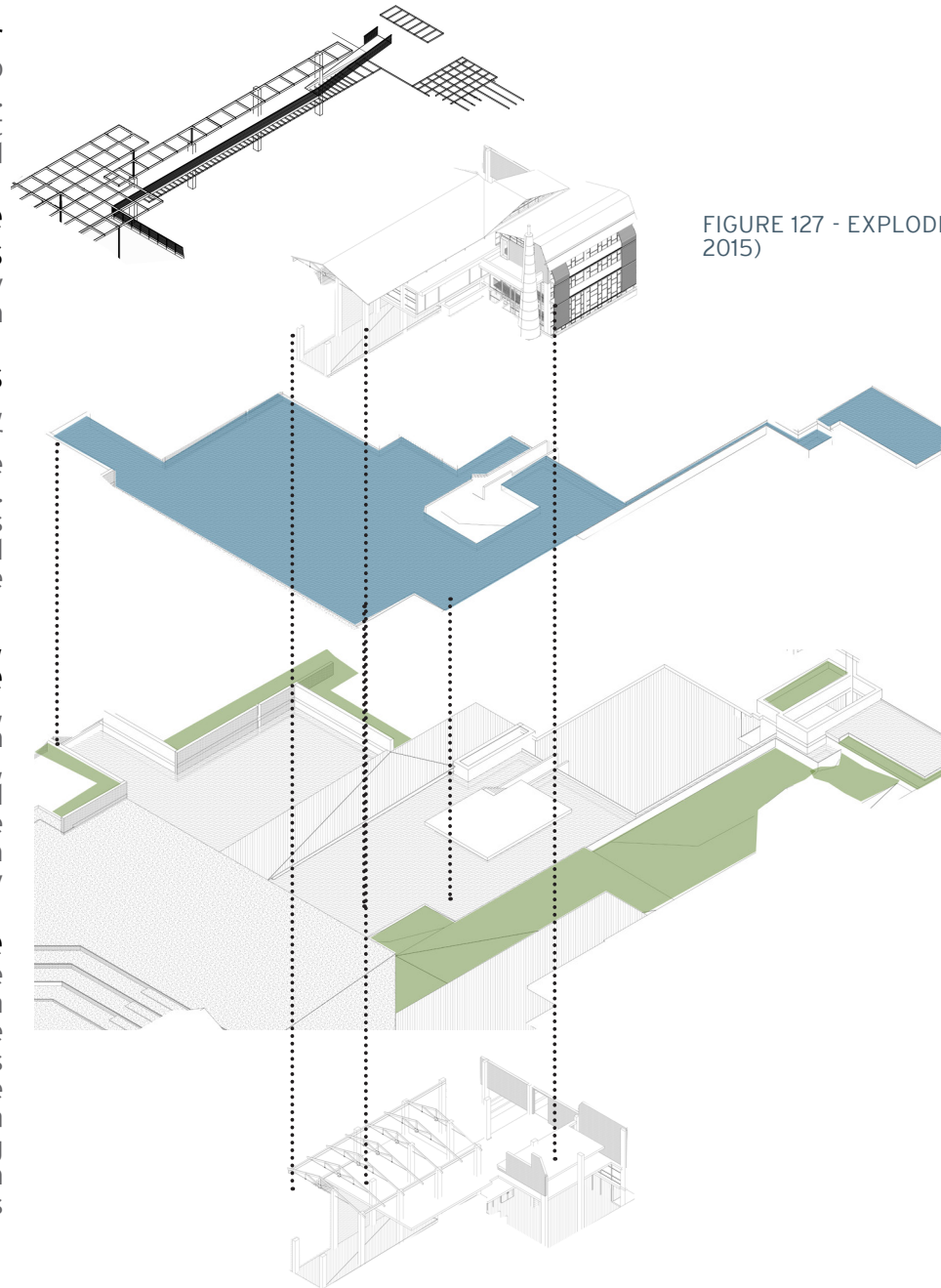
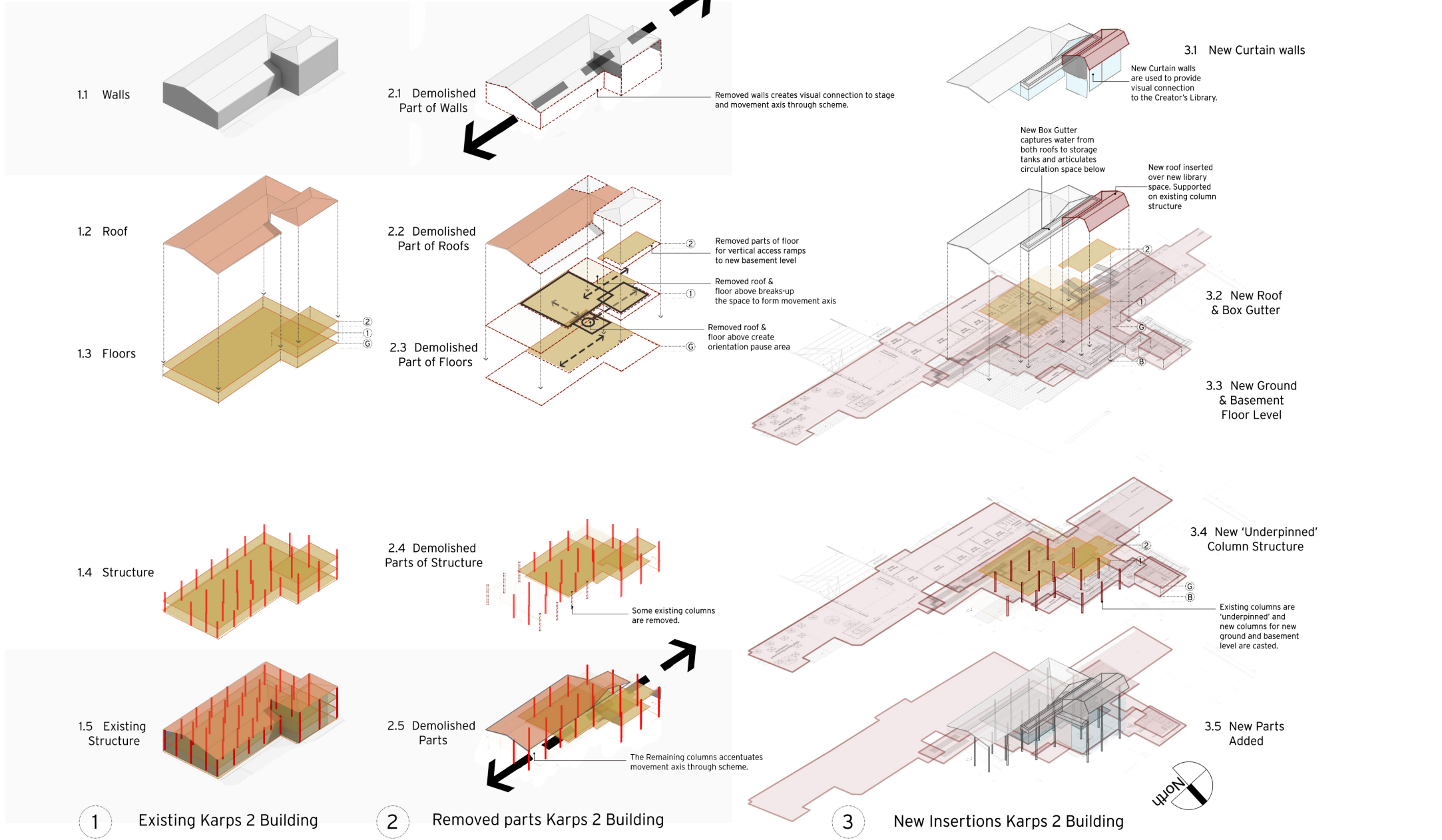


FIGURE 127 - EXPLODED CONCEPT DIAGRAM (AUTHOR 2015)

6.4 Karps 2 Building: Existing Structure, Demolition & New Insertions

FIGURE 128 - KARPS 2 BUILDING DESIGN DIAGRAMS (AUTHOR 2015)



6.4.1 Primary Structure

The primary structure consists of a grid of concrete columns and beams, with a concrete ring beam around the perimeter, which supports the concrete floor slabs. The facebrick infill walls are removed on the ground floor and partially removed of the first floor level, making the building more permeable for visual and physical continuity with the rest of the scheme see, (Fig. 128).

The new ground floor level platform creates new connections from the Prinschurch building to engage with the rest of the scheme. The route makes use of both ramps and stairs to ensure the project is disabled accessible. The route leads the user on an experiential journey through the “Back of House” theatre process and spaces, as opposed to the traditional “static” activity taking place inside a designated theatre space.

6.4.2 Secondary Structure

Most of the secondary structure is removed to allow for an open plan layout and increased freedom of movement, as well as visual connection through the building, allowing the public glimpses of the creators’ work in progress.

6.4.3 Demolition

Sections of the roofs and upper floor slabs will be removed to create a new open courtyard space on the ground floor. These vertical perforations will also separate and define spaces for the new programmes on the first floor level. A number of the concrete columns are removed, with the remaining columns articulating the new circulation corridor below.

6.4.4 New Insertions

A new ground floor level slab and first floor level bridge connects Prinschurch building with Karpis 2 and the rest of the scheme. The building is re-appropriated to host new creative workshops and the creators’ library. The creators’ library also connects the new basement level below with ramps leading to the ground and first floor level. The new basement level hosts the creator’s processes, providing the public with glimpses of these processes, seen in (Fig. 112 - 114). The new basement columns are underpinned and cased underneath the existing column grid, supporting the new ground floor slab, shown in figures 110 - 112. A new roof is inserted onto the existing columns, over the creators’ library and a new concrete box gutter fits in between the existing and new roof, articulating the circulation corridor underneath.

“Since we move in Time
Through a Sequence
of Spaces,.

We experience a space in relation to where we have been and where we anticipate going” (Ching 2007:240).

Existing Material Palette



Face Brick Wall / 'Wilderness'



Brick Paving and Concrete



Concrete Brick Walls



Concrete Column



Timber and Steel Column



Steel Windows

FIGURE 129 (Above) - EXISTING MATERIAL PALETTE (AUTHOR 2015)

The material palette of the existing structures is industrial in nature and aesthetics. It consists mainly of clay masonry, concrete, and steel, with "wilderness" elements dotted through the in-between spaces. The robustness and strength of the materials is expressed.

New Material Palette



Concrete



Wild Grass



Rust Treated Steel



Water-plants



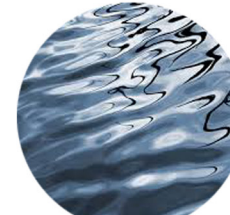
Glass



Shaded Shrubs / Creepers



Mentis Grating



Water



Steel Mesh



Saligna Timber

6.6 Materiality

The new material palette should be juxtaposed with the original materials by working with linearity, creating layers of permanence and temporality. All additions would be done with tectonic and modular components as it should be potentially reversible in future. The inorganic materials consists of in situ concrete for the heavy stereotomic forms and steel and timber for the light tectonic forms.

New materials should be of a light, tectonic nature in their detailing and show surface weathering through the passage of time. The use of a monotone material palette provides a blank canvas to show up the "wilderness" elements which form part of the material palette.

FIGURE 130 (Left) - NEW MATERIAL PALETTE (AUTHOR 2015)

6.7 Sustainability

The project must ground itself, being robust and resilient, by making use of passive sustainable principles above high-tech principles. Pretoria has a very moderate climate in terms of user comfort, with protection from direct sun and rain the user could be comfortable throughout the majority of the year.

6.7.1 Orientation

The building's orientation (of the main façade) should be north, or the optimum orientation of 7.5° east of direct north. Anything within 15° either side of north is an ideal orientation. Good orientation reduces the need for auxiliary heating and cooling.

6.7.2 Passive Systems

The building makes use of thermal mass through its concrete floor slabs. Thermal comfort is better achieved through thermal mass, managing both under and over-heating periods. All parts of the buildings make use of thermal mass in the concrete floor slabs and parts of the walls which allows it to latently re-radiate heat from the day, this is further matched with night purging when the building is not in use. A rock store and trombe assisted stack is also used to draw cool air out from the rock store in the basement level. The trombe assisted stack can also be used to circulate warm air around the building.

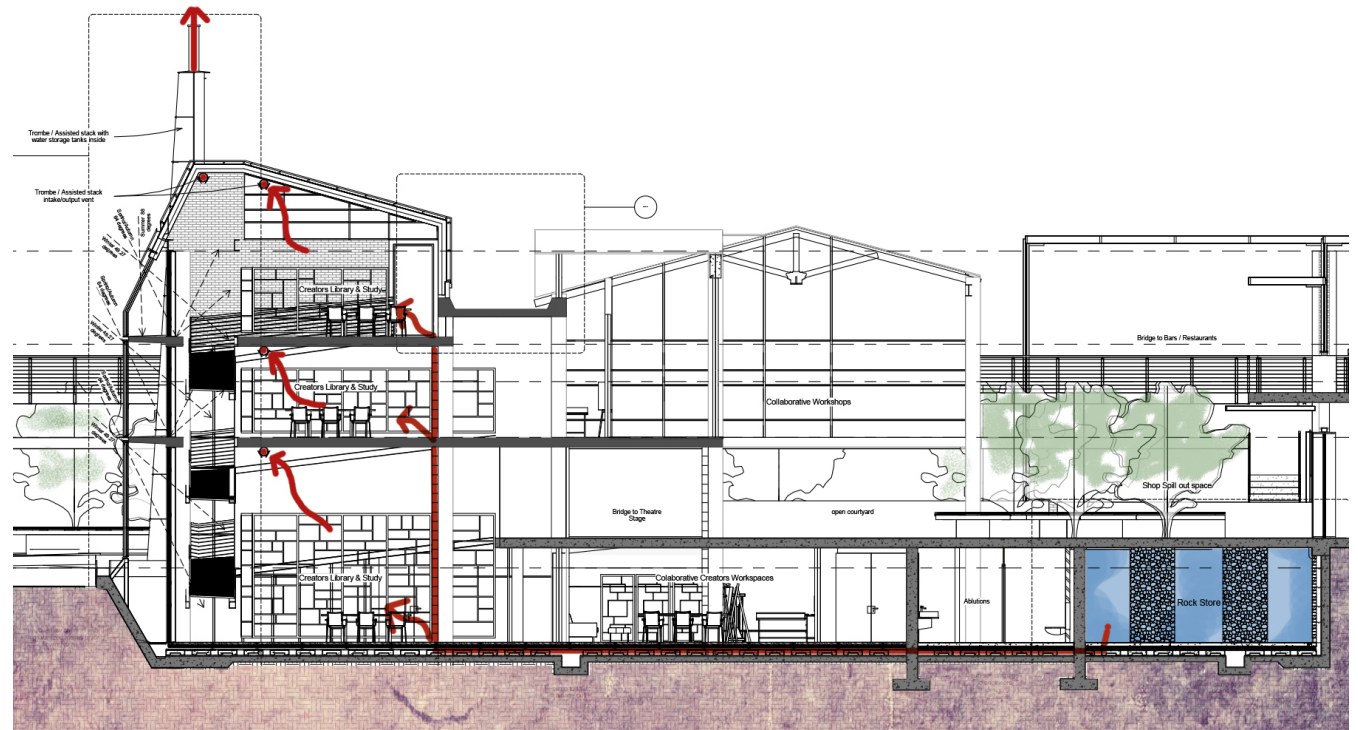


FIGURE 131 - PASSIVE HEATING AND COOLING SYSTEM (AUTHOR 2015)

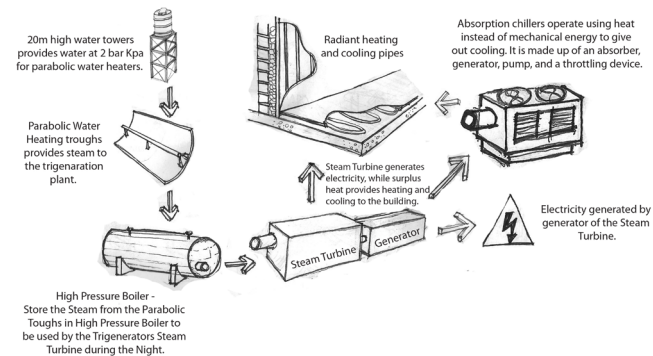
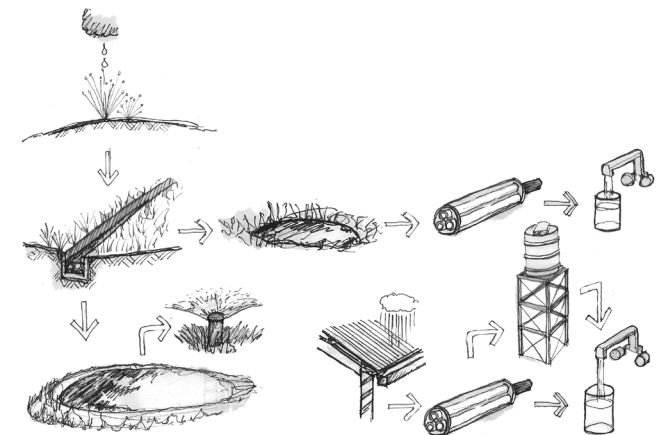


FIGURE 132 - PASSIVE ENERGY AND HEATING AND COOLING DIAGRAM (AUTHOR 2015)



Water Strategy

FIGURE 133 - WATER COLLECTION AND ERADICATION DIAGRAM (AUTHOR 2015)

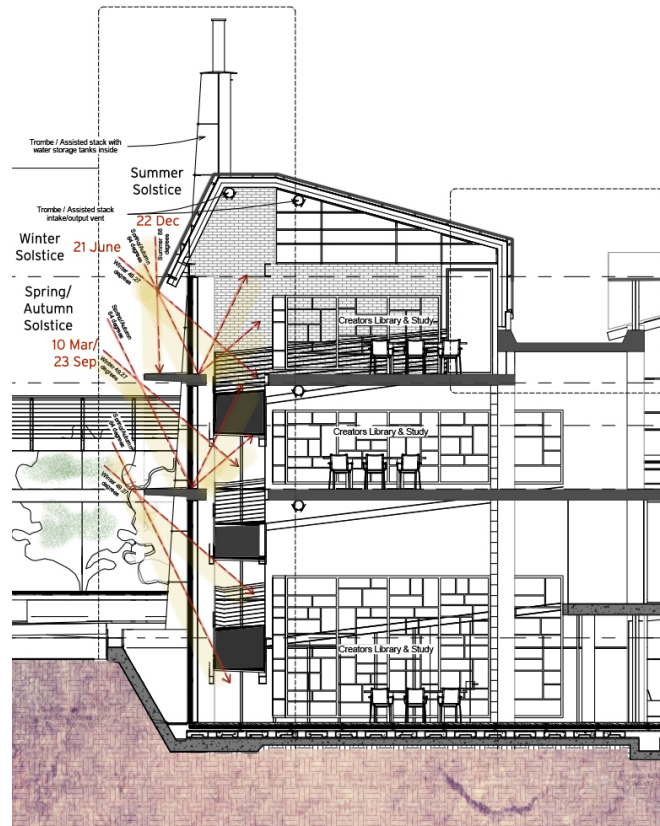


FIGURE 134 - SOLSTICE STUDY 1 (AUTHOR 2015)

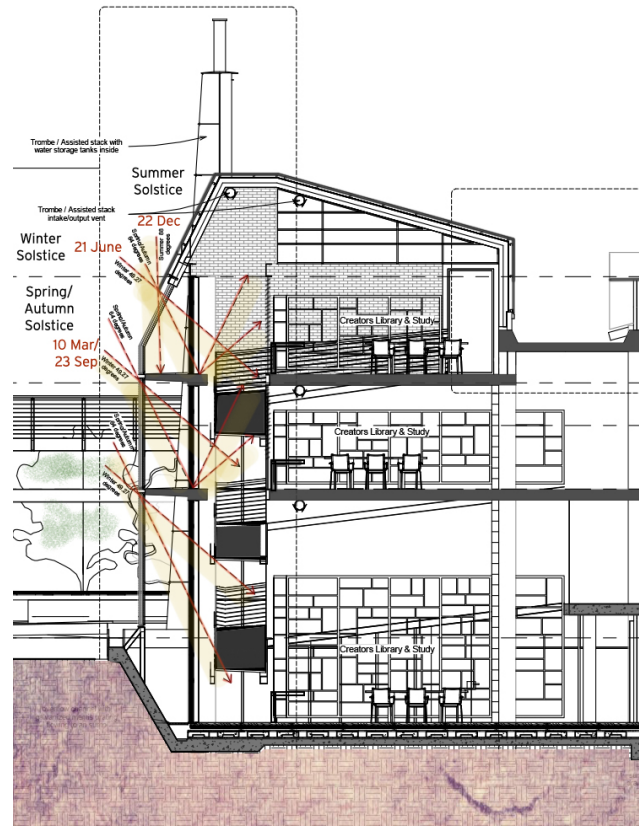


FIGURE 135 - SOLSTICE STUDY ITERATION SUNSHADING (AUTHOR 2015)

6.7.3 Solar Angles

The building site is located in Climatic zone 2, classified as temperate interior, according to the SANS 204-1 (2008). The vertical sun angles at summer solstice (21 March / 23 September) is $64,24^\circ$ and at winter solstice (22 June) it is $40,73^\circ$. Careful consideration should be taken regarding solar exposure in the library component, for purposes of reading comfort and glare avoidance, as well as protecting the books from direct sunlight.

A section through the building is analysed in terms of solar incidence angles in October (Fig. 134). It can be seen that during the winter months some of the books might eventually be damaged by direct sunlight and the incident light may also cause harsh shadows and glare in the library reading spaces, which is undesirable, and needs to be addressed in the architectural design, see Figures 135.

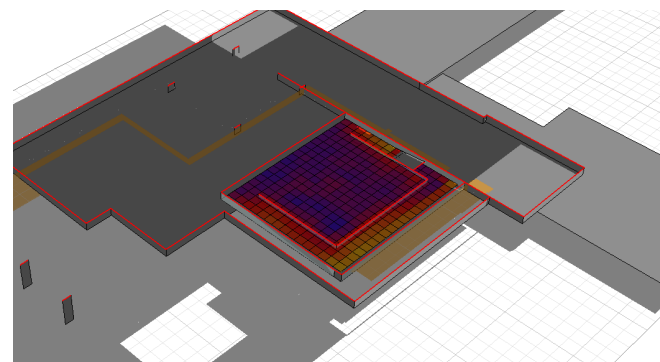


FIGURE 136 - ECOTECT - LIGHT STUDY BASEMENT (AUTHOR 2015)

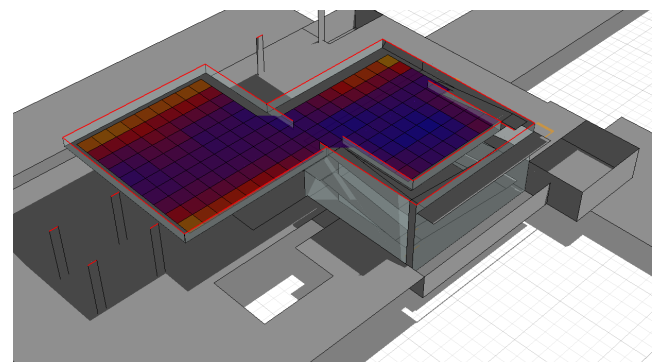


FIGURE 137 - ECOTECT LIGHT STUDY FIRST FLOOR (AUTHOR 2015)

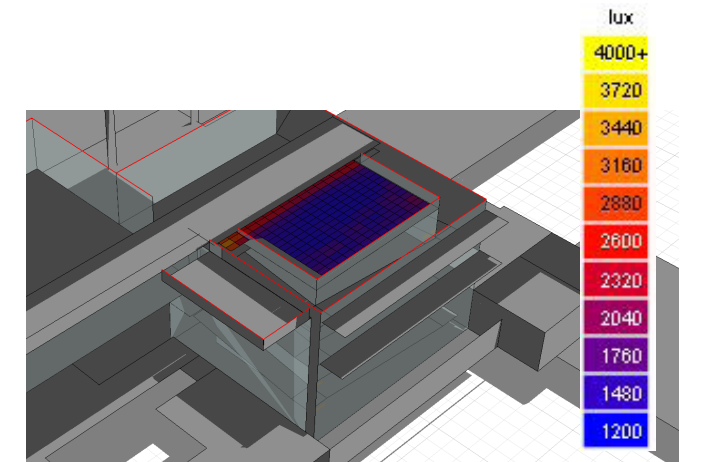


FIGURE 138 - ECOTECT LIGHT STUDY SECOND FLOOR (AUTHOR 2015)

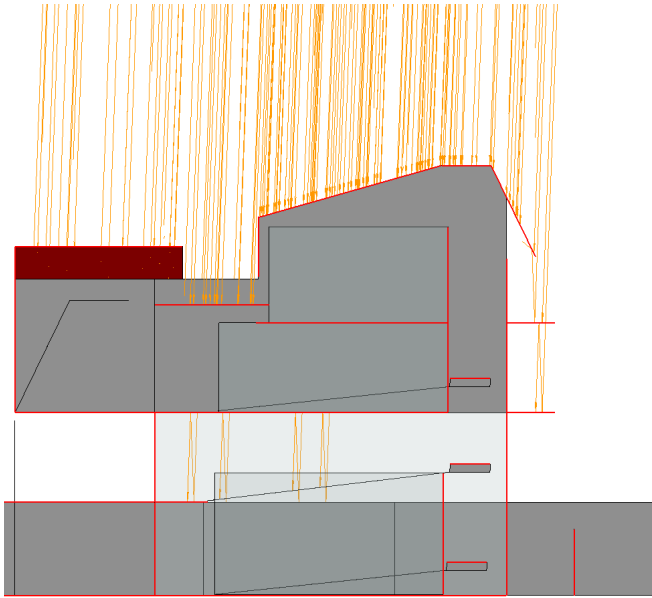


FIGURE 139 - ECOTECT - LIGHT STUDY SECTION SUMMER SOLSTICE 22 DEC (AUTHOR 2015)

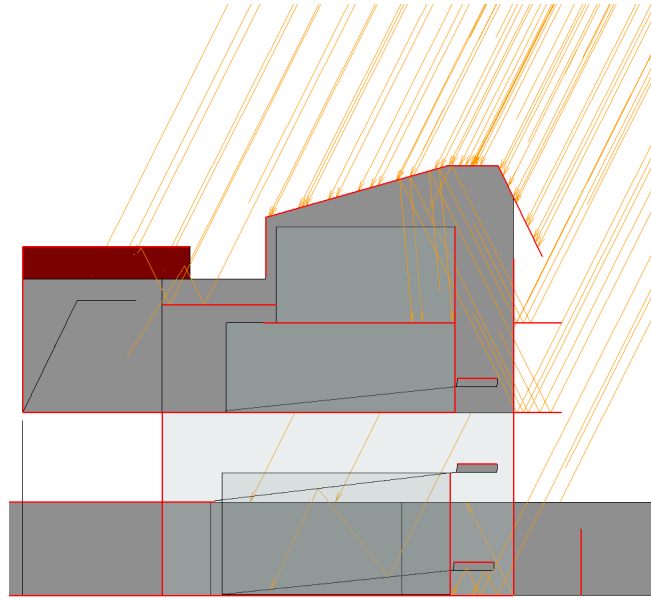


FIGURE 140 - ECOTECT - LIGHT STUDY SECTION SPRING / AUTUMN 10 MAR - 23 SEP (AUTHOR 2015)

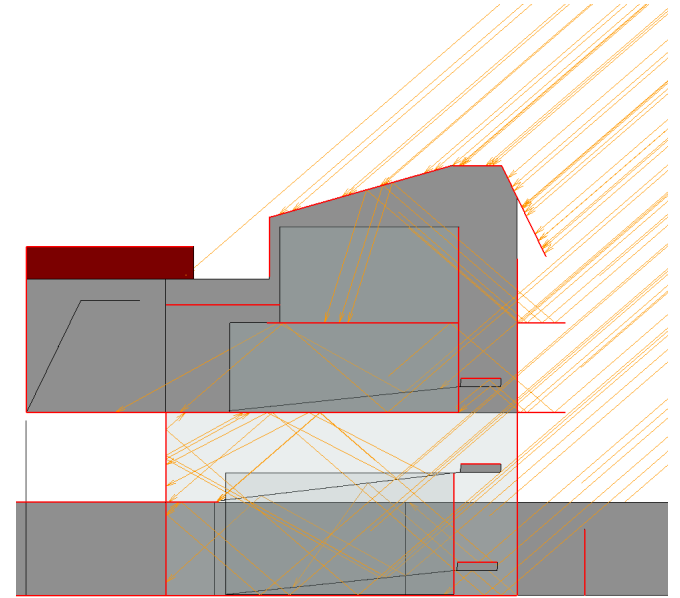


FIGURE 141 - ECOTECT - LIGHT STUDY SECTION WINTER 22 JUNE (AUTHOR 2015)

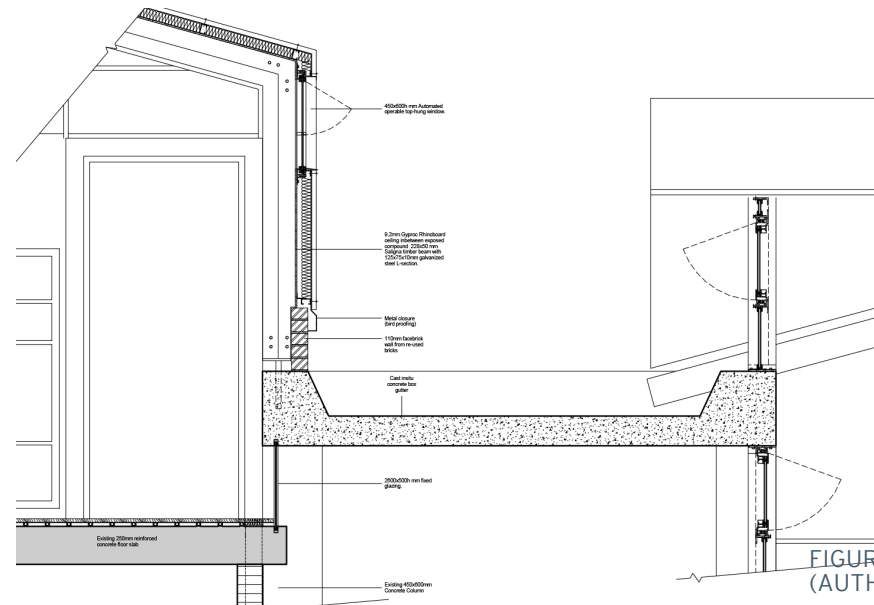


FIGURE 142 - KARPS 2 BUILDING DETAIL - BOX GUTTER (AUTHOR 2015)

FIGURE 143 - KARPS 2 BUILDING DETAIL - LIBRARY ROOF
(AUTHOR 2015) (LEFT)

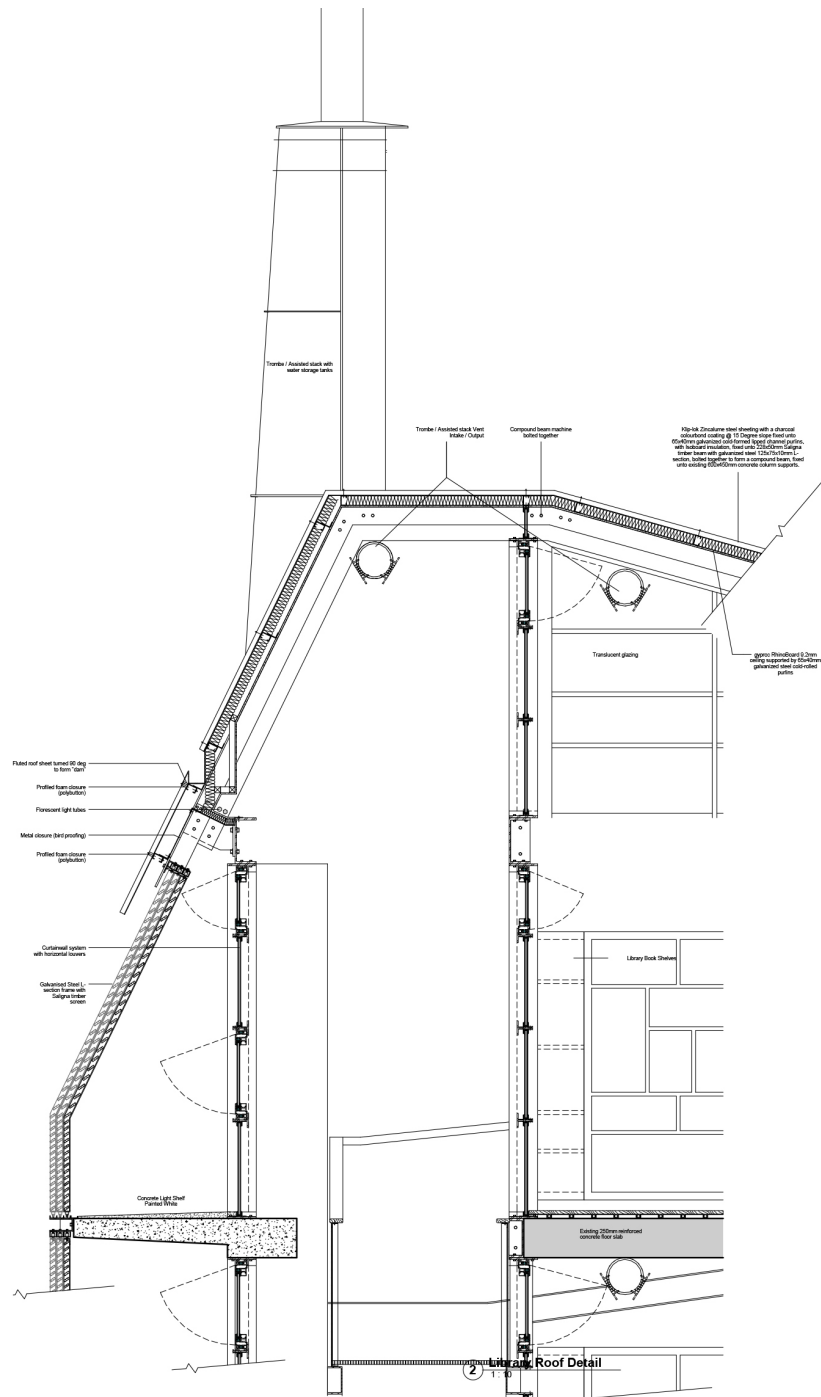
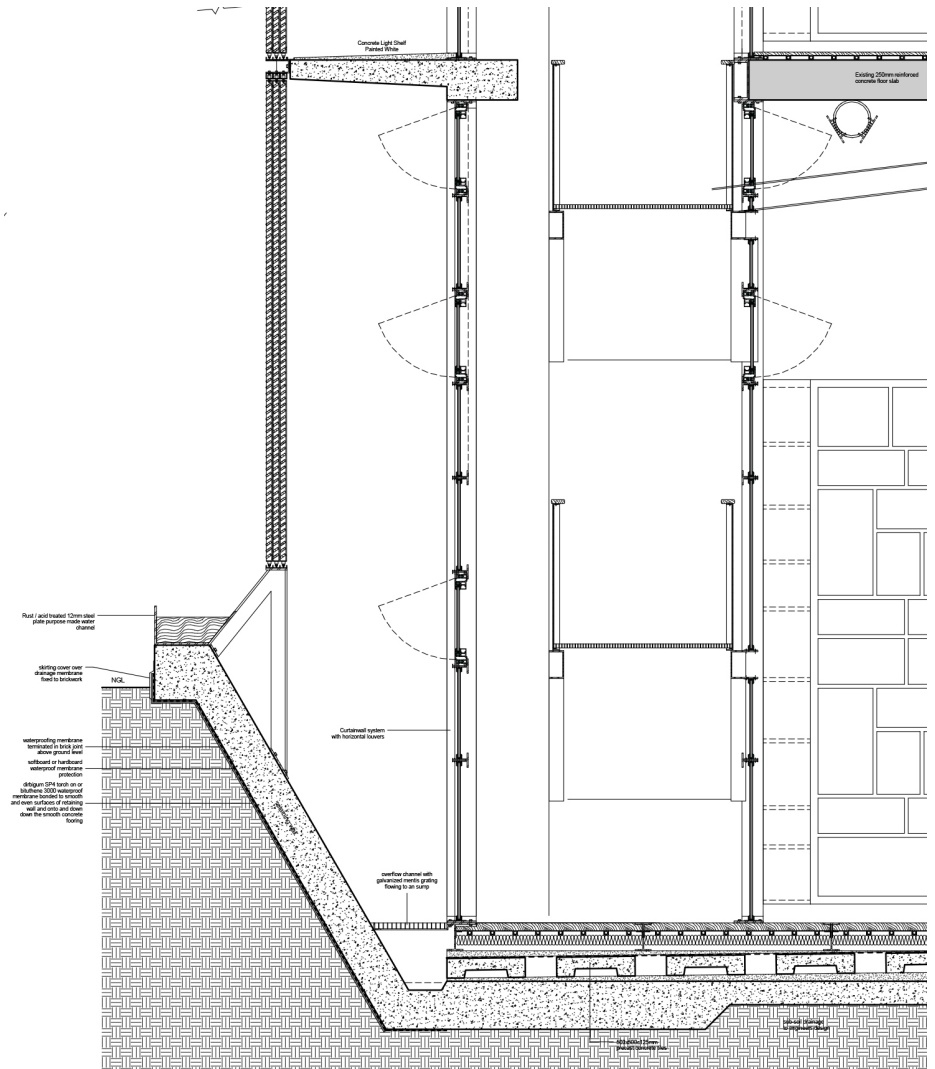


FIGURE 144 - KARPS 2 BUILDING DETAIL - BASEMENT
RETAINING WALL (AUTHOR 2015) (BELOW)





3 Theatre Stage Adaption_closed
1:1
FIGURE 145 - THEATRE STAGE OPEN (AUTHOR 2015)



2 Theatre Stage Adaption_open
1:1
FIGURE 146 - THEATRE STAGE CLOSED (AUTHOR 2015)

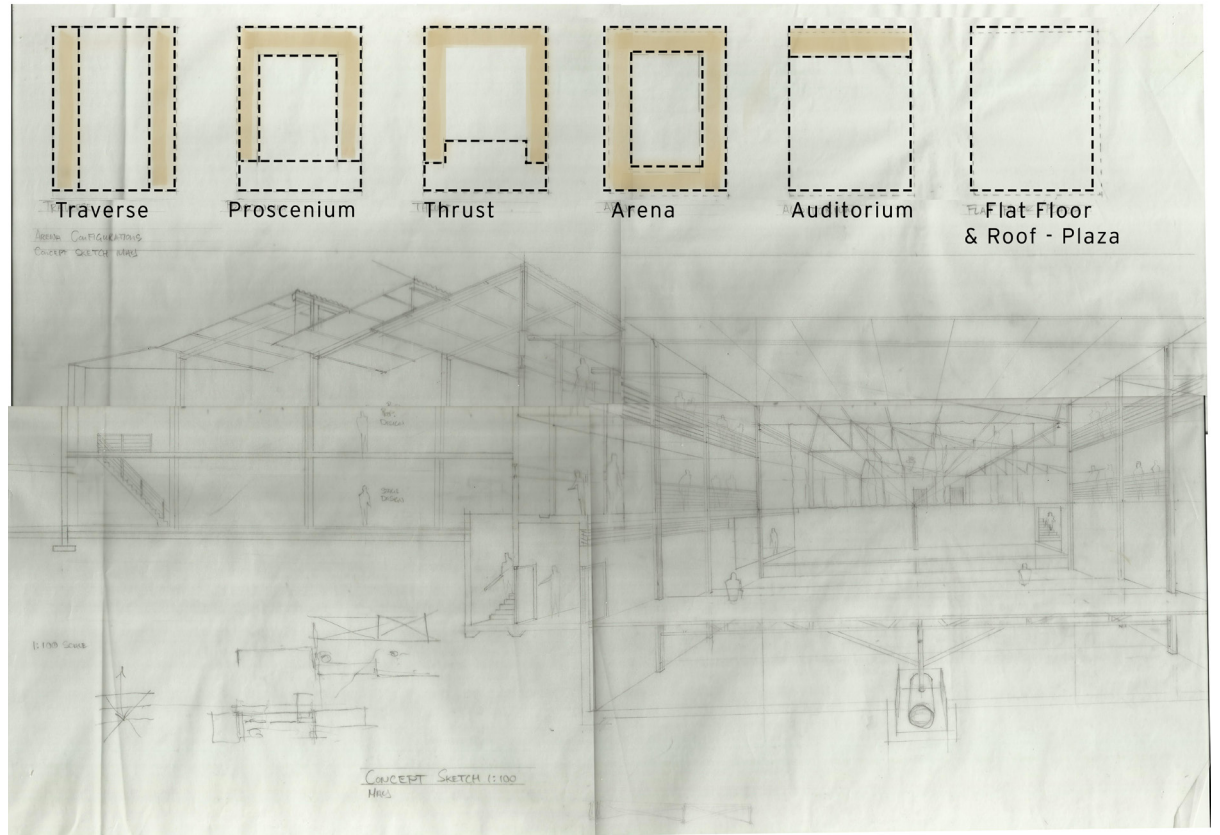


FIGURE 147 - THEATRE STAGE CONCEPT SKETCH (AUTHOR 2015)

6.7.5 Sustainable Urban Environment

Due to rapid population growth, urbanisation and scarcity of materials, it is crucial that provisions for services and infrastructure developments are satisfied and where possible, met by sustainable methods. This is important in order to ensure the preservation of natural resources and also support local economic incentives and the creation of local jobs and growth. Jeremy Gibberd of the CSIR developed the sustainable building assessment tool (SBAT), which has been applied in this project to measure its sustainability. The SBAT tool assesses the project's impact on the three main categories of sustainability, namely social, economic and environmental sustainability (see Fig. 124).

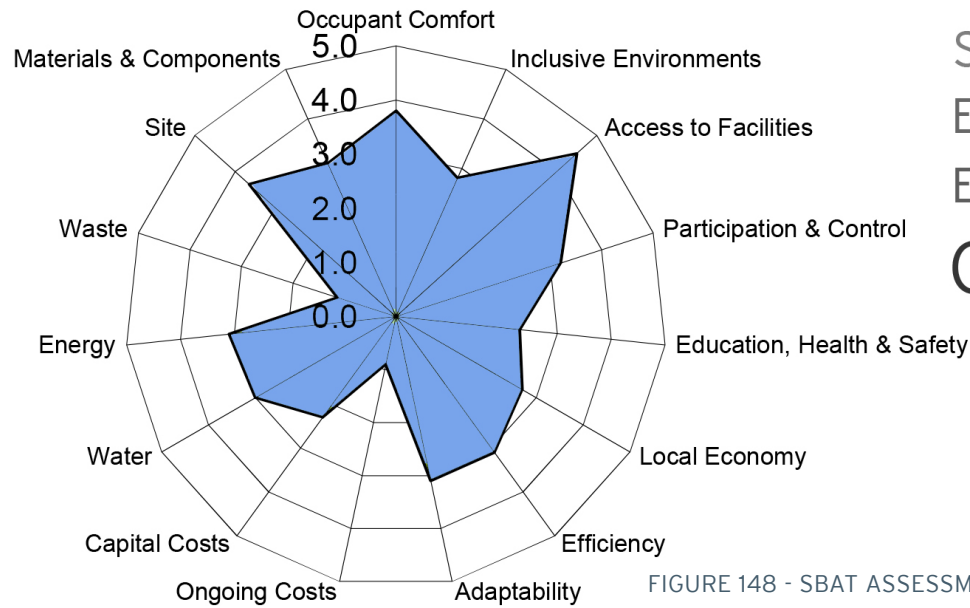


FIGURE 148 - SBAT ASSESSMENT (AUTHOR 2015)

Social
Economic
Environmental
Overall

6.7.6 Social Sustainability

The accessibility of the site is highly sustainable with a ranking of 4.5 out of 5, due to the site location and proximity to public transport and various amenities, such as schools, colleges and retail. This outcome is partially informed by the composition of the programme and public services, as well as the contextual intent to achieve a space inclusive to its "heterogeneous society", both in the existing structures and space surrounding it. Universal access is achieved through ramps and lifts throughout the scheme.

The entire scheme makes use of sustainable passive heating and cooling systems and natural light, with a trigeneration steam turbine producing electricity for artificial lighting when necessary.

6.7.7 Economic Sustainability

The adaptability score in this section (relating to lower costs of future re-use) is the highest at 3.2 out of 5, because the design and material choices were made with modularity and robustness in mind. This score is contributed to by the location, and the principle of pedestrians taking precedence of vehicles, ensuring walking, cycling or public transport are viable and cost effective transport options. Capital cost are kept low, through locally sourced materials and labour and in aspects such as buildings being adapted instead of built new, as well as the demolished brickwork from existing structures being re-used. The new wetlands wall can incorporate the damaged bricks because they can be concealed there. Broken concrete from the demolition process can be crushed and reused as hardcore and used in the backfill needed on some levels on the ground floor platform.

6.7.8 Environmental Sustainability

Environmental sustainability has been achieved through the good management of energy efficiency, scoring 3.2 out of 5. The buildings are designed to be passively ventilated through the use of a rock store and trombe assisted stack. The same system can be used to heat the space by re-circulating the excess heat from the trigeneration water pipes coiled in the floor, that are heated by parabolic solar water heaters. The site choice involves the reuse of a brown-field site, which is ideal as it is also well located in its urban context. The intervention does not overshadow surrounding buildings and improves public access.

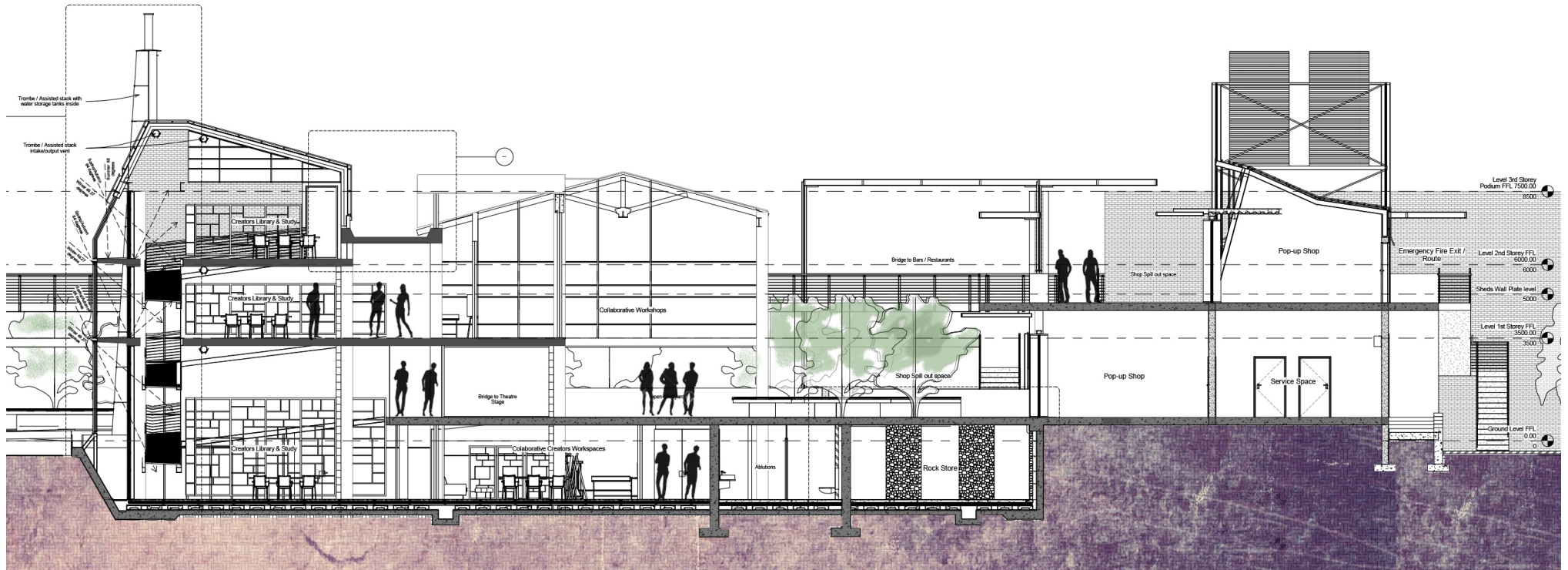


FIGURE 148 - KARPS 2 BUILDING SECTION A-A (AUTHOR 2015)

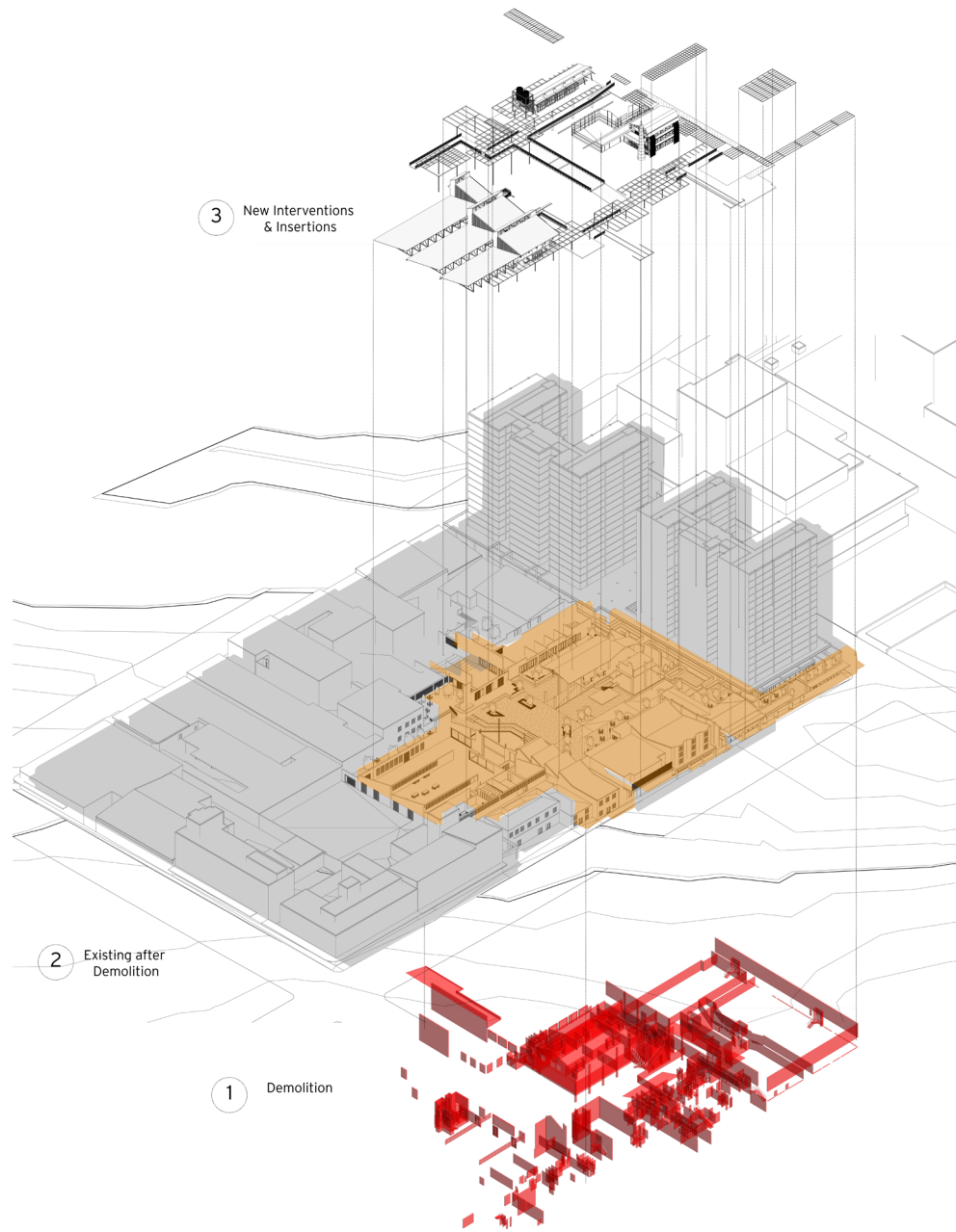


FIGURE 149 - EXPLODED AXO - DEMOLISHED, EXISTING AND NEW (AUTHOR 2015)

Remaining Existing with exploded New Insertions and Demolished

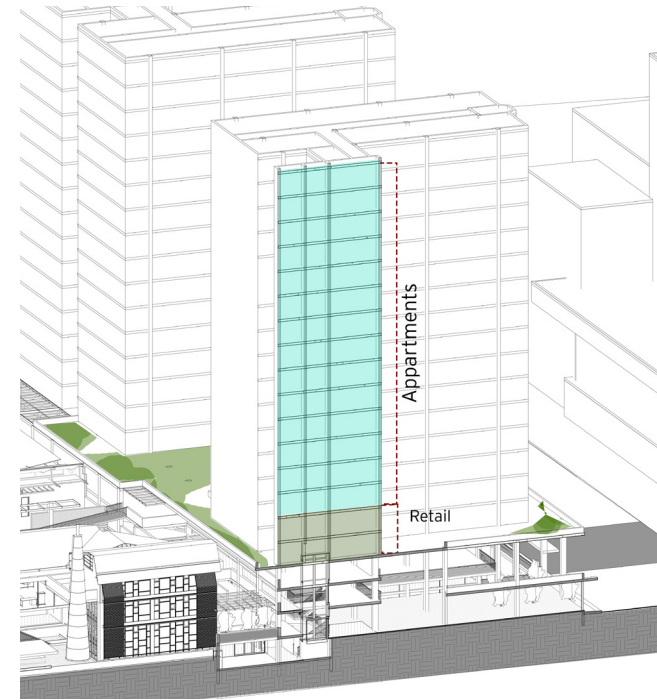


FIGURE 150 - PRINSCHURCH FRAMEWORK (AUTHOR 2015)