7.1// TECTONIC CONCEPT

By introducing a sense of continuity, the tectonic approach is based on the key aesthetic parameter of new meets old. Whilst preserving the integrity of the old fabric, the new interventions should be clearly differentiated and represent a new architectural language.

This method of contrast or juxtaposition favors the programmatic interpretation of respecting our past whilst contributing towards the future. The success of differentiation not only relies on the degree of contrast between old and new but an acute understanding of connecting the latter.

There are different variations of contrast ranging from subtle to apparent or extreme interventions. Bloszies (2012:12) suggest that although extreme contrast encourages an appreciation for both old and new, a restrained or referential approach is equally effective. The technical exploration will be based on a combination of different degrees of contrast depending on the experiential requirements. The effective use of materials will be the key determinant in the process of differentiation.

7.2// CONSERVATION STRATEGY

Although the fort has not been declared as a national monument, it remains under the protection of the 1999 Heritage Act. Alterations and additions is therefore possible if motivated accordingly. The ICOMOS Charter for conservation and restoration (1964: Article 5) suggests that the repurposing of historic monuments for social use is acceptable and should not adjust the layout or decoration of the building. Modification that change the function may be permitted if it is within the limits of the latter.

Adaptive re-use projects is therefore a sustainable method of ensuring the conservation of historical sites given the new intervention respect the integrity of the old. The intention is to preserve all existing structures and ensure that new additions do not compromise the stability or integrity of the latter.

The excavation and levelling of floor levels should be facilitated under the supervision of the required experts such as environmentalists and archaeologists. Any archaeological findings that has been discovered during the excavation phase of the project will be exhibited in the new additions to amplify the narrative experience. All excavated soil is re-used on site for new construction and remains sensitive to the existing ridge line.

Figure 7.1: *Conceptual collage of tectonic approach (Author 2016)*

7.1

7.3// STRUCTURAL SYSTEMS & MATERIALITY

In support of the tectonic approach the method of contrast is illustrated through a combination of three inter-dependent structural systems, each contributing to the narrative experience.

Substructure

Apart from the structural integrity of this system, it should also resemble the endurance and protection of our collective heritage. Given the sub-merged existence of the Fort, the natural condition of the ridge forms the basis of the transitional process of contrasts. To retain the soil of all the excavated floor levels the reinforced retaining walls are finished off with either a board formed concrete or a double coated white Rhino wall plaster finish.

Structural walls will support the lateral imposed loads of the secondary structural system and allow for the alignment of wet and electrical services. The interpretation of the stereotomic quality of the substructure will compliment the new tectonic additions of the superstructure which represents the versatility of our future heritage.

Superstructure

In response to the original design of the fort, the dismantled structural and decorative steel components will be reintroduced in a combination of primary and secondary structural support frames.These steel components are valued for their versatility in form, their compatibility with other materials and structural stability.

Pre-oxidised structural steel beams and columns are also valued for their potential to be dismantled and re-used in future additions. A light-weight steel roof construction is explored as temporary construction to allow for future renovations, additions or demolition of the site.

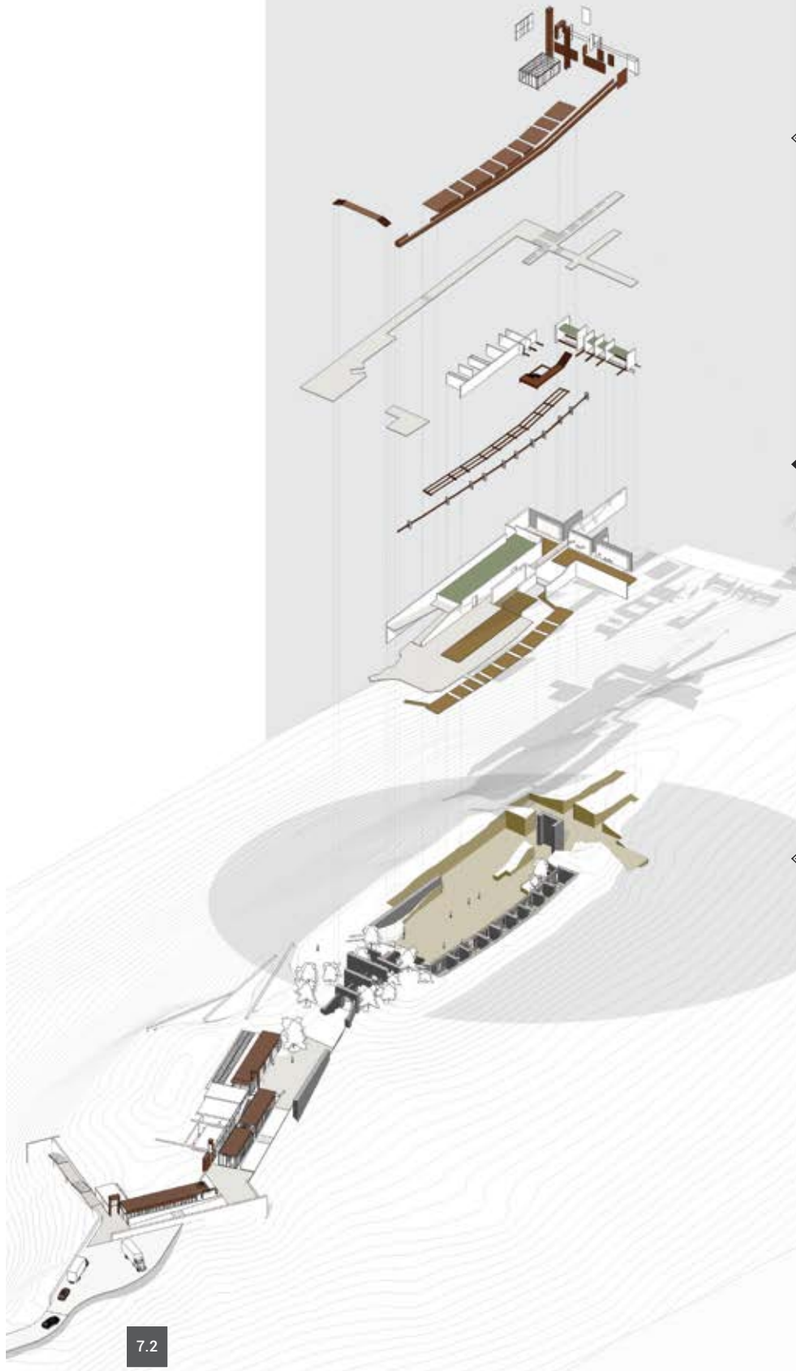
Connections

The success of the techtonic approach is largely subjected to the detail connections between the suggested contrasting structural elements. One of the major concerns is the connection of the new additions to the existing structures without compromising the integrity of the heritage fabric. The intention is to elevate the experience and uniqueness of each structural component whilst connecting them to form part of the greater whole.

Recycled materials

As a product from the ruination at Westfort Village, the original timber floors was stripped and replaced with new materials. These original oak timber planks will be reused in the temporary exhibition rooms. All excavated soil are utilised on site by a well balanced cut and fill construction plan. Recycled steel components are implemented in construction process. The use of Corten steel plates as cladding is valued for it's weathering capacity and unique character as it changes over time.

Figure 7.2: *Extrusion of all Structural systems at the Fort (Author 2016)*



CONNECTIONS
'CONTRAST'
Fixing of different materials
Elevate material integrity
Resemble continuity of
our collective heritage

SUPERSTRUCTURE
'VERSATILE & COMPATIBLE'

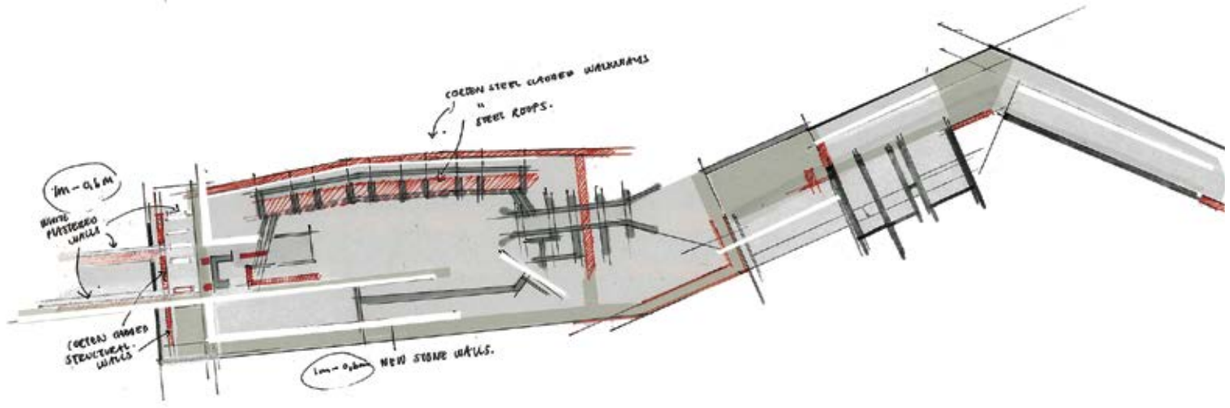
Re-introduce dismantle steel components
Structural & non-structural
Tectonic quality of materials
Temporary construction
Weathering capacity

SUBSTRUCTURE
'ENDURANCE & PROTECTION'

Excavation and re-use of soil
Levelling of surfaces
New Foundations
Introduce white structural walls
Installation of wet services
Stereotomic quality of materials
Permanent construction

EXISTING CONDITION
'A RUIN'

Retain all structural
and non structural elements of
existing Fort

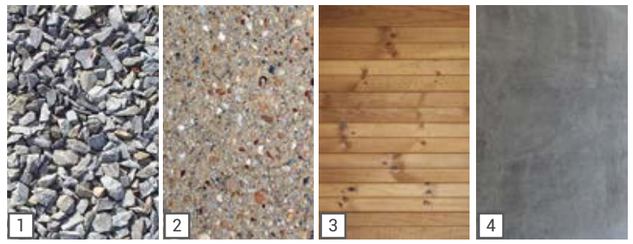


7.3

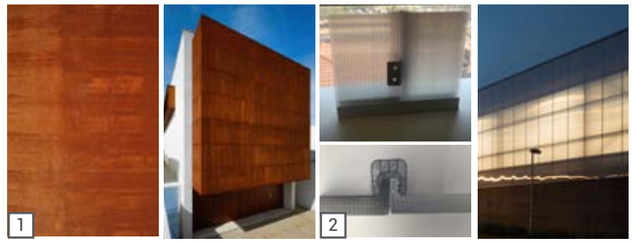
Figure 7.3: *Exploration of the material application (Author 2016)*
Figure 7.4: *Existing and proposed material palette (Author 2016)*

MATERIAL PALETTE

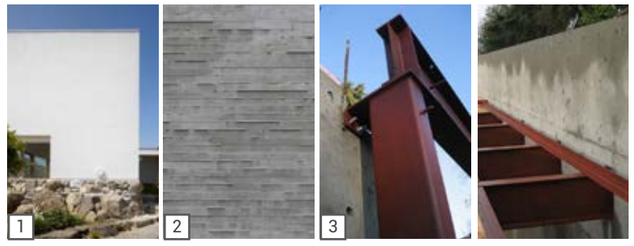
ROOF CONSTRUCTION
1. Copper roof (www.freedompark.co.za)
(Local manufacturer: Copalcor trading)
2. Gravel-Ballested roof
3. Green roof (www.liveroof.com)
(Liferoof LITE SYSTEM over conventional roofing assembly with moisture portals)



FLOOR FINISHES
exterior circulation
1. 13mm grey stone aggregate on compacted soil
2. Lafarge Artevia with exposed aggregate (www.lafarge.co.za)
indoor circulation
3. 32mm Recycled SA Pine t&g timber planks
4. Power floated screed on concrete surface bed



INFILL
1. Corten steel cladding
(Local manufacturer: ArcelorMittal)
2. Danpalon-polycarbonate sheeting
(Local manufacturer: Danpal)
(1 & 2 is fixed to a light weight steel frame)



STRUCTURAL SUPPORT
1. 300-600mm white plastered structural walls
2. 300mm reinforced concrete retaining walls
3. Structural steel portal frames (NJR)
Basement construction (Tanking)
Raft foundations

EXISTING CONDITION AT SITE
600-1,2m dressed stone walls
Rocky ground conditions
Soil erosion
Vandalism

7.4

7.4// ENVIRONMENTAL STRATEGIES

Function	m²	WATER DEMAND *Litres/day*	RAIN WATER HARVEST CONTRIBUTION	ENERGY DEMAND *Watts/day*	SOLAR ENERGY HARVESTING
Research & validation 6- 8 full time staff members ** See programme requirements on page 87*	***108 m²***	***wc*** - 8L (4x4 flush) ***hwb*** - 2L (8x4) ***urinals*** - 1L (4x4) ***kitchen*** - 4x30L TOTAL = 328L/day	*Roof catchment* 117 m² *Surface catchment* 187 m²	*Lighting* 1 856 W/day *Office Equipment* 13 950 W/day	*Solar panels* *Stand alone system* **PRODUCT** 'Sunmodule SW80 Poly RNA **PV Panel size** 958x680x34mm **Weight** **7**.6kg **Energy (Wh/day)** 270Wh **Cost** R4650 / panel **Total panels installed** 40 **Total energy generated / day** 10800 Wh/day
Library & Documentation 40 daily users ** See programme requirements on page 89*	***345 m²***	***wc*** - 8L (20x4 flush) ***hwb*** - 2L (40x4) ***urinals*** - 1L (20x4) TOTAL = 1200 L/day	*Roof catchment* 450 m² *Surface catchment* 306 m²	*Lighting* 2 535 W/day *Office Equipment* 18 034 W/day	
Portal Restaurant 40-100 daily users ** See programme requirements on page 85*	***235 m²***	***wc*** - 8L (30x1 flush) ***hwb*** - 2L (60x1) ***urinals*** - 1L (30x1) ***kitchen*** - 65L (60 seat) TOTAL = 4290L/day	*Roof catchment* 168m² *Surface catchment* 376 m²	*Lighting* 2 807 W/day *Office Equipment* 7 500 W/day	
Events & Exhibitions 60-800 daily users ** See programme requirements on page 85*	***1334 m²***	***wc*** - 8L (300x1 flush) ***hwb*** - 2L (600x1) ***urinals*** - 1L (300x1) ***shower*** - 40L (2x2) TOTAL = 4060L/day	*Roof catchment* 432 m² *Surface catchment* 760 m²	*Lighting* 3 920 W/day *Office Equipment* 12 342 W/day	

Sources:
http://ecotechenergy.co.za/calculator/EnergyCalculator.xlsx
GBC SA-Energy-Water-Benchmarking-Tool-v1-20112014.xls
BUCKLE. J.S, et al. 2007. Water consumption levels in selected South African Cities. Water Research Commision: November.

BUILDING METRIC

GLA	1839.41
Average occupancy hours p/month	110.69
Average daily occupants	180
Water demand p/day (2 events/month)	9879L/day
Water demand p/day (exluding events)	6368L/day
Average water demand p/day	**6602L/day**
Total rain water harvested annually	*1688'774L/y*
Total rain water harvested daily	**4691 L/day**
Potable water supply (municipal reservoir)	
Total energy consumption p/day	42 kW/day
Total energy consumption p/month (18)	808 kW
Solar energy generated p/month	**846 kW**

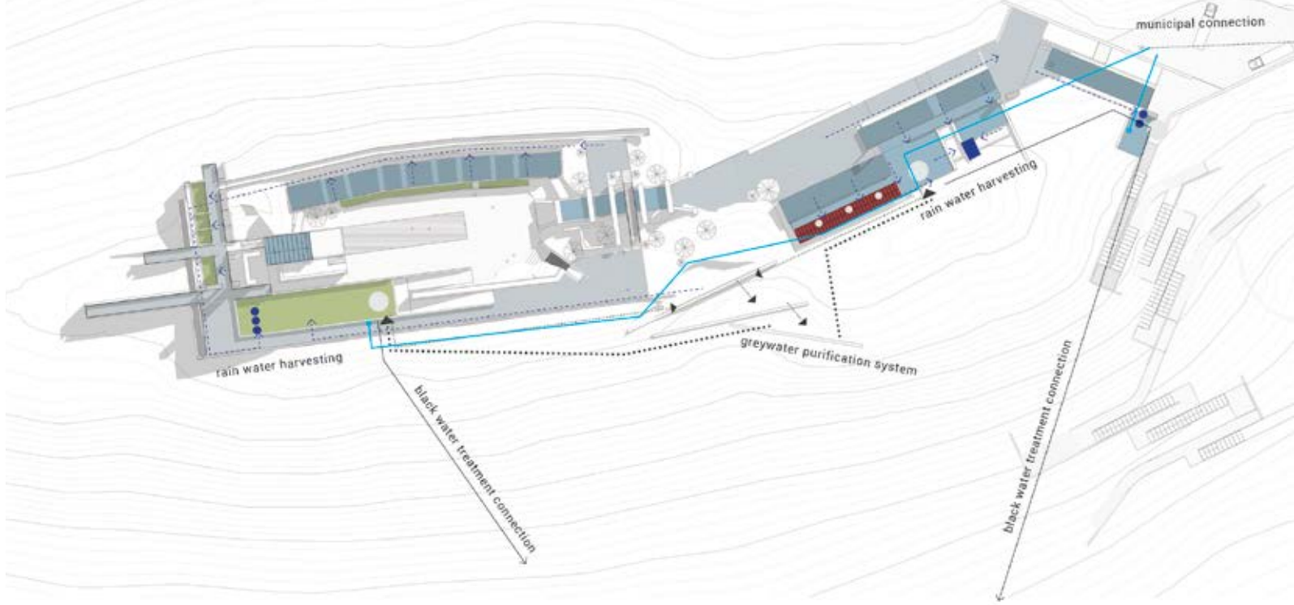
AVERAGE MONTHLY PRECIPITATION FOR PRETORIA (mm)		AVERAGE HARVEST PER MONTH (90% of surfaces)
January	136mm	2796m² x 0.136m = 380,256 L
February	5mm	2796m² x 0.005m = 13,980 L
March	82mm	2796m² x 0.082m = 229,272 L
April	51mm	2796m² x 0.051m = 142,596 L
May	13mm	2796m² x 0.013m = 36,348 L
June	7mm	2796m² x 0.007m = 19,572 L
July	3mm	2796m² x 0.003m = 8,388 L
August	6mm	2796m² x 0.006m = 16,776 L
September	22mm	2796m² x 0.022m = 61,512 L
October	71mm	2796m² x 0.071m = 198,516 L
November	98mm	2796m² x 0.098m = 274,008 L
December	110mm	2796m² x 0.110m = 307,560 L

Source: http://www.climatetemp.info/south-africa/pretoria.htm

WATER MANAGEMENT
- Main water connections
- Potable water inlet
- Roof catchment area
- Surface catchment area
- Rain water harvesting flow
- Water storage tanks
- Grey water purification system
- Irrigation needed

WASTE
- Black water treatment at Westfort village

SOLAR ENERGY
- Solar PV Panels



7.5 ***Figure 7.5:*** *Proposed water and energy conservation strategies at the Heritage portal (Author:2016)*

7.5// TECHNICAL RESOLUTION

Services

Given its remote location and the current conditions of the site, the fort and the Village has no connection to formal services. It is therefore critical to implement environmental strategies that accommodates the energy and water requirements on site.

The water management plan includes the effective harvesting of rain water which is directed to either 5000L JOJO tanks or a built in steel reservoir with a 120 000L capacity. Potable water is supplied by the adjacent municipal water reservoir with a 126 000L reinforced concrete water reservoir and a booster pump that ensures that the water is under constant pressure and always readily available.

Grey water is transferred to the grey water purification system which circulates through three different treatment stages. The first stage is the sedimentation pond (primary treatment), water is then filtered through a aerobic pond (secondary treatment) which leads to the maturation pond (tertiary treatment). All filtered greywater is then pumped back for reuse in waterclosets, urinals, scullery and for irigation purposes.

The kitchen roof is ideal for solar panel installation as it exposed to maximum sunlight and not visually obtrusive. A battery room below the kitchen allows for central distribution, accessible storage, adequate insulation and natural ventilation

As part of a larger system, all waste is recycled and sorted on site and black water is connected to a larger system of sewage treatment that accommodates the entire Westfort heritage village.

Natural Daylight

The method of contrast could also be explored in the effective use of natural light juxtaposed to the deep shadows of the submerged structures of the fort. This juxtaposition is therefore a mediator to another world of perception which allows for the experiential to take lead in the expression of place.

It reveals people, places, emotion and fosters the connection to the ethereal. Bille et al. (2007:266) considers light as a critical element in our social life through its reflection on identity, cultural heritage, our morality and need to feel safe or rather visible in our environment.

The use of natural light and ventilation is essential to the experiential qualities of place. It is a physical phenomenon which is measurable, quantifiable and influential in the construction of social space (Bille et al. 2007:265). As an extension from the exploration on contrasting materials, the use of natural light as a respected building material will be utilized to further elevate and manipulate the experiential qualities of place.

Using Richard Kelly's three main elemental qualities of light as a basic framework it is possible to identify the intended spatial experience in accordance with a specific light intensity (Kelly 1952:24). The quantity of light is the natural first concern and needs to be assessed in support of software modelling to ensure that the amount of natural light within the building is sufficient according to the suggested programme and intended experiential qualities.

The effective use of natural light as an alternative building material resembles the very idea of phenomenology. By first returning to the essence of the spatial experience, it is possible to establish the quality of the sensory engagement and then designing for the correct light application to enhance the human experience of that particular space.

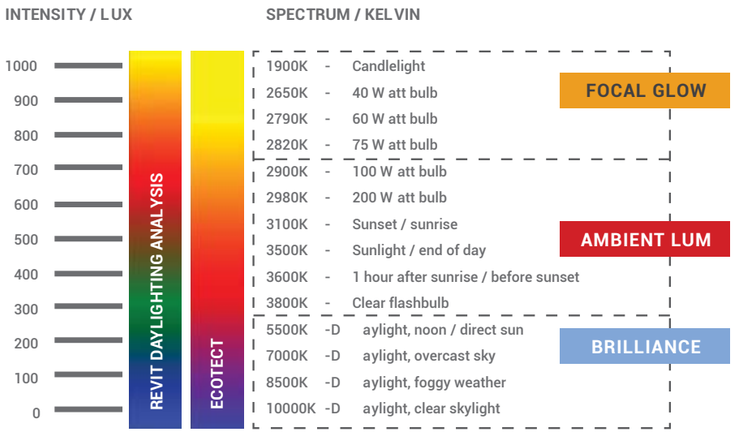
Figure 7.6: *Diagrammatic exploration of natural light as a spatial agent (Author 2016)*

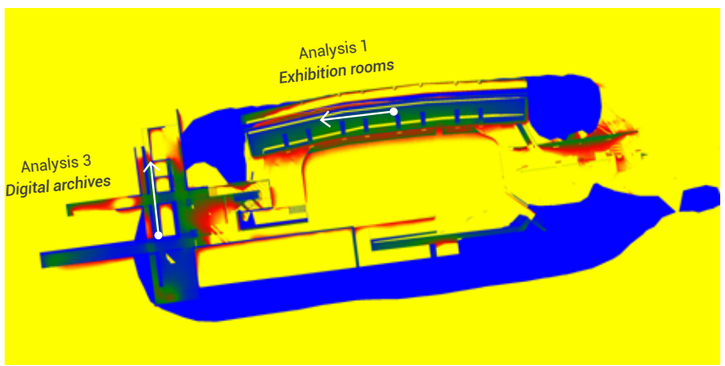
7.6

Natural daylight

RICHARD KELLY **FRAMEWORK**

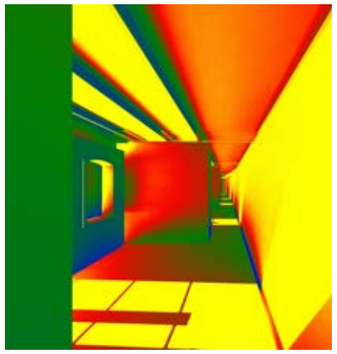
CONDITION 1 **FOCAL GLOW**	CONDITION 2 **AMBIENT LUMINANCE**	CONDITION 3 **PLAY OF BRILLIANCE**
Draws attention HIGHLIGHTS	*Safe and reassuring* GRADED WASHES	*Stimulates the spirit* SHARP DETAIL
INDOOR APPLICATION Research office Meeting rooms Exhibition rooms	**INDOOR APPLICATION** Library Ablution facilities Indoor irculation	**INDOOR APPLICATION** Digital archives Recording rooms Reflection spaces
REQUIREMENTS ***Light intensity*** 700 - 1000 Lux	**REQUIREMENTS** ***Light intensity*** 300 - 700 Lux	**REQUIREMENTS** ***Light intensity*** 700-1000 Lux



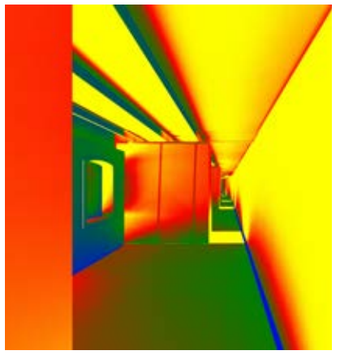


DAYLIGHT SIMULATION
Revit daylight analysis

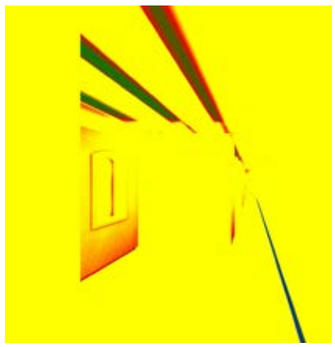
Exhibition rooms
10:00



13:00

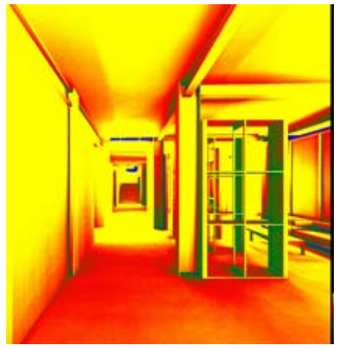


15:00



DAYLIGHT SIMULATION
Revit daylight analysis

Library
10:00



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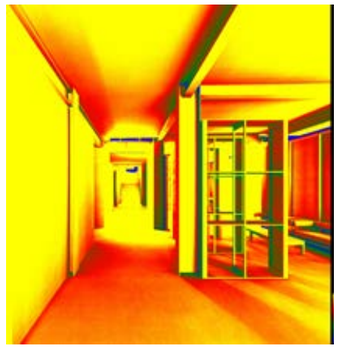
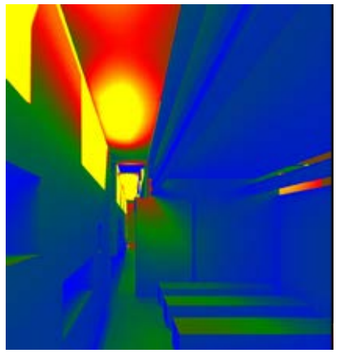


15:00

DAYLIGHT SIMULATION
Revit daylight analysis

Digital storytelling
10:00



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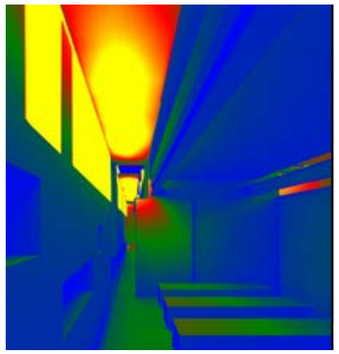

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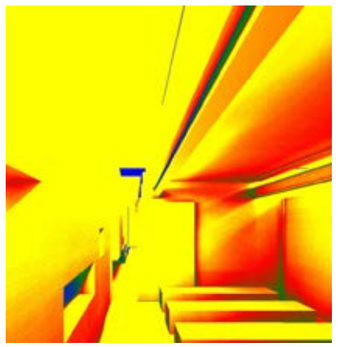
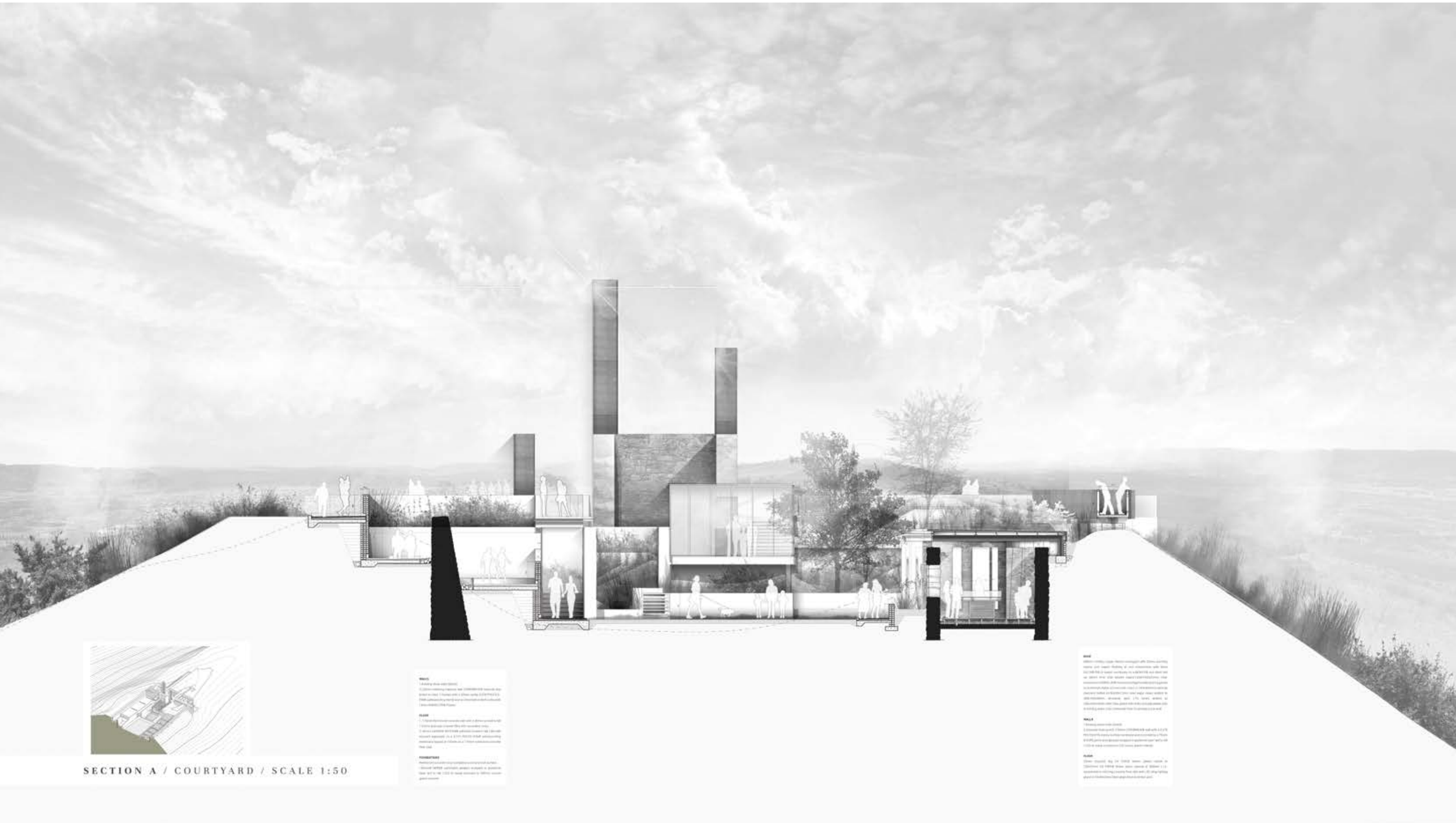


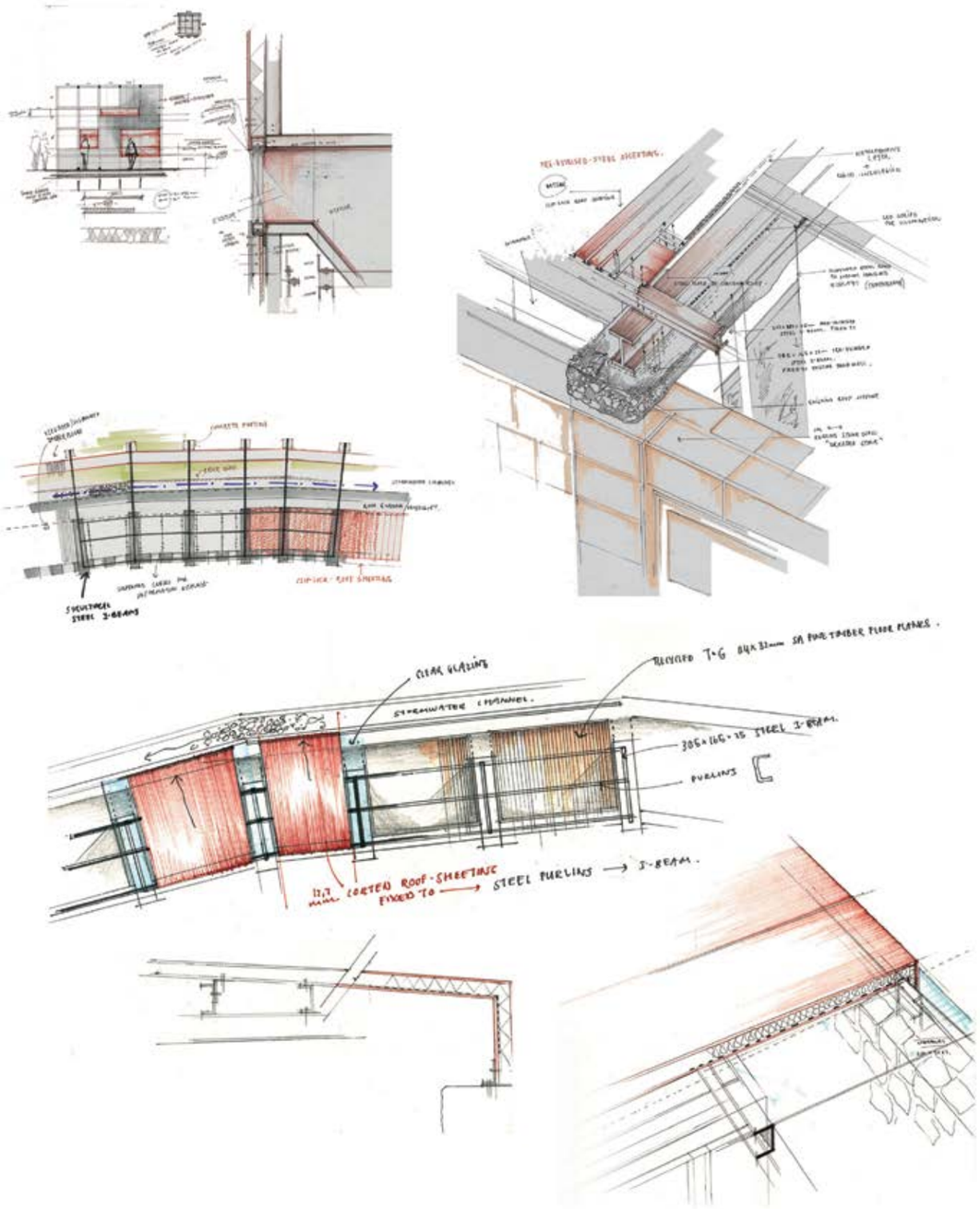
7.7

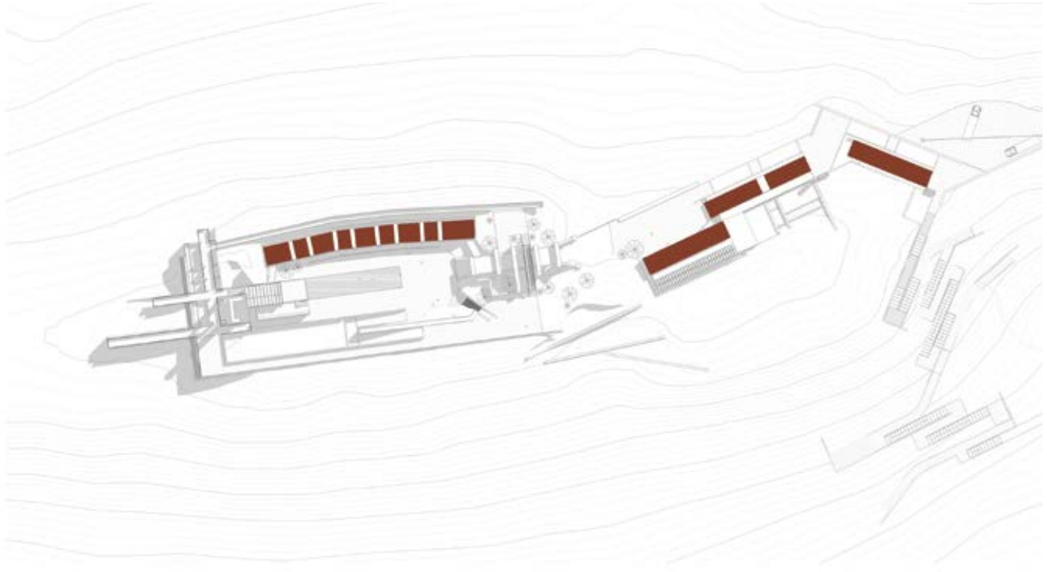
Figure 7.7: *Daylight simulations to test the desired daylight requirements (Author:2016)*

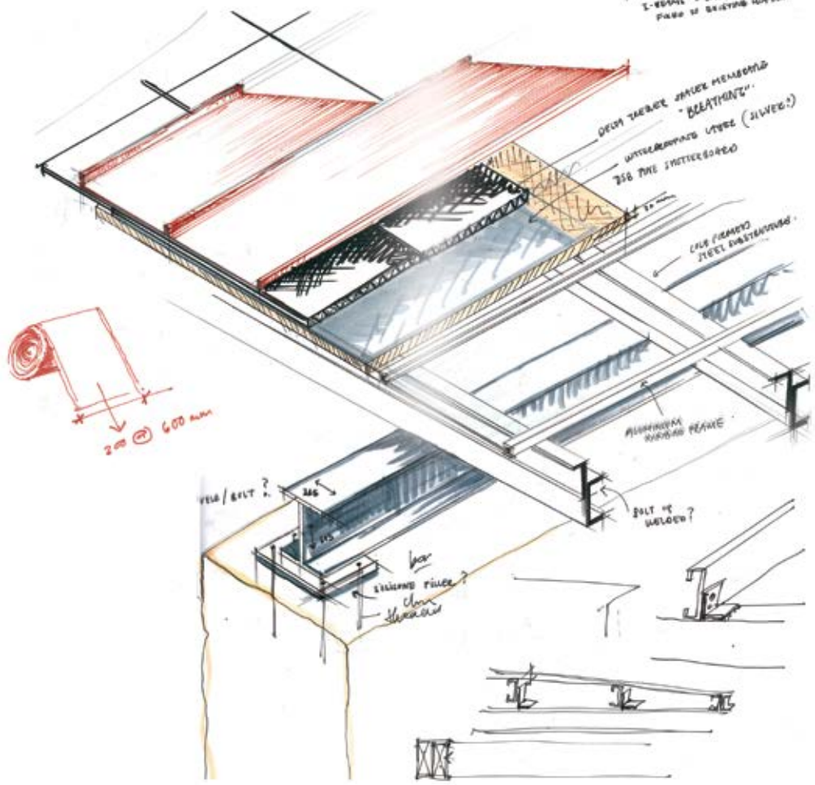


7.8

Figure 7.8: *Detailed section development of courtyard and exhibition rooms (Author:2016)*







7.9 ***Figure 7.9:*** *Detail exploration temporary roof structure (Author:2016)*

DETAIL ONE

NEW EXHIBITION ROOMS

ROOF

* Copper roof assembly (see next detail)

WALLS

Existing stone retaining wall with 40mm rough plaster interior finish

6mm safety glass in aluminium frame nail fixed to existing dressed stone facade and sealed with silicone

FLOOR

32mm recycled t&g SA PINE ® timber planks nailed to

228x76mm SA PINE ® timber joists spaced at 400mm c.t.c. suspended on an existing floor slab

FINISHING

LED strip lighting glued to 50x50x2mm steel angle fixed to timber joists

7.10 ***Figure 7.10:*** *Detail illustration of new exhibition rooms (Author:2016)*

NEW EXHIBITION ROOMS
SCALE 1:20

DETAIL TWO

COPPER ROOF WITH SKYLIGHT INSERTS

600mm roofing copper sheets overlapped with 25mm standing seams and copper flashing at end connections with

8mm DELTA®TRELA spacer membrane on a

MONIER® slip sheet laid on

20mm Pine OSB Shutter board

1200x1000x20mm clear translucent DANPALON® microcell polycarbonate glazing panels in aluminium frame

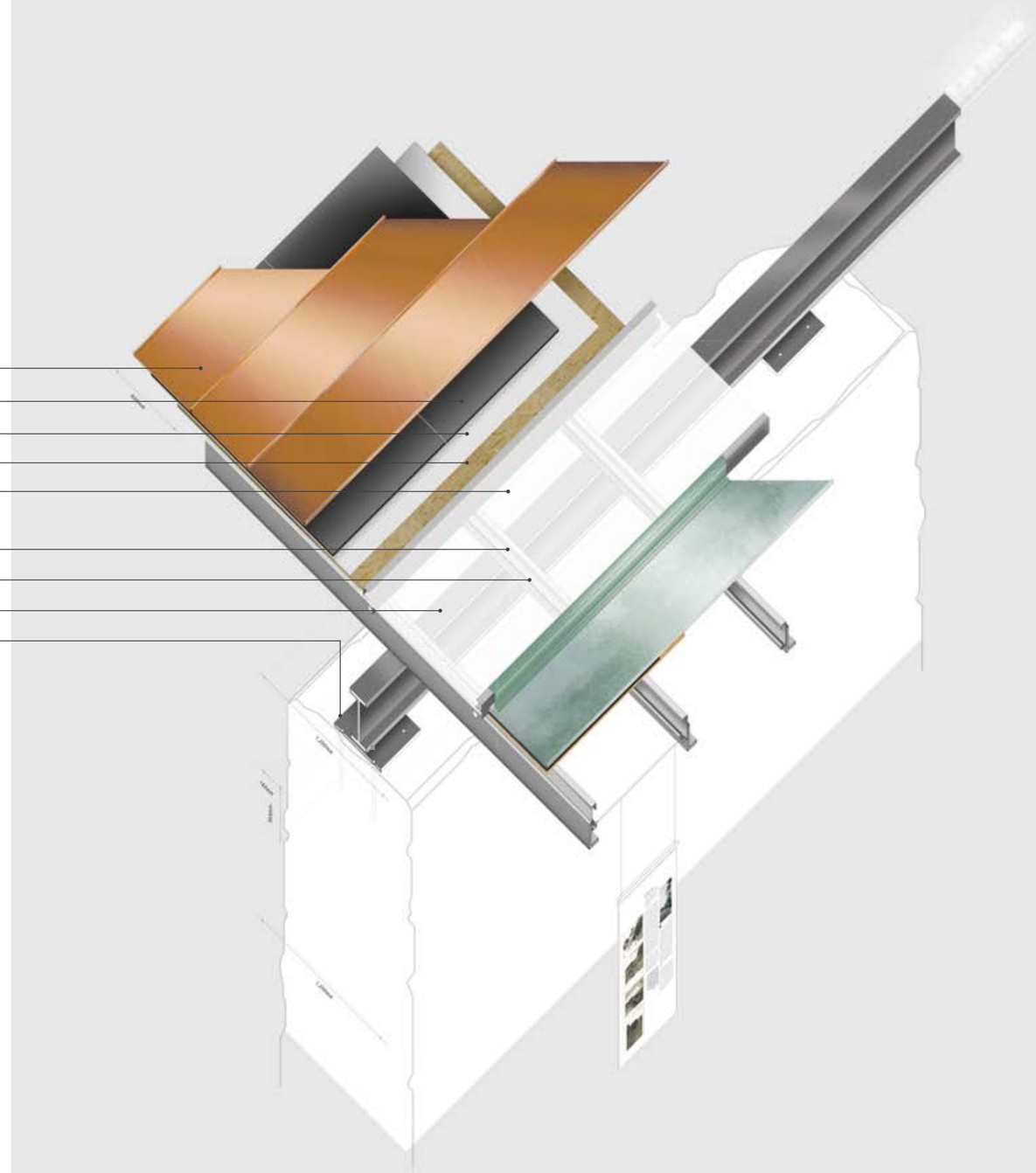
all fixed with cleats to

150x50x3mm steel lip channels bolted to

150x90x12mm steel angle cleats welded to

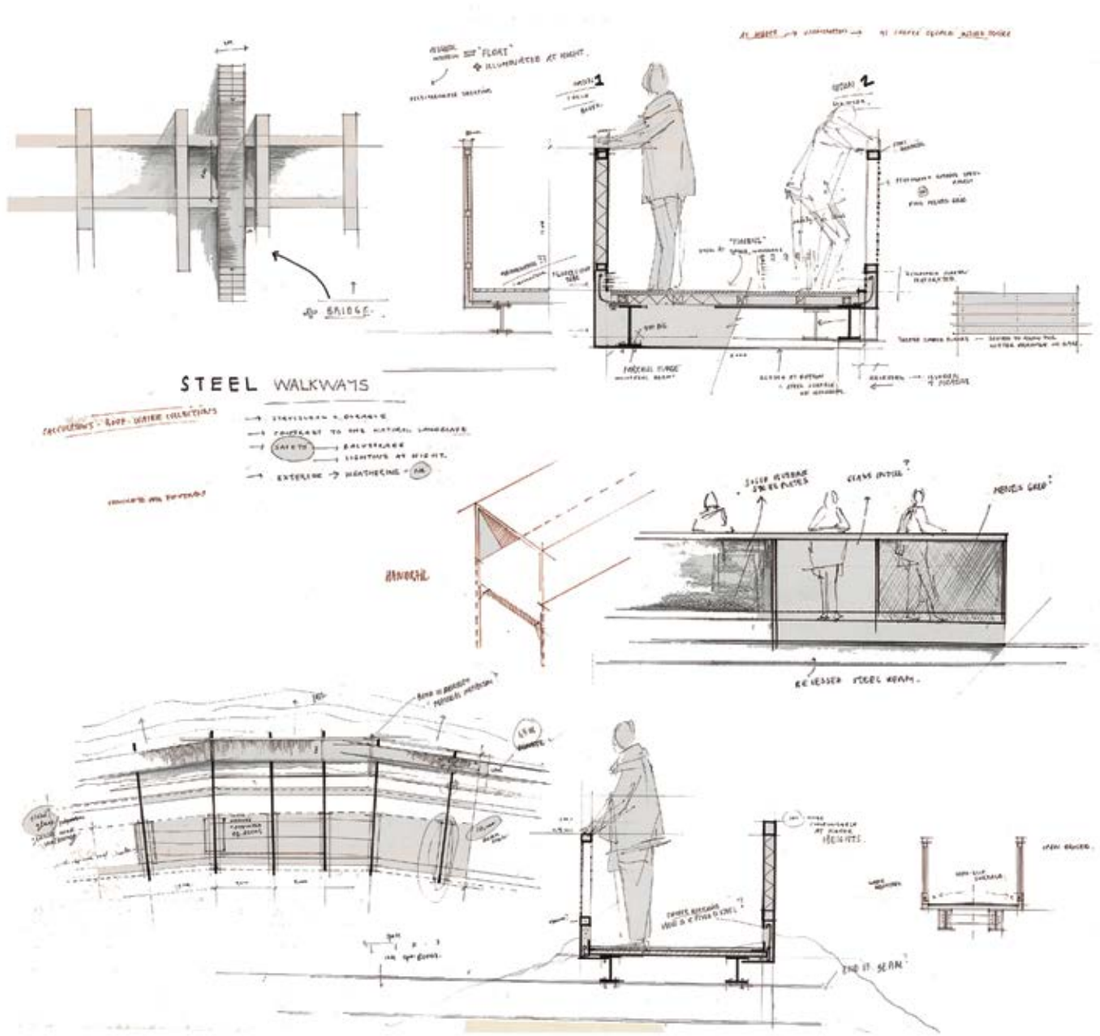
305x165x40mm structural steel I-PE beam welded to

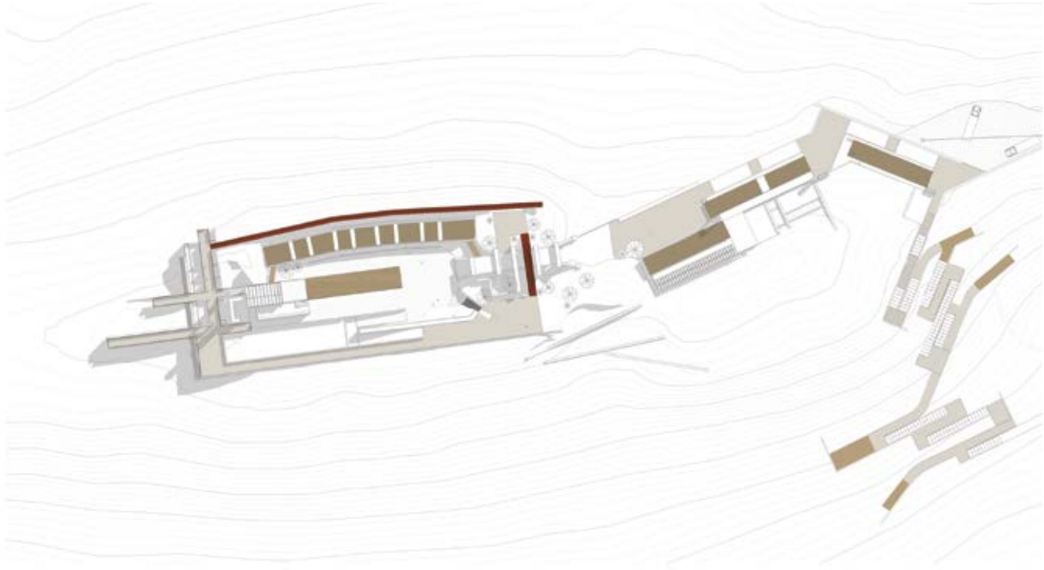
200x200x10mm steel base plated with bolts and adjustable nuts to holding down rods chemically fixed to existing stone wall

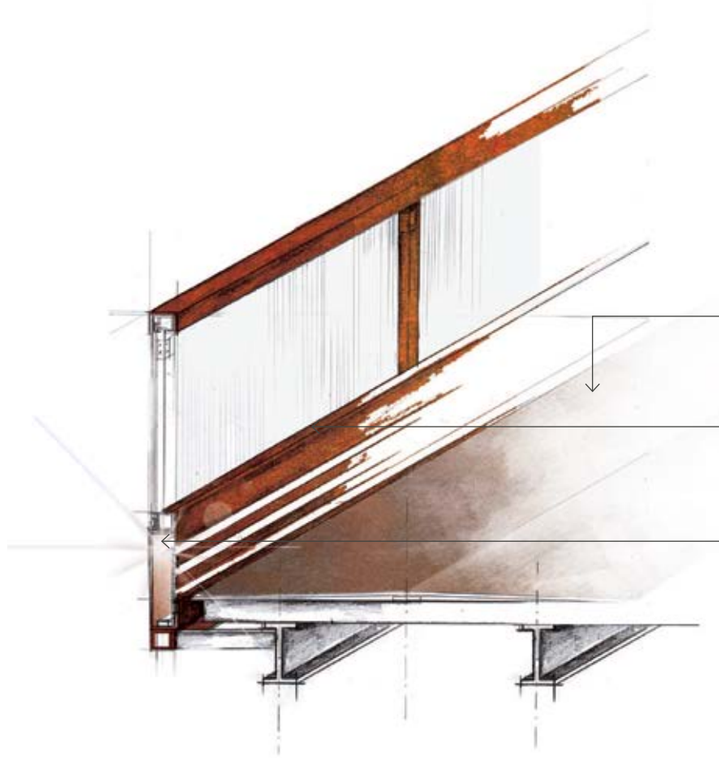


COPPER ROOF ASSEMBLY
SCALE 1:10

7.11 ***Figure 7.11:*** *Detail resolution of the copper roof construction (Author:2016)*







STRUCTURAL SUPPORT

Floor

100/50mm pre-oxidised steel sheeting welded to 76x50x4mm rectangular hollow steel sections bolted to 203x133x25mm steel I-beams

Balustrade

50x50x3mm square hollow section for vertical bracing- welded to 75x75x5mm square hollow section bolted to 65x50x6mm unequal angles bolted to steel I-beam

INFILL

4mm welded Corten steel cladding

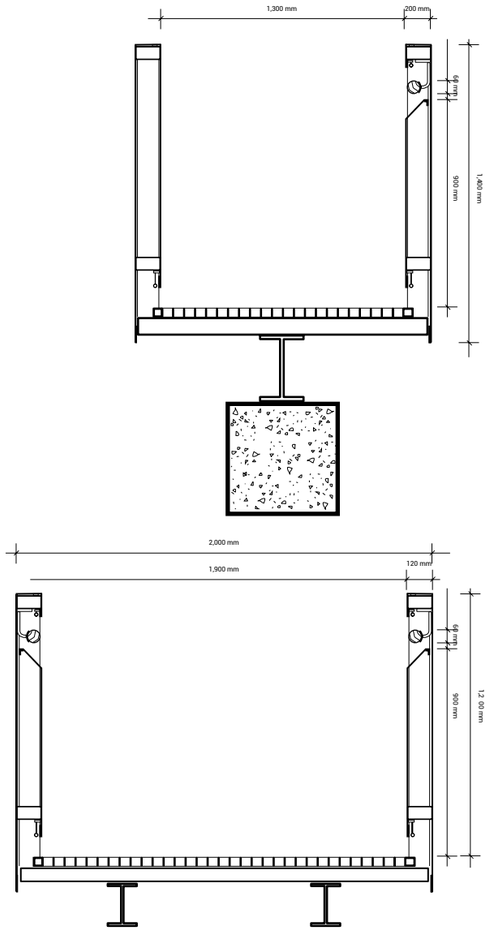
12mm Danpalon Multicell seamless polycarbonate sheeting fixed to basic frame fixed to steel angles

120 Pure white LED lighting strips glued to steel angles

7.12 ***Figure 7.12:*** *Detail exploration of elevated walkways (Author:2016)*

DETAIL TWO

ELEVATED STEEL WALKWAYS

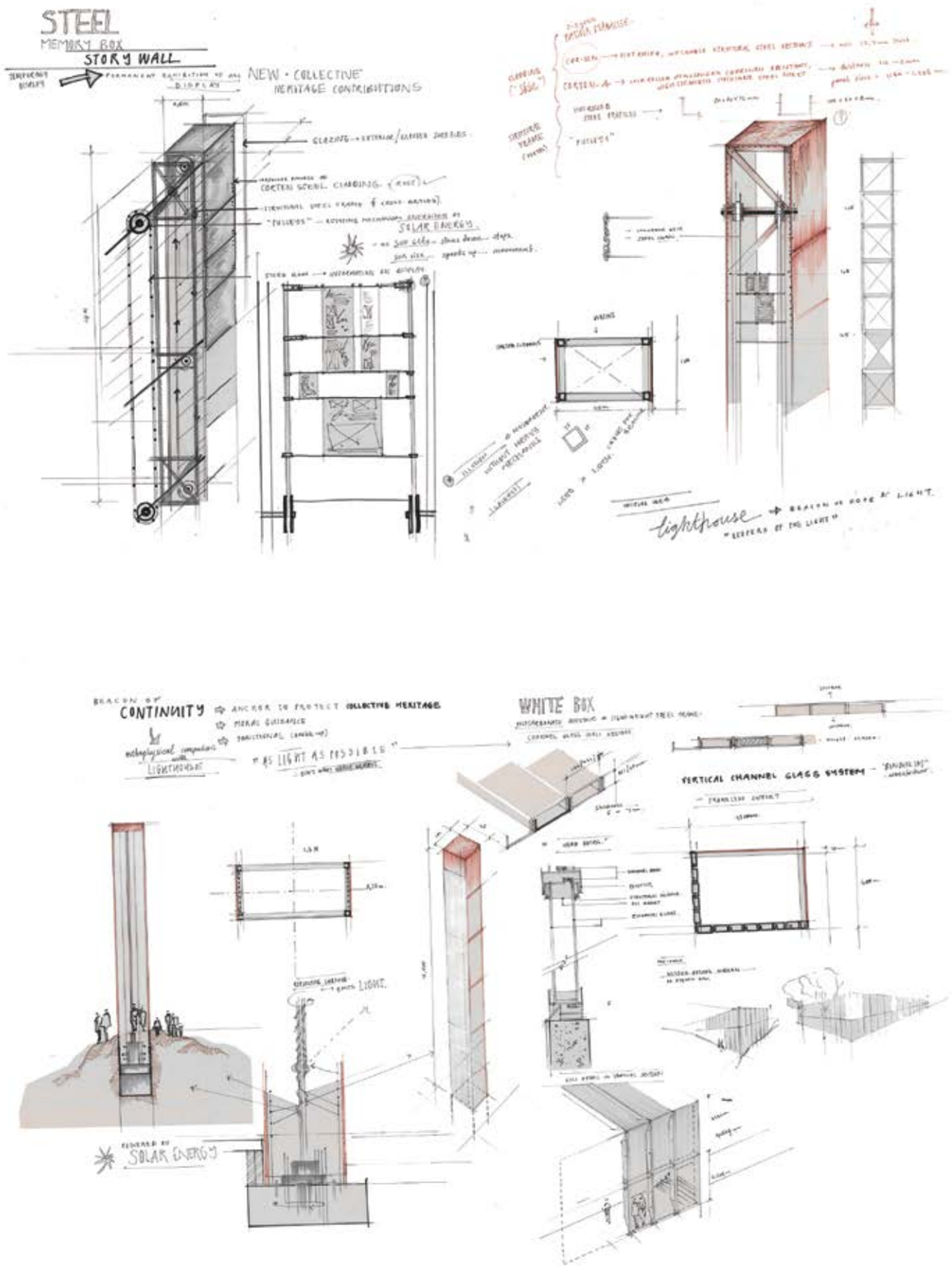


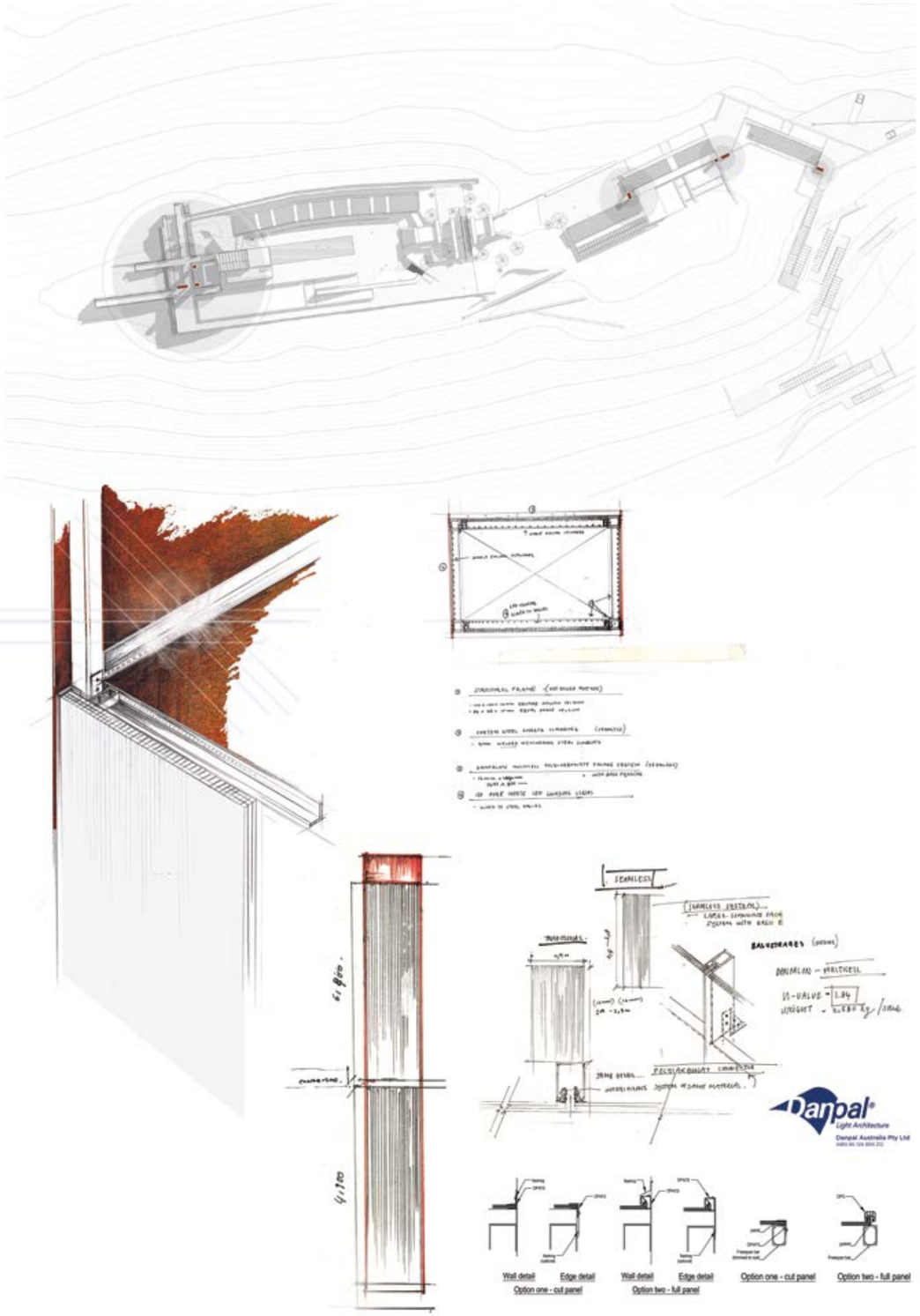
7.13 ***Figure 7.13:*** *Detail resolution of elevated walkways (Author:2016)*

ELEVATED WALKWAYS
SCALE 1:10

SECTION B
BEACON OF HOPE

7.14 ***Figure 7.14:*** *Detail section of the beacon of hope (Author:2016)*

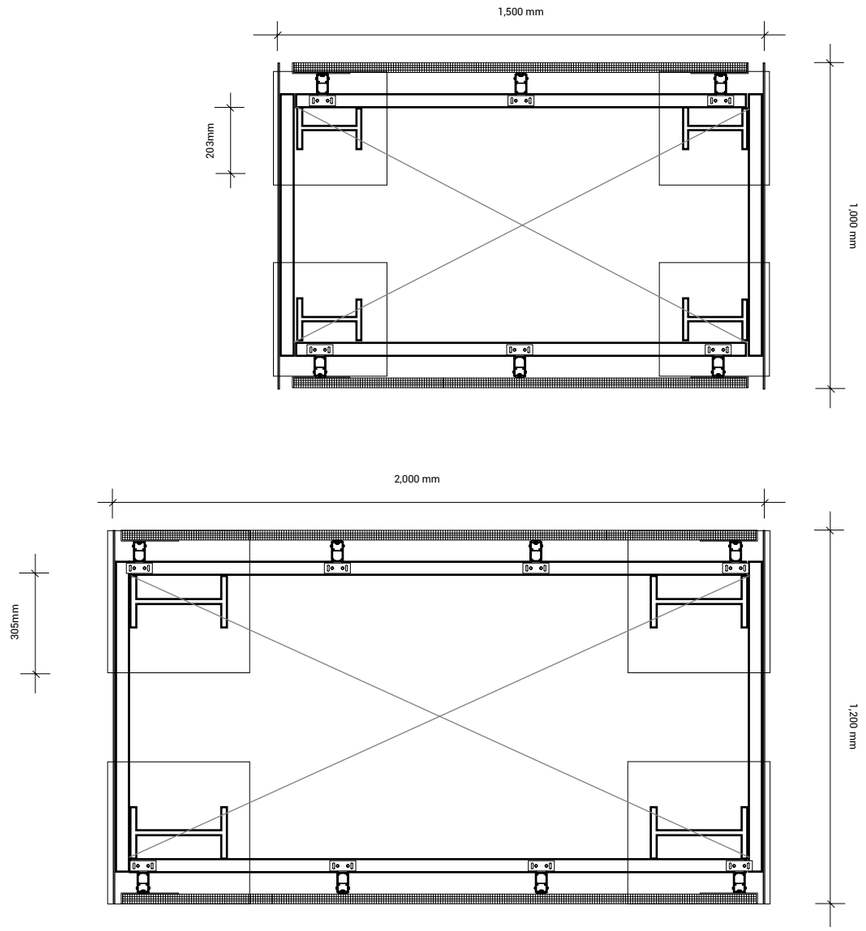




7.15 ***Figure 7.15:*** *Detail exploration of the beacons (Author:2016)*

DETAIL THREE

BEACONS OF HOPE



7.16 ***Figure 7.16:*** *Detail resolution of the beacons (Author:2016)*