Revitalised Intersections, VOL. 1

By YP Mudaly

Technical Exploration

08.

Detailing the system infrastructure, materiality and water servicing

8.1. Intention for techné and contribution to dissertation

Through the new urban framework, the scale of enquiry situates itself in the bigger picture through accessible scales of movement, city connections and arrival. Being respectful of existing ruins and not demolishing it was important, however integration of a new language of materiality with stylistic instances were drawn from existing spaces. The end goal is to amplify the buildings existing character and express its evolution in space and time.

8.2. Structures and systems within context

8.2.1. Window openings in repetition

The window openings of the existing ruin facades as well as the hotel on the southern and northern quadrant of the chosen site were strong heritage aspects which were carefully considered. The voids were analysed in order to calculate the size of the opening as well as the position of windows in terms of its height in elevation. For the intervention, the window openings are utilised to aid the elevation points of space as well as the design of the green facade for the northern elevation.

8.2.2. Steel components in heritage facade and cruise terminal

The steel component of the new cruise terminal informed the materiality of context as well as the structure of steel pergola system in the front and back of the North and South elevation.

8.2.3. Canal as existing urban infrastructure

The new rainwater canal in the courtyard is informed by the existing canal, bringing in a water edge within the site and acts as an active coolant within the humid Durban Climate

8.3. Contextual materiality palette

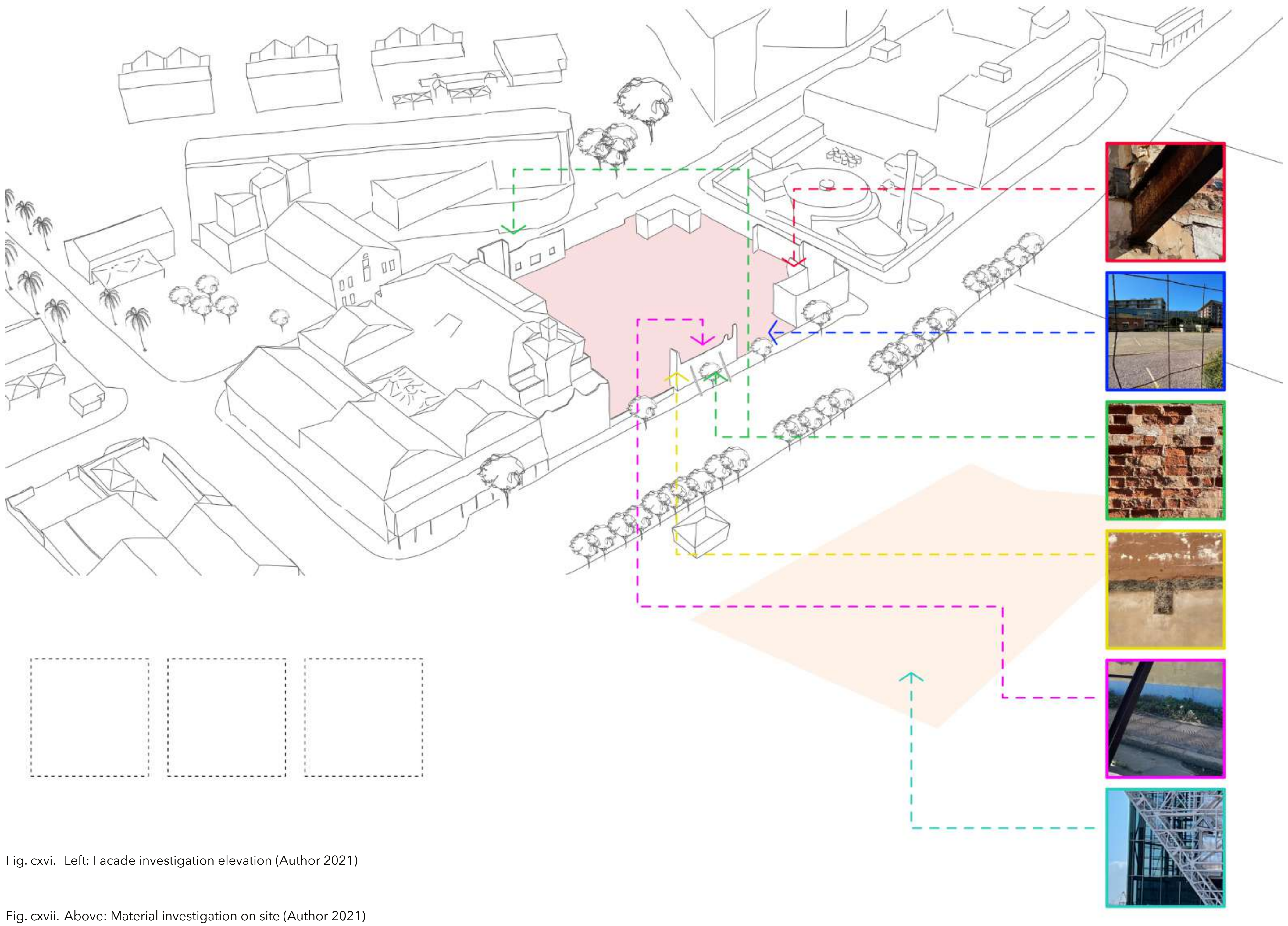


Fig. cxvi. Left: Facade investigation elevation (Author 2021)

Fig. cxvii. Above: Material investigation on site (Author 2021)

Technical Exploration

8.3.1. Materials explored

In keeping with the regenerative and reuse nature of the project to exemplify the palimpsest of space in time, the material strategy is devised from a combination of limited pallets which would add to the tectonic history of place as described by the 'historical materialism' by Henri (Lefebvre 1991). The choices are derived from the context and consolidated into the intervention strategy. The choices are deemed to encourage local labour construction through economic and ecological value systems to articulate the commercial programme in a changing landscape.

5 main materials were consolidated around the urban area and were deemed vital to the new language of architecture that was going to be developed: water, steel, clay, glass, and cementitious. Through the design and construction process, the materials formed a hierarchy of importance and responded to the existing infrastructure

CONTEXTUAL MATERIALS

THE CANAL PRESENTS ITSELF AS AN IMPORTANT ASPECT OF THE SITE WHICH RUNS THROUGH THE URBAN SCHEME

THE CRUISE TERMINAL HAS A STEEL LATTICE AS AN INFORMED STRUCTURAL PRIMARY GRID

DUE TO THE HERITAGE RUINS BEING FACADES, THE INTERNAL SPACE NEEDS STEEL TO REINFORCE THE SPACE

THE MAIN BRICK THAT EXISTS IS IN THE HERITAGE FACADES IN THE NORTHERN AND SOUTHERN ELEVATION WHICH USED TO FORM PART OF THE OLD OFFICE SPACE IN THE HARBOUR OPERATIONS AND MANAGEMENT SECTOR

COMPLETED IN 2021 THE CRUISE TERMINAL IS THE NEW LANGUAGE OF MATERIAL INVESTMENT IN THE SITE COMPOSED OF MANY GLASS FACADE ELEMENTS

GENERAL COBBLE RUNS ALONG THE NORTHERN ELEVATION OF THE SPACE

IN NEWLY REWORKED SPACES OF THE SITE THERE IS A LANGUAGE OF PLASTERING THE BUILDINGS OVER THE CLAY BRICK

THIN WALKWAY PAVEMENT ALONG AXIS OF THE SOUTHERN ELEVATION

MERGED WITH THE HERITAGE FACADE AS STRUCTURE

CANAL
WATER

CRUISE TERMINAL | HERITAGE RUIN | STEEL STRUT
STEEL

HERITAGE RUIN | HERITAGE RUIN
CLAY

CRUISE TERMINAL | CRUISE TERMINAL
GLASS

COBBLE | PLASTER | PAVEMENT | CONCRETE
STONE/CEMENTITIOUS

PRIMARY MATERIALS

CONCRETE | STEEL COLUMNS | STEEL SECTIONS

SECONDARY MATERIALS

GLASS INFILL | STEEL CLADDING | GREEN MESH I NFILL

TERTIARY MATERIALS

WATER | COBBLE LANDSCAPING

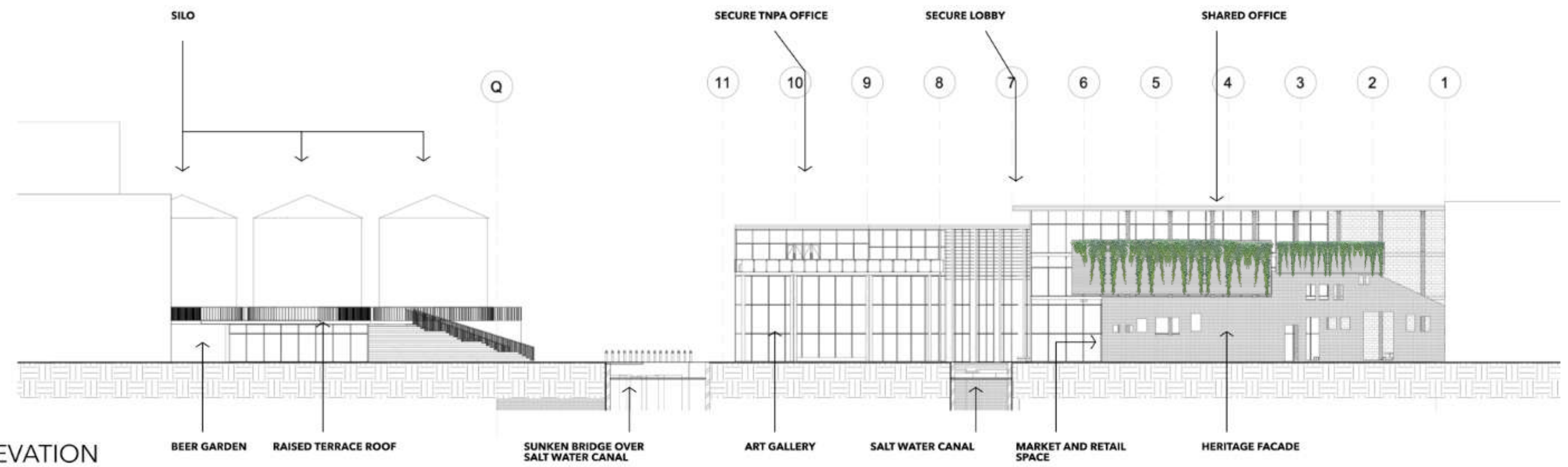
INTERVENTION MATERIALS

8.4. Main construction concept

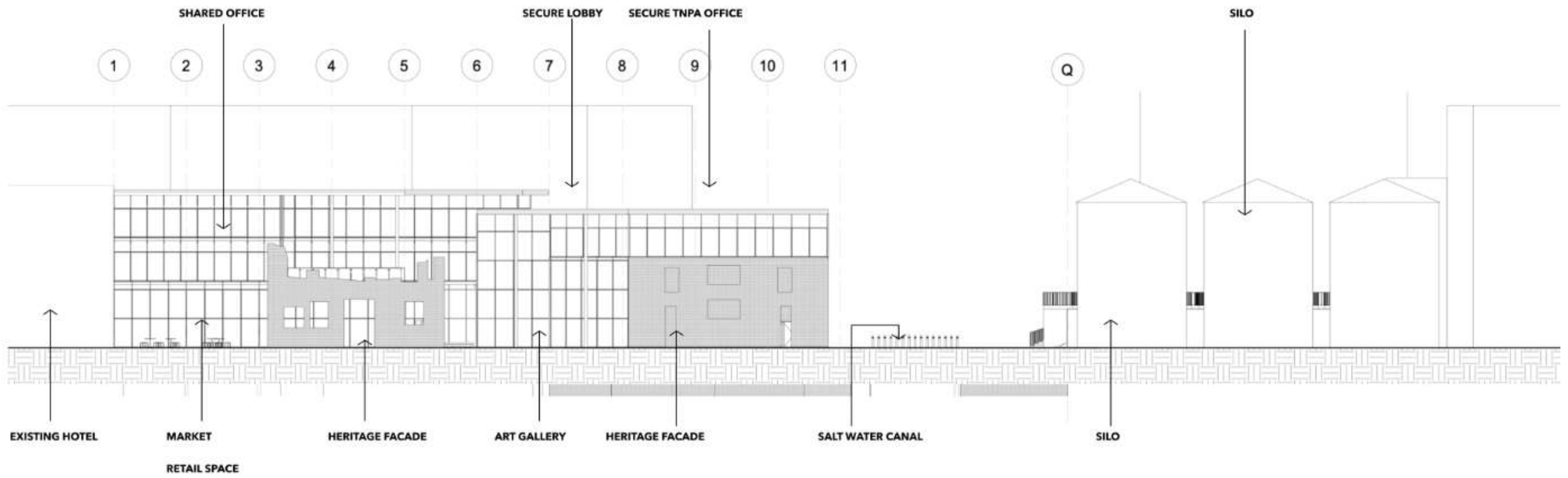
8.4.1. Build upon existing whilst respecting heritage

The intention was to fracture the nature of the ground plan then introducing very recognisable (facade-ical) elements in the elevation. this dichotomy between the old and the new balances the discourse in the detail creation and space making. Therefore, this backs the design intent to use the existing ruins (as seen in the essay 2) but reinvent it through new structure through a dialect of materialism where it has a tolerance of transformation. New functions and programme are introduced through celebrating the hospitality industry and creating a building which not only contains a range of retail offerings but institutions which facilitate operations of the working port and spaces in the city as well as facilities which show the adaptable nature of the framework such as an open air market near the existing hotel.

Fig. cxviii. Elevations (Author 2021)



NORTHERN ELEVATION



SOUTHERN ELEVATION

Technical Exploration

8.4.2. Building concept explained through material palette

Structural System:

The structural system was materialised through the concept of the existing port and mediating the harbour systems into an architectural construction typology whilst avoiding unnecessarily complex systems. The system is imagined as a levelled concrete structure mediated by steel structures and a glass facade representing the unique meaning and function of the harbour space. Throughout the design, structure and functional services - there is constant integration to define economic sustainability for the future port of Durban new transit orientation programme and gastronomic hub.

Primary Structure:

The primary structure is made up of levelled concrete slabs which are in dialogue with the heritage facades. It relates to current level conditions of the old heritage offices and the concept of mediating the ground to the sky through water and open space.

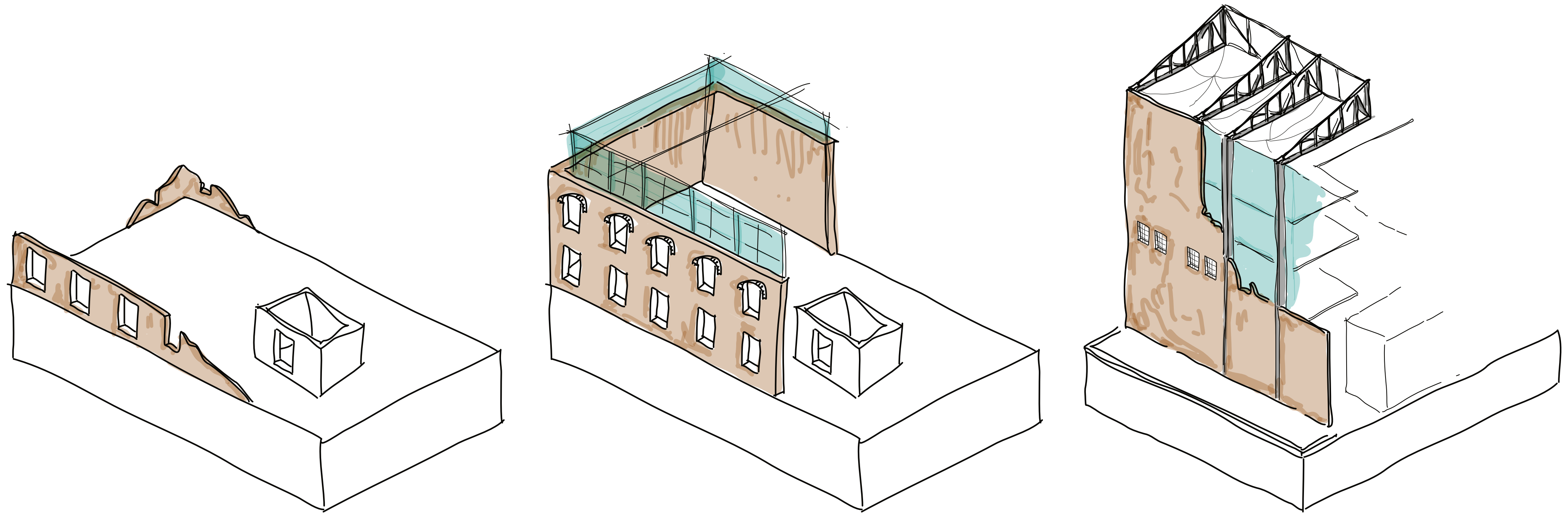
Secondary System:

Architecturally connecting to the new cruise terminal was important, so the structure adopted the nature of such space which was glazed and open.

Fig. cxix. Material amalgamation diagram for technification (Author 2021)

Tertiary System:

Green Mesh facades existing on the Northern Quadrant of the heritage facade adds to the quality of space and is conceptualised as the envelope. The tertiary structure primarily informs how the building merges into its context, as it simultaneously articulates the existing facade systems. The structural members and services are integrated. The structural systems such as the northern gutter facade detail form part of the design and service and articulate the movement of water as resource, not just as an edge condition.



8.4.3. Technological building concept

The overarching concept then takes reference to port operation and celebrates each chain link to create the parti

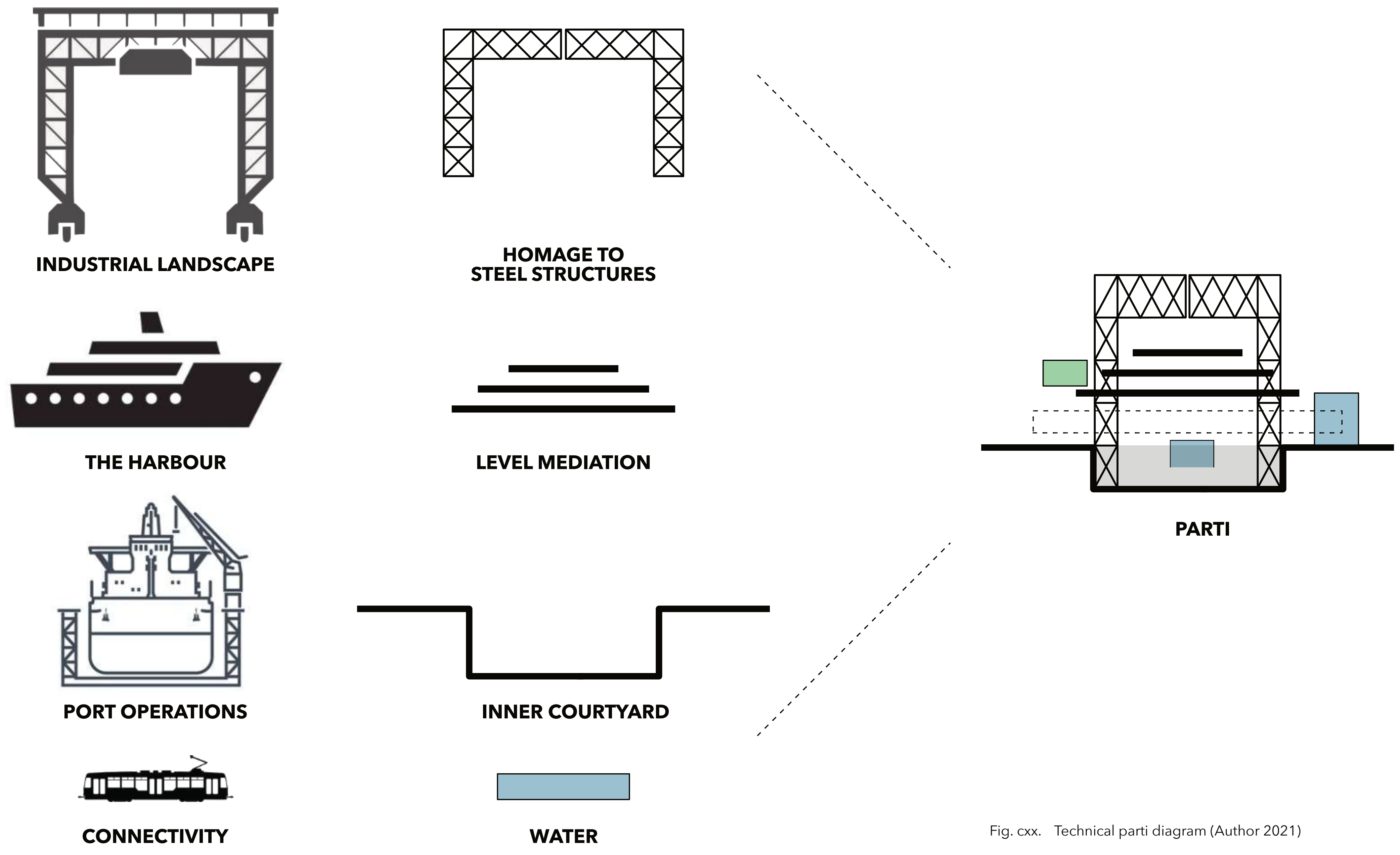


Fig. cxx. Technical parti diagram (Author 2021)

Location:

Zurich

Switzerland

Architect:

Raderschallpartner

Value to Research:

Green mesh facade creation and steel construction

Facade precedent

8.5. MFO Park: The North Zurich Parkscape

As a technical precedent dealing with structural steel as well as greenery the MFO Park was a prime example of successful material integration in a complex multi-tiered urban space which referenced the neighbourhoods heritage in an industrial typology.

The structure is made of an architectonic form which has two vegetation facades made of a steel perimeter matrix. This space as defined is extraordinary due to its permeable nature and circulatory patterns. The public association to space allows sundecks and access to upper decks which are populated by vines greenery that grow right on the structure (Urbannext 2021).

Fig. cxxi. Images from URBANNEXT. 2021. *MFO Park: The North Zurich Parkscape* [Online]. urbanNext. Available: https://urbannext.net/mfo-park/ [Accessed 3 September 2021].

Conclusions and relevance to Port of Durban

The symbiotic nature of the architecture reinforces the need to integrate more permeable space through the use of the existing heritage facade as catalyst for technological advancement. Dominated perhaps by too much foliage, the new Durban Point Waterfront precinct design would integrate less in a more subtle but unique way in its present enclave on the Northern fringe of the site. It speaks of time and structure cycles, by which the greenery grows and dies as time moves; consolidating the building as a living organism

8.5.5. Green mesh facade exploration

The one important aspect of the design is the ability to merge the new technology with the existing facade and this ideology is created when the green mesh facade merges with the existing heritage facade on the northern quadrant of the site.

The green mesh followed the articulation of the facade void openings where the windows used to be instead of being separate mesh panels as shown in below

Fig. cxxii. Left: Iteration 1 of Green facade (Author 2021)

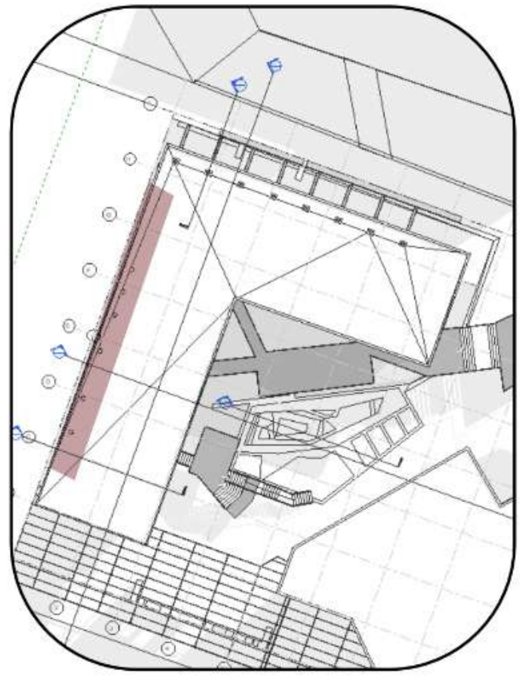
Fig. cxxiii. Right: Render of Green facade (Author 2021)

8.6. Technical Iterations

Three focus areas are highlighted for the technical iterations: the duct services wall in the main market/shared office space, the freshwater canal system in the court yard and the roof drainage system and green facade on the Northern Elevation.

8.6.1. Concept Water Duct Detail

The duct detail is identified in the section of the shared office space and runs from the ground floor to the upper level. It is hidden behind the western facade wall system and is accessible from all points across the wall.



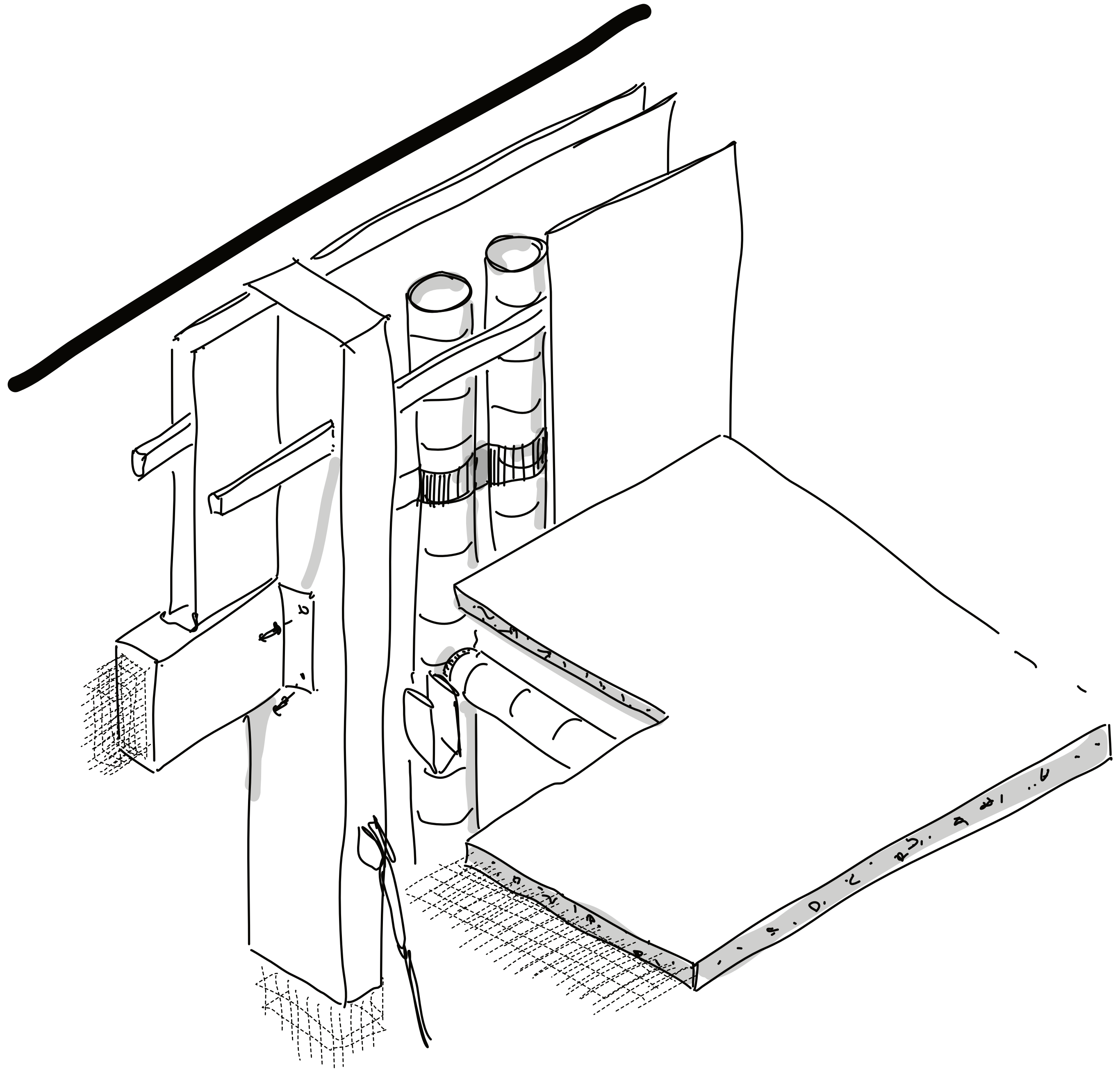
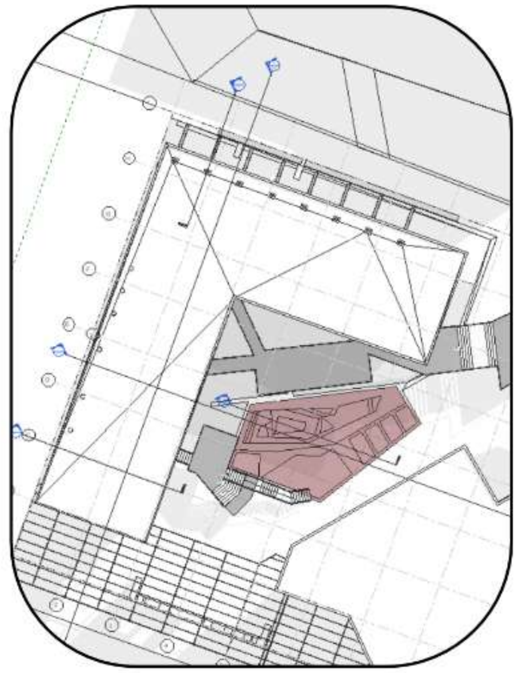


Fig. cxxiv. Concept of duct detail (Author 2021)

8.6.2. Fresh Water Canal Detail

The idea of the canal came from the overlay of the grander urban canal framework and bringing in that water edge into the site. The canal captures rainwater and becomes an active sculpture in the landscape which users are able to interact with as well as being a mechanism for active water harvesting on site.



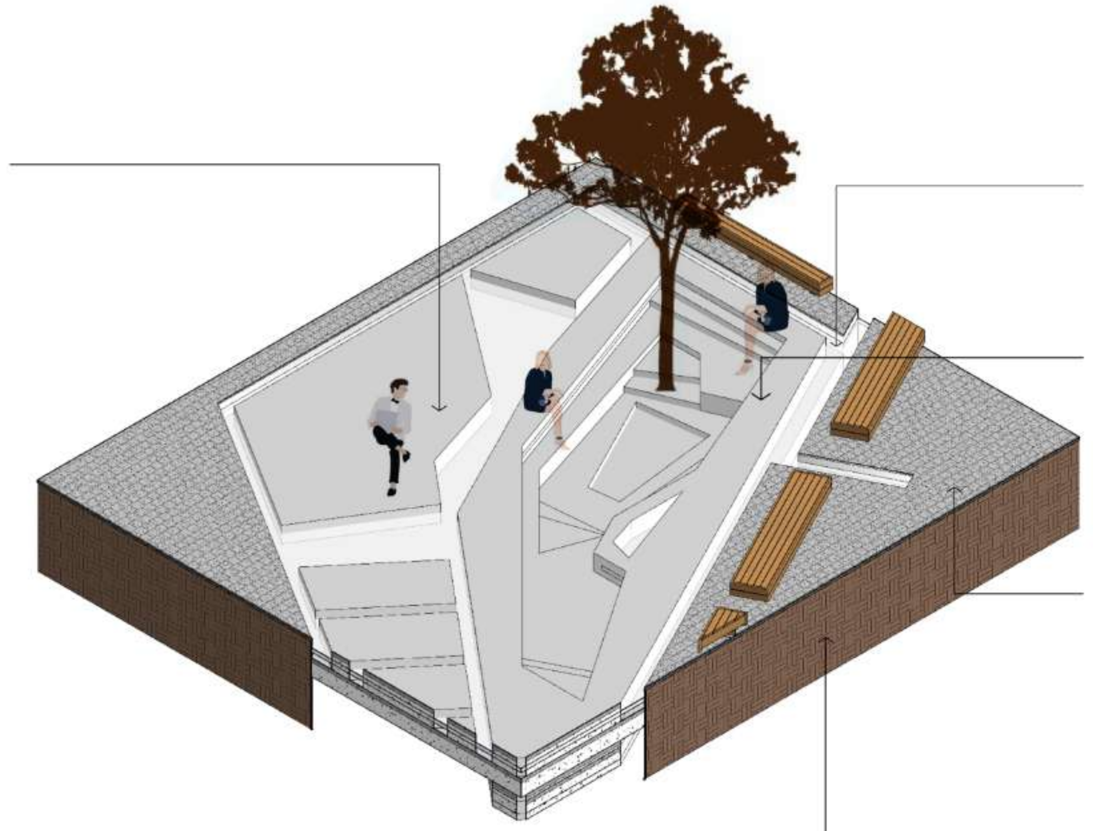


Fig. cxxv. Fresh water canal 3D detail in the courtyard (Author 2021)

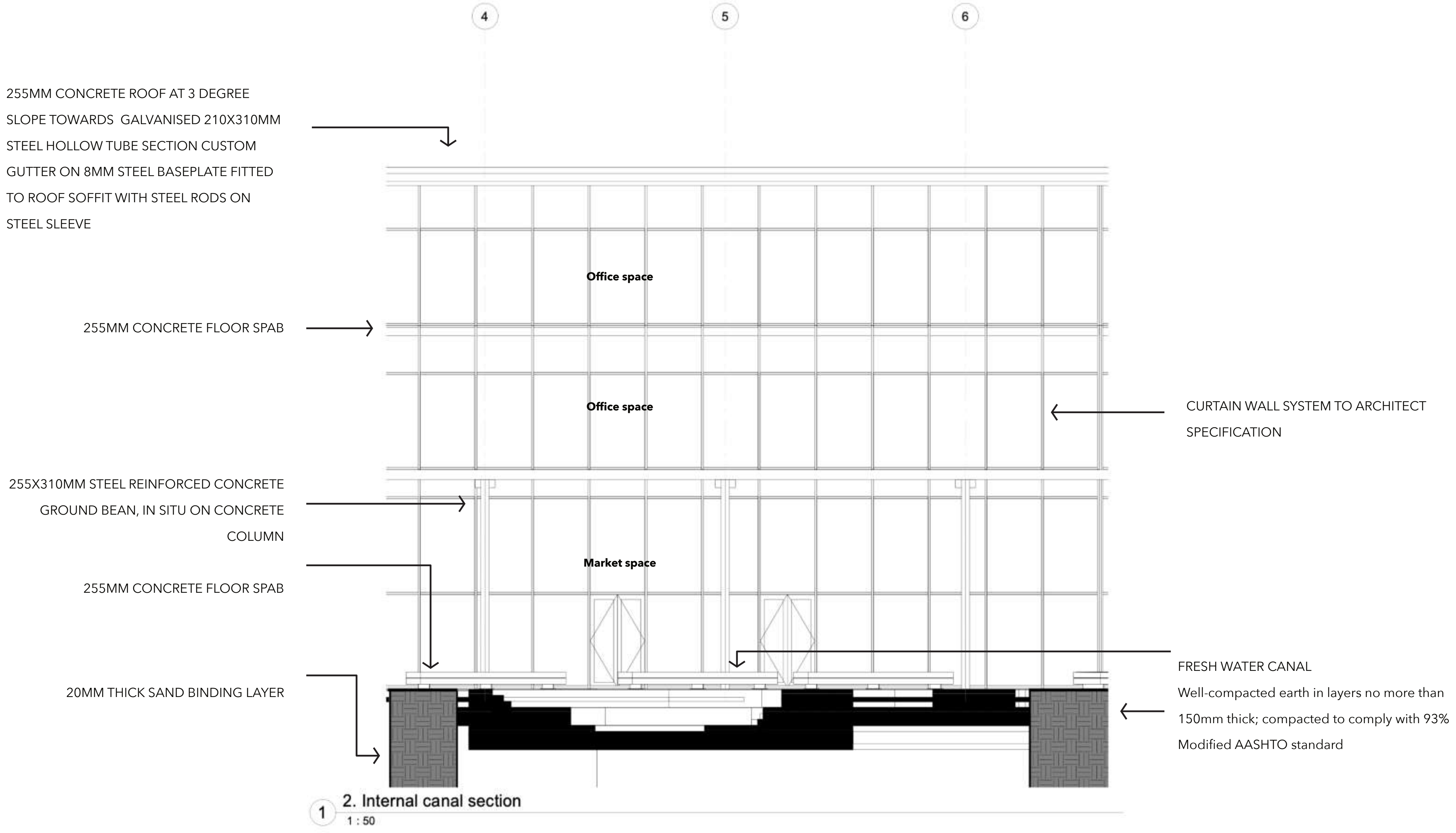


Fig. cxxvi. Fresh water canal section (Author 2021)

8.6.3. Northern facade detail

The main gutter detail on the Northern facade captures water from the roof scape and lets it drain into the canal system.

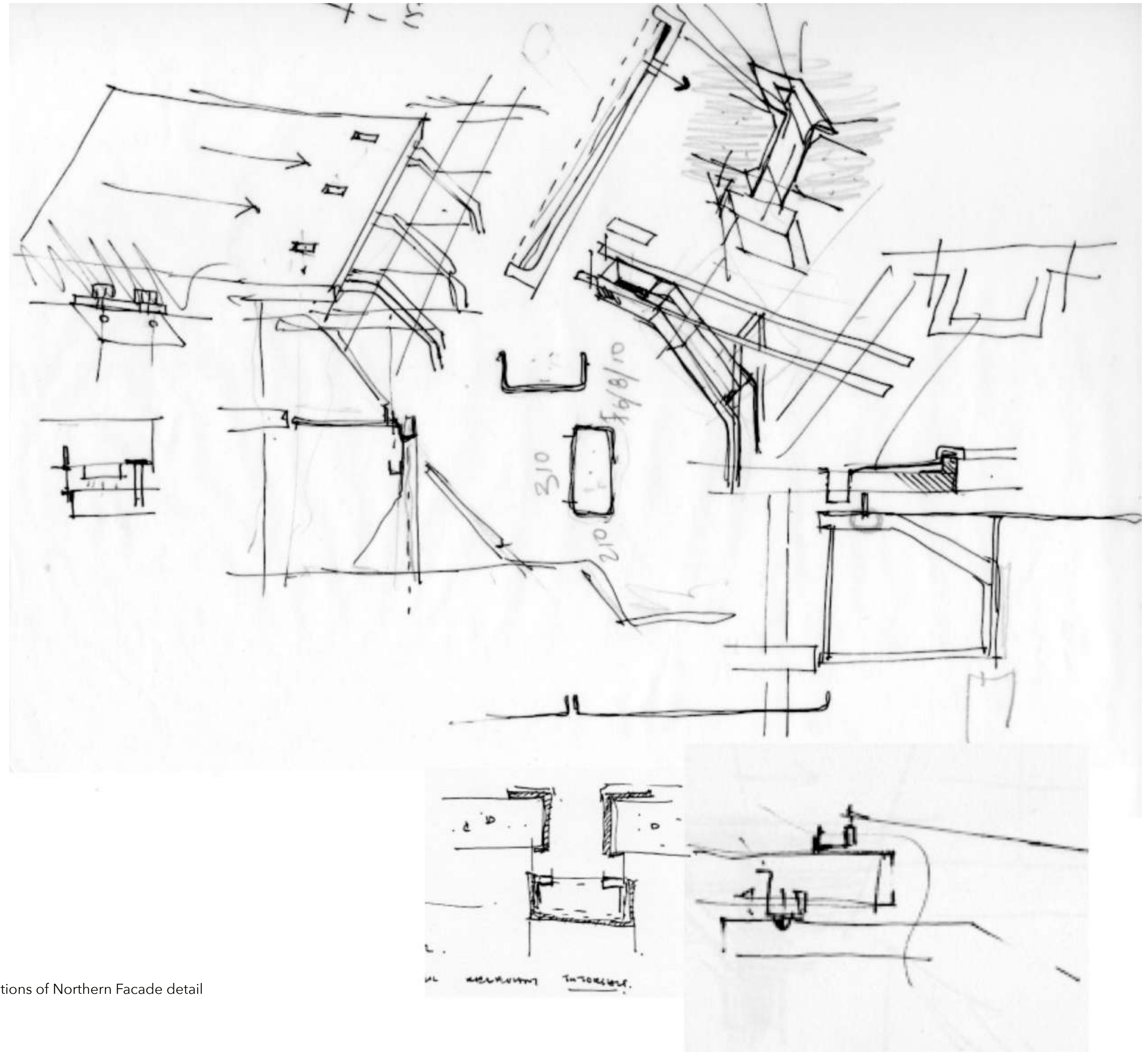


Fig. cxxvii. Iterations of Northern Facade detail (Author 2021)

Technical Exploration

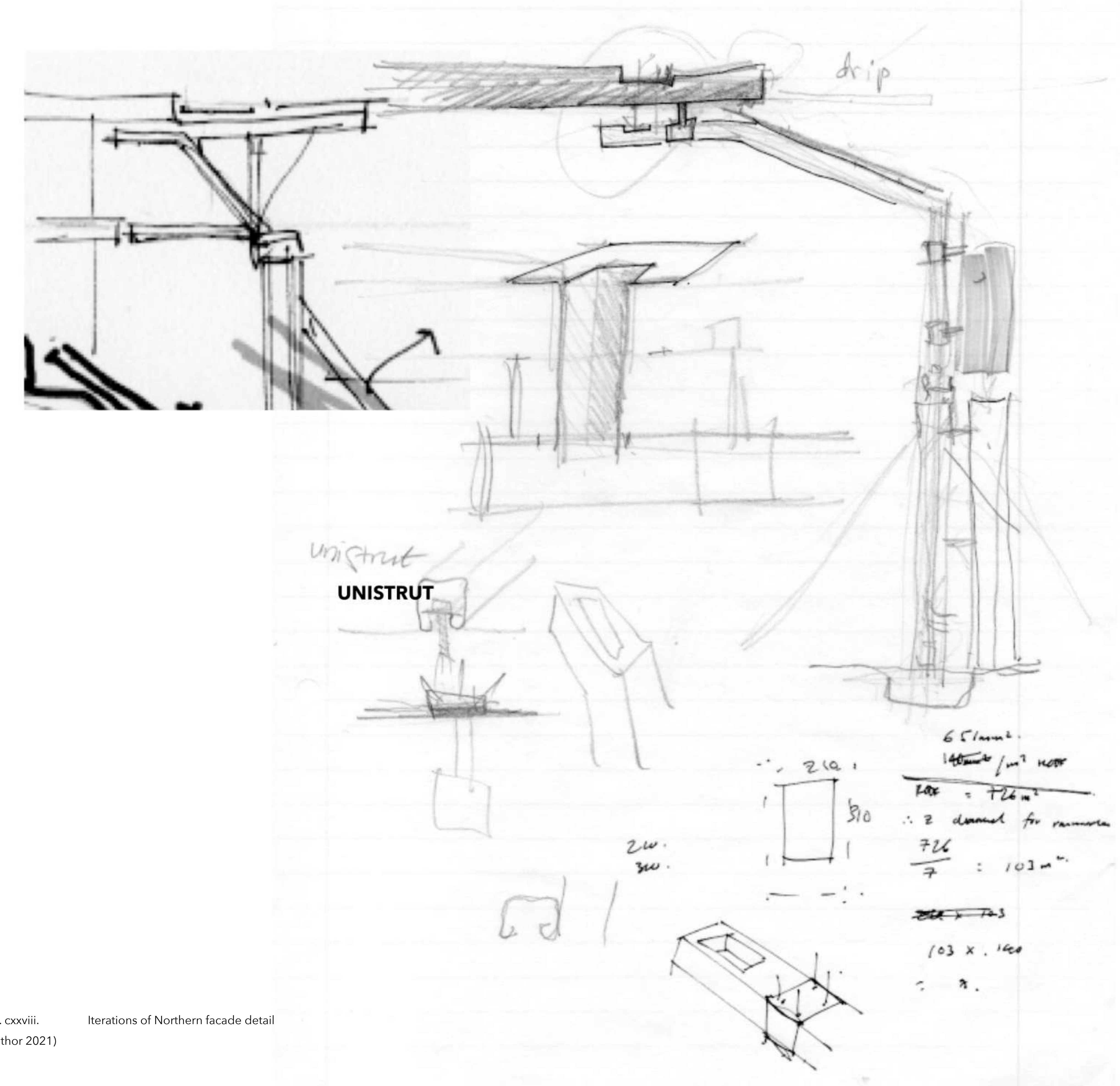


Fig. cxxviii. Iterations of Northern facade detail (Author 2021)

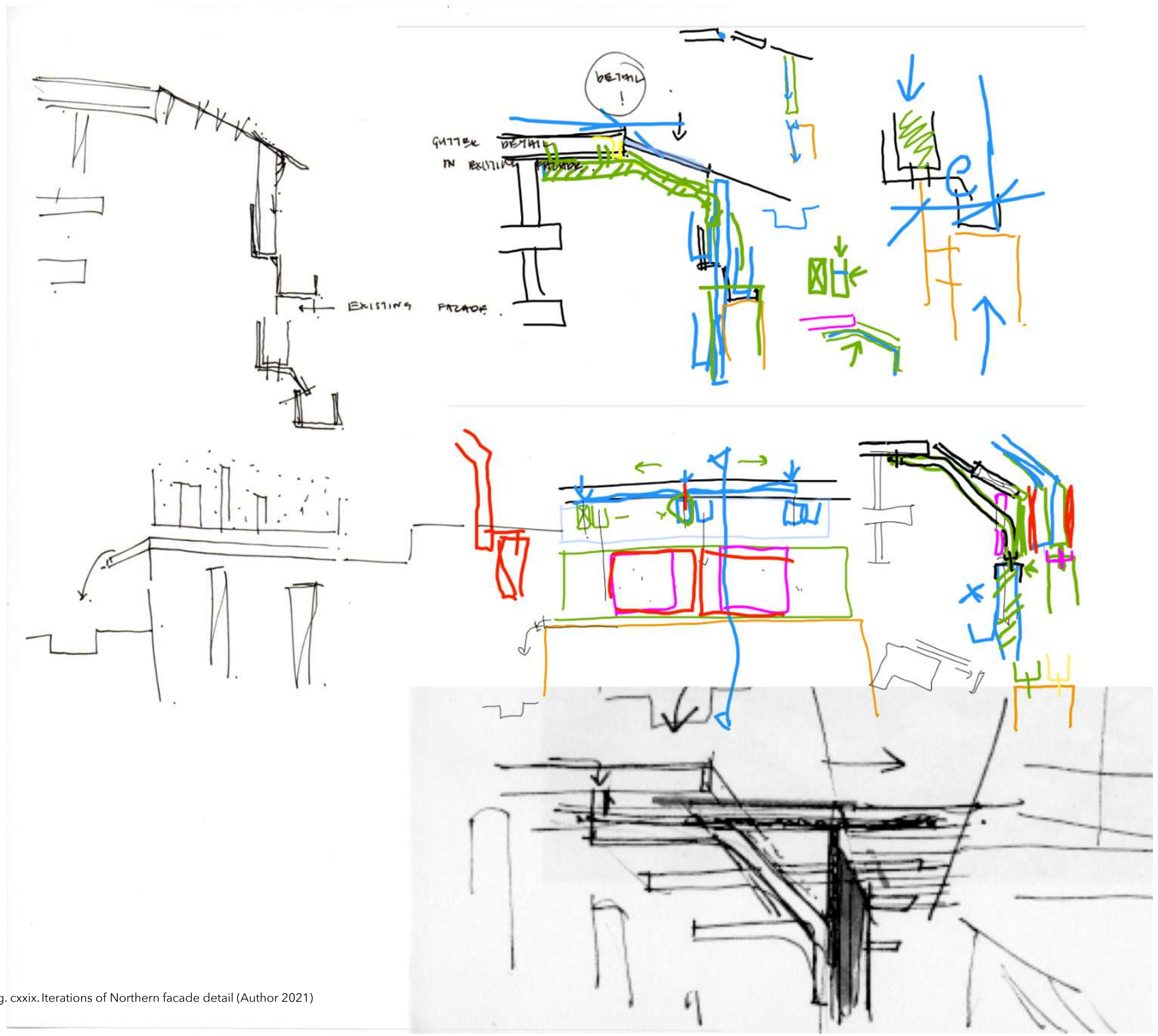


Fig. cxxix. Iterations of Northern facade detail (Author 2021)

8.6.4. Northern facade Detail

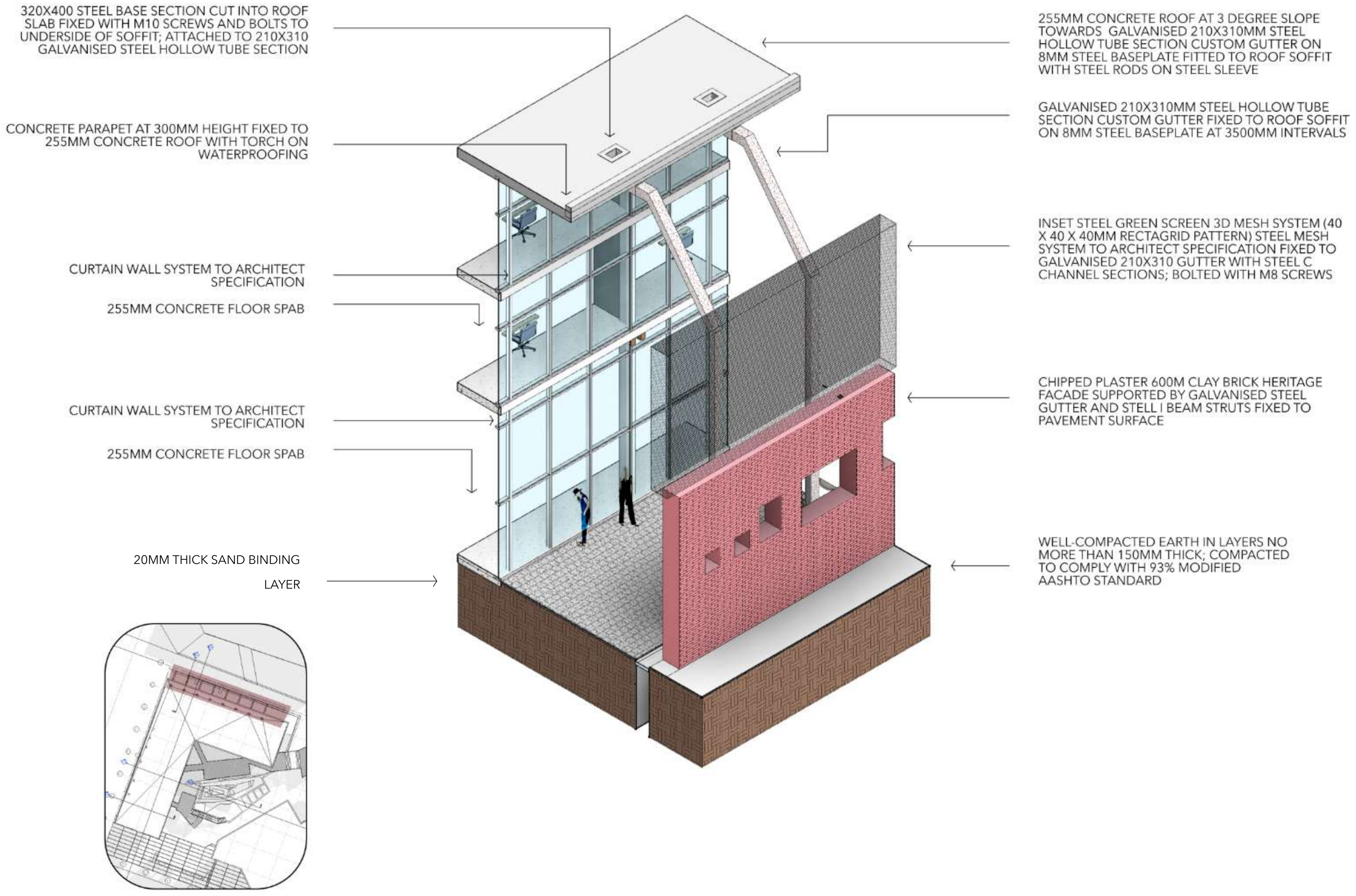


Fig. cxxx. Northern facade 3D detail (Author 2021)

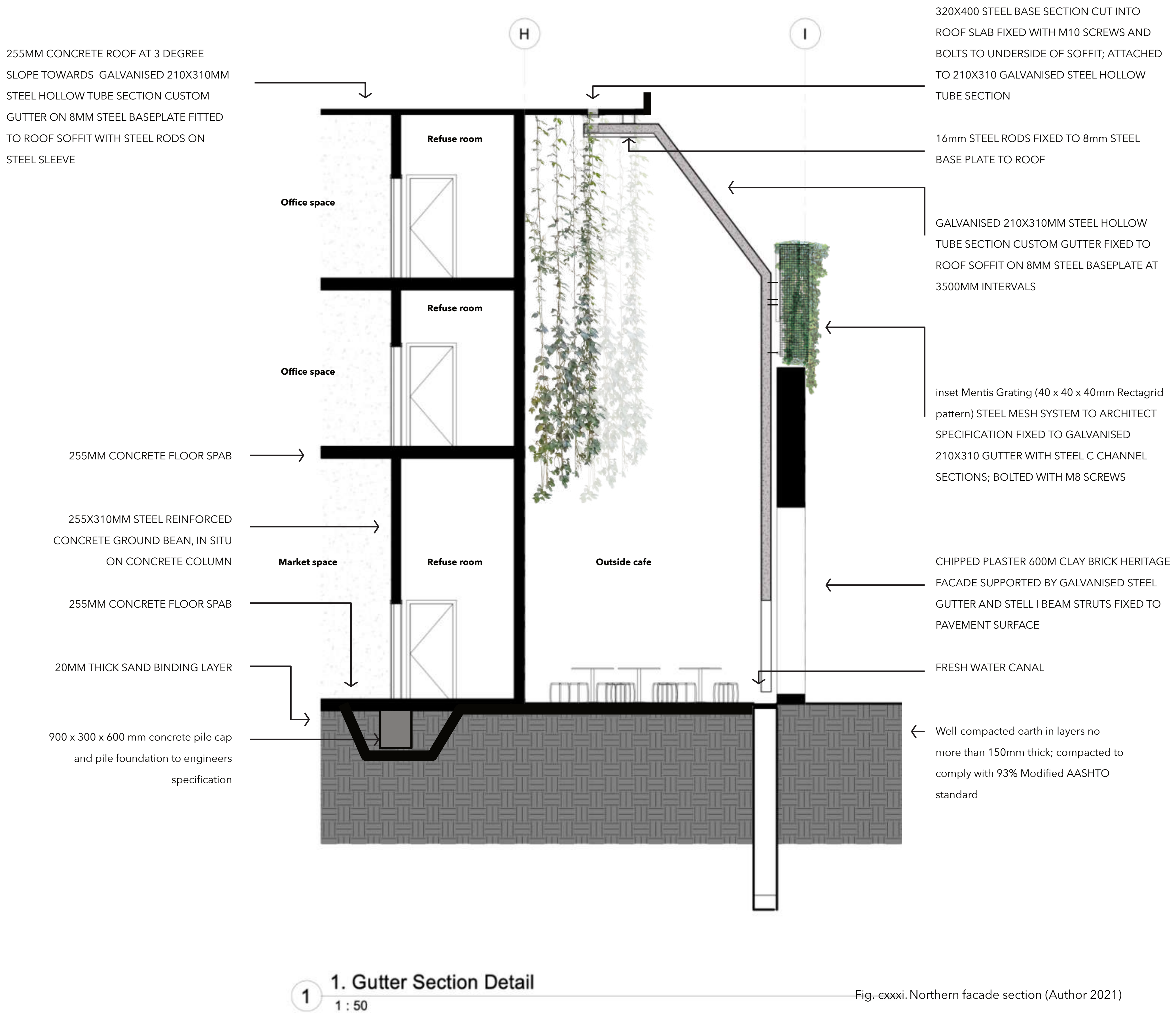
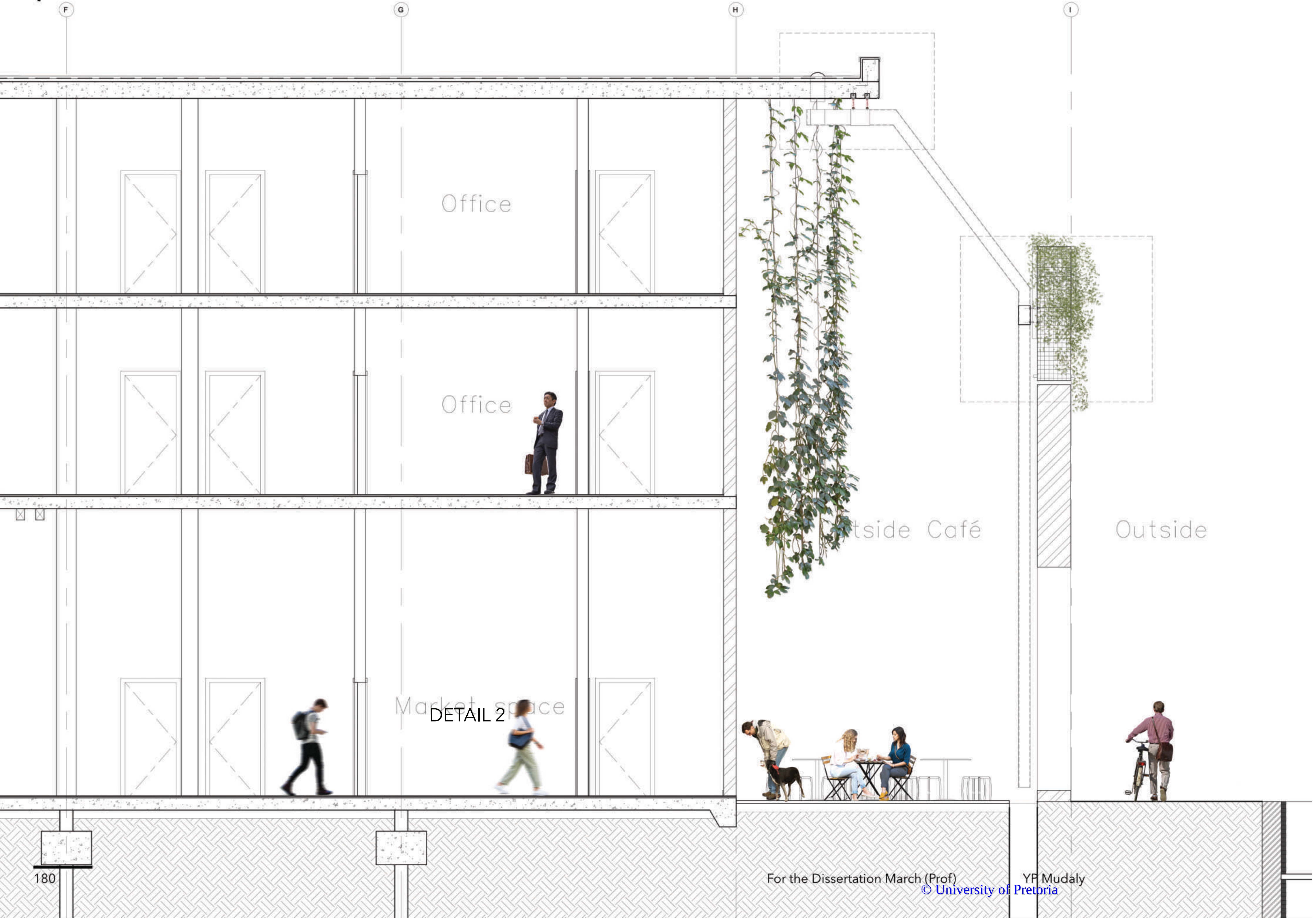
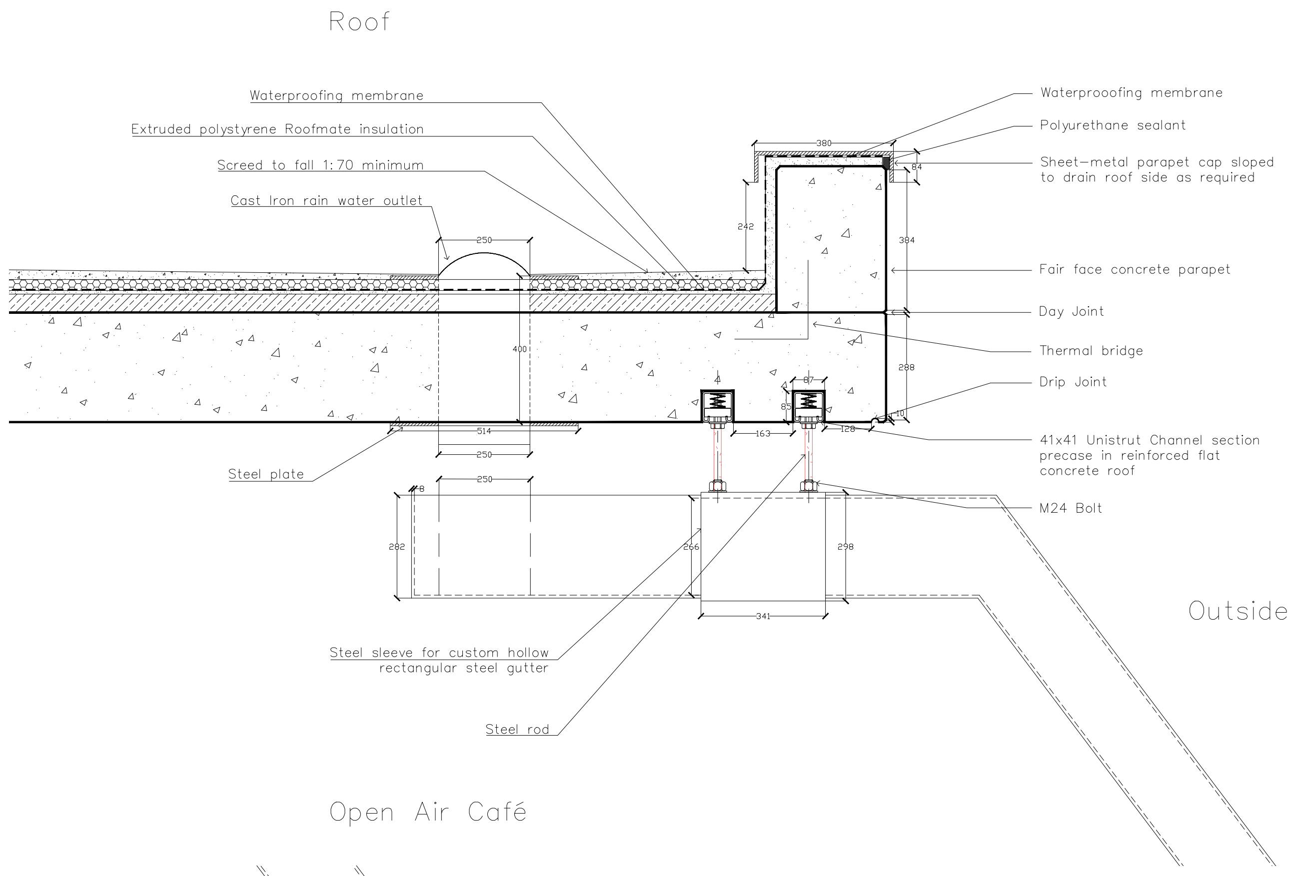


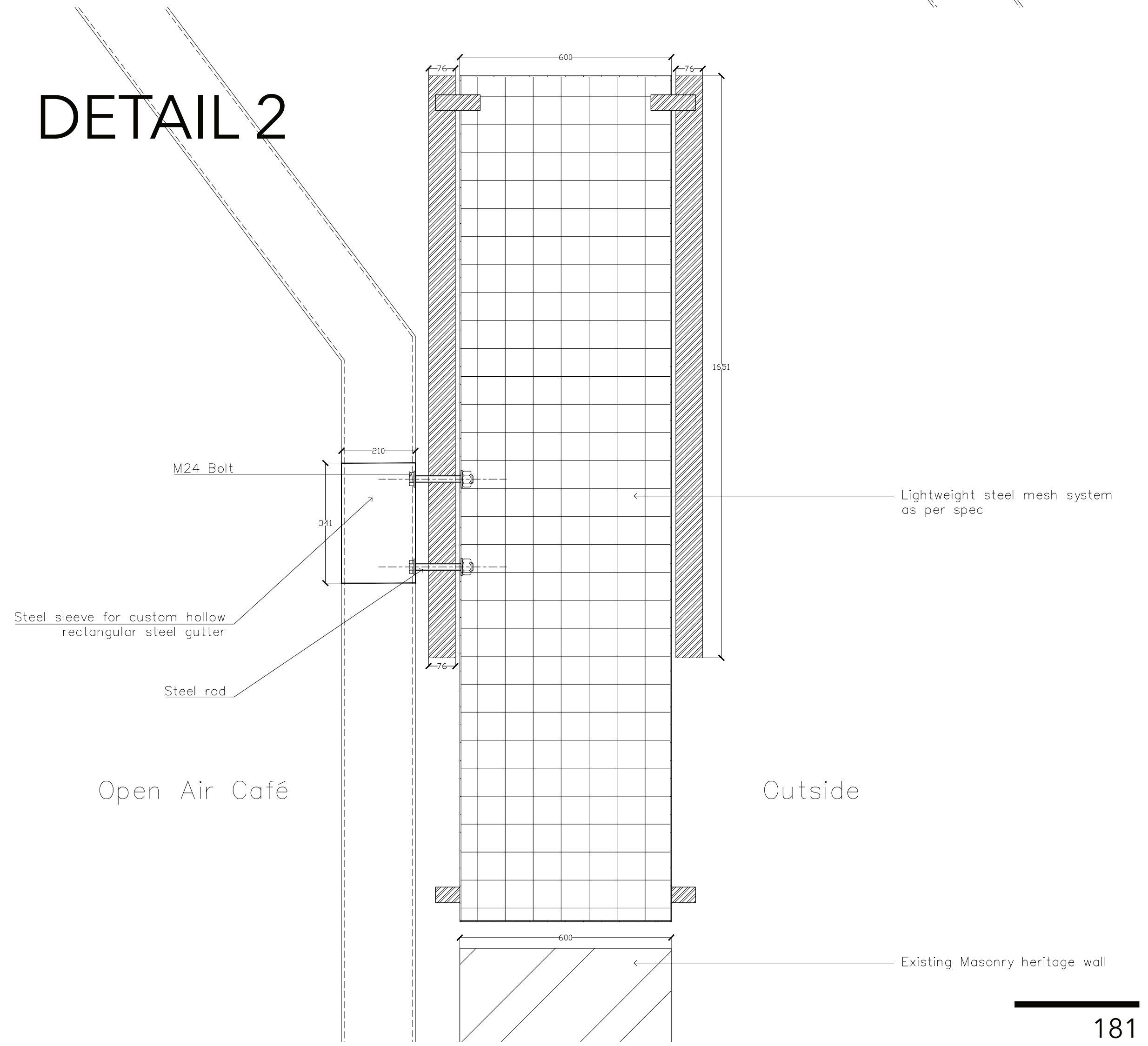
Fig. cxxxi. Northern facade section (Author 2021)



DETAIL 1



DETAIL 2



Technical Exploration

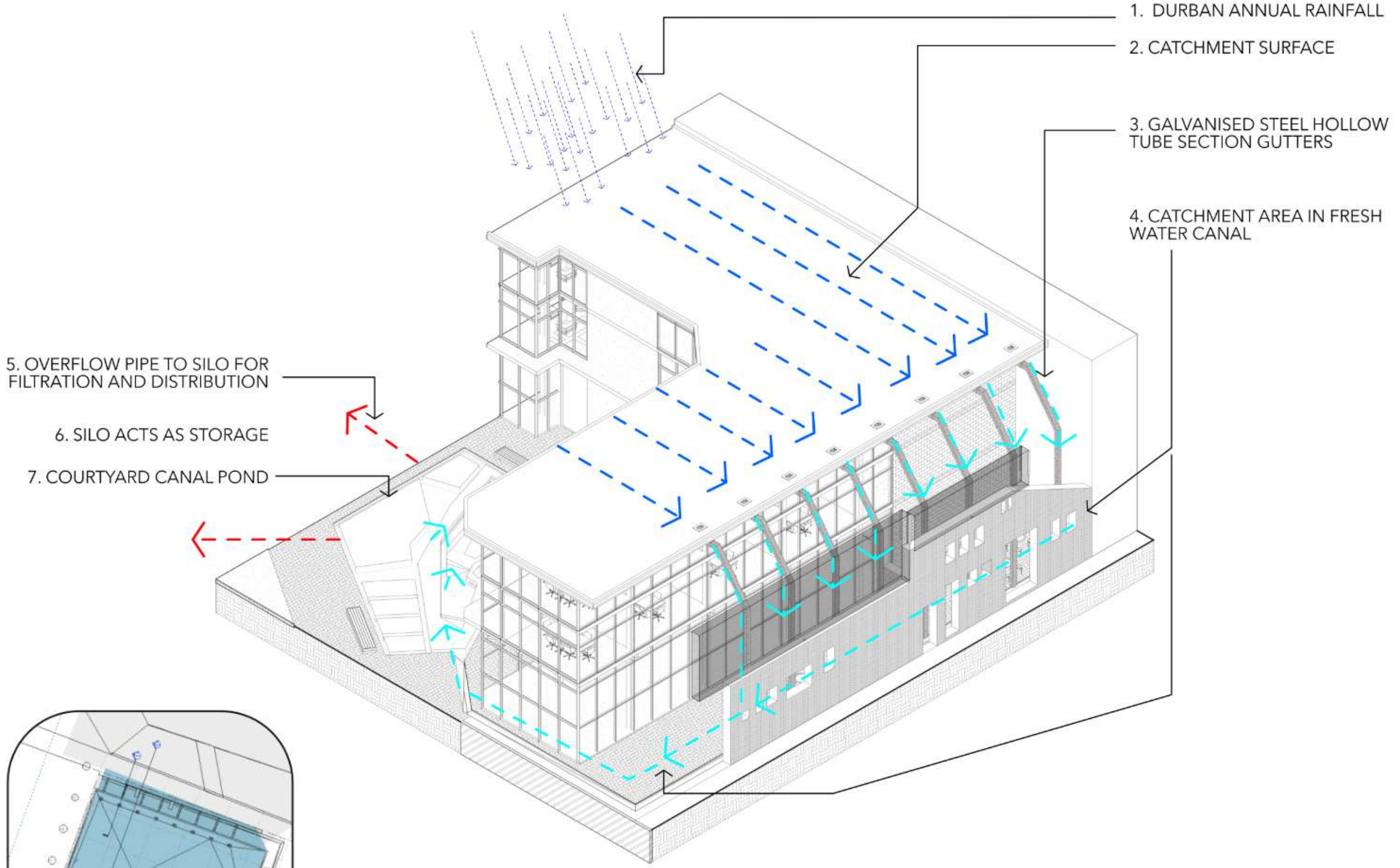
8.7. Rainwater harvesting

Water is most definitely the most important element in the design to connect the visitors to the genesis and emphasis of the port-city/ seaport identity with a defined water edge. It plays a key role in illustrating that new International style of port urban infrastructure and contributes to the projects production in development around the canal edge. In order to create a impactful design within the courtyard a fresh water canal that was designed as seen in figure 29 in the canal detail shows how the gutter transports the rain water into the canal for treatment which uses bio filters to purify the rainwater and the canal itself acts as evaporative cooling which is most suitable for the Durban climate.

The water yield would be from the roof, the courtyard and the canal system itself as seen in the figure 32 where the collection of runoff is caught to save cost and align with the sustainability factor of the project. Grey water provides an alternative catchment which will be recycled in the silo as a mechanistic system.

Fig. cxxxii. Rainwater harvesting area diagrams (Author 2021)

8.7.1. Rainwater harvesting diagram Northern facade



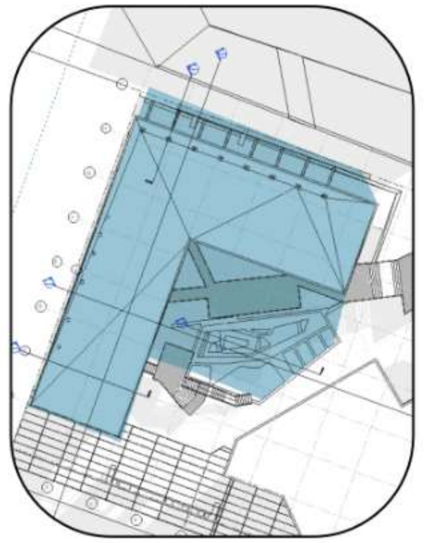


Fig. cxxxiii. Rainwater harvesting 3D diagram shared office and market space to steel hollow section (Author 2021)

8.7.2. Rainwater harvesting schematic

The newly designed Point Waterfront addition considers water as a natural system where seasonal precipitation was considered in the design as well as construction phase. eThekweni and the grander Durban area is a summer rainfall region which works well with the recreational water system in the precinct.

Water has been inclusive as a design intent, due to the incapacity for the Port of Durban to incorporate a known water edge to the city waterfront. The articulation of the architecture aims to capture water to irrigate and replenish the system whilst providing a visible water edge within the courtyard whilst being optimal enough to produce sufficient water demand levels annually.

The roof structure [**A**] was designed specifically atop the shared office and market space with precision cut custom rectangular steel hollow sections [**B**] with custom rectangular steel hollow sections as the gutter forming both structure and facilitating the procurement of water flow towards the fresh water canal [**C**] in the courtyard. It is naturally treated in a selected silo [**E**] as it runs off from the courtyard [**D**] to feed the entire system and the precinct area.

After filtration the water is suitable for human consumption and is used in the market space, beer manufacturing facility as well as irrigation for vegetation in and around the site.

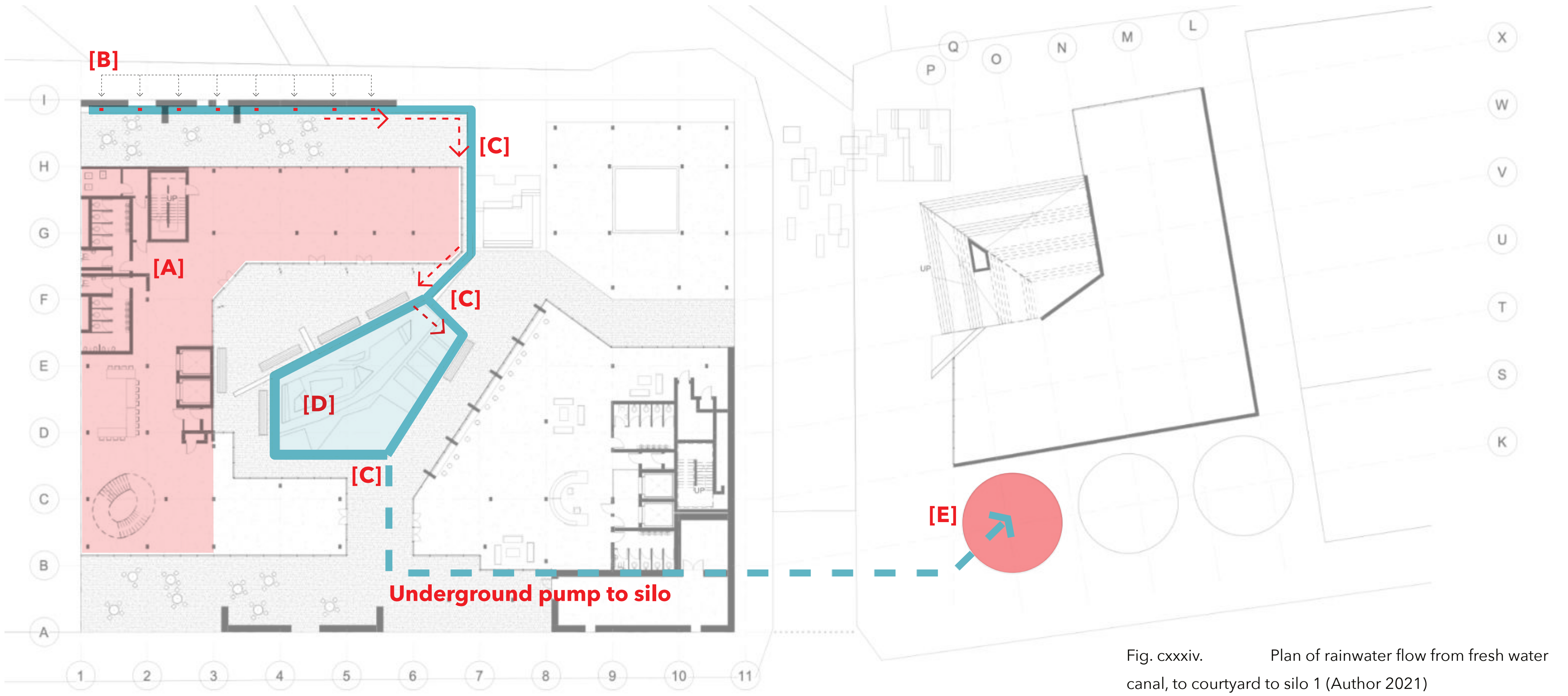


Fig. cxxxiv. Plan of rainwater flow from fresh water canal, to courtyard to silo 1 (Author 2021)

Total water yield

Month	Average Rainfall (m)	Catchment Area (m²)	Catchment yield coefficient	Alternative Water Source (m3)	Total Water Yield (m3)
January	0,134	2028,9	1,1	12,0	311,06
February	0,113	2028,9	1,1	12,0	264,19
March	0,126	2028,9	1,1	12,0	293,21
April	0,073	2028,9	1,1	12,0	174,92
May	0,059	2028,9	1,1	12,0	143,68
June	0,028	2028,9	1,1	12,0	74,49
July	0,039	2028,9	1,1	12,0	99,04
August	0,062	2028,9	1,1	12,0	150,37
September	0,073	2028,9	1,1	12,0	174,92
October	0,009	2028,9	1,1	12,0	32,09
November	0,01	2028,9	1,1	12,0	34,32
December	0,102	2028,9	1,1	12,0	239,64
	0,828	24346,80	13,20	144,00	1991,92

Fig. cxxxv. Water yield and demand calculations. (Anon. , Municipality 2003, Climatemps 2017)

Demand Per Person

Month	Persons	Demand (Drinking & hand-washing / person / day) (m3)	Total Demand
January	400	0,003	37,2
February	400	0,003	33,6
March	300	0,003	27,9
April	300	0,003	27
May	300	0,003	27,9
June	300	0,003	27
July	300	0,003	27,9
August	300	0,003	27,9
September	300	0,003	27
October	400	0,003	37,2
November	400	0,003	36
December	450	0,003	41,85
			378,45

Water Evaporation Demand

Month	Monthly Evaporation Rate	Open fresh water area	Evaporated water
January	0,15	150	22,5
February	0,15	150	22,5
March	0,15	150	22,5
April	0,15	150	22,5
May	0,15	150	22,5
June	0,15	150	22,5
July	0,15	150	22,5
August	0,15	150	22,5
September	0,15	150	22,5
October	0,15	150	22,5
November	0,15	150	22,5
December	0,15	150	22,5
			270,00

Total Demand

Month	Total Demand Per Month
January	59,7
February	56,1
March	50,4
April	49,5
May	50,4
June	49,5
July	50,4
August	50,4
September	49,5
October	59,7
November	58,5
December	64,35
	648,45

Monthly Balance for irrigation and other services

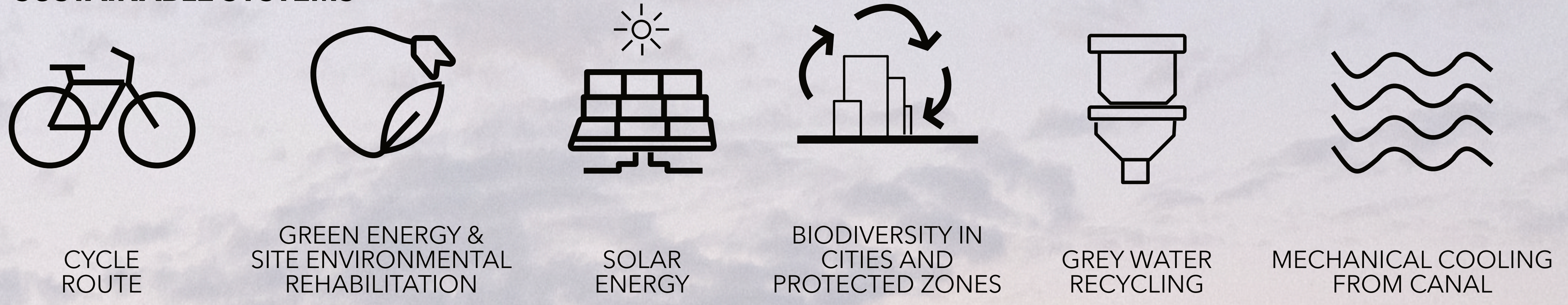
Month	Total Yield	Demand	Balance
January	311,06	59,7	251,35986
February	264,19	56,1	208,09227
March	293,21	50,4	242,80554
April	174,92	49,5	125,42067
May	143,68	50,4	93,27561
June	74,49	49,5	24,99012
July	99,04	50,4	48,63981
August	150,37	50,4	99,97098
September	174,92	49,5	125,42067
October	32,09	59,7	-27,61389
November	34,32	58,5	-24,1821
December	239,64	64,35	175,29258
			1343,472

These two months will require equivalent balance from previous months to deal with surplus demand

8.8. Ventilation Strategy

The Precinct follows a strong tolerance of wind axis from the North Eastern quadrant of the site where the prevailing wind approaches from sea, therefore the precinct and urban quarter acknowledges wind as a natural daily system where air movement was considered. It is ventilated naturally in the central courtyard which forms a wind retainer in the space and is able to harvest this natural energy to cool the facades of the space in a humid tropical climate. The surface envelope made primarily of glazing, the roof and walls allow for quick thermal heat conductivity and a balance to cool or heat where needed was considered.

SUSTAINABLE SYSTEMS

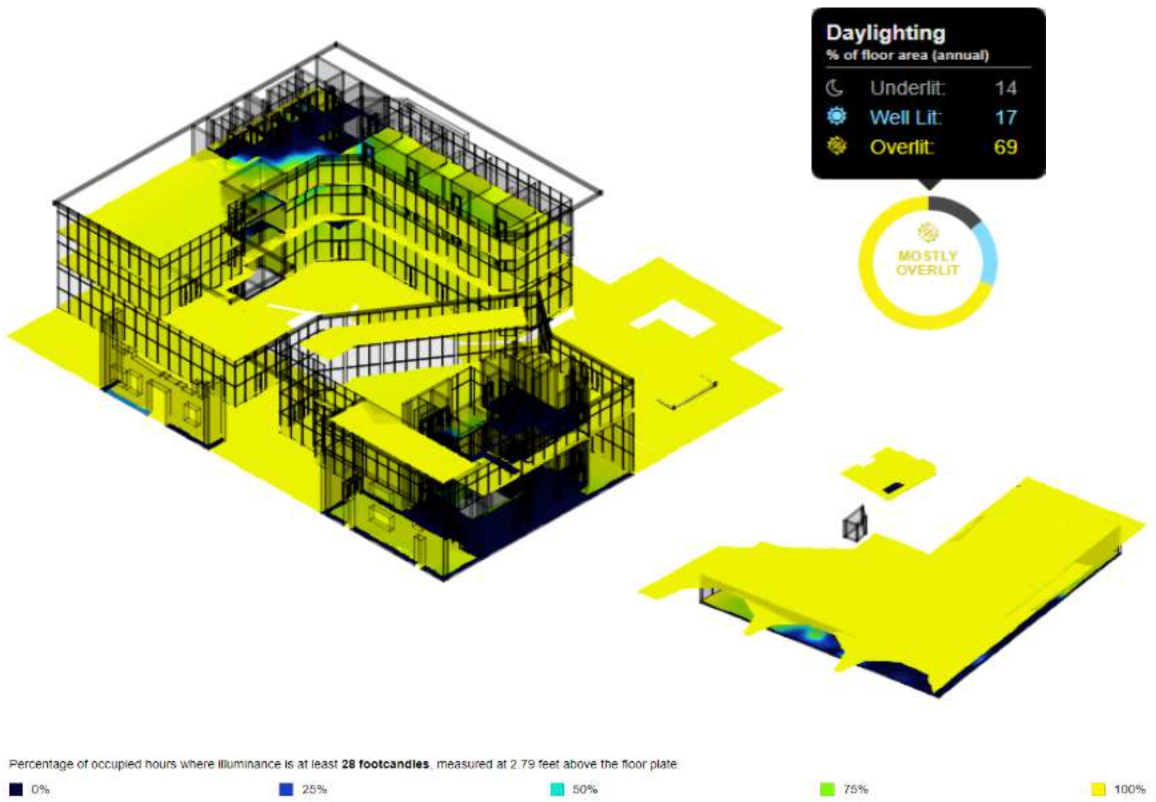


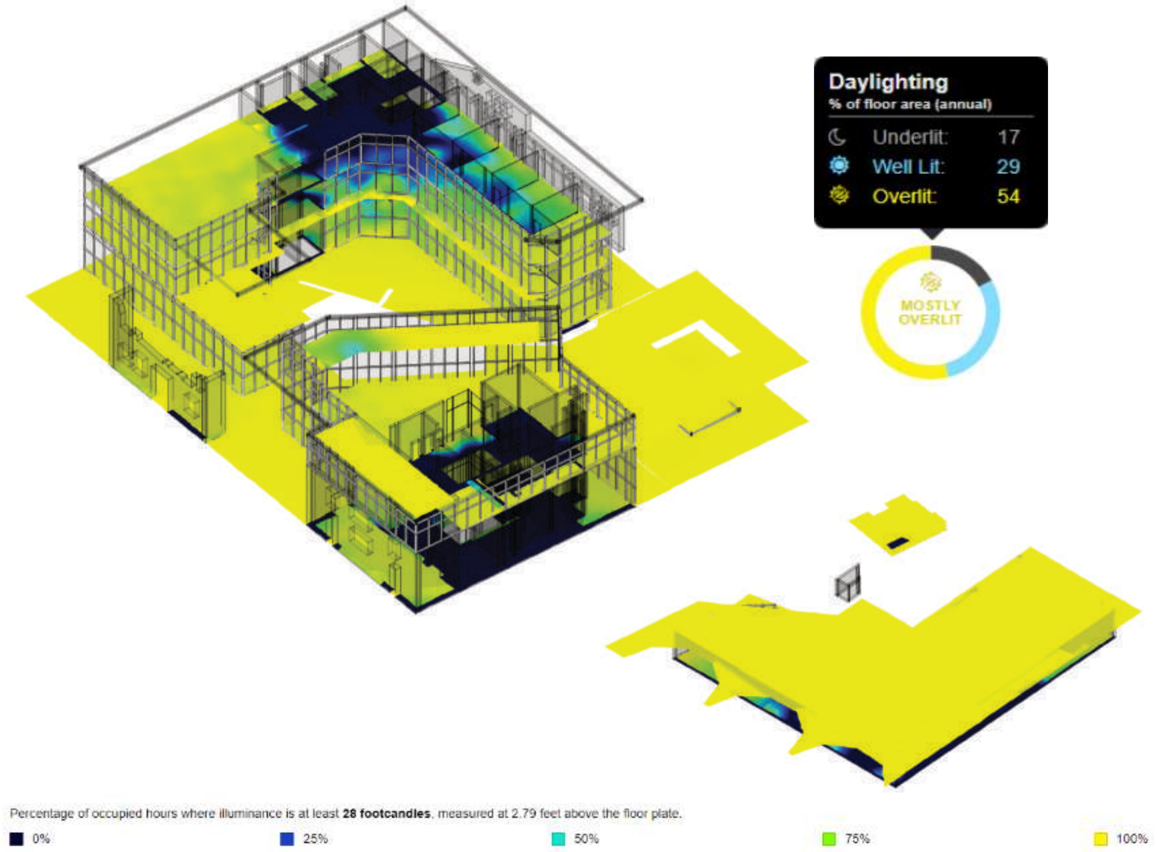
Technical Exploration

8.9. Lighting Strategy

Light is considered in the system where the use of natural daylight and artificial lighting cycles were considered and orchestrated on site. The tolerance of total glazing on all facades with horizontal louvres on the main TNPA secure office block harmful ultra-violent light which also allowing sufficient natural lighting inside. The module is constructed in such a way where the building heights do not interfere with the courtyard lighting through certain times in the day and lighting is therefore provided. Given the programme is largely commercialised and indoors, natural lighting would not be enough therefore artificial lighting supplies were considered according to space depth and electrical use tolerance.

8.10. Sefaira



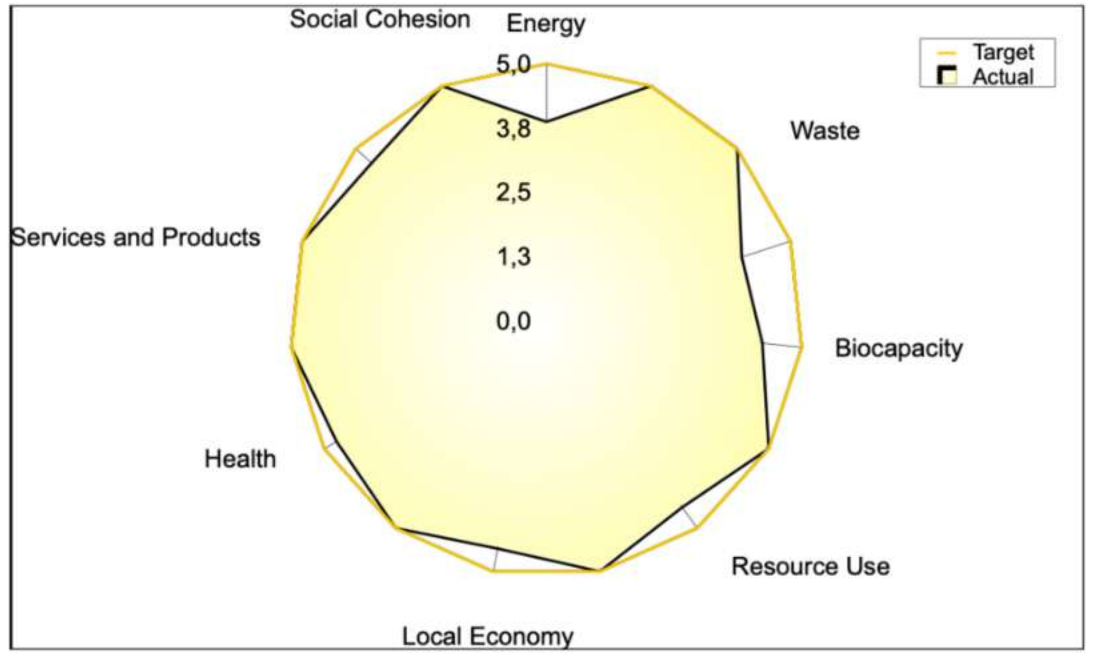


8.11. SBAT Report

Achieved
4,7

SB1	**Project**	
	Point Precinct	
SB2	**Address**	
	30 Mahatma Gandhi Road, Point Waterfront, Durban, 4001	
SB3	**SBAT Graph**	

	Actual	Target
Energy	3,9	5,0
Water	5,0	5,0
Waste	5,0	5,0
Materials	4,0	5,0
Biocapacity	4,2	5,0
Transport	5,0	5,0
Resource Use	4,5	5,0
Management	5,0	5,0
Local Economy	4,5	5,0
Access	5,0	5,0
Health	4,7	5,0
Education	5,0	5,0
Services and Products	5,0	5,0
Inclusion	4,6	5,0
Social Cohesion	5,0	5,0



SB4	Environmental, Social and Economic Performance	Score
	Environmental	4,4
	Economic	4,8
	Social	4,9
	SBAT Rating	4,7

SB5	EF and HDI Factors	Score
	EF Factor	4,5
	HDI Factor	4,7

SB6	Targets	Percentage
	Environmental	88
	Economic	96
	Social	97